TPG Telecom's cloud transformation journey

Network evolution to 5G powered by Ericsson

ERICSSON

in partnership with

tpg TELECOM

November 2022

TPG Telecom breaks ground in Australian 5G first

Executive summary
In 2021, TPG Telecom celebrated the successful creation of its commercial 5G standalone (SA) network – the first in the Australian market. It was launched within just 6 months of the contract being signed.

Previously, TPG Telecom had become the first communications service provider in Australia to migrate its entire customer base to a virtualized core platform. Driving this success is a transformation of TPG Telecom's network that has been ongoing since 2016. Ericsson collaborated with TPG Telecom throughout this journey as prime system integrator, taking responsibility for the solutions end-to-end, from consulting through to testing and delivery.

The transformation began with the deployment of the Ericsson Network Functions Virtualization Infrastructure (NFVI) and the virtualization of multi-vendor network functions from as many as 10 vendors. This was followed by the evolution to a 5G Core to support 5G SA, using Ericsson's cloud-native dual-mode 5G Core. Ericsson is also delivering automation capabilities, through Ericsson Expert Analytics and built-in software probes which will further improve TPG Telecom's customer experience.

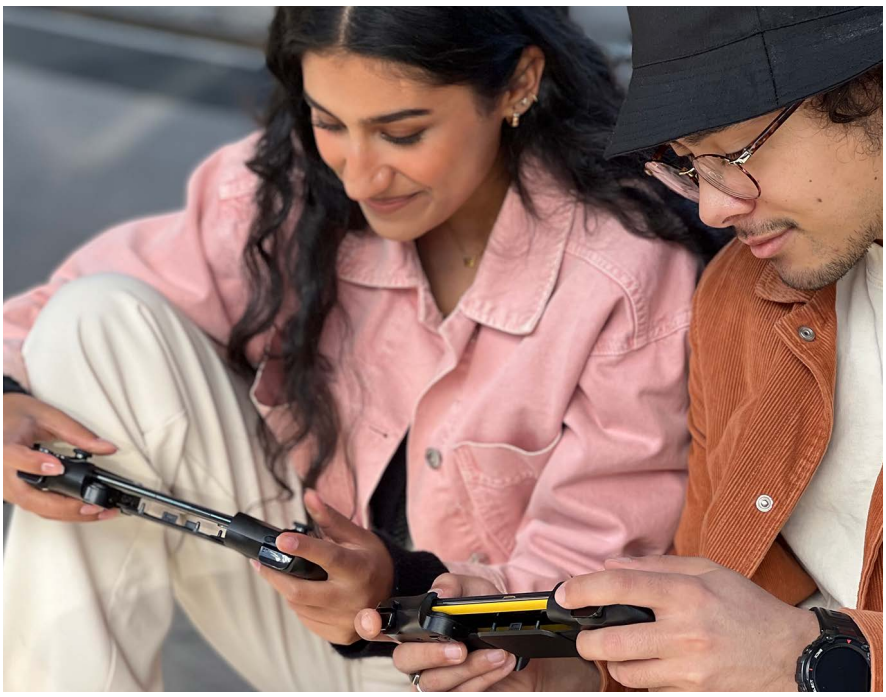
TPG Telecom is now in a strong position to start automating its network, building on the solid foundations that have been laid in the last few years.

