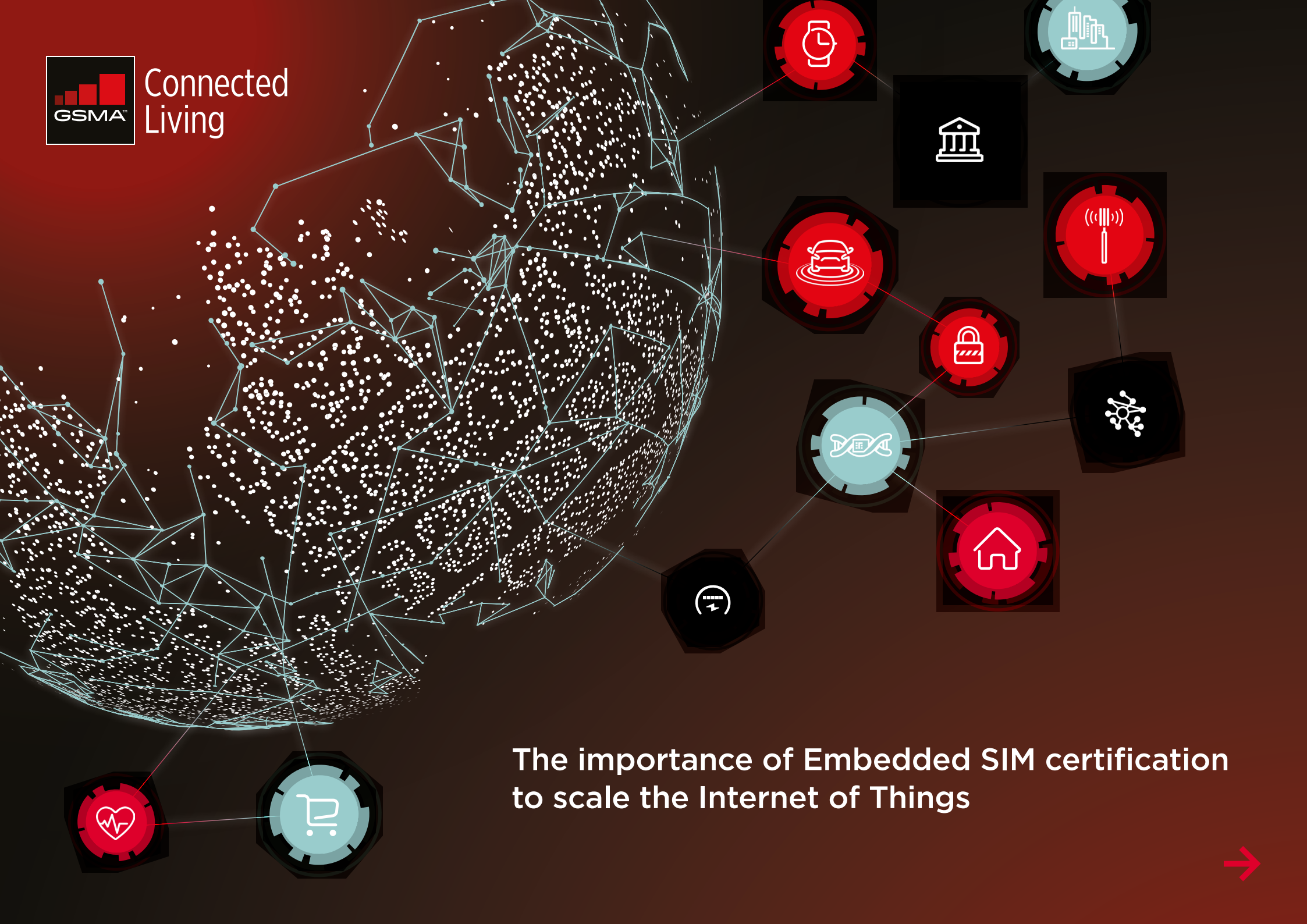




Connected Living



The importance of Embedded SIM certification to scale the Internet of Things





## About the GSMA

**The GSMA represents** the interests of mobile operators worldwide, uniting nearly 800 operators with almost 300 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces industry-leading events such as Mobile World Congress, Mobile World Congress Shanghai, Mobile World Congress Americas and the Mobile 360 Series of conferences.

For more information, please visit the GSMA corporate website at [www.gsma.com](http://www.gsma.com).

Follow the GSMA on Twitter: @GSMA.

