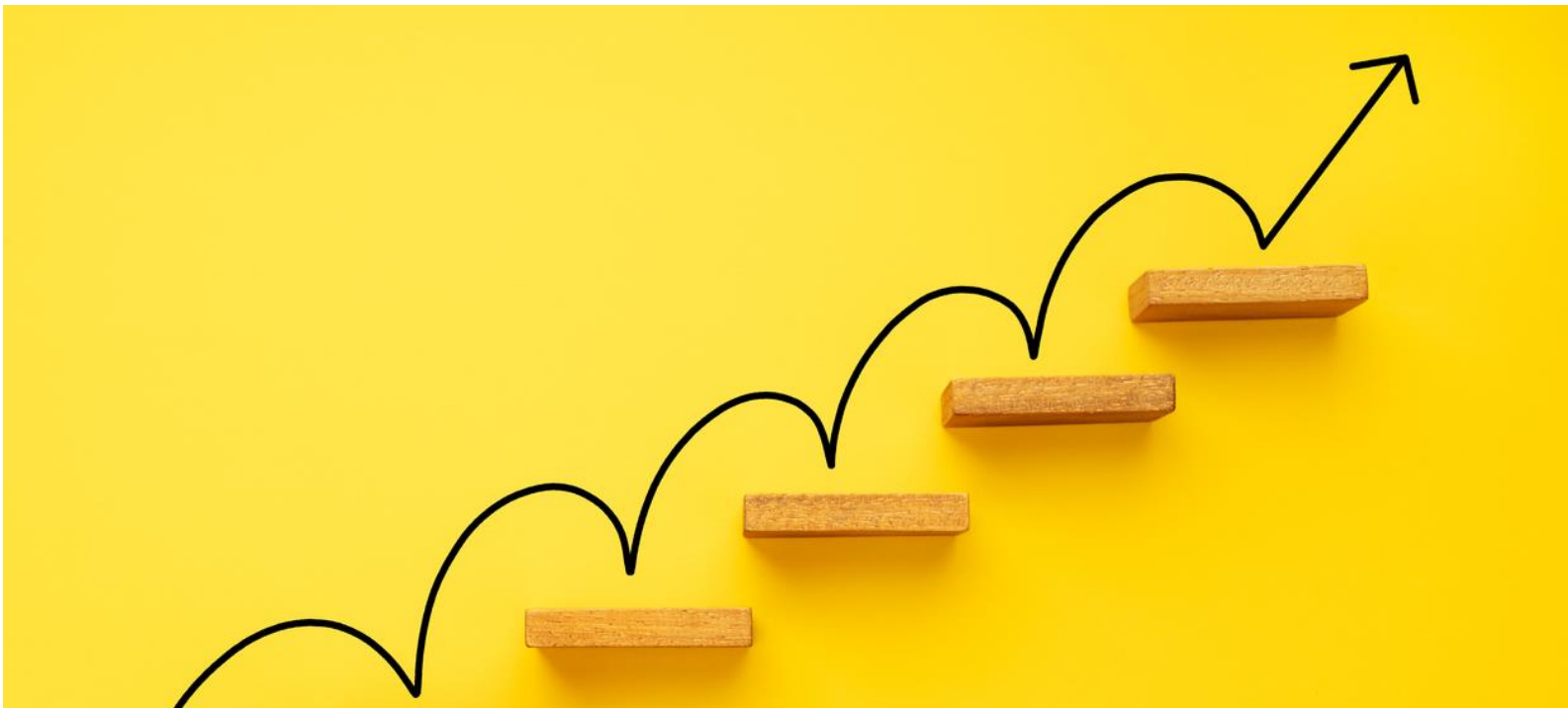

5G network slicing examples: 6 recent trials, proofs of concept and collaborations

Network slicing has long been a hot topic for telcos, considered as a major benefit of 5G and a key opportunity for enterprises. Last year, we discussed where we were at with network slicing. We explore what progress has been made since then, along with 6 recent examples of trials, proofs of concept and collaborations.

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October 2022

What's changed in the network slicing domain?

There has been widespread hype around the concept of network slicing for a number of years. Back in 2018, claims were made that 5G network slicing would generate "$66 billion in value for enterprise verticals including manufacturing, logistics, and transportation by 2026." The technology is claimed to be an integral part of the 5G opportunity, allowing operators to offer enterprises a unique and flexible service, customised to their specific needs. Fast forward four years, despite this hype, the technology seems to still be far away from adoption at scale and still remains very much in the early trial and proof of concept stages.