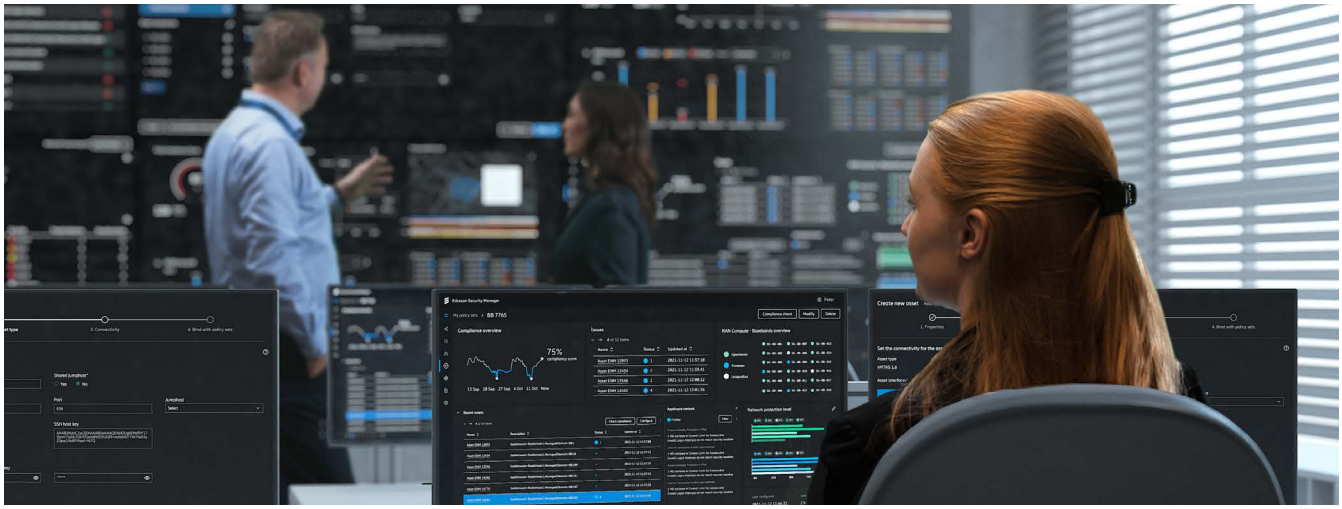
Collaborating for 5G success
The strong collaboration between Ericsson and TPG Telecom enabled it to become Australia's first service provider to have its entire 4G and 5G customer base migrated to a virtualized core platform, and then go on to successfully launch a commercial 5G SA network in 2021.

The project was initiated in 2016, with the ambition to transform and virtualize TPG Telecom's network in preparation for emerging services, as well as evolving its core network to increase the level of agility and programmability. First, the NFVI was created including orchestration capabilities and lifecycle management of the cloud infrastructure. Then, the cloud-native 5G Core was enabled to support the deployment of 5G SA on the existing NFVI architecture, and solutions such as Ericsson Expert Analytics and built-in software probes were incorporated, helping to manage the complexity brought about by 5G.

"From a technical perspective, it was a significant effort to rationalize the vendor footprint and the spectrum strategy. With an ambitious 5G roll-out ahead of us, there were several requirements on the table that were conflicting with each other. The implementation of a new, modern, fully virtualized core network, on a multi-vendor capable cloud infrastructure, was seen as a perfect solution to address those requirements."

Giovanni Chiarelli,
Chief Technology Officer,
TPG Telecom





Drivers for change

Vendor rationalization was one of the key drivers for change, due to the high number of VNFs from both Ericsson and third parties that needed a common platform. Regulatory requirements, the business merger between Vodafone Australia and TPG Telecom and the need to plan for the 5G roll-out were some of the other key reasons TPG Telecom decided to embark upon this ground-breaking transformation, as well as the drive to create a more efficient network, with less complexity and lower opex.

