Connected Living

GSMA Embedded SIM Specification
Remote SIM Provisioning for M2M

A single, common and global specification to accelerate growth in M2M

Purpose of this Reference Messaging Pack

- Appropriate slides may be selected to be used for within different presentations for multiple audiences
- To provide consistent and accurate messaging for the GSMA Embedded SIM capability
- To be distributed widely for use by GSMA staff, Operators, Vendors and Industry partners
- To provide a central reference slide pack which will be kept up to date with appropriate changes as required

GSMA Embedded SIM – Essential benefits

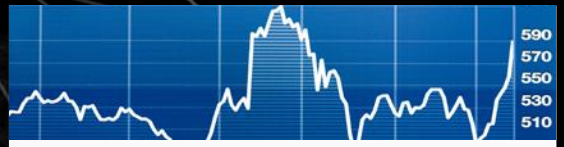
- Accelerating the market growth of Machine to Machine (M2M)
- Increasing operational efficiency for the M2M ecosystem
- Single Stock Keeping Unit at point of manufacture
  - Enables flexible global product distribution
  - Selection of operator subscription is performed on first switch on in destination country
  - Allows change of operator during the product lifecycle
- Enables new business models
- Preventing market fragmentation by avoiding different, incompatible technical solutions
- Driving economies of scale within the M2M industry

A single, common and global specification to accelerate growth in M2M

GSMA Embedded SIM - Description

The GSMA Embedded SIM Specification has been developed to promote a common global remote SIM provisioning architecture enabling a the new era of Machine to Machine technology.

Backed by the key industry players, including the world's largest mobile, SIM suppliers, this technical specification enables 'over the air' installation and management of operator SIM profiles in M2M devices.



The GSMA Embedded SIM Specification will accelerate the M2M market and increase opportunities for operators and M2M customers around the globe by reducing costs and improving flexibility and efficiency as it drives economies of scale.

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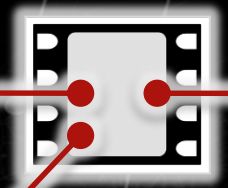
GSMA Embedded SIM at a glance

1

An ‘embedded’ SIM has the same functionality as a removable SIM, but in a different form factor – a chip, designed to be permanently soldered into an M2M device.



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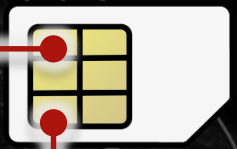
It has 8 electrical pins, which are exactly the same as the 8 gold contacts on a normal SIM.



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These SIMs have many benefits for the M2M industry: cheaper to produce, withstands vibration, and it’s small size lends itself well to the growing IoT market.

4

But there’s a problem:

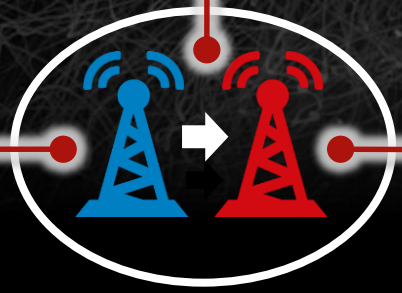
If you can’t easily change SIM, how can you change from one mobile operator to another?

5

The GSMA Embedded SIM Specification solves this by allowing new operator profiles to be downloaded when required.

This makes it possible to change from one operator to another at the end of contract.

All of this carried out securely Over The Air.



6

The GSMA Embedded SIM Specification also applies to removable M2M SIMs too.

There are millions of M2M devices already already deployed using removable SIMs - retrofitting them with GSMA Embedded SIMs allows them the same benefits going forward.

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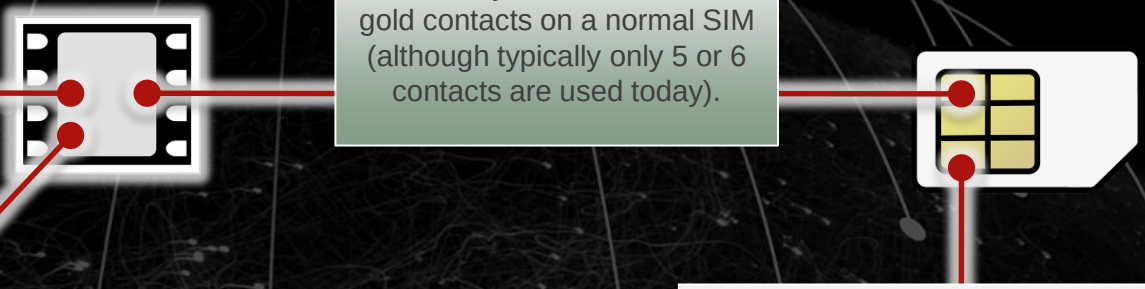
What is GSMA Embedded SIM and Remote SIM Provisioning?

An embedded SIM is exactly the same functionality as a normal SIM, but in a different form factor. It's actually a chip, designed to be permanently soldered into a machine of some kind.

It has 8 electrical pins, which are exactly the same as the 8 gold contacts on a normal SIM (although typically only 5 or 6 contacts are used today).



There are many benefits for the M2M industry using an embedded SIM – it's cheaper to produce, it can withstand vibration and shock, and it's small size lends itself well to the growing IoT market.

But there's a problem:

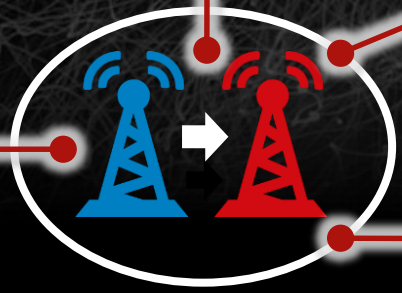
How do you change from one mobile operator to another if the Embedded SIM cannot be removed?

And it's not just restricted to embedded SIMs – GSMA Embedded SIM can by applied to normal M2M SIMs too.

