Webinar

Streamlining the manufacture of electronic devices with In-factory Profile Provisioning
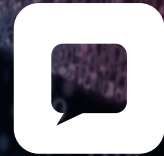
TRANSFORMA **INSIGHTS**

Kigen

We'll be starting soon, but in the meantime, let us and your network know you're here.

@Kigen

@Kigen_Ltd

Use the chat panel for questions

Meet the panel

Matt Hatton
Founding Partner - Transforma Insights

Paul Bradley
VP - Solutions Sales - Kigen

Bee Hayes Thakore
VP of Marketing - Kigen

TRANSFORMA INSIGHTS

Kigen

Today's agenda

- Volume manufacturing for cellular products

- eSIM and SGP.32: Remote SIM provisioning

- The evolution of eSIM management standards

- Benefits of the in-factory solutions for OEMs

- IFPP usage scenarios

- Your questions!

Driving (integrated) eSIM to be the cornerstone of IoT Scalability

(integrated) eUICC
Solutions for the semi-conductor and device ecosystems

OEM focused
In-Factory Connectivity Enablement

eSIM Solutions
GSMA
In-Field Connectivity Management

IoT SAFE
Securing Data and Transactions with Zero Touch Provisioning

Transition Position Paper

'In-Factory Profile Provisioning (IFPP): new eSIM approach drives profitability and improves product performance in connected electronics manufacturing

Published February 2024 and available to download:
https://transformainsights.com/research/reports/in-factory-profile-provisioning-ifpp-position-paper

Volume manufacturing for cellular products

- Manufacturing approaches have changed: onshoring, efficiency and automation

- Plus, electronic hardware is becoming increasingly connected

- Plethora of technology options for connectivity, including LPWAN

- Agile production processes combined with adding cellular connectivity creates a headache

- Connectivity provisioning becomes simplified with Remote SIM Provisioning

TRANSFORMA
INSIGHTS

Kigen

eSIM and SGP.32: The Physical SIM card

- Gradually smaller and smaller.

- Full, mini, micro and nano were all removable.

- Embedded MFF2 is soldered into the device.

- Soldered is much more ruggedised and able to deal with extremes of temperature and vibration.

- iSIM is not a dedicated component at all.

Figure: UICC form factors [Source: Transforma Insights, 2021]

Name	Form Factor	Size	Notes
SIM	1FF	85.6mm x 53.98mm x 0.76mm	Now obsolete.
Mini SIM	2FF	25mm x 15mm x 0.76mm	Introduced for GSM handsets in 1996.
Micro SIM	3FF	15mm x 12mm x 0.76mm	Introduced in 2003.
Nano SIM	4FF	12.3mm x 8.8mm x 0.67mm	Introduced in 2012.
Embedded SIM	Machine Form Factor (MFF2[2])	6mm x 5mm x 1mm	Introduced in 2016.
Soft SIM	-	No separate physical element.	No appetite from MNOs.
iSIM	-	No separate physical element.	Launched 2018

2FF
Mini SIM

3FF
Mini SIM

4FF
Mini SIM

MFF2

Terminology confusion: "eSIM" vs "eUICC" – often used interchangeably for either the hardware or the management of profiles.

TRANSFORMA
INSIGHTS

Kigen

eSIM and SGP.32: Remote SIM Provisioning

eSIMs/iSIMs demand a new mechanism for switching provider (i.e. changing the identity on the SIM)

Great for IoT because normally there's no-one there to switch the cards out anyway and lifespan of decades.

New process: subscription management, aka Remote SIM Provisioning (RSP).
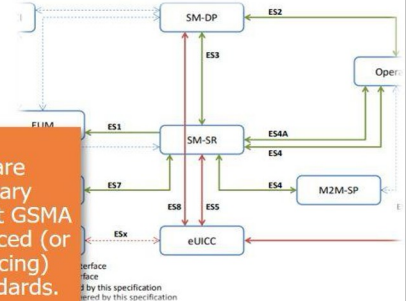
SIM can be localised after the device arrives in territory. Great for streamlining deployments.

RSP is handled by SIM vendors (and increasingly by operators and others).

