IoT Now: ISSN 2397-2793

2024 • VOLUME 14 • ISSUE 3

# IoT NOW

HOW TO RUN AN IoT ENABLED BUSINESS

## COVER INTERVIEW

**Giesecke+Devrient Mobile Security's CEO explains how IFPP embeds secure and flexible device connectivity in the factory**

**The IoT Now CEO Guide to IFPP 2024**

**PLUS:** How in-factory profile provisioning is helping OEMs address the need for greater manufacturing speed • Inside Giesecke+Devrient's AirOn360 IFPP system • Why connected device makers should take a closer look at IFPP • Will IFPP help accelerate eSIM adoption? • Read the latest News, Features and Interviews at **www.iot-now.com**

# IFPP embeds secure, flexible device connectivity in the factory

In-factory profile provisioning (IFPP) has been created to enable the secure loading of mobile network operator (MNO) profiles onto consumer and IoT devices during manufacture. The technology promises to streamline embedded and integrated SIM (eSIM and iSIM) integration, enabling business benefits such as a single global stock-keeping unit (SKU) to be accessed. Here Dr. Philipp Schulte, the CEO of Giesecke+Devrient (G+D) Mobile Security, tells George Malim, the managing editor of IoT Now, how IFPP is transforming device manufacture

***IFPP enhances security by ensuring that devices are protected from the outset, minimising the risks associated with manual configurations and physical SIM handling***

**George Malim: Please can you tell us what IFPP is and explain the benefits to OEMs?**

**Dr. Philipp Schulte:** IFPP is an innovative solution that allows device manufacturers to securely load MNO profiles onto consumer and IoT devices during the manufacturing process. This means that when devices leave the factory, they are already equipped with the necessary connectivity, ready to function immediately upon activation. At G+D, we say that these devices are 'Born Connected'.

Until now, manufacturers were often working with different physical SIM cards from their preferred MNOs, which needed to be inserted manually into the device. Even when working with eSIM technology, manufacturers needed to prepare different modem SKUs depending on the target destination.

By digitalising these processes, IFPP offers several key benefits to OEMs. It enables devices to be pre-configured with eSIM profiles, providing instant connectivity straight out-of-the-box, which significantly enhances the end-user experience. The solution also streamlines the deployment process by embedding connectivity during production, thereby reducing the need for post-purchase configuration and accelerating time-to-market.

Furthermore, IFPP enhances security by ensuring that devices are protected from the outset, minimising the risks associated with manual configurations and physical SIM handling. Finally, by eliminating the need for manual SIM card installation and activation, OEMs can achieve substantial cost savings, allowing them to allocate resources more effectively towards innovation and scaling their operations.

As the producer of the first commercial SIM card and a pioneer in eSIM management, G+D is currently the only provider in the market to have rolled out a large-scale commercial deployment of more than 100 million profiles to a leading global consumer OEM.

**GM: What technologies have made IFPP a reality?**

**PS:** IFPP is based on eSIM technology, which is now taking off in the consumer as well as the IoT space. eSIM allows for secure and remotely programmable SIM profiles, eliminating the need for physical SIM cards. This is further enhanced by remote SIM provisioning (RSP) which enables the remote management and updating of these eSIM profiles over-the-air (OTA).

IFPP is based on the newest standard for RSP currently being finalised by the GSMA (SGP.42), which is closely linked to the SGP.22 (consumer) and SGP.32 (IoT) standards. These use a common technology base which makes IFPP easily scalable for MNOs and device manufacturers that already work with these standards. When combined with SGP.22 or SGP.32, IFPP also gives maximum flexibility to the end user, who can then make further changes to the profile once the device is in the field.

In addition, advancements in secure manufacturing processes and cloud-based management platforms have played crucial roles in making IFPP viable. These technologies ensure that the profile provisioning process is not only secure but also scalable and efficient, meeting the rigorous demands of modern OEMs. ▶

**SPONSORED INTERVIEW**

**GM: How do you foresee mainstream adoption of IFPP accelerating?**

**PS:** Mainstream adoption of IFPP is likely to accelerate as the demand for connected devices continues to grow across various industries. With the proliferation of IoT devices, the need for efficient, secure and scalable connectivity solutions is becoming increasingly critical. IFPP addresses this need by simplifying the onboarding process, reducing deployment times and ensuring secure connections from day one.

Furthermore, as more OEMs recognise the operational and cost efficiencies associated with IFPP, adoption is expected to increase. Regulatory standards and industry collaborations will also play a role in accelerating mainstream adoption, as they establish a unified framework that drives confidence and adoption across the ecosystem.