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# Embedded SIM and the Internet of Things

**The Subscriber Identity Module** – better known as the SIM – has been a vital part of our mobile experience for around a quarter of a century. The SIM controls authentication, identity and security on a chosen mobile network, effectively operating as trusted ‘gate keeper’ and enabling us to securely access the network and use our mobile devices. The SIM has changed form factor several times, getting smaller with each iteration, before reaching the eUICC form factor to be used in our new Internet of Things (IoT) and machine to machine communications (M2M) world.



## THE UICC AND THE EUICC

### What is a UICC (Universal Integrated Circuit Card)?

It is the physically secure computing device that conforms to the specifications written by the ETSI Smart Card Platform project – a SIM is one example of a UICC.

### What is a eUICC?

This is an Embedded UICC, one capable of supporting the GSMA Embedded SIM Specification, which is not easily removable from the radio module.



2FF - Mini Sim  
25mm x 15 x 0.76mm



3FF - Micro Sim  
15mm x 12 x 0.76mm



4FF - Nano Sim  
12.3mm x 8.8 x 0.67mm



MFF2 - M2M Form Factor  
5.0mm x 6.0mm



**Embedded SIM** represents a shift from the traditional physical, removable SIM to the SIM being part of the device. When changing mobile networks we have typically had to open up mobile devices and physically swap out the SIM card. IoT devices are commonly deployed remotely, so their SIM cards are not accessible – which is where Embedded SIM comes in. Embedded SIM enables digital swapping of SIMs, bringing greater flexibility, convenience and choice to how we connect devices to the global network.

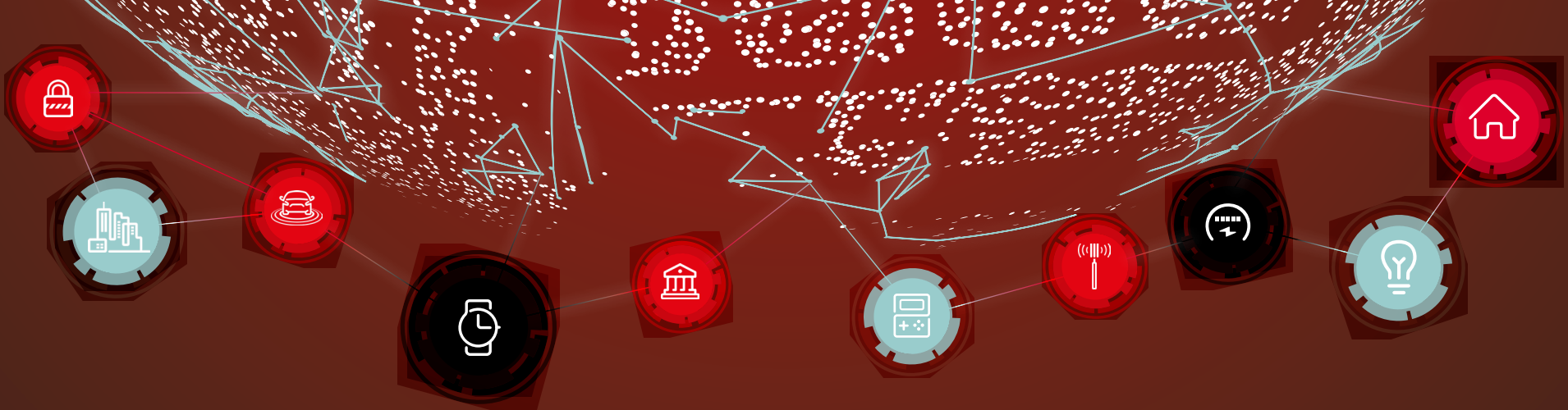


**Embedded SIM in IoT** means that manufacturers of connected devices like connected cars, smart meters, eHealth devices and more deliver devices with a SIM already embedded and ready to

be registered on the network. This enables simple and seamless mobile connections for all kinds of devices in IoT. New value offerings and business models can be developed in IoT, for example in the insurance industry – providers can leverage the connected car model to create more flexible and affordable insurance policies for safer younger drivers.

The GSMA has worked with industry stakeholders to develop a set of specifications for global Embedded SIM technology that provides a mechanism for remote provisioning and management of IoT and M2M connections. The GSMA Embedded SIM specification enables “over the air” provisioning of initial operator subscriptions and the ability to change subscriptions from one operator to another.





# M2M and IoT: a whole new world for the SIM

**The adoption of the Embedded SIM specification** by the world’s leading mobile operators will bring consumers and manufacturers greater choice and flexibility in how they connect devices and machines. This will have a significant impact on IoT, as everything from smart meters to autonomous cars connect to the Internet. To address these challenges the GSMA Embedded SIM specification provides a mechanism for remote provisioning and management of machine to machine (M2M) connections – and enables a simple, seamless mobile connection for different types of connected machines.