There are proprietary versions but GSMA has introduced (or is introducing) three standards.

© 2024 Kigen

TRANSFORMA INSIGHTS

Kigen

eSIM and SGP.32: GSMA standards

M2M	**Consumer**	**IoT**
(SGP.02)	**(SGP.22)**	**(SGP.32)**
Pushed profile download via service provider platform direct to the device.	**Pull profile, could be activated with QR code or pre-provisioned on a device.**	**Allows users to order a profile from any operator, connecting to the relevant SM-DP.**
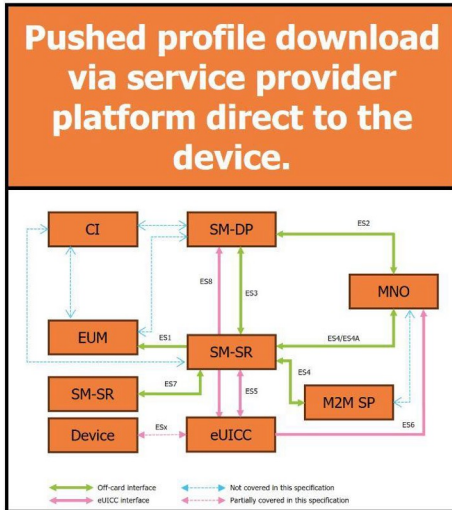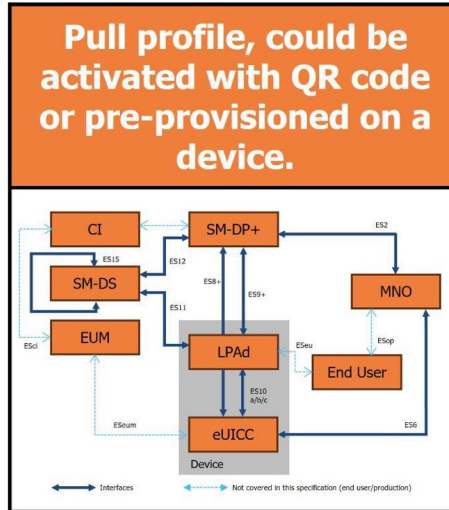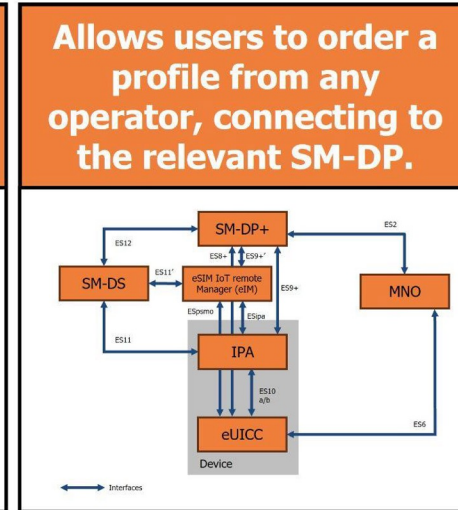
SM-DP (Subscription Management Data Preparation) – stores eSIM profiles and prepares for download.
SM-SR (SM Secure Routing) – establishes secure channel to the eUICC to manage it
SM-DP+ (SM Data Preparation and Secure Routing) - both elements handled through a single platform
SM-DS (Discovery Service) – optional add on for Consumer, where SM-DP+ address is unknown to eUICC
LPA (Local Profile Assistant) – local profile to communicate with SM-DP+ located on SIM or device