For example, G+D has already seen significant interest from OEMs, with the first large-scale commercial deployment in the consumer space, which has proven to be very secure and scalable. While the GSMA standard is still in progress, G+D's solution is ready for deployment and we also see demand from IoT markets such as the smart metering and automotive sectors.

**GM: How will it be applied to existing products and use cases and what types of new use cases do you envisage?** ▶

**Dr. Philipp Schulte**
**G+D Mobile Security**

**PS:** IFPP can be applied to a wide range of existing products across various sectors, such as consumer electronics, automotive, utilities and industrial IoT. For example, in the automotive industry, OEMs need to manufacture vehicles for distribution all over the world, making local connectivity per country a pre-requisite. Whereas previously this could only be done by deploying different SKUs for different countries. IFPP saves time and money by allowing them to use a single SKU for all vehicles and include the eSIM profile during the manufacturing process. Vehicles can therefore be delivered with global-ready connectivity, enabling seamless communication and telematics for vehicles on the go.

In smart metering, for example, utilities companies can pre-configure meters with network profiles during the manufacturing process, enabling the meters to automatically connect to the network upon installation. This eliminates the need for technicians to manually configure or activate the devices in the field, resulting in faster deployment, reduced operational costs and a more seamless integration of smart metering solutions into energy grids.

As for new use cases, we envisage applications in emerging fields such as smart cities, where connected infrastructure could benefit from out-of-the-box connectivity, and in smart agriculture, where sensors and devices could immediately connect to monitor and optimise crop production. The scalability and flexibility of IFPP opens up possibilities for numerous innovative use cases across industries.

**GM: What differences are there for consumer, IoT and automotive OEMs?**

**PS:** While the core principles of IFPP remain consistent across various sectors, the requirements and advantages can differ depending on the specific vertical and type of OEM. For consumer electronics, the focus is primarily on providing instant connectivity for devices such as wearables and smartphones. For these high-convenience consumer devices there is often a requirement to connect directly out-of-the-box without the need to use Wi-Fi. IFPP helps to enhance the user experience by eliminating set-up steps as well as ensuring seamless connectivity across different regions.

In the IoT sector, IFPP is particularly beneficial for OEMs that produce devices like smart meters, industrial sensors and logistics trackers. Using IFPP based on eSIM to pre-configure these devices with connectivity during production simplifies the deployment of large fleets of devices by eliminating the need to manually insert plastic SIM cards.

The automotive sector has its own unique set of needs. IFPP allows automotive OEMs to equip vehicles with global-ready connectivity right from the production line, facilitating essential functions such as telematics and vehicle-to-everything (V2X) communication. This capability is crucial for OEMs aiming to standardise vehicle connectivity across various markets. Combined with a private network, IFPP can help transfer large amounts of data. This helps OEMs to streamline their production and achieve their goals for the software-defined vehicle.

While the underlying technology of IFPP is the same, its application is tailored to meet the distinct demands of each sector, whether it's enhancing user experience, ensuring real-time data connectivity, or enabling seamless global communication.

**GM: What is G+D's approach to IFPP and how does your experience ensure IFPP is secure, scalable and simple to deploy?**

**PS:** G+D's approach to IFPP is rooted in our extensive experience in secure communications and our deep understanding of the mobile connectivity landscape. We have designed IFPP to be a seamless, end-to-end solution that integrates security, scalability and simplicity.

Security is paramount in our solution, which is why we utilise GSMA-certified standards and secure elements to protect the eSIM profiles during provisioning. Our cloud-based infrastructure ensures that the process is not only scalable but also flexible, ▶

***The G+D AirOn360 portfolio complements IFPP by providing a comprehensive suite of services for secure connectivity management***

accommodating the needs of OEMs regardless of their production volumes. In addition, our global presence and partnerships with MNOs allow us to offer a solution that is both universally applicable and tailored to specific market needs.

The simplicity of deployment is another key aspect. We've designed IFPP to integrate easily into existing manufacturing processes, minimising disruption and enabling OEMs to quickly realize the benefits of in-factory provisioning.

**GM: What other offerings in the G+D AirOn360 portfolio enhance the functionality of IFPP and enable new use cases?**

**PS:** The G+D AirOn360 portfolio complements IFPP by providing a comprehensive suite of services for secure connectivity management.