Why? Because in the M2M environment, even if removable SIMs are used in devices (e.g. electricity meters) it is expensive to send engineers out to these devices in order to change the SIM.

This is where the GSMA Embedded SIM Specification comes in. The mobile subscription on the SIM rather than being fixed at time of manufacture is actually managed by a remote server!

This makes it possible to change from a **BLUE** MNO subscription to a **RED** MNO subscription at any time using a secure Over The Air (OTA) command.



This is called

Remote SIM Provisioning

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Accelerating M2M Growth

By 2020, handsets will constitute only **72%** of cellular connections (currently 88.4%)

Growth will come from connected **M2M devices** – estimated to be **14.7 Billion*** by **2020**

- 652 Million Healthcare Devices (Up from 61 Million in 2013)
- 956 Million Automotive Devices (Up from 111 Million in 2013)
- 7.5 Billion Smart Cities Devices

Accelerates M2M growth

- By cutting operational costs and increasing flexibility
- Enable longer term planning and higher returns from business models
- By implementing industry leading security standards to maintain consumer confidence

Accelerating growth and operational efficiency in the M2M world

* All connection types Source Machina Research

Broad based industry support

- GSMA represents the global mobile industry
  - Membership comprised of 800 mobile operators with more than 250 companies in the mobile industry
  - Helping businesses in all industry sectors – financial services, healthcare, media, transport, utilities and more
  - Spanning more than 220 countries
- GSMA is working in partnership with leading mobile operators and SIM suppliers worldwide

Broad based industry support

- Companies who have launched or committed to launch GSMA Embedded SIM Specification compliant solutions are:

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Advantages over current removable SIM Cards

- Removable SIM cards are often inaccessible within M2M wireless modules making it difficult if not impossible to change the SIM once deployed.
- GSMA Embedded SIMs never need to be removed – new operator profiles are simply downloaded to the SIM when required.
- The GSMA Embedded SIM Specification simplifies logistical processes:
  - installation of a single SIM Stock Keeping Unit (SKU) into an M2M device at the point of manufacture
  - Download of an appropriate operator profile in the destination country for that device.
  - Removes the need for stock control and shipping of physical pre-provisioned SIM cards.
  - All this operational flexibility is delivered with no compromise on security.

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Global standardisation is vital for scaling the market

- The GSMA goal is to accelerate growth of the M2M Industry by providing a single de facto standard for remote SIM provisioning
- The GSMA Embedded SIM Specification avoids market fragmentation and also drives economies of scale for all stakeholders
- Supports development of a strong, global M2M ecosystem, unifying operators, SIM suppliers and vendor partners

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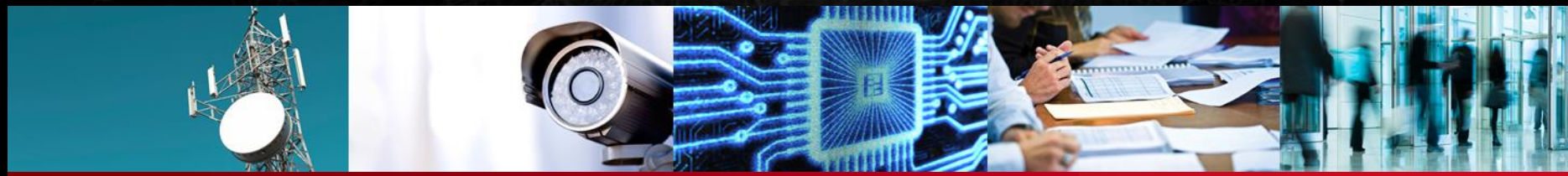
Benefits for all stakeholders

Operators	M2M Product Manufacturers	SIM Suppliers	Business Customers	End Consumers

- Opens up new market opportunities
- Reduced costs in handling M2M SIM products
- Retains industry leading security levels
- Minimal impact to existing systems and network infrastructure
- Low integration and testing costs



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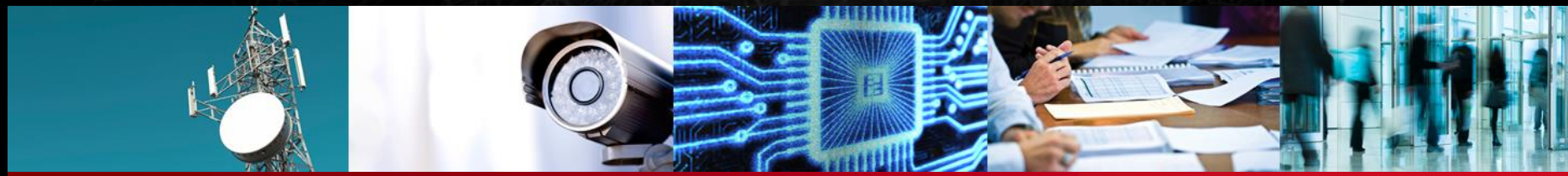
Benefits for all stakeholders

Operators	**M2M Product Manufacturers**	SIM Suppliers	Business Customers	End Consumers

- Opens up new M2M market opportunities
- Single Stock Keeping Unit at point of manufacture
- Enables flexible global product distribution
- Selection of operator subscription is performed on first switch on in destination country
- Allows change of operator during the product lifecycle
- Improved product reliability and longevity through hermetic sealing - as there is no need to change the physical SIM



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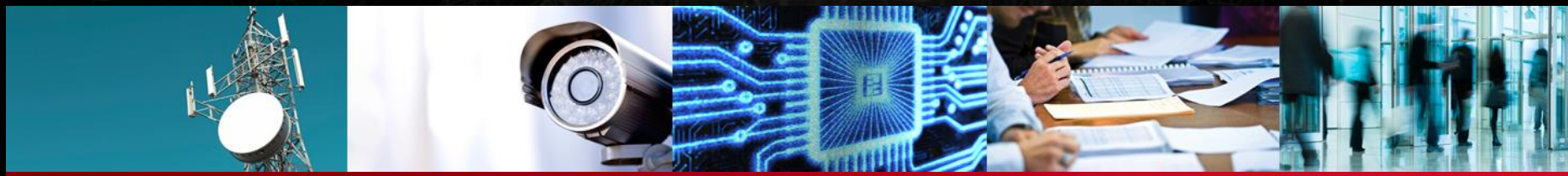
Benefits for all stakeholders