TRANSFORMA
INSIGHTS

Kigen

eSIM Evolution

M2M RSP	CONSUMER eSIM	eSIM FOR IoT	SIM PROVISIONING
•SGP.01/02 family •Bootstrap connectivity •Supports devices with no User Interface •Strong bind between eSIM and RSP system (SM-SR) leading to complicated integration between SR and DP elements	•SGP.21/22 family •Alternative connectivity possible (and most common) for provisioning •User Intent (via LPA User Interface) needed •Any eSIM profile can be provisioned by any GSMA-certified SM-DP+	•SGP.31/32 family •Bootstrap or alternative connectivity may be used for provisioning •Supports devices with limited/no User Interface •User Intent moved to eSIM IoT Remote Manager, for fleet management use cases •Any eSIM profile can be provisioned by any GSMA-certified SM-DP+ •Requires Consumer RSP as building block to start from	•Helps a device to get connected to the network and provisioned with enterprise cloud credentials in one simple flow •In-factory solutions for cellular profile loading •IoT SAFE & Zero-Touch Provisioning
Separate from future RSPs and likely to be (gradually) sunset when IoT RSP is in the market for a few years	Stable for Consumer devices and will have bolt-ons put around it from IoT RSP.	Consumer RSP with bolt-ons for constrained devices & networks and enable User Intent shift to cloud.	#FutureofSIM

© 2024 Kigen

Kigen

A reality check!

Kigen / industry assumption

- ODMs/OEMs are waiting for eSIM for IoT RSP technology to be able to manufacture devices with a single worldwide SKU and use a global bootstrap to download a local profile, anywhere in the world, over NB-IoT

Reality

- Even when that exists**, many need in-factory connectivity enablement** to pre-load a local profile so that the device works out of the box, and they don't take any chances trying to download a profile over NB-IoT.

- Initial profile download depletes the battery for devices with lifetime batteries

- RSP is only necessary to swap profiles, in-field.

In-Factory Profile Provisioning - Checklist

Is site GSMA SAS-UP Certifiable?

✅ ❌

- Can the site be GSMA SAS-UP certified?

Does the profile loading area have internet access?

✅ ❌

- Is the factory connected to the internet?
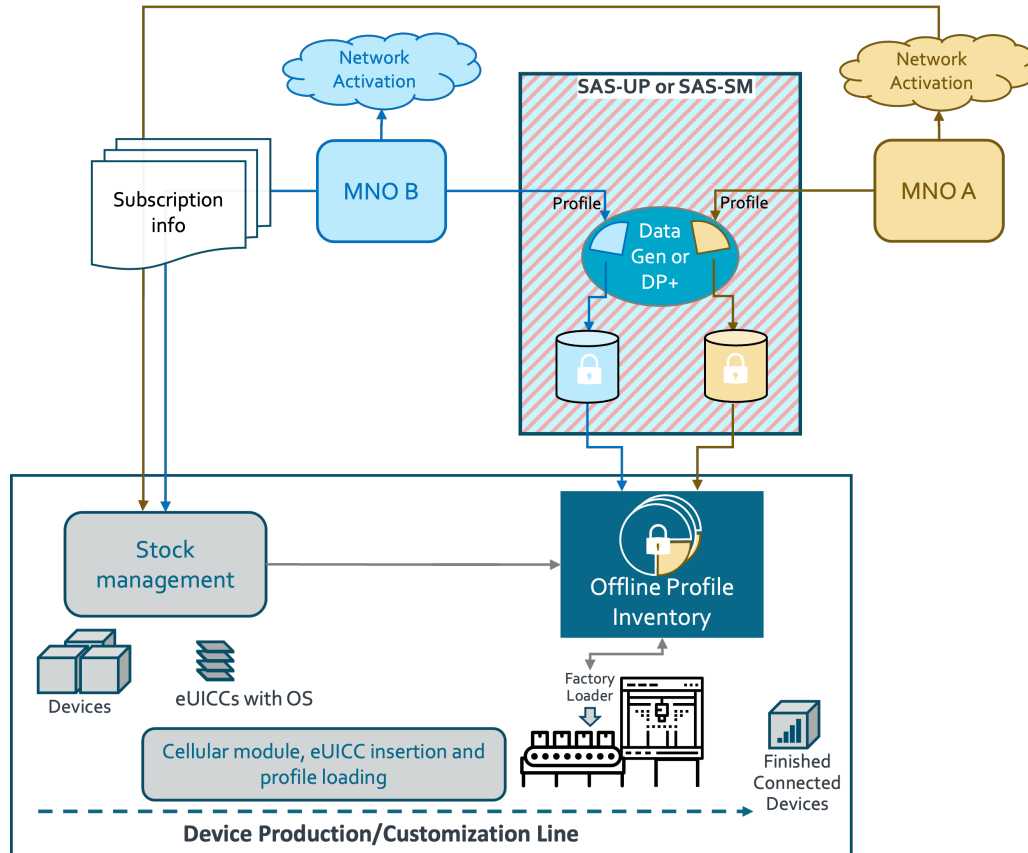- Can production rely on a live internet connection (latency...)?