**Another key difference** for the industry is that it will change the way connected

device manufacturers interact with suppliers and can even impact the way they source SIMs. Manufacturers of connected devices also have the option of sourcing Embedded SIMs directly as well as the tried and trusted method of sourcing from MNOs.

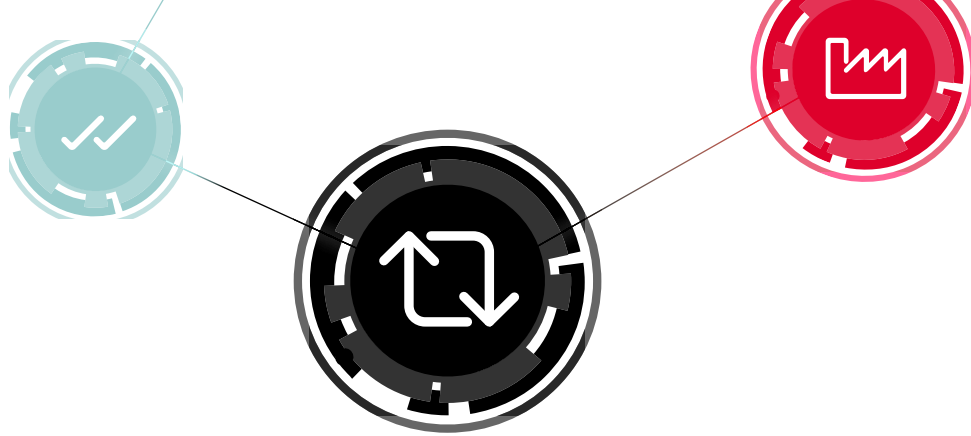
The remote provisioning capability combined with the non-removable form factor enables connected devices with long life cycles to be equipped during production, operate reliably in difficult environmental conditions and be managed easily, in market, over periods of years. This lets device manufacturers invest confidently in connected products safe in the knowledge that they can be remotely upgraded without product recall to dealers or the factory.



**Ultimately, the growth** of IoT and Embedded SIM presents an opportunity for operators to introduce

new commercial solutions based on an interoperable and unified global standard that enables scalable, reliable and secure connectivity. While the interoperability of the Embedded SIM also means reduced fragmentation and the chance to take advantage of the IoT market’s potential - estimated to be valued at as much as US\$1.3 trillion by 2025 (source Machina Research 2016).

**IOT MARKET VALUE**  
ESTIMATED AT **US\$1.3 trillion**  
BY **2025**



## The evolution of the SIM lifecycle

**Recent research has estimated** that immediate industry-wide adoption and deployment of the GSMA Embedded SIM Specification will deliver 34 per cent higher market growth by 2020 (source: Beecham Research). The lifecycle of the SIM has changed and operators and manufacturers can leverage Embedded SIM and RSP to their advantage.

**34%** HIGHER MARKET GROWTH BY 2020

## Ensuring confidence and trust in the new Embedded SIM ecosystem

**The Embedded SIM** secures access to the mobile network and is there to ensure that the end-user and device are who and what they say that they are, that they can be trusted to act as intended on the network and, equally, that the network can trust them. Certification is there to ensure peace of mind for Embedded SIM users and customers.

### GSMA Embedded SIM - Compliance



----- INCREASING CONFIDENCE ----->



**Traditional SIMs** have been very successful because they have been proven to be secure and they behave in a predictable fashion. It can be expected, with

a high degree of confidence, that if you replace the SIM card in your mobile handset, it will connect to a new network. This "interoperability" is necessary to ensure broad adoption of the technology.

### Why is test and certification important?



The **GSMA Embedded SIM specification** describes what is intended to be a robust, secure, scalable and interoperable solution. But these promises can only be delivered if every technology provider interprets and implements the specification in a compliant manner. Compliance is assured with a multi-layered approach. Embedded SIM manufacturers and subscription managers are required to submit their products to a series of tests to achieve various certifications to prove compliance.



**The testing methodology for eUICC** focuses on functional behaviour and the interfaces with backend servers such as the Operator SM-DP (Subscription Manager Data Preparation) and SM-SR (Subscription Manager Secure Routing). Qualified tools are used to check the compliance of eUICCs with the GSMA specifications. The testing methodology is designed to ensure that the eUICC works properly and is interoperable.



**The manufacturing premises** of the SIM vendor is security audited. eUICCs cannot

join the trusted ecosystem unless the factory has been certified as secure following a comprehensive audit of the site. A similar scheme is in place to ensure that the site of operation of the subscription management servers is similarly secure. The standard that applies is similar to the scheme used by manufacturers of bank cards and national identity cards.

