



CASE STUDY

# How Deutsche Telekom easily shares network settings with more than 700 OEMs

Deutsche Telekom uses GSMA's Network Settings Exchange to make sure its devices connect and function seamlessly on the long tail of devices.

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# What is GSMA Network Settings Exchange?

GSMA Network Settings Exchange (NSX) is an online hub based on TS.32 specifications. Here, mobile operators and MVNOs can share and maintain their latest network settings.

This makes it simple for device and equipment manufacturers to download these critical technical settings - and then pre-provision their products so they run reliably on any network anywhere in the world.

By using NSX, a mobile operator can share its network settings with virtually all manufacturers in the market - including top 10 percent.



# An explosion of network and device complexity:

Every mobile network operator (MNO) worries about customer experience (CX). This is understandable. In an era of near-universal mobile penetration in developed economies, MNOs cannot simply find new subscribers to replace those that defect to a new network.

In the past, networks could compete for subscribers on the basis of price and allowances. Today, however, mobile services are more affordable, and allowances are generous. In this new context, CX has become the big differentiator.

When a user has difficulty onboarding to a new network, accessing messages, going online or making voice calls – this is when they will be tempted to look for a new operator.

In recent years, four factors have combined to increase the risk of these problems. They include:

## Next-gen network upgrades

The switch from 2G/3G to 4G/5G brings a world of complexity. The new 4G and 5G networks enable voice and video services to move from circuit to packet technology. This gives MNOs and MVNOs multiple options to manage quality, choose bearers and select routing strategies.

Another key difference is that 2G and 3G services are hardcoded into standards and devices. By contrast, service settings under 4G and 5G are configurable within each device.

And yet every operator is at a different stage in this network upgrade process, meaning that there is a complex grid of interconnections for MNOs and their device partners to navigate whenever they want to on-board a new customer.

## Customer buying habits

In parallel to network evolution, there has been a change in the way people acquire devices. The old days when the market was dominated by operator-configured handsets has gone.

Today, a growing percentage of mobile devices are independently sourced. In fact, the market for pre-owned handsets is estimated at \$62 billion<sup>1</sup>. People buy online, or they hand on devices to family and friends (usually on different networks). As a result, fewer than a third of handsets are provisioned and set up for specific carriers.

The problem is self-evident. On possession of the new device, the customer wants a quick, easy and fully working set-up. If they don't get it, the risk of complaints and churn rises dramatically.

Source:

1. Expert Market Research, Global Refurbished and Used Mobile Phones Market Outlook
2. GSMA Intelligence, IoT Connections Forecast to 2030, Dec 2023

## eSIMs and non-human users

For the last decade, the mobile industry has gone beyond the human; it has started to connect machines. Indeed, GSMA Intelligence forecasts Internet of Things connections to reach more than 38 billion<sup>2</sup> by 2030.

The traditional plastic SIM card doesn't suit the IoT. Manually inserting and setting up SIMs into remote and inaccessible machines (wind turbines, shipping containers etc) is costly and impractical. To address this issue, the mobile industry created the embedded SIM, which is soldered into place and set up over-the-air at a later date.

The IoT has brought a vast range of new devices, modules and modems into the market – and a host of new manufacturers too. Self-evidently this has increased complexity in settings.

## New networks

The 2000s saw a number of mobile virtual network operators (MVNOs) launch services on top of existing network infrastructure. Brands tapped advances in network and cloud technology to build direct relationships with their customers via mobile. The advent of the eSIM accelerated this trend. The absence of a physical SIM card made it easier for consumers to select a new network – and therefore for new companies to enter the MVNO space.

Today, the GSMA says there are [more than 1900 live MVNOs](#) – that’s more than double the number of MNOs.

And now a new kind of network is joining them: the private mobile network (MVNE). Thanks to the virtualisation, enterprises can lease and run their own discrete mobile networks as a more secure and wide-ranging alternative to Wi-Fi. According to a 2023 GSMA study, 55 percent of operators (that have launched or are testing private 4G/5G) [already have 150 customers or more](#).

The consequence of the above rise in complexity is self-evident: it is not possible for networks to rely on default settings for devices, and

expect them to work at all times. While the industry has done its best to create universal standards, the reality is that each network implements them differently – and updates them constantly.

It raises the question: how can the rising number of different networks and device manufacturers share their new settings with each other?