Last year, in our article Network slicing: where are we today and how far is there to go?, we explored the status of network slicing and its progress toward large-scale deployment. This article serves as an update to explore the progress of the technology since 2021, some examples of the technology's early trials and the barriers it still faces in its journey to deployment.

Recapping the value of network slicing

We have previously defined network slicing as 'a mechanism to create and dynamically manage logical and functionally discrete end-to-end networks over common physical infrastructure'. In essence, operators can create multiple discrete networks (network slices), segmented from a wider network, that has its own complete functionality whilst being able to be customised to the specific needs of enterprises.

For telcos, this means a new opportunity to provide more tailored and flexible services for customers. As opposed to the traditional 'one-size-fits-all' approach, network slicing enables telcos to customise a network slice to customers' or use case specific needs and spin up, alter, and retire slices as required.

One notable example has been the work Deutsche Telekom and Nokia have done with the Port of Hamburg. The Hamburg Port Authority (HPA), Deutsche Telekom and Nokia partnered to test 5G applications in an industrial environment. The project installed a 5G radio base station on an existing television tower in Hamburg to provide the connected to the 8,000-hectare site. Part of the research project 5G-MoNArch, the focus of the trial was to test the concept 5G network slicing against the diverse requirements of various complex industrial applications. Three use cases were tested in this trial, all with differing network requirements:

- Mobile data sensors on three HPA ships enabled real-time environmental monitoring.
- The Port Road Management Centre connected with traffic light through a network slice of the 5G mobile network to enable remote controlling.
- AR applications were used by the port's engineering team providing them access to necessary data when on-site.

The project provides a demonstration of the flexibility and adaptability 5G network slicing can afford in real-life conditions, serves as a 'blueprint for the industrial use of 5G technology'.

The barriers still facing network slicing

5G SA deployment is still slow

As already mentioned, dynamic network slicing depends on fully virtualised infrastructure of 5G standalone (SA). We have catalogued only 17 operators as having deployed 5G SA in public networks.

In March 2022, GSA catalogued only 20 operators as having deployed or launched 5G SA in public networks. As noted in our recent report, 5G standalone (SA) core: Why and how telcos should keep going, many

operators have delayed their rollout process, we noted that many operators are dwelling on the risks of SA deployments. One of these risks outlined is that enterprise use cases exploiting SA capabilities (including network slicing) have not yet been well developed.

Slow move to commercialisation

Regardless of the slow roll-out of 5G SA, another issue facing network slicing and its journey to wider deployment is the lack of clear network slicing deployment models in practice. There is no clear template for telcos on how to logistically deploy these end-to-end network slices across their networks. There have been a few PoC trials. Earlier this year, Telefonica, Ericsson and Google collaborated in a lab test that demonstrated an end-to-end automated network slicing concept in a 5G SA environment, that illustrated the onboarding of a network slice from core to the RAN in less than 35 minutes. Similarly, A1 Telekom Austria Group and Amdocs partnered and announced their end-to-end service and network orchestration of 5G network slices. With this aspect of network slicing also in the PoC stage, network slicing seems to be far from commercial deployment.

Lack of clarity on net neutrality regulations

Net neutrality is all about the belief that all internet traffic should be treated the same. Different users, websites, applications or content should not be treated differently to each other, e.g. some users 'discriminated' against whilst others receive preferential treatment. Many countries across the globe, including those in the EU, have some regulations and guidelines around net neutrality but the implications of net neutrality on something like network slicing are not yet clear. There are outstanding questions on how these regulations/guidelines should be interpreted: e.g. whether network slicing breaches the principles of net neutrality or whether it can be treated as an exception defined by certain regulations. For example, Andrea Dona, Chief Network Officer at Vodafone, has asked for greater clarity from the regulators for the telecoms industry to be able to remove any restrictions on innovation.

Despite these aforementioned obstacles, network slicing trials have progressed and become more promising to demonstrate the opportunities that come with the technology's capabilities.

Network slicing examples: recent trials and PoCs

1. Ericsson, TIM and Comau (June 2022)

In June 2022, three new applications are being tested in the 'factory of the future' facilitated by 5G network slicing at Comau's headquarters in Turin, Italy. Using the TIM and Ericsson deployed 5G network, each use case aims to demonstrate the benefits of slicing functionalities specifically for industrial contexts.