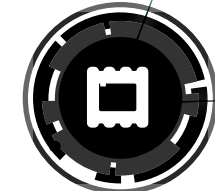


**The software and data** installed on the eUICC is tested to ensure that it is hack-proof. This “penetration testing” is done at specialised security laboratories and products that succeed are certified by national security agencies such as BSI.bund.de.

The eUICCs must behave in a predictable way in response to inputs. This common functional behaviour is very important because eUICCs can have a long life in the field and ownership can change many times. A brake pedal should stop a vehicle and an accelerator should make it go. In the world of eUICC instructions to download, enable, disable and delete must work as predicted, otherwise eUICC will not be easily adopted and scale will not be achieved.



**The testing process** itself is carried out by Test Houses and laboratories that have received prior accreditation and approval from GlobalPlatform. These approved Test Houses carry out a range of key functions, including testing the provisioning of single and multiple subscriptions, provisioning a new device’s first subscription, making new added subscriptions or changes to existing ones, transferring subscriptions and of course cancelling them.



### The changing landscape



The **GSMA Embedded SIM specification** defines various roles in the service delivery chain. Traditionally, MNOs purchased SIMs. In the new landscape, device manufacturers may choose to purchase eUICC directly from SIM vendors. It will then be necessary for the manufacturer to “over the air provision” the eUICC to activate it on a network. This function is performed by the subscription management platforms. This flexibility of roles highlights the importance of certification, because entities might be acting in roles that they have not performed traditionally.

These features of the GSMA Embedded SIM specification - the eUICC, the remote management and the flexibility of roles has a profound impact on the overall life cycle a “new SIM” fit for a “new purpose”. This is illustrated in the figure below;

From today’s linear model...



To outcome-based model with repeat provisioning



# What is being certified, why and by whom?

**The GSMA Embedded SIM specification** has a corresponding test specification. This document defines the test conditions which must be in place to validate compliant behaviour. The test specification is interpreted by test tools which are certified by GlobalPlatform. eUICC manufacturers can submit their products to test labs that use GlobalPlatform qualified test tools. If the product passes the tests, it will be certified by GlobalPlatform.

➔ **Embedded SIM manufacturers** and **subscription managers** are required to submit their products to a series of tests to achieve various certifications to prove compliance.

The anti-hack credentials of an eUICC are certified in a similar fashion. The GSMA Embedded SIM specification has a corresponding “protection profile”, which is a common criteria where the “protection profile” is validated and approved by national security agencies such as BSI.Bund.de in Germany and equivalent agencies in other countries. Vendors submit their products to

specialised test laboratories that conduct penetration tests to try to “hack” the product. Products that prove to be impenetrable to the required standard (EAL4+) can be certified.

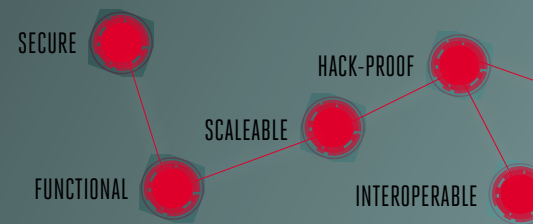


**The security** of (eUICC) manufacturing and (subscription management) operations is assured by

a GSMA managed scheme called “Security Accreditation Scheme”, with which sites are audited to a defined standard so that they demonstrate security best practices. If the site passes the audit, they can join the ecosystem as a trusted entity. Trust is demonstrated with PKI digital certificates.

## Ensuring quality, delivering confidence

A multi-layered quality assurance enables customers throughout the service delivery chain, to have confidence that their investments will return products that work as they are supposed to, can scale as desired and last as long as needed.



## COMPLIANCE





**For many years** the GSMA's Security Accreditation Scheme (SAS) has enabled all GSM operators to assess the physical security at supplier sites. The scheme is managed by the SAS group within GSMA, whose role it is to define the security standard which must be maintained at sites where eUICC product is manufactured and where subscription management systems are operated.

This is to help mobile operators to ensure that the highest level of security is in place to manage their subscriber credentials.

Suppliers request an official audit from the GSMA. Auditors visit the site to conduct a comprehensive site audit based on the applicable GSMA security standard (one for the eUICC production called SAS-UP and one for the subscription manager operations called SAS-SM). The audit report will be reviewed by the GSMA SAS Certification Body and if approved, an "Accredited Site" certificate is issued to the supplier.

## ACCREDITATION



For many years the GSMA's Security Accreditation Scheme (SAS) has enabled all GSM operators to assess supplier's security.

The supplier of the products requests an official audit from the GSMA accredited Auditors.