Of course, the larger players can do this via one-to-one relationships. In practice, a multi-national telco will have bi-lateral arrangements with 20 or so OEMs. But as we know, there are now thousands of manufacturers active in the market.

To address the above challenge, the GSMA created the [Network Settings Exchange \(NSX\)](#).

It provides a central destination at which manufacturers can easily download the latest network settings of a significant cohort of the world’s MNOs, MVNOs and MVNEs.

The service was conceived in 2015, and was ready to launch a year later. In 2024, it launched version 16. NSX has been embraced enthusiastically by the many stakeholders in the mobile network and device sectors.

Here is the latest key data for the service:

**720+**  
OEMs registered with the service

**30%**  
OEMs that have downloaded a settings file in the past 12 months

**More than 160**  
MNO and MVNO accounts

**More than 400**  
Unique network settings featured on NSX

**940+**  
OEM settings files downloaded in a typical month





# NSX customer story: Deutsche Telekom

**How does NSX help operators to cut costs, boost efficiency and improve customer experience? What is it like to use? We asked Florian-Leon Schmitt, partner engineer at Deutsche Telekom, to share his insights**

**Deutsche Telekom joined NSX six years ago. What did the settings landscape look like then?**

Even six years ago in 2018, it was already pretty complicated. It still is! Take IMS. It powers all the voice services that we have launched since LTE emerged as a standard, and yet different operators each have their own processes for making those services work. There's still huge variation here.

Meanwhile the networks themselves are evolving. 5G is proliferating – and it is very complex. As a carrier, 5G lets you aggregate and combine technologies, and it means that everything grows exponentially in terms of the combinations that are possible.

But that's just the network side. There is also more variation than ever among device manufacturers. Alongside the established OEMs is a long tail that's becoming an ever more significant part of the market.

**How would you work with OEMs if they are not members of NSX?**

Well, there are a small number of large and established manufacturers. They have big partnering and engineering departments, and we work with these teams directly. But, as I said, there are now all these new smaller manufacturers popping up. They barely know that we exist – and often we don't know who they are either. But they might already be super successful in their own markets.

These OEMs could be making smartphones or IoT devices or even chipsets. But in many cases they have no clue how our network functions or how to contact us.

**So what are their options if they don't use NSX?**

It's a very good question. They don't have many. It is possible to do some web searches, and maybe discover something like an APN list somewhere. Obviously you can find access points and configurations in some of the Open Source specs but even they are not always well-maintained and maybe not be up to date. This is all the long tail OEMs have to rely on.



And it shows why NSX is such a welcome innovation. It gives any manufacturer the ability to download settings not just from us, but from any network active on the service.

### What problems arise when OEMs don't have access to the correct settings?

Fundamentally, when a device is not configured correctly, it might not work properly on our network. The best example is probably IMS. If it's misconfigured, a voice caller might not get through. Or they might wait for 10 seconds before they hear anything. Or they will fall back to 2G.

### Can you describe how NSX was launched?

At first, before NSX, we established a system of TS32 sheets. This established a standardised way to share network settings. It was a big step forward. But we still shared the TS32 sheets manually. There was no central platform where manufacturers could find them.

When we launched NSX it started out with basic functionalities, and a relatively small amount of operators participating. Maybe 40 or so. It was really just a platform to host these settings sheets that we had previously handled manually.

### How has NSX evolved since then?

It's improving constantly, which is a great credit to the GSMA team. They have worked hard to ensure it works well for all networks and OEMs. For example, we started an initiative a year ago where you could do feature requests for the NSX database, and everybody could just raise them and they were discussed in the group very openly, and then agreed and implemented. And we have just introduced an [ideas product sheet](#) so it's easy for anyone to suggest new innovations.

### How has joining NSX benefited Deutsche Telekom?

It's very hard to quantify the benefits precisely in terms of call drops and so on. The best indicator for me is when we can see active involvement and usage from the OEMs, e.g. through direct feedback. They frequently ask: do you have this in the setting? What does this setting mean? How should I implement this setting? The questions show they are actually using NSX! This is all positive feedback.

Another big milestone was the commitment to the service from one of the major (top) device manufacturers besides the 700 other OEMs already registered to the service. I expect this to keep growing, since there is no fee for manufacturer. There is a lot of room for growth in terms of networks. But I really believe that NSX will become an industry-wide essential service.