Operators	M2M Product Manufacturers	SIM Suppliers	Business Customers	End Consumers

- Opens up wider M2M market opportunities by providing GSMA Embedded SIM infrastructure and services on a mass market basis
- Add value and flexibility to current SIM products



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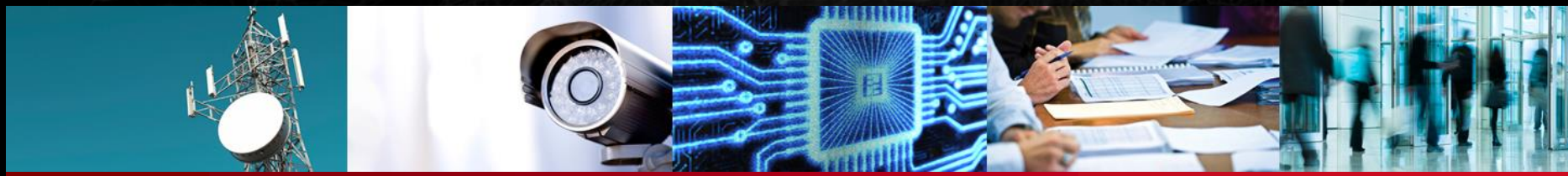
Benefits for all stakeholders

Operators	M2M Product Manufacturers	SIM Suppliers	**Business Customers**	End Consumers

- Business opportunities from new M2M connected services including new deployment models
- Remote service activation enables the up-sell of connected options after initial sale
- Connectivity management will be more flexible and cost effective



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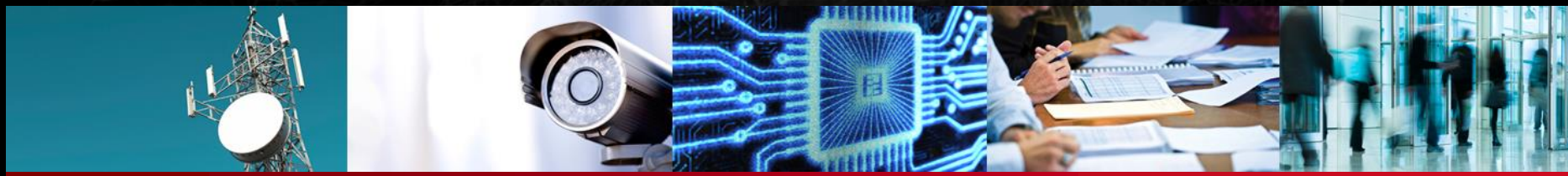
Benefits for all stakeholders

Operators	M2M Product Manufacturers	SIM Suppliers	Business Customers	End Consumers

- Improved customer experience – products will work ‘out of the box’
- Lower cost connected products
- Increase in number of valuable connected services



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Automotive is leading the way

- GSMA Embedded SIM technology is revolutionising the motoring experience. SBD predicts almost all new cars will have connectivity by 2025
- Connected Car Market will be worth almost €40 billion globally in 2018 (up from €13 billion in 2012)
- According to SBD Research, 83% of this growth is due to embedding SIM technology into new vehicles
- Enabling a wide range of mobile based services in safety, security, navigation, traffic updates and infotainment

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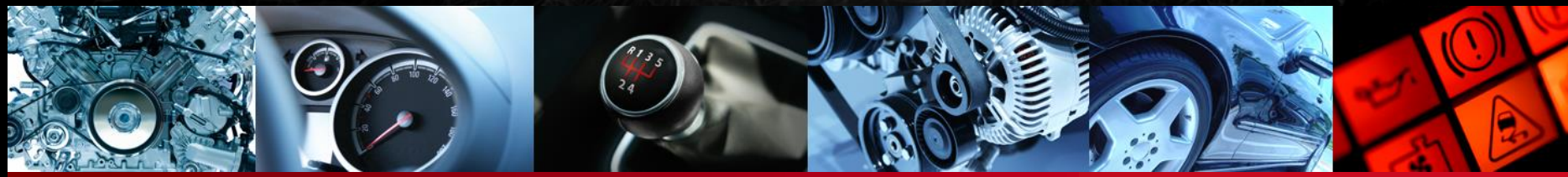
Opportunities for Automotive

Embedded SIM technology offers big opportunities for auto manufacturers over the 10-15 year life cycle of a vehicle including:

- The opportunity for late stage operator profile installation based on location
- Profile updates when a vehicle permanently changes ownership or location



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GSMA Embedded SIM Specification - scope

- **Specification covers**
  - The remote *over the air* provisioning of a one (or more) operator profiles into a SIM.
  - The remote *over the air* enablement / disablement of an operator profile within the SIM, thus enabling a change of active operator.
  - *Over the air* deletion of an operator profile within a SIM.

- **Operation**
  - To facilitate the secure *over the air* management of mobile operator credentials within a SIM.
  - Two new key network elements have been specified by the GSMA.