Firstly, the G+D eSIM chip enables the service, in combination with our AirOn360 IoT Suite eSIM management solution and the GSMA SGP.22 and SGP.32 standards which give customers the freedom to change the operator while the device is in the field. RSP allows for the OTA management of eSIM profiles, enabling OEMs to update or switch profiles post-deployment, thus enhancing the flexibility and longevity of connected devices.

In addition to the eSIM solution, the OEM must have access to the right connectivity agreements globally. To ensure scalability and end-to-end security, it's important that all these elements are centrally managed by the same provider. G+D can provide global multi-network connectivity on over 600 networks in 185 countries, ensuring that the OEM has the best connectivity solution, wherever the devices are deployed.

Additionally, our AirOn360 IoT Suite platform includes advanced analytics and lifecycle management tools that help OEMs monitor and optimise the performance of their devices in real-time. This not only improves operational efficiency but also opens up new possibilities for use cases that require dynamic management of connectivity, such as pay-per-use models or location-based services.

Together, these offerings ensure that IFPP is not just one solution but part of a broader, integrated ecosystem that supports the evolving needs of connected devices across industries. ■

**www.gi-de.com**

# IFPP helps OEMs address the need for greater speed in IoT device manufacturing

In-factory profile provisioning (IFPP) enables OEMs to embed cellular SIM profiles into devices on the factory floor, thereby accelerating and opening up embedded and integrated SIM benefits. Simply put, IFPP embeds SIM functions into devices at the point of manufacture so configuration isn't needed outside the factory at the point of deployment

***A key benefit of IFPP is that it enables a manufacturer to flash various SIM profiles to the device in production depending on the requirements of the deployment***

Provisioning of SIM cards in the field or national distribution centres is time-consuming and expensive. It is also inflexible because installation of SIMs doesn't allow for the device to change mobile network operator unless it has a new, alternative SIM installed. To address this and take advantage of the flexibility that embedded and integrated SIM (eSIM and iSIM) offer, OEMs have been looking to install SIM functionality into devices at the factory, during the manufacturing process.

The technology is based on the upcoming GSMA SGP.42 specification which is being developed currently. This specification will simplify loading of operator profiles during manufacturing and ensure security is maintained. However, SGP.42 remains more than a year away, even though IFPP-enabled options are already on the market from players such as **Thales, G+D** and others. These offerings provide an upgrade path to IFPP when it arrives and, in the meantime, allow OEMs to access the benefits of IFPP.

## Streamlined manufacturing

A key benefit of IFPP is that it enables a manufacturer to flash various SIM profiles to the device in production depending on the requirements of the deployment. This allows a product to have a single global stock-keeping unit (SKU) number and eliminates the need to manufacture regional variants with localised SIM cards inside. Plastic cards and all the inventory headaches they necessitate become a thing of the past thanks to eSIM and iSIM but IFPP makes adoption simpler and more flexible and therefore has the potential to drive uptake.

A further benefit is the flexibility that IFPP brings to the manufacturing process. IFPP IoT products are pre-configured to connect to the optimum network on activation and therefore there is no need for the SIM to update via a bootstrap profile or to be pushed an initial over-the-air (OTA) profile update via remote SIM provisioning (RSP). This offers advantages in terms of power saving because the battery-hungry RSP process isn't utilised.

In addition, the removal of cumbersome OTA and RSP processes greatly simplifies initial introduction of an IoT device, reducing the need for operators to support bootstrap profiles on the home subscriber server (HSS). The acceleration of the manufacturing, deployment and installation process that IFPP helps contribute to is becoming of increasing importance as development lifecycles for IoT deployments grow longer.

Research firm **IoT Analytics** has reported that this has seen the average time from the start of the project to the first paying customer increasing from 23 months to 41 months. Given the intensely competitive IoT landscape and the sheer volume of devices and applications being introduced, time-to-market of more than three years is unacceptable for IoT-connected products. According to the firm's survey of 100 senior executives and department leaders at OEMs, queried as part of the IoT Analytics' 206-page 'IoT Commercialisation and Business Model Adoption Report 2024', companies took an average of 18.5 months to go from project kick-off to proof of concept, with business case development and stakeholder alignment taking a large chunk of the time. It then took 22.8 months from proof of concept to the first paying customer.

The firm goes on to say that the 80% increase in time-to-market has occurred in spite of recent technological developments that would be expected to have resulted in better tools and hardware to help accelerate product introduction. Although the 80% increase in product time to market appears on the high side, the team at IoT Analytics has had several discussions with various market actors who shared that they have seen OEMs taking longer to get their products to market as well.