When do we know what eUICC needs which profile?

Early ──────────────── Late

- How early or late are the eUICCs to be provisioned identified?
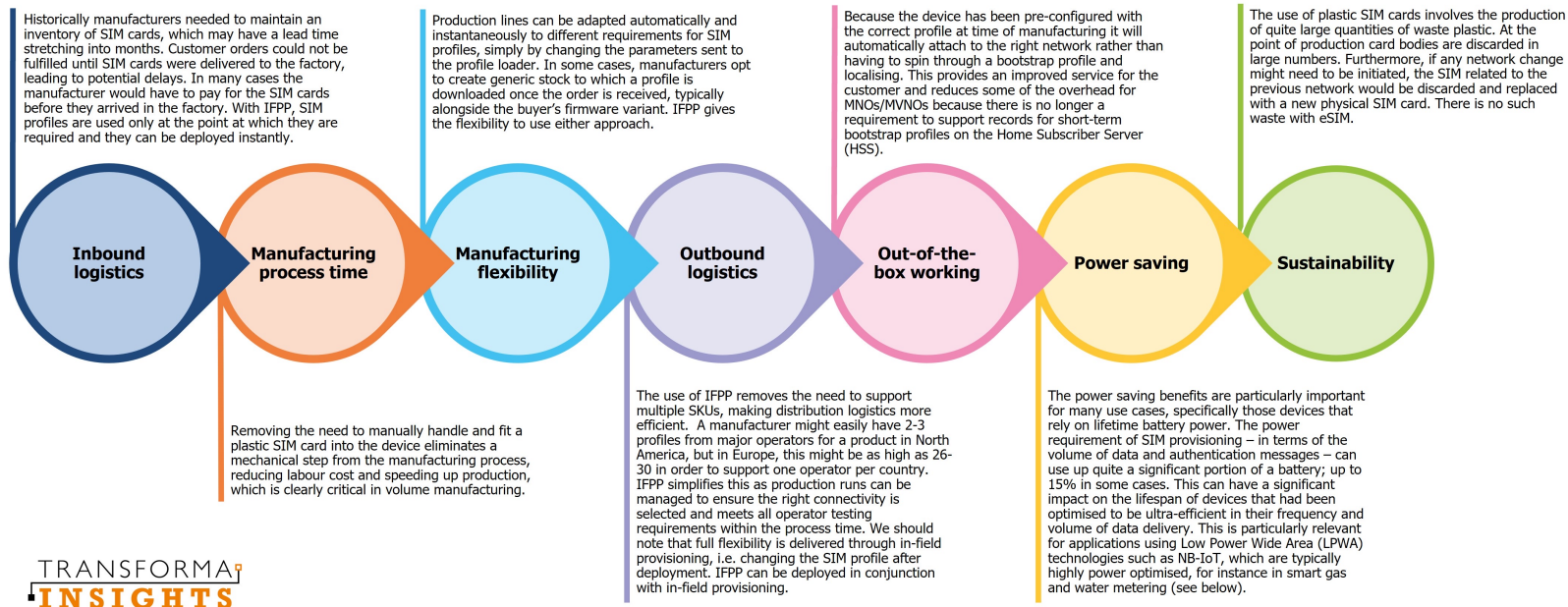
Kigen

In-Factory Profile Provisioning

© 2024 Kigen

IFPP Benefits and options

The 7 benefits of In-Factory Profile Provisioning (IFPP)
[Source: Transforma Insights, 2024]

Historically manufacturers needed to maintain an inventory of SIM cards, which may have a lead time stretching into months. Customer orders could not be fulfilled until SIM cards were delivered to the factory, leading to potential delays. In many cases the manufacturer would have to pay for the SIM cards before they arrived in the factory. With IFPP, SIM profiles are used only at the point at which they are required and they can be deployed instantly.