The auditor visits the site, conducts an official audit, then produces an Audit report for the GSMA SAS Certification Body.

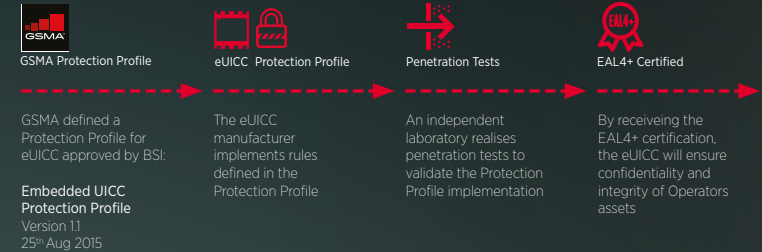
The audit report is sent to three GSMA SAS Certification body for review and approval.

If approved an 'Accredited Site' certificate is issued to the supplier.

Security Accreditation Scheme for UICC Production - Standard  
Version 7.0  
27<sup>th</sup> July 2016

GSMA SAS Standard for Subscription Manager Roles  
Version 2.0

## CERTIFICATION



THE **HIGHEST** LEVEL OF   
SECURITY TO MANAGE  
SUBSCRIBER CREDENTIALS



**eUICC products** are required to be tested to Evaluation Assurance Level 4+ standard. EAL

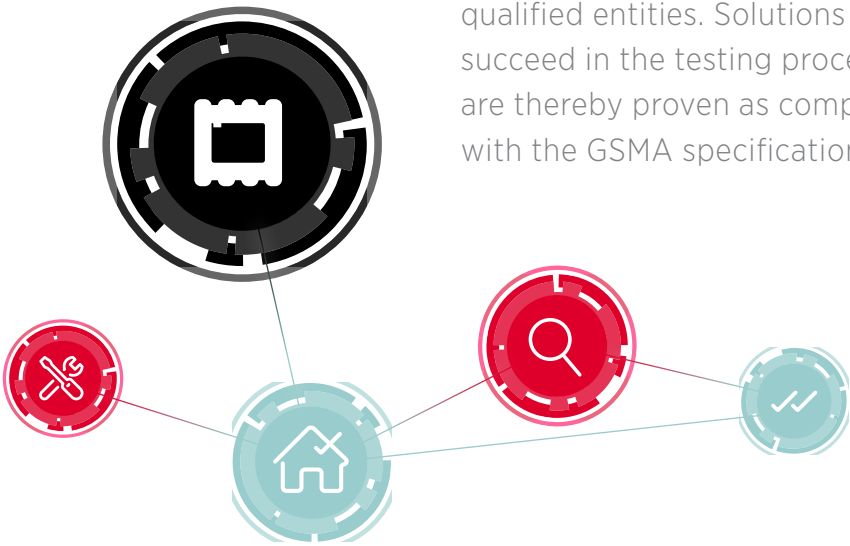
is an international Common Criteria security evaluation standard which is designed to give confidence that the designed security features are reliably implemented. The certification is linked with security mechanisms put in place in the eUICC to avoid hacking of the data store on the eUICC. This is specified by the GSMA in a protection profile describing what needs to be protected and how. Penetration testing is performed by laboratories that are recognised by national security agencies.





# How testing and certification takes place

**The testing process covers** the functional behaviour and the interfaces of the supplier solution. The GSMA test specification is implemented as a test suite by GlobalPlatform and this forms the basis of rigorous formal testing by qualified entities. Solutions that succeed in the testing process are thereby proven as compliant with the GSMA specification.



**In the test process itself,** eUICC manufacturers are responsible for ensuring that their eUICCs are certified in line with GlobalPlatform approved processes. They must also test to ensure compatibility with multiple network environments and for compliance with multiple MNO profiles over the device's lifespan.

## End-to-end testing



**It is important for service providers** to carry out end-to-end testing, to field-test the eUICC and the device that it is embedded in.

End-to-end testing helps to ensure that processes function as required and that there is complete interoperability between all parts. So that from the MNO to the end-user, the embedded SIM works as it should 'in the field' and the user experience will be satisfactory.

As the internet of things scales, interoperability becomes increasingly important. Users expect devices to be reliable, long lived and that changing network subscriptions need not involve the traditional switch-out process.

## The GlobalPlatform Processes



**GlobalPlatform Product Qualification** - products must perform a number of approved laboratory tests to achieve GlobalPlatform qualification.



**GlobalPlatform Laboratory Qualification** - laboratories must successfully meet criteria set by GlobalPlatform and use GlobalPlatform qualified test tools to achieve qualified status.