## More complete, more complex deployments

For example, a senior manager at an edge computing software provider recently shared that customers are spending more time addressing ▶


**Figure 1: Time to market for IoT-connected products**

Source IoT Analytics

security requirements and developing value-adding features, capabilities and analysis tools. A senior manager at a cloud-based IoT platform provider added that their clients' average project team size increased from 14 team members in 2014 to 20 in 2024, leading to increased complexity. This demonstrates that greater maturity in IoT is leading to more complete yet more complex products and services being brought to market.

More features and stronger security take longer to develop so increased time-to-market isn't a surprise. However, clawing back the lost time is desirable and IFPP provides a means to do this alongside its other benefits.

Berg Insight sees RSP and IFPP, both of which are being worked on by GSMA, as significant contributors to SIM-related efficiencies. Most industry participants foresee the new GSMA IoT eSIM specification (SGP.32) for RSP to replace the M2M eSIM specification (SGP.22) over time and contribute to higher eSIM adoption, the firm says. It expects commercial implementations to start in the first half of 2025, assuming no further delays occur.

The eSIM working group in GSMA has also started working on IFPP of consumer and IoT devices. The specification (SGP.41/42) will help simplify the loading of profiles at the manufacturing stage but is at an earlier stage of development with commercial implementations a few years out, says Berg Insight. The major SIM vendors are in various ways helping customers to prepare and transition to the next generation of eSIM solutions. **Eseye** for example has announced that it is working with Thales to test IFPP and utilises the Thales Adaptive Connect solution to support SGP.32-type remote provisioning.

The GSMA specifications simplify SIM provisioning and the outline capabilities of IFPP detail how iSIM profiles can be allowed to be uploaded to a device during production. As a result of this increased convenience, the **Juniper Research** predicts that the number of iSIM connections will rise to 210 million by 2028 globally. The firm identified use cases such as smart energy meters and remote logistics as being primed for immediate adoption; owing to requirements for power-conscious and small form factor devices.

In order to prepare for this growth, report author Elisha Sudlow-Poole recommended: "eSIM vendors must ensure that they provide standard-agnostic platforms that are flexible to upcoming form factors, standards and use-case demands. Additionally, eSIM vendors must develop trusted partnerships with manufacturers to ensure adoption of iSIM connectivity services once it becomes demanded in the market."

***Berg Insight sees RSP and IFPP, both of which are being worked on by GSMA, as significant contributors to SIM-related efficiencies***

# Revolutionise device connectivity with in-factory profile provisioning

With IoT reshaping industries, the demand for seamless, secure and ready-to-use connectivity is more urgent than ever. IoT devices, along with consumer electronics such as smartphones and smartwatches, require efficient, secure and immediate network access the moment they leave the factory

*Traditional device provisioning requires a second-step connectivity setup after production*

**Giesecke+Devrient (G+D)** utilises in-factory profile provisioning (IFPP) technology in its AirOn360 In-Factory eSIM solution, which addresses these challenges by allowing mobile network operator (MNO) profiles to be directly installed into devices during production, enabling devices to be connected straight out of the box.

The use cases in this article highlight the benefits and real-world applications of IFPP technology in IoT and consumer electronics. Focusing on telecommunications, smart metering and consumer devices, we show how IFPP streamlines device deployment, improves user experience and drives new business models.

## Why is IFPP better?

Traditional device provisioning requires a second-step connectivity setup after production. Customers must configure devices to connect to Wi-Fi, Bluetooth, or mobile networks, adding time, effort and potential security risks during onboarding. For MNOs leasing or selling smartphones and connected devices, this means the devices aren't immediately network ready. The complexity caused by this extra setup step causes delays, higher support costs and a less optimal user experience.

**SPONSORED CASE STUDY**

In contrast, IFPP integrates MNO profiles directly into devices during manufacturing, enabling them to access mobile networks instantly without additional configuration. This pre-provisioned connectivity simplifies user onboarding and enhances security, as devices connect to secure networks from the start.

## The challenge

Before the advent of IFPP, manufacturers and MNOs faced several key challenges:

- **Complex configuration:** Traditional IoT and smartphone onboarding requires manual network setup, which can be time-consuming and confusing.
- **Delayed access:** Devices often lack pre-installed network profiles, causing service delays, especially for MNO-supplied devices.
- **Increased support costs:** MNOs face increased support costs as users struggle with initial network connections.
- **Security concerns:** First-time setup can expose devices to vulnerabilities, especially when connecting to unsecured networks.