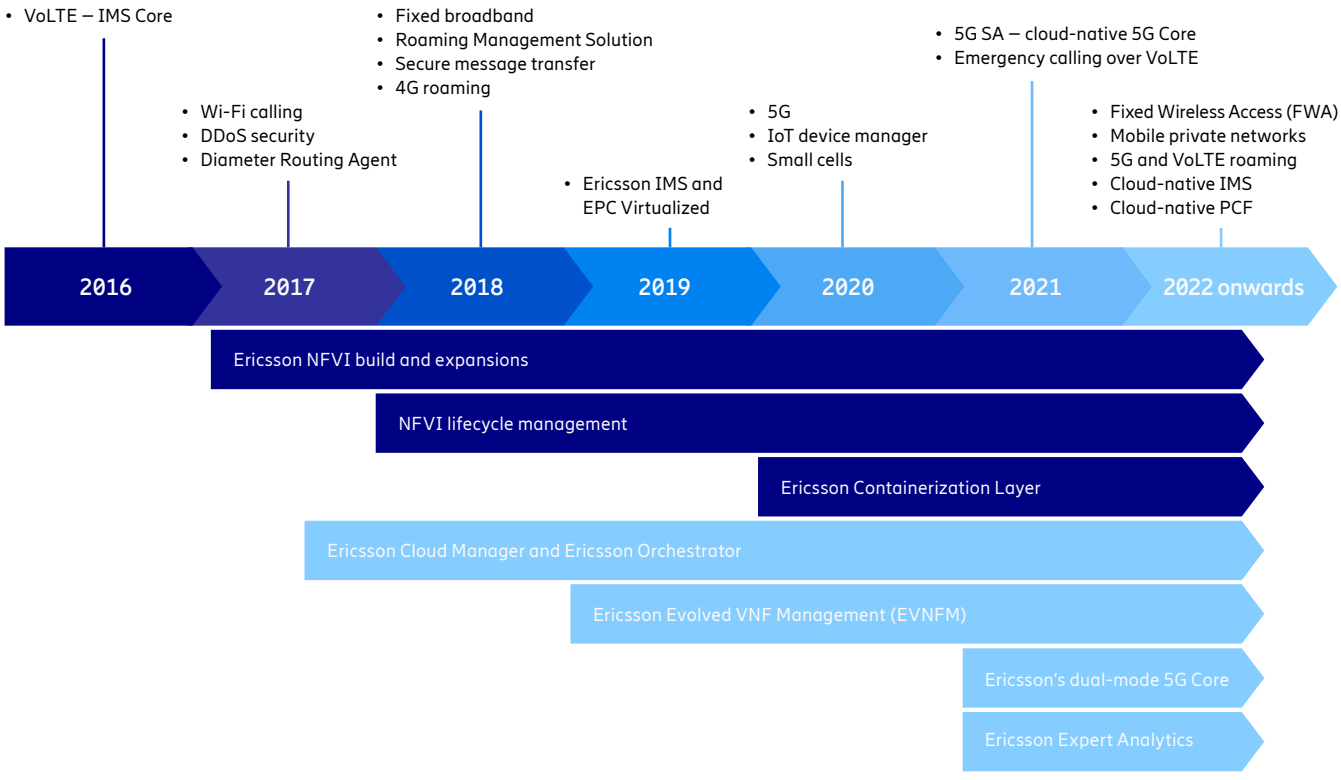
Reducing the amount of dedicated hardware and software required for deployments by adopting a cloud-native approach was also a desirable outcome – in terms of reducing operational complexity and simplifying deployment, but also for the sustainability benefits of having a smaller physical footprint.

TPG Telecom also recognized that changing its strategy to embrace cloud-native and 5G Core would be vital for offering exciting new services and improved 5G coverage to customers, as well as furthering its status as a strong challenger in the market.

tpg TELECOM

TPG Telecom is a full-service telecommunications company, with an aim to connect Australia with its nationwide mobile and fixed networks. Its purpose is to build meaningful relationships and support vibrant, connected communities.

Figure 1: TPG Telecom's cloud-native transformation journey



Ericsson's role in TPG Telecom's transformation journey

Ericsson played a key role in TPG Telecom's transformation, leading the network evolution program end-to-end as the prime system integrator.

The project was undertaken according to a unique outcome-based approach, focusing on the delivery of 14 business outcomes that covered the key areas of NFVI: orchestration, virtualization of VNFs and lifecycle management. Ericsson's role of prime systems integrator meant taking responsibility for the entire end-to-end solution, and ensuring the business outcomes were delivered. This encompassed design through to deployment, including all testing and acceptance within a testing environment in the pre-production stages, and pushing solutions out to production environments for delivery.

The network was designed based on global standards, with Ericsson's own guidelines for resiliency, flexibility and maintenance. Ericsson also supported TPG Telecom as it became familiar with the new systems and the cloud infrastructure ways of working.

NFVI: The first steps on the journey

The first step forward was to realize TPG Telecom's ambition to build an NFVI architecture and undertake a virtualization program that would include the consolidation of legacy technologies. Ericsson was responsible for deploying the NFVI stack and virtualizing the core, voice and IP network functions. Ericsson deployed the NFVI solution across the country and began onboarding applications throughout 2017.

Existing network functions were successfully virtualized during this initial phase, including all IMS applications, Evolved Packet Core (EPC), 3PP VNFs, signaling solutions such as the Diameter Signaling Controller and more. The NFVI also hosts functions from third parties. Today, TPG Telecom has more than 60 different network functions implemented from 10 different vendors on the Ericsson NFVI. To accommodate this demanding environment, TPG Telecom adopted a rigorous verification program led by Ericsson to test and validate the performance of each VNF type before the migration into the live network.

Creation of cloud-native 5G Core for standalone

After the successful deployment of the NFVI, TPG Telecom recognized that it was time to take the next step on its journey – evolving to a 5G Core, using the existing NFVI architecture plus cloud-native network functions (CNFs) such as Ericsson's dual-mode 5G Core.