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Uses of Embedded SIM Specification

Provisioning of multiple M2M subscriptions 1	An M2M service provider sets-up subscriptions for a number of connected M2M devices to start telecommunication services with a network operator
Provision of first Subscription with a new M2M device 2	A M2M customer purchases a new type of connected M2M device from a device vendor/ distribution channel
Subscription change 3	A M2M customer changes the subscription for a device to stop services with the current mobile operator and start services with a new mobile operator
Stop subscription 4	A M2M customer sells his device and stops the subscription for services from the current mobile operator
Transfer subscription 5	A M2M customer transfers subscription between devices

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The Elements Involved

Embedded SIM

- Functionally identical to a traditional SIM
- At manufacture will have a ‘provisioning profile’ assigned with secret keys that allows the associated subscription manager to download and manage ‘operational profiles’ on the eUICC
- The technical specification can accommodate both an initial declaration of the MNO in the eUICC, as well as the selection of a new MNO later. The implementation will depend upon the commercial agreement between the operators and their customers

Subscription Manager

Manages the embedded SIM by

- Generating SIM profiles in real-time
- Management and execution of MNO policy
- Secure routing profiles to the embedded SIM

MNO

- Uses subscription manager to manage profiles
- Maximum re-use of existing provisioning interfaces and processes

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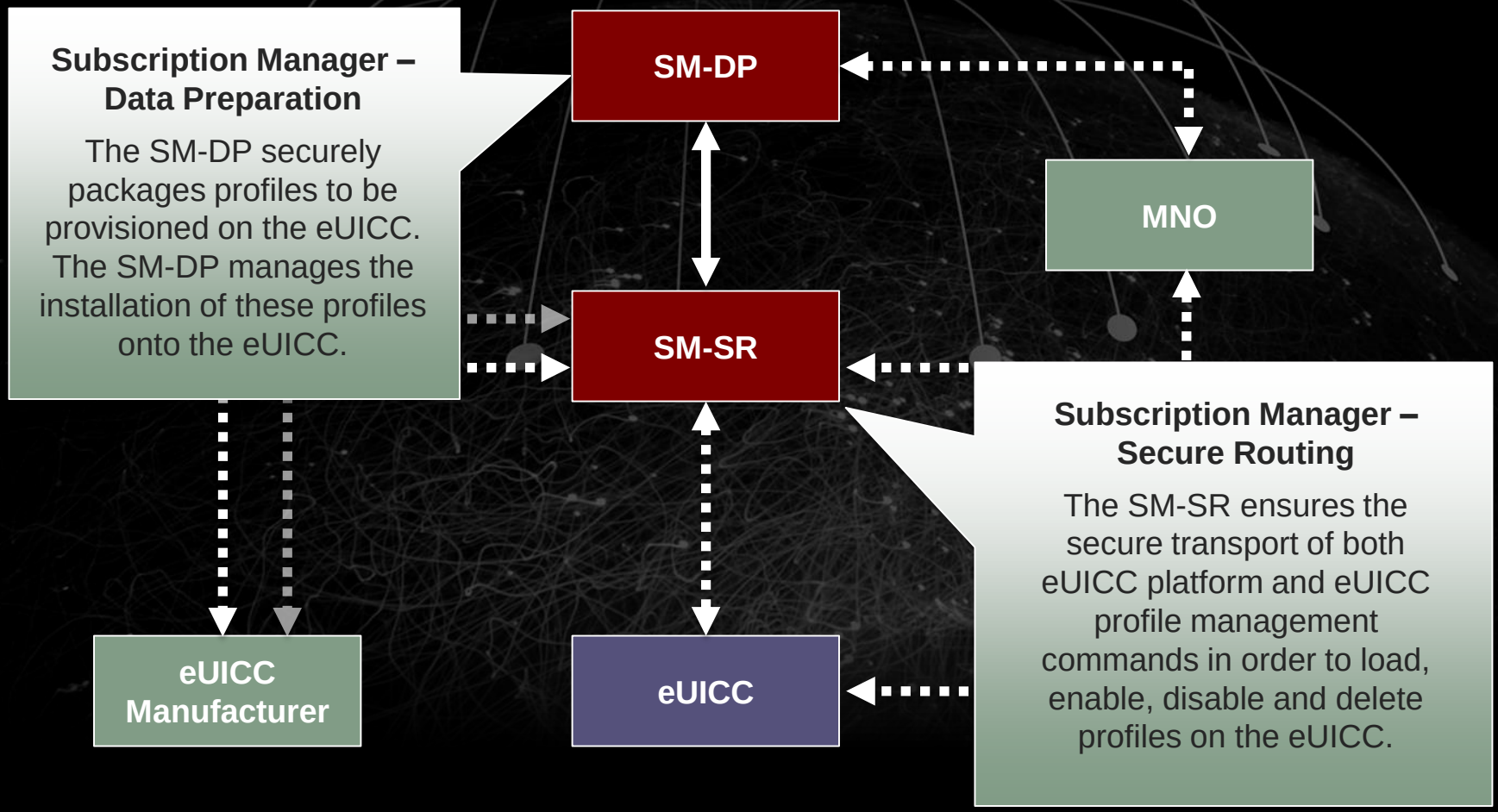
Embedded SIM Basic Architecture