## G+D's AirOn360 In-Factory eSIM

G+D's IFPP solution, AirOn360 In-Factory eSIM, addresses these challenges by provisioning MNO profiles directly into devices during production, offering key benefits for MNOs and device manufacturers. This simplifies logistics and allows sale of connectivity-enabled devices directly, such as through flagship stores. Conversely, MNOs can sell devices that are enabled for their network.

## How it works:

- **Ordering:** Typically, the device manufacturer orders a connectivity service and cellular eSIM profiles from the MNO, which commissions G+D to create the eSIM profiles and produce the eSIM modules. These eSIM modules are equipped with the G+D SIM-OS, but without MNO credentials. MNO-specific eSIM profiles are delivered digitally to the manufacturer via a secure transfer channel, while eSIM modules are shipped through standard logistics.
- **Device production:** Profiles are securely loaded onto the eSIM during production, without needing a permanent online connection or GSMA Security Accreditation Scheme (SAS) certification of the manufacturing landscape.
- **Shipment:** Completed devices are dispatched to the target destination.
- **Streamlined deployment:** After the device leaves the factory, it is fully configured for the designated cellular network, offering instant connectivity to end users.

This method ensures devices are pre-configured to connect directly to the MNO's network without needing Wi-Fi or Bluetooth. Smartphones, smartwatches, and IoT devices can immediately start using cellular networks for sending and receiving data.

## Real-world applications

**Telecommunications (MNO-supplied devices)**
MNOs, especially those selling or leasing smartphones, benefit most from IFPP. Customers often receive phones with pre-installed SIM cards or must configure them before connecting to the MNO's network.

With IFPP, MNOs can ship fully pre-configured devices with a suitable cellular profile, allowing customers to use them immediately without visiting a store or following complex setup instructions. This can drastically reduce activation times for customers, resulting in higher customer satisfaction and lower operating costs, as there are fewer support calls related to the initial network setup, for example.

**Consumer electronics (smartwatches and wearables)**
For consumer electronics like smartwatches and wearables, IFPP ensures instant out-of-the-box functionality. This seamless integration benefits devices that rely on cellular networks for messaging, GPS and health monitoring.

Wearable vendors utilise IFPP to pre-provision devices with eSIM profiles for global MNO partners. This not only enhances the user experience but also allows the company to expand their global reach by shipping region-specific devices that are ready to connect to local mobile networks.

**IoT device manufacturers (smart meters and industrial equipment)**
In industrial IoT, devices such as smart meters, security cameras, and machinery sensors benefit from immediate network connectivity via cellular networks. IFPP eliminates the need for technicians to manually configure and connect devices at the deployment site, significantly reducing setup time and operational complexity.

For instance, a smart meter manufacturer integrates IFPP into its production process, allowing the meters to automatically connect to mobile networks upon installation in customer homes. This streamlined deployment process improves scalability, as technicians no longer need to spend so much time setting up devices on-site and it ensures a faster return on investment for utility companies.

Before IFPP, physical SIM cards would sometimes have to be exchanged in-field when updating the contracted MNO. By replacing this labour-intensive and error-prone process with a fully digital one, the manufacturer can reduce costs while providing a faster and more reliable service. Greater flexibility is still maintained by allowing seamless integration with multiple MNOs.

## Benefits of G+D's AirOn360 In-Factory eSIM

The key benefits of our IFPP technology are:

- **Faster time-to-market:** Devices are immediately connectivity-ready, reducing lead times and accelerating product launches.
- **Reduced support costs:** Simplified setup processes reduce the need for extensive customer support, improving operational efficiency.
- **Enhanced user experience:** Customers enjoy instant network access with no need for complex configurations, leading to greater satisfaction.
- **Improved security:** Pre-configured devices reduce the risk of security vulnerabilities during initial network setup.
- **Scalability:** G+D's AirOn360 In-Factory eSIM enables manufacturers to deploy IoT and consumer devices at scale without the need for manual provisioning processes.

G+D's AirOn360 In-Factory eSIM revolutionises device manufacturing by loading network profiles during production. This technology reduces complexity, enhances user experience and improves security. As IoT grows and consumer expectations rise, IFPP helps MNOs and manufacturers stay competitive in a connected world. ■

***MNOs, especially those selling or leasing smartphones, benefit most from IFPP***

**www.gi-de.com**

# What is in-factory profile provisioning and why is it useful for connected device makers?

Over the last couple of years, the topic of eSIM and remote SIM provisioning (RSP) has been a prominent one in the consideration of how to connect cellular IoT devices. The majority of the emphasis has been on in-field provisioning, i.e. changing the profile on the device after it has been deployed. However, in 2024 attention has also grown in the theme of in-factory profile provisioning (IFPP), which involves the secure loading of SIM profiles during the manufacturing and/or order fulfilment process, writes Matt Hatton, the founding partner of Transforma Insights

*IFPP works by allowing the manufacturer to load an eSIM profile via a profile loader in the manufacturing line from a digital inventory of mobile network operator (MNO) eSIM profiles*

In February, **Transforma Insights** and **Kigen** published a Position Paper 'In-factory profile provisioning (IFPP): new eSIM approach drives profitability and improves product performance in connected electronics manufacturing' examining the concept of IFPP as an emerging approach to remote SIM provisioning for IoT connected devices.