Ericsson was again engaged to support, as the existing partnership would enable TPG Telecom to move quickly to introduce the changes and to keep up the high momentum of the transformation. As TPG Telecom and Ericsson had proactively deployed Ericsson's cloud container solution in 2020, with a view to deploying new containerized services in the future, the 5G Core was able to be launched within 6 months of the contract being signed.

On top of the existing NFVI architecture, Ericsson added the Kubernetes layer, called Ericsson Cloud Container Distribution (CCD), to make the solution compatible with Ericsson cloud-native applications. Once these pieces were in place, Ericsson's cloud-native, dual-mode 5G Core functions to support 5G SA were successfully deployed.

Throughout 2020–2021, TPG Telecom fully virtualized its 4G network by migrating all the physical core network functions to virtualized applications, and by the end of 2021 introduced the new 5G Core. TPG Telecom plans to start migrating around 5 million 4G subscribers from the current EPC network to the new cloud-native dual-mode 5G Core.

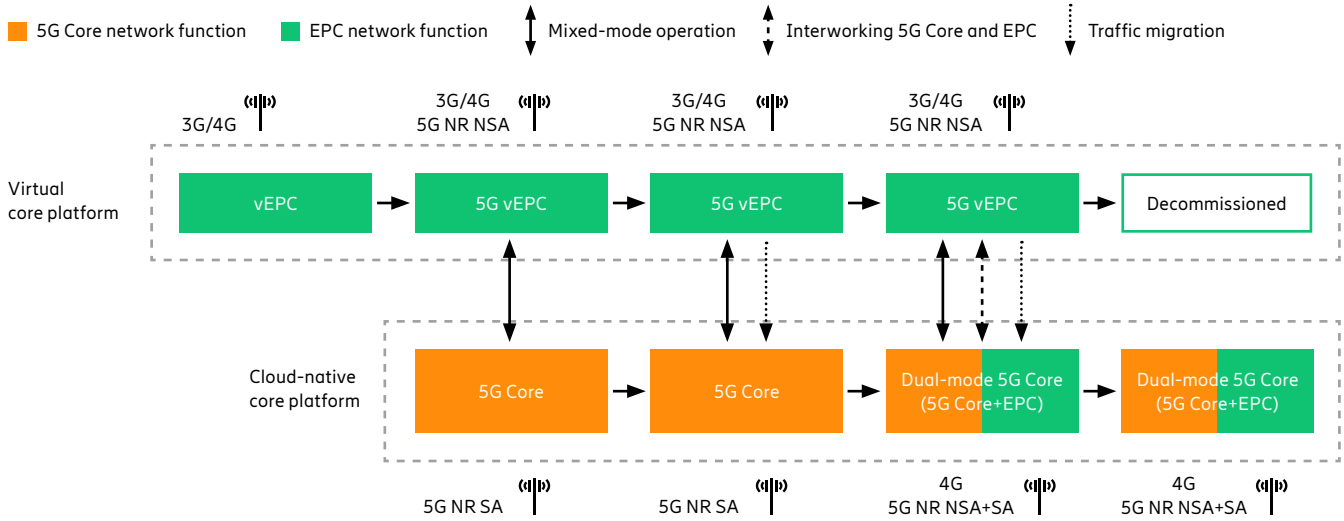
Increasing automation with Expert Analytics and software probes

TPG Telecom's network was one of the first globally to have a cloud-native deployment of Ericsson Expert Analytics, a user experience management tool. The solution uses Ericsson's dual-mode 5G Core with built-in software probing capabilities and intelligent data handling in order to tackle the increasing complexity. With traffic passing through the 5G Core being heavily encrypted, the built-in software probes ensure sensitive data can get from A to B while remaining encrypted, and essential performance data can be captured and delivered.

This fully cloud-native solution provides monitoring, troubleshooting and continues to develop toward customer-centric intelligence for 5G.

> "Ericsson was selected as they really committed on the final result, not just on the intermediate steps and the capabilities. That was the element that made the difference, on top of a strong partnership with Ericsson that was already existing."
>
> Giovanni Chiarelli,
> Chief Technology Officer,
> TPG Telecom

Figure 2: TPG Telecom's path to cloud-native dual-mode 5G Core



Note: 3G access to be turned off from the network by 2024. New 4G traffic is provisioned to the cloud-native platform.