**GlobalPlatform Test Tool Qualification** - test tools must support GlobalPlatform's functional requirements and perform a test suite on a number of products during a GlobalPlatform TestFest.



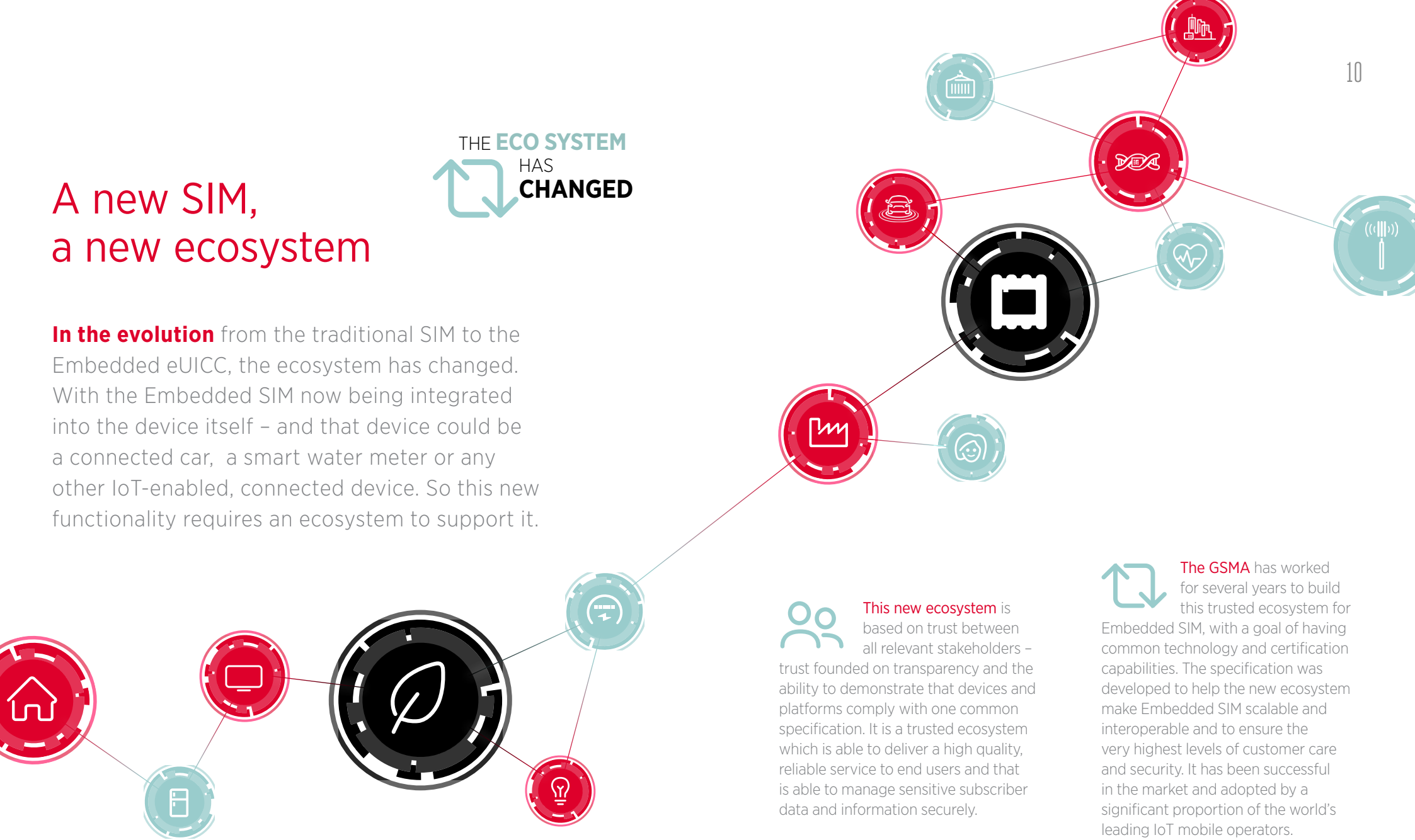
**Self-Testing Products** - vendors can self-test products by purchasing a GlobalPlatform qualified test tool.




# A new SIM, a new ecosystem

THE **ECO SYSTEM** HAS **CHANGED**

**In the evolution** from the traditional SIM to the Embedded eUICC, the ecosystem has changed. With the Embedded SIM now being integrated into the device itself - and that device could be a connected car, a smart water meter or any other IoT-enabled, connected device. So this new functionality requires an ecosystem to support it.