## What is IFPP?

With the increasing prevalence of soldered eSIM chips, and the likely growth in the use of integrated SIM (iSIM) in future, combined with increasingly strict rules requiring network localisation in many countries, there was a requirement to develop the capability to switch the SIM profile in a way that did not involve the physical swapping out SIM cards. That mechanism RSP. In addition to some non-standard and pre-standard approaches, the **GSM Association** developed a set of standards for the eSIM/RSP architecture: SGP.02 ("M2M") introduced in 2014, SGP.22 ("Consumer") in 2016, and now SGP.32 ("IoT") which was introduced in 2023 and is currently going through final process of standardisation.

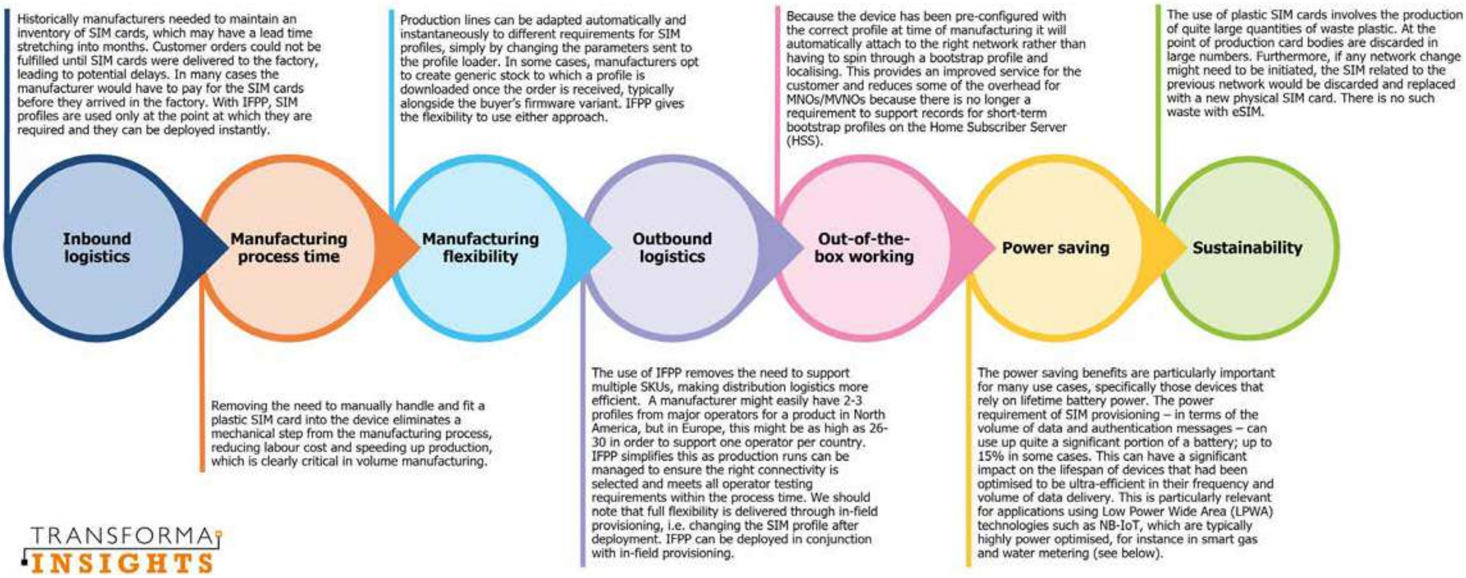
Beyond the in-field profile switching, there is another scenario in which SIM provisioning might be more effectively supported: to set the initial SIM profile(s) during the manufacturing process. This is known as IFPP. It is focused specifically on the secure loading of SIM profiles during the manufacturing and/or order fulfilment process. The profile installed on the device can be determined by the connected device manufacturer based on characteristics such as the device capabilities or the location in which it will be installed. And the GSM Association has also been active here, working on the SGP.41 specifications for an IFPP standard.