- The first use case involves the connection between a physical robot and its corresponding digital twin. Facilitated by low latency, the real-time synchronisation between the robot and its twin will enable modelling of production processes that can later provide insights for optimisation.
- The second use case uses data from various sensors to demonstrate real-time asset monitoring. The data is then collected in a central application which can provide insights on predictive maintenance, production processes and quality.
- Using AR and digital tutorials, the third use case enables enhanced support for on-site staff. High bandwidth connects staff to experts remotely to provide video transmission for more effective problem resolution.

2. Telefónica, Cisco, Securitas, Alisys, ZTE, and the Universidade de Vigo (November 2021)

In November 2021, Telefónica, Cisco, Securitas, Alisys, ZTE and Universidade de Vigo in collaboration launched the world-first POC on dynamic robotics and 5G networks in security. Cisco provided the 5G SA network core infrastructure and software enabling service virtualisation, orchestration and automation; and ZTE provided the 5G SA radio with native slicing capabilities.

Taking place at the Universidade de Vigo campus, the trial saw the Boston Dynamics made robot, Spot, provided by Alisys, connected to a specific slice of the campus network dedicated and tailored for critical services. Alisys' software platform facilitated the remote operation of the robot itself and the capturing of environmental data and images, such data is then communicated in real-time to security and control personnel.

3. Lishui Municipal Emergency Bureau, China Mobile and Ericsson (August 2022)

China Mobile and Ericsson developed a critical natural disaster management solution using 5G capabilities with network slicing technologies and expect nationwide deployment as a result. Under the leadership of Lishui Municipal Emergency Management Bureau, the solution was developed and tested in Lishui as a susceptible location to large-scale natural disasters and flash floods. The project aims to apply 5G and network slicing capabilities to enable monitoring of potential natural disasters and subsequent emergency response in small basin areas. For example, utilising network slicing capabilities for tailored characteristics, the solution uses a slice customised for high reliability, security and coverage to facilitate the remote control of drones and unmanned lifeboats as part of its life-saving system for automated person search and rescue.

4. Sky, Vodafone, Ericsson and Bundesliga (February 2021)

Sky, Vodafone and Ericsson collaborated with Bundesliga, a football league in Germany, to trial the impact of 5G on sports coverage production at Dusseldorf Fortuna's 5G-enabled stadium. The trial saw the use of 5G enabled cameras to allow for more flexibility to the traditional method of broadcast, which required transmission from wired camera equipment to an outside broadcast van via satellite or fibre optics, to the production studio before finally reaching screens. To fully enable the benefit of real-time video transmission to production locations, Ericsson provided the required network slice to protect broadcasting from interference from spectators' smartphones. The Ericsson orchestrator creates an end-to-end network slice across the core network, transport and RAN to provide bandwidth, resilience and latency necessary for seamless broadcasting.

5. Nokia and Google (August 2022)

At their network slicing development centre in Tampere, Finland, Nokia successfully trialled network slice selection functionality on 4G/5G networks on Google Pixel 6 phones running Android 13 using UE Route Selection Policy (URSP) technology. According to Nokia, the trial demonstrated 5G network slicing capabilities that allow a smartphone to connect to multiple network slices simultaneously through different enterprise and consumer applications, determined by the subscriber's requirements. The URSP technology also allows network slices to be tailored according to certain variables including network performance, traffic routing and security. Conducted using Nokia's end to end 4G/5G network slicing product portfolio across RAN-transport-core, the trial also included LTE-5G New Radio slice interworking functionality. The solution once deployed will unlock the opportunity for operators to offer new 5G network slicing services to enhance the customer experience of applications operating on Android 13.

6. Turkcell and Ericsson (May 2022)

In May 2022, Turkcell and Ericsson trialled the industrial use case of an Autonomous Mobile Robot (AMR) at Turkcell Kartal Plaza/Captive Office deployed using network slicing from both a public network (Dual-mode 5G Core SA) and a private 5G network (also SA). The AMR itself, provided by Milvus Robotics, includes an industrial modem with 5G SA connectivity. The trial illustrated the way in which 5G in combination with network slicing technology can enable and facilitate new industrial use cases with specific requirements, in this case being real-time data transmission with low latency and its ability to withstand an environment with a high density of connected devices.

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