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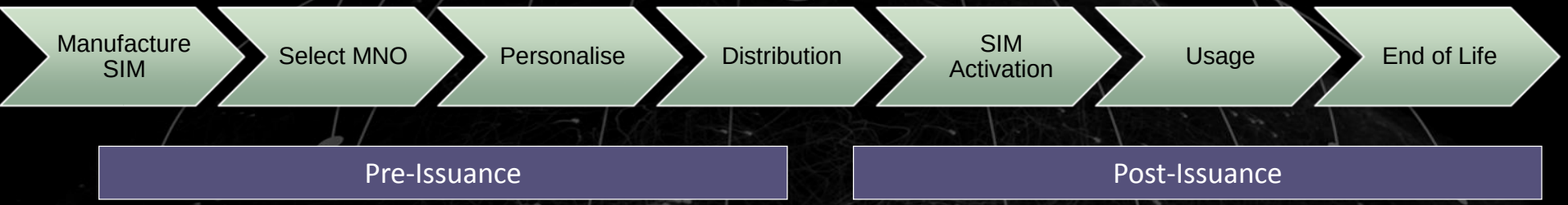
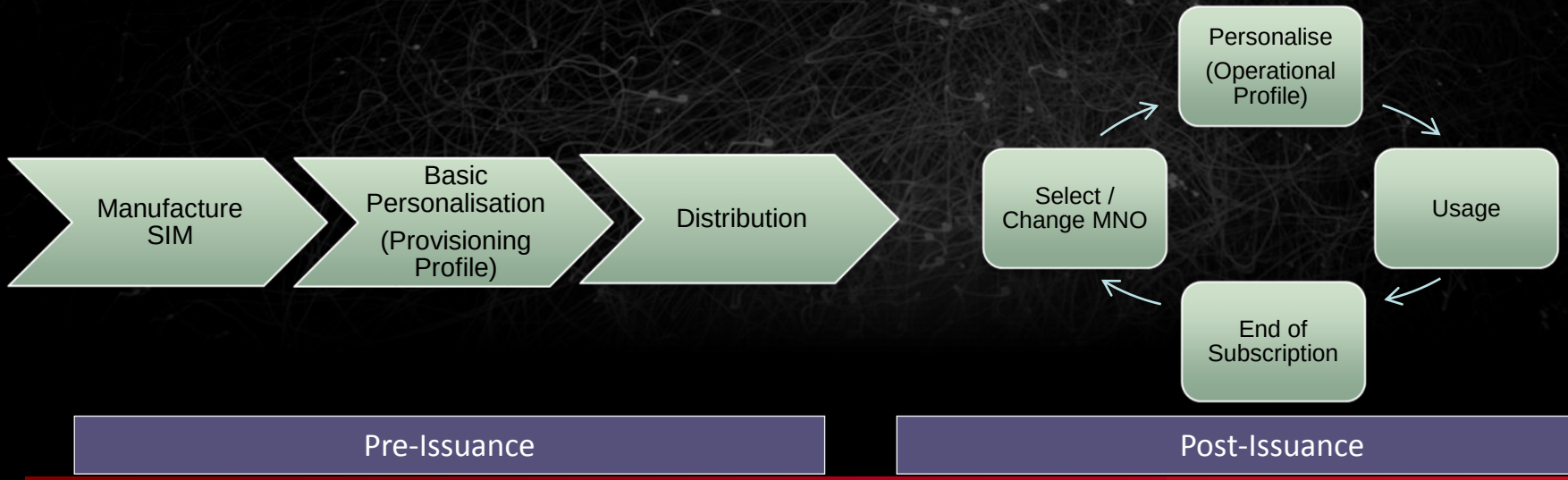
GSMA Embedded SIM – A change in SIM life-cycle model

From the linear model used today….



To an outcome based model with remote provisioning ….



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What is a GSMA Embedded SIM Profile and SIM Subscription?

Before we look at how subscriptions are managed remotely between MNOs let's look at Profiles and Subscriptions:

The NAA is the Network Access Application – basically everything required to allow the SIM to register onto the mobile network.

This includes information like home network, tower frequencies, location data, authentication algorithms and keys, and of course a unique subscriber identity (IMSI).

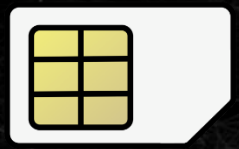
All of this we refer to as a **Subscription**

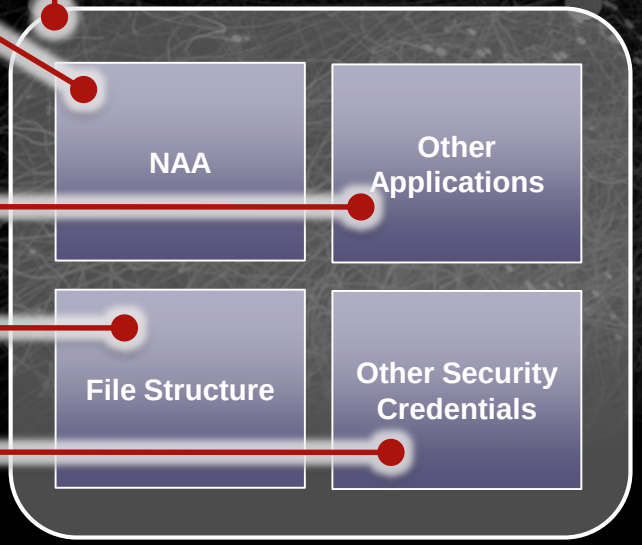
The SIM typically contains a number of other applications, each providing some kind of value-added service.

Just like a PC the SIM has a file structure, with each file having a specific purpose.

The SIM may have a wide range of secret keys, algorithms, certificates and other cryptographic data

Today's SIM cards contain lots of types of data, collectively called a **Profile**





In this slide pack this symbol will denote a **Profile**

Where the colour of the symbol is different this denotes a Profile from a **different** MNO.

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How Do Profiles Work with a GSMA compliant Embedded SIM?

We're now starting to use GSMA Embedded SIM terminology.

The Embedded SIM chip itself is called an **eUICC**.

The eUICC can hold any number of profiles, the only limitation is the size of the memory available.