IFPP works by allowing the manufacturer to load an eSIM profile via a profile loader in the manufacturing line from a digital inventory of mobile network operator (MNO) eSIM profiles. The loader will use a set of pre-established parameters to apply the next appropriate profile. Usually, the application of the profile will happen at the same time as firmware/software loading or firmware updates during the personalisation of devices before they ship.

## Why should connected device makers use IFPP?

Transforma Insights has identified seven key characteristics of IFPP from which manufacturers of connected devices, including benefits from IFPP specifically and remote SIM provisioning broadly.

1. **Inbound logistics** - Traditionally, connected device makers maintain an inventory of SIM cards, which they need to order from MNOs and the lead time for which can stretch into months. Many OEMs have found that customer orders have been delayed while waiting for the delivery of the SIM cards. With IFPP, SIM profiles are used only at the point at which they are required and they can be deployed instantly.
2. **Manufacturing process time** - The requirement to manually handle SIM cards and fit them into devices adds an additional step in the manufacturing process, increasing labour cost and slowing down production, which is clearly critical in volume manufacturing.
3. **Manufacturing flexibility** - With IFPP it becomes possible to automatically adapt production lines to make use of different SIM profiles, simply by changing the parameters sent to the profile loader. ▶




**The seven benefits of In-Factory Provisioning (IFPP)**

(Source: Transforma Insights, 2024)

4. **Outbound logistics** - By using IFPP the manufacturer does not need to maintain multiple stock-keeping units (SKUs) based on the SIMs installed in the device, making distribution logistics more efficient. 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. Full flexibility is delivered through also using in-field provisioning, i.e. changing the SIM profile after deployment, in conjunction with IFPP.

5. **Out-of-the-box working** - With the device having been pre-configured with the correct profile at time of manufacturing it will automatically select the right network rather than having to spin through a bootstrap profile and localising. This improves the service for the customer and removes the need for short-term bootstrap profiles on the home subscriber server (HSS).

6. **Power saving** - One of the key benefits of IFPP for some applications is power saving. 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 battery-powered 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.

7. **Sustainability** - With the use of eSIM there is not the plastic waste associated with plastic SIM cards. At the point of production card bodies are discarded in large numbers. Furthermore, with plastic SIM cards, any network changes would require replacement and discarding of the old SIM card.

## A valuable technology for volume manufacturing

The conclusion of Transforma Insights research on IFPP is that it offers volume electronics manufacturers multiple mechanisms for improving profitability and competitiveness, and making a better end product. Cost savings in production/fulfilment will have a notable impact on cost of operations, while reduced power consumption might make the difference between a product that meets deployment requirements and one that doesn't.

Volume manufacturers of cellular connected electronics devices will almost certainly benefit from the use of IFPP. The move from plastic SIM to eSIM is well under way, but there are still options for where provisioning happens, in field or in factory.

Connectivity providers need to adapt to the needs of manufacturers. The arrival of IFPP is in reaction to a real need from volume manufacturers for a more appropriate approach and they will embrace the new technology. Connectivity providers need to support the capability.

IFPP is particularly relevant for deployments that are power-constrained. Any cellular-enabled IoT device that runs on batteries will be, by definition, power-constrained and will benefit from eliminating the need for power-hungry in-field provisioning.

We should note that it's not really necessary to use a standard to benefit from IFPP. There are standards coming for IFPP in the form of SGP.41/42. However, in the same way that pre-standard versions of SGP.02 and SGP.32 have pre-empted the arrival of the standard, in the case of IFPP a non-standard approach is also valid. In fact, it is even more valid because the deployment is in a closed and highly managed environment, and manufacturers may be actively looking for their own 'special sauce' differentiator.

***Connectivity providers need to adapt to the needs of manufacturers***

# Make eSIMs work easier and better with in factory profile provisioning

Service providers will soon be offering a streamlined way for organisations to quickly get the best out of their new IoT deployments, writes Antony Savvas

*Use cases such as smart energy meters and remote logistics are “being primed for immediate adoption”*

In factory profile provisioning (IFPP), according to the GSMA SGP.41/42 standard, allows the loading of device- and region-specific mobile network operator and mobile virtual network operator profiles, onto eSIMs and iSIMs during device production.

This process is designed to be secure and enables out-of-the-factory connectivity, flexible production, simplified logistics and reduced complexity in supply chains

## Driving force

A recent study from **Juniper Research** found that the global number of integrated SIMs (iSIMs) installed in connected devices will rise from 800,000 in 2024 to over 10 million by 2026. It cited the GSMA's SGP.41/42 specifications, anticipated to launch by the end of next year, as a key driver for this 1,200+% growth. As a result of the increased convenience, it also predicts the number of iSIM connections will rise to 210 million by 2028 globally.