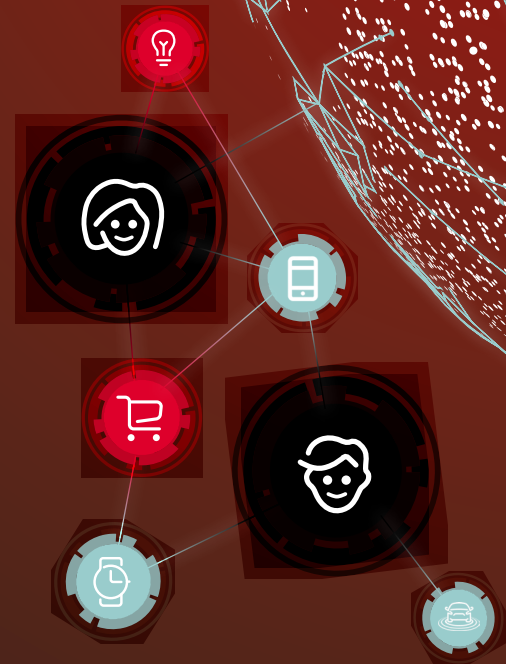


 **This new ecosystem** is based on trust between all relevant stakeholders - trust founded on transparency and the ability to demonstrate that devices and platforms comply with one common specification. It is a trusted ecosystem which is able to deliver a high quality, reliable service to end users and that is able to manage sensitive subscriber data and information securely.






 **The GSMA** has worked for several years to build this trusted ecosystem for Embedded SIM, with a goal of having common technology and certification capabilities. The specification was developed to help the new ecosystem make Embedded SIM scalable and interoperable and to ensure the very highest levels of customer care and security. It has been successful in the market and adopted by a significant proportion of the world's leading IoT mobile operators.

# What are the benefits of Embedded SIM certification?

**As a provider of connected devices** why should you care about test and certification of Embedded SIM? Because it enables your devices to reach market faster since they do not need to pass through proprietary test processes for every network.



## THE GSMA EMBEDDED SIM SPECIFICATION OFFERS THE INDUSTRY A RANGE OF BENEFITS:

-  Manufacturers can quickly and easily source compliant eUICC products
-  Profiles can be loaded and updated remotely and with no need for physical interaction with the M2M device - streamlining management of devices across different environments, use cases and markets
-  MNOs have the assurance that embedded products are compliant before profiles are loaded
-  MNOs also benefit from reduced costs for issuance and management of M2M SIM products and expanded market opportunities
-  End-users enjoy an enhanced customer experience since products will now work 'out of the box' and cost less to deploy



**The benefits to operators** are underpinned by the reassurance of test and certification of Embedded SIM, include an accelerated M2M market growth and new business opportunities. The de facto Embedded SIM standard for the industry prevents market fragmentation while impacting minimally on existing systems and network infrastructure. It brings added reliability, lower costs and continued security.



**From the customer perspective,** new business opportunities are enabled through more devices than ever being connected, including hard to reach devices which were previously uneconomical or impractical to connect. Cost savings, space savings, the ability to personalise products, plus an improved customer experience all add to the mix.



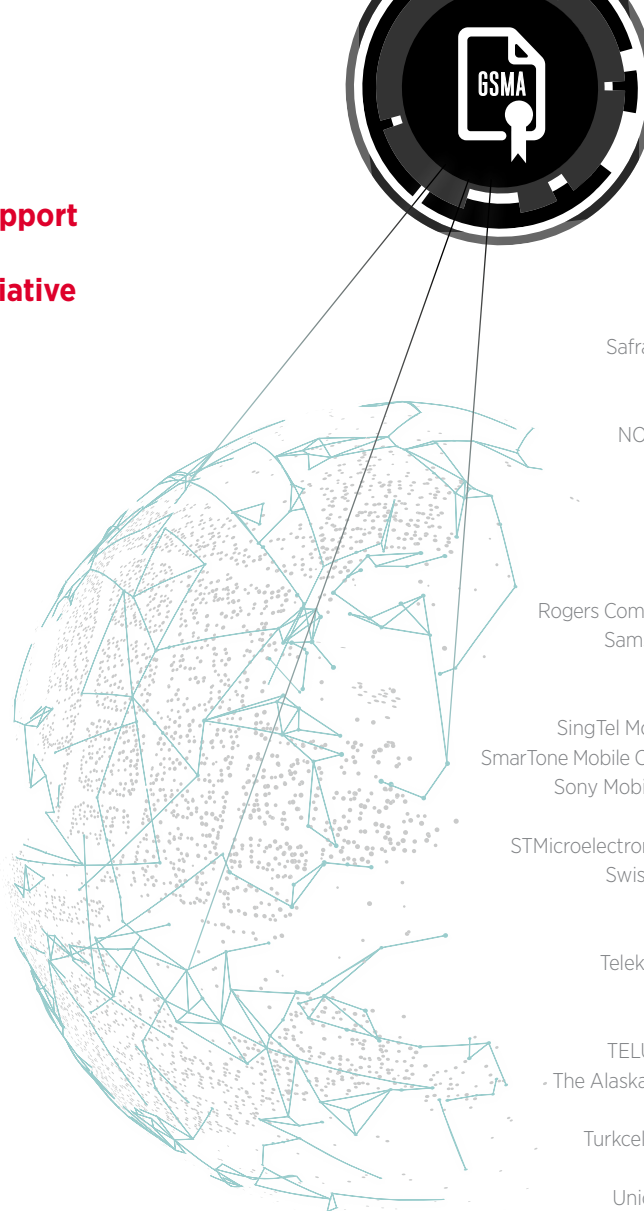
**Therefore mobile operators** and other stakeholders can achieve lower costs without the need to invest extensive time and money undertaking product certification on a piecemeal basis. The ecosystem members also enjoy the peace of mind of knowing they have in place a secure solution for over the air provisioning underpinned by the world's leading wireless industry representative body, the GSMA.