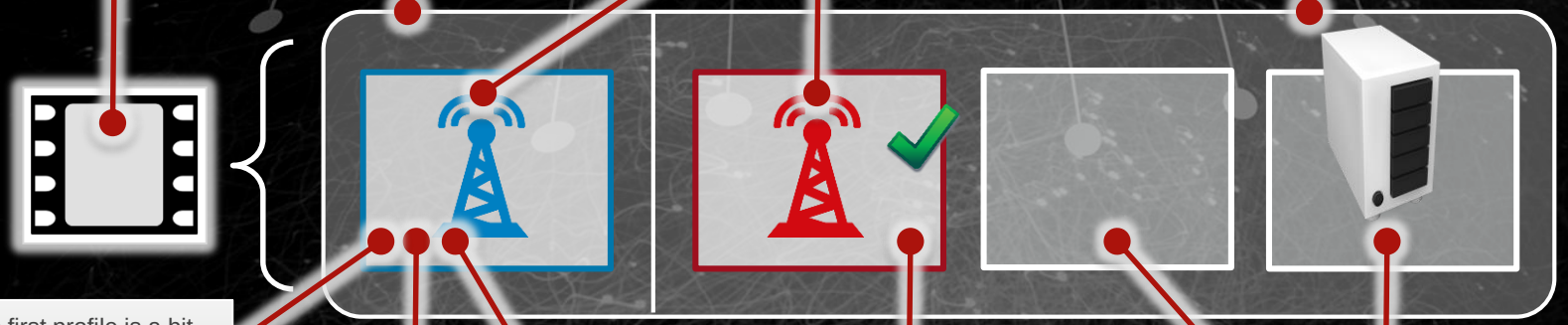
A typical profile could be 64Kbytes upwards.

As an example, on this particular eUICC, there are two profiles installed.

The **BLUE** profile was installed at manufacture, the **RED** was downloaded via OTA sometime later.

All of the management of the download, activation, deletion of profiles on an eUICC is managed by a remote server (technically known as SM-DP and SM-SR entities).

Critically, there is ***no*** management possible locally (other than the fallback recovery).



This first profile is a bit special, it's called the Provisioning Profile and is always present on the eUICC. It has two main functions:

When the eUICC is first switched on, it provides that initial connectivity to the mobile network. At that point another profile could be download (perhaps one specific to the country the eUICC is in at that time).

If there are any problems with the active profile during the lifetime of the eUICC then it can automatically switch back to the Provisioning Profile as part of a fallback recovery procedure.

Only one profile can be active at any one time, as decided by a remote server.

This particular eUICC has enough free memory space for another two profiles.

But consider just how much memory would be required on a eUICC with 4 profiles – possibly up to 1Mb!

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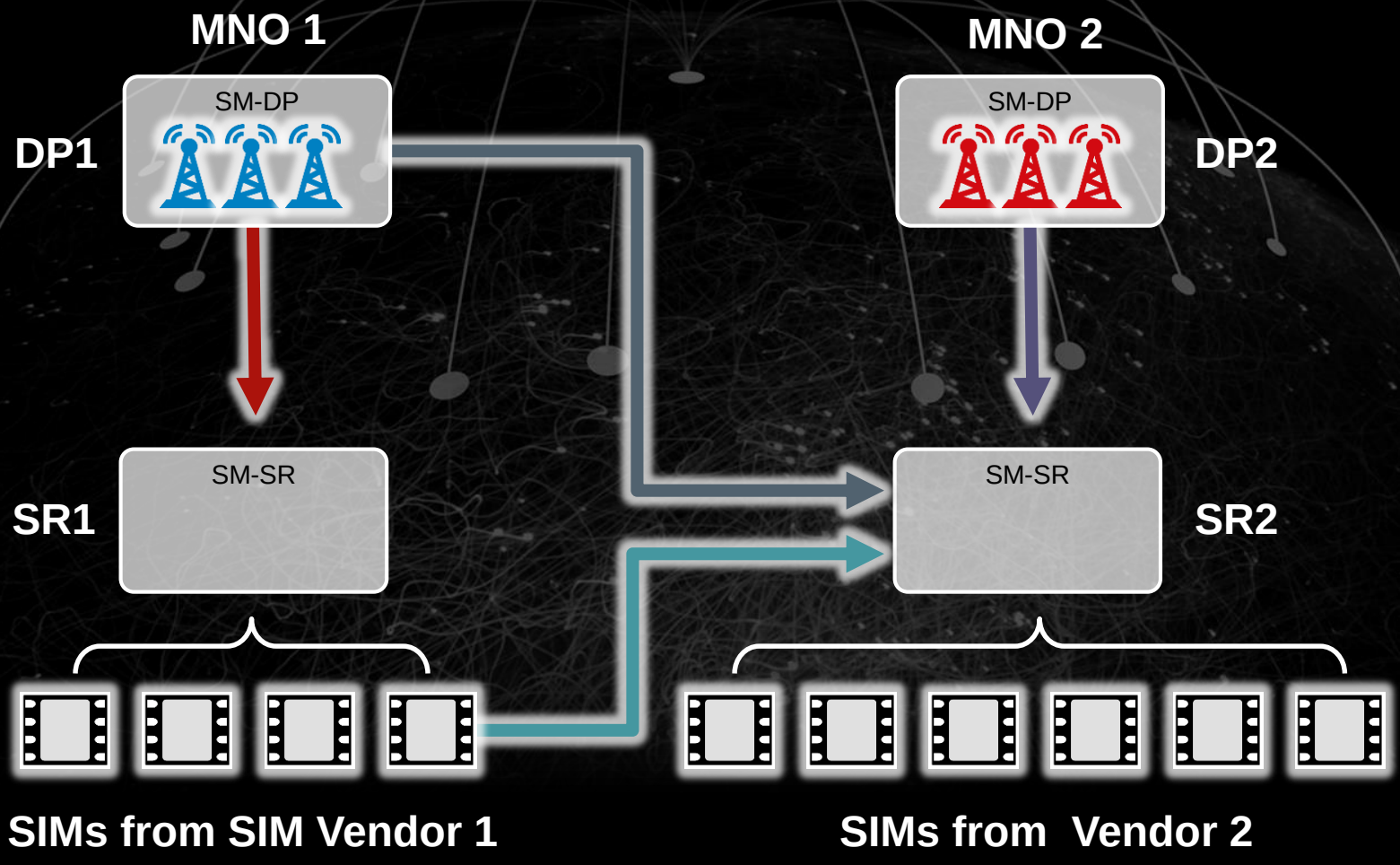
How are SIMs Remotely Managed?