Deployed Ericsson solutions

Ericsson NFVI: The foundation of the cloud infrastructure, including the key components:

- Ericsson Cloud Container Distribution: Manages and orchestrates all containerized applications
- Ericsson Cloud Execution Environment: Telco-grade VIM, certified on OpenStack and OpenNFV
- Ericsson Software Defined Infrastructure: Manages all hardware in the NFVI solution, independent of vendor, in a common pool from a single integration point with a common set of skills, tools and procedures
- Ericsson Software Defined Networking: Provides seamless intra-datacenter connectivity for virtual and physical workloads in a telecom cloud
- Ericsson Software Defined Storage: Provides market-leading solutions suitable for Ericsson system-verified NFVI and CNIS solutions

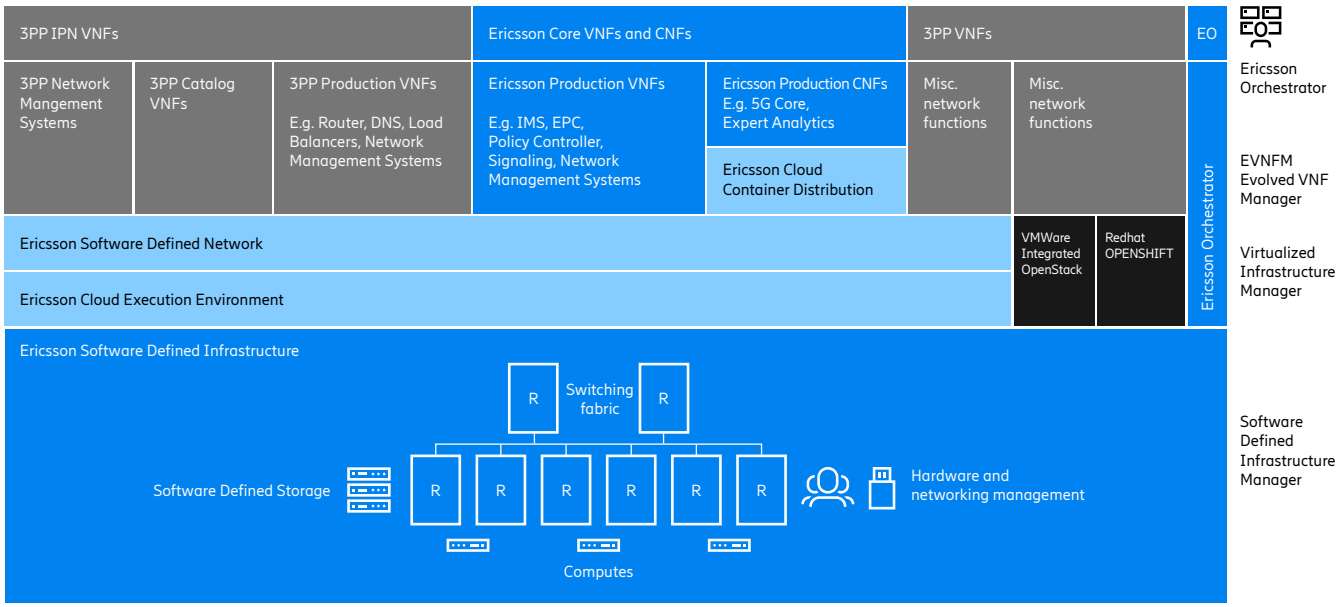
Ericsson's dual-mode 5G Core: Combining EPC and 5G Core network functions into a common cloud-native platform for efficient TCO and migration to 5G

Ericsson Cloud IP Multimedia Subsystem (IMS): Supporting voice services, initially with EPS fallback and later voice over NR (VoNR)

Ericsson Expert Analytics and built-in software probes: A cloud-native solution that performs customer-centric monitoring and identifies and troubleshoots issues

Ericsson Orchestrator: Provides end-to-end cloud orchestration capabilities

Figure 3: Overview of TPG Telecom's solution



A successful transformation

Increased efficiency and evolved ways of working

TPG Telecom can now manage and expand its network capabilities on demand, using virtual applications in place of physical boxes in the network architecture. This, together with centralized orchestration, makes it easier to load-balance, scale up and down, and move functions across distributed hardware resources.

TPG Telecom adopted the virtual POD (vPOD) and tenant traffic separation, allowing more than 30 vPODs to carry different functions across the datacenters. This concept is enabled by Ericsson's Software Defined Infrastructure, which manages all data network, compute and storage hardware, independent of vendor, in a common pool from one integration point with a common set of skills, tools and procedures. The management functions include discovery, configuration, lifecycle management, alarm monitoring and networking configuration.