# Why the GSMA certification standard?

**The Embedded SIM Test Specification** is designed to help all industry and ecosystem stakeholders comply with the GSMA Technical Specifications. The GSMA has also extended its successful Security Accreditation Scheme (SAS) to cover remote SIM provisioning subscription management service providers to ensure the robust security and product integrity requirements are maintained.

## Major industry players support the GSMA remote SIM provisioning for M2M initiative

7layers GmbH  
Advanced Info Service PLC  
AT&T Mobility  
Bell Mobility Inc  
BlackBerry Limited  
Bouygues Télécom  
China Mobile Limited  
China Telecommunications Corporation  
China Unicom  
Cisco Systems Inc  
Cloud 9 Mobile Communications PLC  
Com4 AS  
COMPRION GmbH  
EE Limited  
Emirates Integrated  
Telecommunications Company PJSC  
epay Limited  
Ericsson  
Evolving Systems Limited  
FIME SAS  
Gemalto NV  
Giesecke & Devrient GmbH  
GigSky Mobile LLC  
GM  
Hewlett Packard Enterprise  
Huawei Technologies Co Ltd  
Hutchison 3G UK Limited  
Intel Corporation  
Jasper Technologies Inc  
JLR (Jaguar Land Rover)  
KDDI Corporation  
KORE Wireless Group Inc  
KPN B.V.  
LG Electronics Inc  
MediaTek Inc  
MEO - Serviços de Comunicações e Multimédia SA  
Mobileum, Inc



Safran Identity and Security  
NEC Corporation  
Nokia  
NOS - Comunicações, S.A.  
NTT Docomo, Inc  
O2 Czech Republic a.s.  
Oberthur Technologies  
Orange  
Renault  
Rogers Communications Canada Inc  
Samsung Electronics Co Ltd  
Scania  
Simulity Labs Ltd  
SingTel Mobile Singapore Pte. Ltd  
SmarTone Mobile Communications Limited  
Sony Mobile Communications Inc.  
Starhome Mach  
STMicroelectronics Srl - Incard Division  
Swisscom (Switzerland) Ltd  
Symantec Corporation  
Telefónica S.A.  
Telekom Deutschland GmbH  
Telenor Group  
Telia Company AB  
TELUS Communications Inc  
The Alaska Wireless Network, LLC  
T-Mobile USA, Inc  
Turkcell Iletisim Hizmetleri A.S.  
UL TS B.V.  
Union Telephone Company  
Valid Soluciones Tecnologicas S.A  
Verizon Wireless  
Vodafone GmbH  
Volvo  
WINS Limited  
ZTE Corporation

## To find out more about the GSMA Embedded SIM specification, please see:

<http://www.gsma.com/connectedliving/embedded-sim/compliance/universal-profile/>

**GlobalPlatform** is a non-profit, association which defines and develops specifications to facilitate the secure deployment and management of multiple applications on secure chip technology. Its standardised infrastructure empowers service providers to develop digital services once and deploy them across different devices and channels. GlobalPlatform's security and privacy parameters enable dynamic combinations of secure and non-secure services from multiple providers on the same device, providing a foundation for market convergence and innovative new cross-sector partnerships.

For more information on GlobalPlatform membership visit [www.globalplatform.org](http://www.globalplatform.org)

### SOURCES:

1. Beecham Research - 'GSMA Embedded SIM Specification will deliver 34 per cent higher market growth by 2020'
2. Machina Research - 'Forecasting the Internet of Things revenue opportunity'