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The GSMA Embedded UICC Protection Profile

1. It is imperative that the SIMs used in GSMA Embedded SIM solutions are ***as secure*** as today's SIMs.

2. To ensure this, a Common Criteria security evaluation process is used. The starting point for this process is what is known as a **Protection Profile**.

3. A Protection Profile is actually a document that states rigorously states a security problem for the Target of Evaluation (TOE) – in our case the GSMA Embedded UICC itself. The problem includes the environment, security threats, objectives and assumptions.

4. The document then goes on to specify the security requirements to address that problem without dictating how these requirements will be implemented.

8. If successful, a certificate is issued validating the product's evaluation. The product is placed on the Validated Products List, and the report is made publicly available.

   Periodic reassessment is required

5. In order for a vendor to get their embedded UICC (eUICC) product evaluated they must supply to the evaluator their actual product.

6. And they must also supply what is known as a Security Target (ST) – another document, which is created directly from the Protection Profile document and used in the evaluation process.

7. The vendor's eUICC Product is evaluated and certified according to Common Criteria (EAL4+) using GSMA Protection Profile as a template for the vendor product's ST.

For more information on Common Criteria and Protection Profiles please visit: https://www.commoncriteriaportal.org

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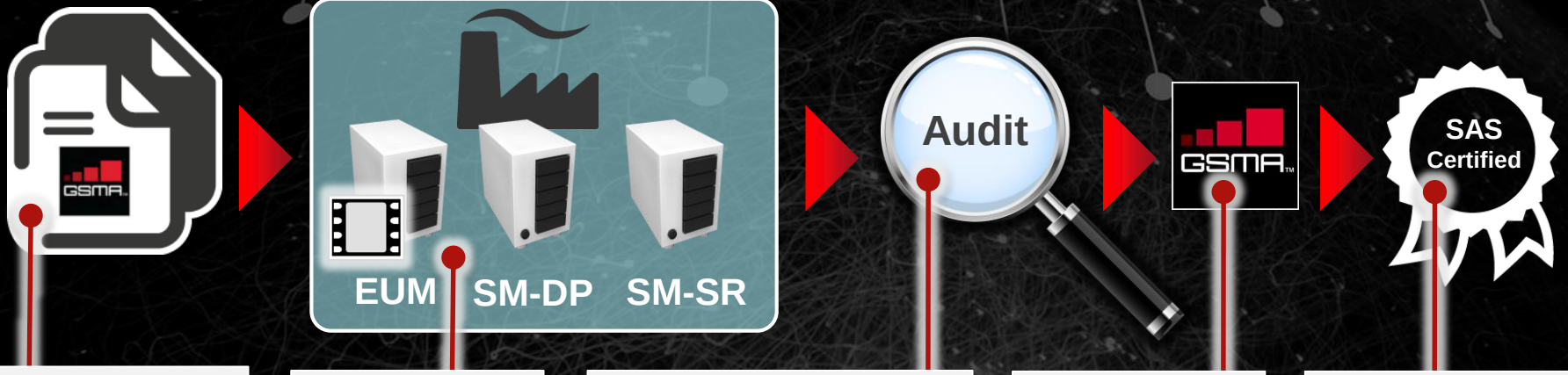
Security Accreditation Scheme (SAS) for GSMA Embedded SIM

For many years now, the GSMA's Security Accreditation Scheme (SAS) enables all GSM operators to assess SIM vendors' security.

With the advent of GSMA Embedded SIM this scheme is being extended to cover security assessments of the Embedded UICC and also the Subscription Managers (DP and SR).

Security Accreditation Scheme



The SAS documents are used to design the environment in which the Embedded UICC or SM Products are produced.

The provider of the products requests an official audit to 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 send to the GSMA SAS Certification body for review and approval.

If approved, an "Accepted Supplier" certificate is issued to the audited site.

For more information on SAS please visit: http://www.gsma.com/technicalprojects/fraud-security/security-accreditation-scheme

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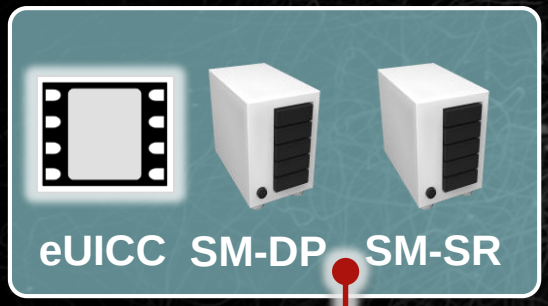
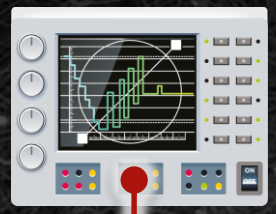
GSMA Embedded SIM Test Specification

The purpose of the Test Specification for GSMA Embedded SIM is to ensure that products made by vendors, including eUICC, SM-DP and SM-SR entities are functionally compliant to the GSMA Embedded SIM Technical Specification

Test tool manufacturers use the GSMA Embedded SIM Test Specification to develop dedicated test tools for the market



Vendors develop their products



Vendors can commission test houses to test their products, or buy in appropriate test tools and perform the testing themselves

The vendors may self-certify their products if all the test cases are passed, and the appropriate criteria are met that permits self-certification. (ISO/IEC 17050)

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GSMA Embedded SIM Test Specification

The Certificate Issuer (CI) process within the GSMA Embedded SIM architecture ensures the various system entities (SM-DP, SM-SR, EUM, eUICC) can all be trusted by each other.

