COMPRION | eSIM Tracer

Visualizing eSIM–Device Traffic

How NOS Enabled eSIM Profile Validation with the COMPRION eSIM Tracer

Challenge: No Visibility into eSIM-Device Interaction

More and more devices today rely on eSIM technology, with an increasing number of smartphones and IoT devices even being eSIM-only. Unlike traditional SIM cards, eSIMs are permanently soldered into the device. As a result, there is no conventional, physical SIM card interface available for diagnostics.



NOS, a leading Portuguese telecommunications and technology provider and a pioneer in the adoption of 5G and eSIM technologies, wanted to monitor the eUICC-to-Mobile Equipment (eUICC-ME) interface.

This was crucial to validate the critical interactions between the eSIM and the device—an essential part of thorough eSIM profile validation. Especially with the new capabilities introduced in ETSI TS 102 221 Releases 15 and 16, making sure the SUCI (Subscription Concealed Identifier) was really generated by the eSIM itself—not by the device—became a crucial step to guarantee security and proper operation.

NOS had already been using the COMPRION spy tool MiniMove to analyze the communication between plug-in SIM cards and mobile devices. When NOS learned about the eSIM Tracer, the equivalent tool for eSIM technology, it was a natural next step to try it out and integrate it into their workflows.

What is the eSIM Tracer?

The eSIM Tracer is a trace and diagnostic solution designed to efficiently troubleshoot and analyze communication between embedded eSIMs and mobile devices. The system combines versatile monitoring software with dedicated APDU tracing adaptors, which can be smoothly integrated into existing test setups. These adaptors are customized for the specific chipset model of the target device, allowing accurate capture of communication data.

> *For us, eSIM Tracer is a valuable asset to acknowledge the full chain of an eSIM profile lifecycle from the SM-DP+ to its hosting eUICC, which is a must in our case.*
>
> Christophe Saraiva, VAS Senior Specialist at NOS

Business
Mobile Network Operator

Customer
NOS, Lisbon, Portugal

Challenge
Ensuring full transparency in eSIM validation—SUCI calculation, profile download, and OTA—to guarantee robust security and quality for new 5G profiles

Sector
Telecommunications

Product
eSIM Tracer

Overcoming the obstacles with eSIM Tracer



Reliable Proof of SUCI Calculation
With the introduction of the COMPRION eSIM Tracer, NOS was, for the first time, able to fully verify where exactly the SUCI calculation is performed—a crucial part of authentication in modern mobile networks. The tool clearly demonstrated that the SUCI calculation for all tested profiles was carried out on the eSIM itself and not in the device. This level of transparency is a key quality and security factor, especially when rolling out 5G standalone technology, where the correct implementation of new security mechanisms is of the highest priority.



Validation of OTA Commands
Another advantage of the COMPRION eSIM Tracer is the ability to monitor over-the-air (OTA) behavior, a critical aspect of secure and reliable eSIM management. NOS used the tool to trace how remote actions were received and processed by the device—specifically how commands were relayed as Envelope APDUs and often followed by proactive commands like RAM applet manipulations, refresh triggers, or proof of receipt responses sent back to the OTA system. This precise oversight confirmed that all steps in the SUCI generation and profile activation worked exactly as designed.



Deep Insights into eSIM Lifecycle
The eSIM Tracer provided NOS with deeper insights into the initial steps that occur before the profile download itself, specifically the sequence from the SM-DP+ through the LPA to the eUICC and the related Store Data APDUs. It also helped validate the use of various GSMA eSIM profile template structures.



Conclusion
The eSIM Tracer helped NOS gain transparency into complex eSIM processes, verify critical security functions like SUCI calculation, and lay the foundation for reliable 5G services. The close collaboration with NOS also provided valuable insights into how the eSIM Tracer is used in real-world scenarios. These learnings have directly contributed to further developing and refining the tool.

> *eSIM Tracer was extremely valuable in confirming that the preparation work was correct, as it clearly demonstrated that the SUCI was indeed calculated by the eSIM, not by the device.*
>
> Christophe Saraiva, VAS Senior Specialist at NOS

Get in touch with us at COMPRION to discuss your specific requirements:

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