### How can NSX be improved?

I think NSX is going really well, but we might look at ways to integrate it more with OEMs' own systems and services. I'm not working for an OEM, but I assume they have their own databases where they store their operator settings. I think we might explore if it's possible to connect NSX to these systems in a

simple & standardised way.

We could also look at how to bring the OS vendors like Google on board. Some OS vendors operate platforms which can be used to manage devices, including network connectivity and other settings. They have a similar aim to NSX so it would make sense to connect the services in some way.

On the reporting side, it would be good to see if settings are actually being implemented. At present, we have this 'downloaded' feature, so we can see who requested a setting, but there's no good way to see if it's being implemented or not. More clarity on that would also be nice, though it might be difficult to do. That said, the positive feedback I get from OEMs does tell me they are really engaged and happy with the service.

### What is your message for OEMs and networks that are not members of NSX?

I think they should join! It's a truly collaborative service that benefits everyone. And I would urge members to get involved when they do join. NSX gives everyone a voice, so all members can get involved in working groups that discuss improvements.

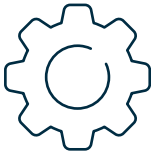




# How NSX works:

1. Operators or MVNOs upload new device network settings - or update existing ones - to the NSX exchange platform. Networks and OEM can use a messaging feature to communicate and share updates when needed.
2. Device manufacturers are notified of new or updated settings, and download these settings to their local servers.
3. New subscribers switching on their device receive the correct and most up-to-date settings, while current subscribers receive updated settings for ongoing optimal performance
4. Device manufacturers and operators can use the messaging service to co-ordinate and communicate settings implementation status with each other.

## THE SERVICE SUPPORTS THREE GROUPS OF SETTINGS:



### General settings

- Operator/MVNO name, MCC, MNC, and GID
- APN info
- Registration settings
- Local numbering format policy
- Voice bearer preferences (home and roaming)
- Local break out or home routing preferences when roaming
- Circuit switch fall back preferences
- Wi-Fi to Cellular handover preferences
- Voice/Video over Wi-Fi preferences
- Emergency call over Wi-Fi parameters
- IPv4 and IPv6 support

### IMS

- Voice/Video over LTE preferences
- Conference bridge platform address and settings
- Voice composer (presence) preferences
- RCS Capability Discovery preferences
- RCS - Integrated or separate IMS core
- SMS over IP and alphabet
- Supplementary Service platform address and settings
- USSD over IP
- SIP signalling parameters
- Voice/Video codec and bandwidth preferences

### IP services radio settings

- 5G Settings
- LTE radio signalling parameters
- LTE radio, mode and bearer transmission parameters
- 2G, 3G, 4G handover preferences
- 3G settings
- 2G settings
- CDMA 2000 and TD SCDMA support
- Data centric only device designation



# GSMA Network Settings Exchange : the benefits

## **Better customer experience**

When OEMs can download – and configure – the latest networks settings quickly and easily, it helps services to run smoothly. Customers can on-board fast, and enjoy basic mobile services (voice, messaging, roaming) as well as sophisticated 4G and 5G features with no technical issues.

## **Lower costs**

It takes time, resource and cost to make arrangements with those manufacturers individually. NSX communicates new networks settings to hundreds of OEMs in one go.

## **Reduced churn**

When subscribers can access services with no issues, they're less likely to leave to go to another network that supports those services.

## **A future-proofed network**

Any network migrating to 4G and 5G can be sure the more intricate IMS and APN settings are configured correctly on devices in their networks. This will support the quality and speed of services like VoLTE and ViLTE, and the big-data capacity of 5G.

## **One upload for universal reach**

The NSX provides a standardised template, so OEMs can easily download to their local servers.

## **Clear reporting**

Networks control which OEMs see their settings. The service also provides instantaneous reporting to keep track of which OEMs have downloaded settings, when, and how many times.

## **Easy messaging**

Operators and manufacturers can use the in-app messaging feature to communicate with each other to coordinate settings implementation plans and status.





### GSMA Industry Services

Data, resources and tools that improve and support global connectivity by underpinning important interoperable backend functions and addressing the problems GSMA Working Groups have identified.

**NSX: get in touch!**

**If you want to know more about the GSMA Network Settings Exchange, please contact us [here](#).**

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