Production lines can be adapted automatically and instantaneously to different requirements for SIM profiles, simply by changing the parameters sent to the profile loader. In some cases, manufacturers opt to create generic stock to which a profile is downloaded once the order is received, typically alongside the buyer's firmware variant. IFPP gives the flexibility to use either approach.

Because the device has been pre-configured with the correct profile at time of manufacturing it will automatically attach to the right network rather than having to spin through a bootstrap profile and localising. This provides an improved service for the customer and reduces some of the overhead for MNOs/MVNOs because there is no longer a requirement to support records for short-term bootstrap profiles on the Home Subscriber Server (HSS).

The use of plastic SIM cards involves the production of quite large quantities of waste plastic. At the point of production card bodies are discarded in large numbers. Furthermore, if any network change might need to be initiated, the SIM related to the previous network would be discarded and replaced with a new physical SIM card. There is no such waste with eSIM.

Inbound logistics

Manufacturing process time

Manufacturing flexibility

Outbound logistics

Out-of-the-box working

Power saving

Sustainability

Removing the need to manually handle and fit a plastic SIM card into the device eliminates a mechanical step from the manufacturing process, reducing labour cost and speeding up production, which is clearly critical in volume manufacturing.

The use of IFPP removes the need to support multiple SKUs, making distribution logistics more efficient. A manufacturer might easily have 2-3 profiles from major operators for a product in North America, but in Europe, this might be as high as 26-30 in order to support one operator per country. IFPP simplifies this as production runs can be managed to ensure the right connectivity is selected and meets all operator testing requirements within the process time. We should note that full flexibility is delivered through in-field provisioning, i.e. changing the SIM profile after deployment. IFPP can be deployed in conjunction with in-field provisioning.

The power saving benefits are particularly important for many use cases, specifically those devices that rely on lifetime battery power. The power requirement of SIM provisioning – in terms of the volume of data and authentication messages – can use up quite a significant portion of a battery; up to 15% in some cases. This can have a significant impact on the lifespan of devices that had been optimised to be ultra-efficient in their frequency and volume of data delivery. This is particularly relevant for applications using Low Power Wide Area (LPWA) technologies such as NB-IoT, which are typically highly power optimised, for instance in smart gas and water metering (see below).

TRANSFORMA INSIGHTS

Kigen

Benefits of the in-factory solutions for OEMs

Single SKU

In-factory connectivity enablement during order fulfilment means no need to maintain multiple SKUs for different versions of the same product

Reduce the cost of manufacturing, supply, and logistics of the eSIM

Future-proof

Protection and compliance even when regulations evolve

Ability to change connectivity provider later in field using an eSIM (Remote SIM Provisioning) solution should it be required

Latency

Can deliver profiles in batch mode, reducing dependence on connectivity

Resiliency against costly outages

Simplified eSIM management

Pre-standard but fully aligned to the needs of SGP.32 for remote provisioning and carrier profile swap

IFPP usage scenarios

Smart Metering

Water and gas meters rely on power saving as a key feature. Data is transmitted infrequently and firmware and SIM profile management for connectivity is kept to a minimum to preserve the battery.

Fixed Wireless Access/CPE/Routers

Emerging trend of use of cellular as alternative to, or back-up for fixed broadband. IFPP streamlines the process of out-of-the-box working for FWA products superior to that of generic router products.

Car Manufacturing

Majority of new vehicles have cellular connectivity. IFPP increasingly under consideration to personalise during order fulfilment. Use of in-field is common. Key benefit of IFPP is streamlined provisioning.

Consumer Electronics

Three of the five top segments for IoT. Some will use SGP.22. IFPP simplifies supply chain and streamlines manufacturing. Some also battery powered. No requirement for WiFi for bootstrapping.

IFPP
key use cases

TRANSFORMA
INSIGHTS

Kigen

Over to you for questions

@Kigen

@Kigen_Ltd

Use the chat panel
for questions

https://kigen.com/contact/