Use cases such as smart energy meters and remote logistics are “being primed for immediate adoption”, says Juniper. Also, the automotive, fixed-wireless access and consumer electronics segments are among the areas to benefit too.

### IFPP target industries, as cited by Giesecke+Devrient:

- **Consumer electronics:** Devices and wearables with pre-provisioned network profiles for instant cellular connectivity – no matter where
- **Transport and logistics:** Built-in and battery-operated trackers as well as IoT devices that connect immediately to monitor on the go
- **Smart metering:** Utilities meters that connect straight away, eliminating in-field set-up
- **Automotive industry:** Vehicles delivered with ready-to-go connectivity for global communication and telematics
- **Healthcare and well-being:** Medical and monitoring devices securely connecting wherever they are deployed for reliable data transmission and remote management
- **Industrial IoT:** Machinery and sensors supplied with ready-to-use connectivity for real-time reporting and control ▶

## Power savings

IoT services firm **Eseye** says power is a key challenge that IFPP addresses as well. It says: "Even with the arrival of remote SIM provisioning (RSP), which oversees the secure storage, deployment and activation of multiple network operator profiles on embedded universal integrated circuit card (eUICC) SIMs, the focus has been on managing the SIM of a device after it has been deployed into the field, resulting in a not insignificant power draw. And in IoT, battery life is everything."

While RSP in IoT enables eSIM profiles to be installed, switched and deactivated over-the-air when the device is in the field, the process can consume up to 15% of the battery's capacity, says Eseye.

This can significantly reduce the lifespan of a low power wide area (LPWA) device that might be intended to be in-situ for up to ten years. But applying the appropriate SIM profile at the point of manufacture via IFPP, says Eseye, eliminates the need to push an update when the IoT device is activated in the field, conserving valuable battery capacity. And IFPP can still be used in conjunction with RSP, so updates can still be made after deployment.

## Dynamic changes

IFPP manages and integrates eSIM profiles by way of an over-the-air profile loader in the manufacturing line. As relevant MNO or MVNO SIM profiles are loaded this way, it allows for dynamic changes to the production line, based on characteristics such as the geographic location into which the IoT device is to be deployed. Eseye says the standard is currently awaiting completion, with commercial implementations "still a few years out". But while SGP.42 can be expected to arrive in "12-24 months", it says, there are IFPP-enabled solutions already on the market, that will "bridge the evolution gap" and offer an "upgrade path". Eseye and Thales are jointly working on such a solution.

## Streamlined deployment

Because IFPP IoT devices are pre-configured to connect to the most relevant network on activation, there is no need for a bootstrap profile or to push an initial over-the-air (OTA) profile update via RSP.

This makes the initial deployment of an IoT device easier, and reduces the need for local MNOs and MVNOs to support bootstrap profiles on the home subscriber server (HSS), adds Eseye.

While in factory profile provisioning is certainly not here yet, in terms of widescale availability, it is certainly a technology that manufacturers, operators and IoT business users will be keeping a very keen eye on.

*IFPP manages and integrates eSIM profiles by way of an over-the-air profile loader in the manufacturing line*

### Full IFPP benefits cited by IoT services provider Workz:

- Device manufacturers can save money by not needing to install SIM cards in devices during manufacturing
- Out-of-the-box connectivity, as IFPP offers an improved customer experience by making it easier for end users to activate their devices with pre-provisioned profiles on the device
- Provides OEMs and MNOs more flexibility in how they offer connectivity with pre-provisioned profiles, offering end-users more choices and being able to cater to different regions or usage requirements
- Fast offline process, as IFPP offers a high-speed offline process for provisioning of eUICC profiles, avoiding the slower option of online provisioning through a SM-DP+
- No certification costs compared to standard onsite SM-DP+ implementations, as providers can reduce cost and administration needs as the GSMA SAS (security accreditation scheme) certification is not required
- On-demand options, as IFPP enables last-mile offline provisioning, allowing providers to provision at a later stage in production if required
- IFPP offers late binding options that allow a profile to be linked to a specific device eID. This may be useful in cases such as enterprise deployments where profiles are required to be provisioned only on company devices
- IFPP is an alternative to purely relying on in-field provisioning, especially for applications using LPWAN technologies, including NB-IoT, which rely on devices with finite battery life