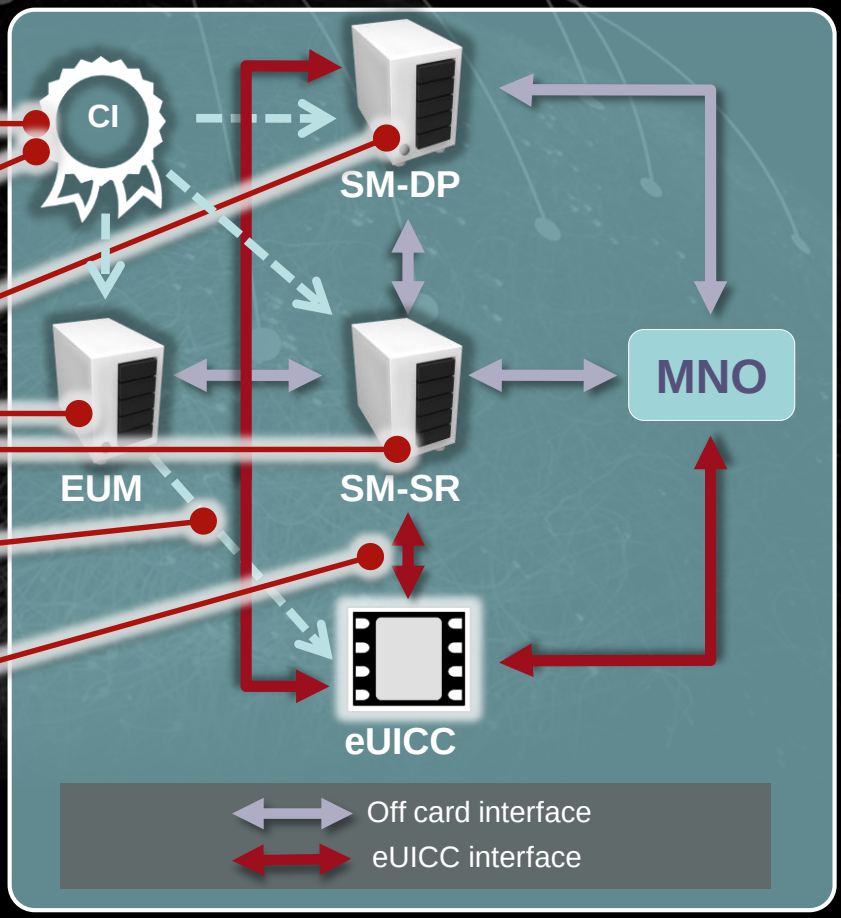
Initially the GSMA will be the sole Certificate Issuer

But as the market establishes, other Certificate Issuers can be added in a hierarchy. For example, issuers per region, or country. Or even market sector.

Vendors of certified and SAS accredited GSMA Embedded SIM product/entities can apply for certificates for each of their system entities

Once the EUM has a valid root CI from the Certificate Issuer it is able to self-certify eUICC products.

When these entities communicate with each other they use the certificates to mutually authenticate themselves. In that way they can trust each other.



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Embedded SIM is NOT Soft or Virtual SIM

- **GSMA Embedded SIM technology is an extension of today's SIM technology:**
  - It uses the same SIM hardware in devices, but now subscription credentials can also be downloaded remotely at any time during the lifetime of the SIM
  - All of the existing standardised SIM form factors can be used, including embedded (MFF1, MFF2) and removable (2FF, 3FF)

- **Soft or Virtual SIM is a very different concept:**
  - It not use existing SIM form factors, instead using hardware and software within the M2M device itself to perform the role of the SIM
  - This approach may benefit from removal of traditional SIM costs, but mobile operators are very concerned about the reduction in security of their credentials
  - Any SIM approach not based on a certified hardware secure element will be subject to continual attack by the hacking community and if compromised result in a serious loss of customer confidence in the security of Operator systems
  - Additionally, Multiple Soft SIM platforms carrying credentials in differing physical platforms, all requiring security certification and accreditation would become an unmanageable overhead – both in terms of resource, and proving their security in a non-standardised virtual environment

FAQs

- Q. Why the does GSMA Embedded SIM Specification use the word ‘Embedded’?

- A. Given the focus on M2M it is likely that the SIM will be soldered into the device (an embedded SIM form factor such as MFF1/MFF2), but of course the GSMA Specification also allows the use of removable M2M SIM form factors also.

FAQs

- Q. Will this standard mean greater operator churn in the M2M market?

- A. The technology certainly allows the customer to download profiles from any operator during the lifetime of the SIM, but in reality it now allows the operator, for example, to provide for the customer the most appropriate profile no matter which country the M2M device is used in. This strengthens the relationship between customer and operator.

FAQs

- What is the role of the GSMA in relation to ETSI?
  - The GSMA has delivered the GSMA Embedded SIM Specification as a pre-standard in order to meet the immediate needs of the M2M market.
  - The GSMA is very supportive of ETSI activity and believe that ETSI is best placed to agree a long term standard.
  - ETSI is kept regularly updated by GSMA on the GSMA Embedded SIM project.

FAQs

- **How can I find out more information about the Embedded SIM project progress?**
  - The Embedded SIM project is part of the Connected Living Programme - for more information contact connectedliving@gsma.com

Media Messaging

- The GSMA created a specification that enables the remote ‘over the air’ provisioning of machine-to-machine (M2M) devices that are hermetically sealed or installed in hazardous or remote locations.
- Backed by global operators and SIM suppliers, the specification promotes a common, global, remote provisioning architecture that will help to ensure interoperable technical solutions that reduce costs, boost security and accelerate the rapidly growing M2M market.
- The GSMA’s vision is to unite all stakeholders behind a single, common and global specification to help accelerate the growing machine-to-machine (M2M) market.
- The GSMA’s remote provisioning specification allows mobile network operators to provide scalable, reliable and secure connectivity for M2M connected devices, removing the need for each operator to develop their own technical solution.

A single, common and global specification to accelerate growth in M2M