Additionally, a container-as-a-service (CaaS) layer was introduced for deploying cloud-native applications on the same NFVI platform as the VNFs. These innovations and telco cloud building principles have improved granularity and increased speed of software upgrades/releases, and have enabled automation through embedded features in the NFVI solution.

The transformation has allowed TPG Telecom to launch a "cloud brokerage" model internally. This has significantly reduced the time needed to add network capacity, offering the agility to move quickly and meet business demands.

TPG Telecom's operational efficiency has been improved following the introduction of a service catalog, which standardizes TPG Telecom's offerings to cloud consumers, reducing the time taken to validate, test and deploy new virtualized functions.

The agility of predefined patterns of scaling the NFVI has allowed TPG Telecom to roll out new functions such as 5G Core and enable faster time-to-market of new services in parallel to improved operational simplification and acceptance processes.

Automation is key

The business opportunities of the 5G SA world come with new challenges that require a novel approach to troubleshooting and analytics. TPG Telecom addressed the challenge of handling the ever-growing data in 5G by taking full advantage of 5G Core's built-in software-probing capabilities. This is introducing troubleshooting capabilities and end user-centric experience monitoring while at the same time reducing the overall total costs of implementing and maintaining the end-to-end analytics system. Experience degradations are detected and efficiently resolved.

Decoupling software from commercial off-the-shelf (COTS) hardware has allowed TPG Telecom to experiment with a centralized, multi-vendor software continuous integration and continuous deployment (CI/CD)pipeline, and is striving for cloud-native quarterly software lifecycle events in contrast to the 12–18 month legacy lifecycle.

Machine learning and AI capabilities enabled by customer-centric monitoring will not only continue to enable further network automation, they will also become an asset and potentially enable new offerings for TPG Telecom's enterprise customers, as well as consumers, in the near future. TPG Telecom aims to ensure the best customer experience through this transformation.

New market possibilities

The speed with which TPG Telecom can offer new services to customers has been significantly accelerated. The 5G SA network was commercially launched within months instead of years, allowing the launch of an enhanced mobile broadband service.

Following this success, the 5G FWA service was also enabled in a matter of months, offering the Australian market an attractive fiber alternative. 5G Core also allowed for the aggregation of the low-band 700 MHz spectrum with the 3,600 MHz mid-band, enabling a significant coverage increase compared to the traditional deployment of 5G solely on the mid-band. This enabled TPG Telecom to quickly achieve 95 percent population coverage in the top 12 urban areas in Australia.

TPG Telecom's network capacity has grown almost 6 times in 4 years. Looking ahead, growth is expected to continue thanks to high demand for 5G mobile broadband and other services from consumers and enterprises. The NFVI solution enabled 600 percent growth while only increasing the physical size of the core network by about 100 percent.

This equates to significant power-efficiency benefits, supporting TPG Telecom's environmental objectives and delivering tangible cost savings.

Additionally, TPG Telecom has rationalized the hardware vendors in their telco cloud down to two, allowing them to focus on long-term, sustainable partnerships. Conversely, it has expanded its software partners and adopted a quick and efficient onboarding process, allowing them to follow a best-of-breed approach.

The standardization has also allowed TPG Telecom to distribute its footprint and ready the network for edge and deep edge solutions, offering more new services to their customers in the future.

> "Looking at our competitive position, thanks to this innovative implementation, we can say that we are leading from an Australian perspective and it's really delivering great benefits to our customers."
>
> Giovanni Chiarelli,
> Chief Technology Officer,
> TPG Telecom

TPG Telecom and Ericsson's 5G future

The completion of the first phase of the project is not the end of the transformation.

The evolution of TPG Telecom's network has been extremely successful. TPG Telecom and Ericsson's willingness to enter an exploratory partnership – working towards joint goals, and focusing on reaching desired outcomes together – led to better results within a shorter timeframe than ever before.

In terms of key lessons taken from the journey so far, Giovanni Chiarelli said that TPG Telecom are reflecting on two key elements: Firstly, the trade-off between ensuring operational stability and implementing innovative solutions. While innovation carries risks and should be a "very well-weighted decision," it is also true that "innovation makes sense exactly when it's in front of our customers, so they can directly benefit." Secondly, there have been lessons learned already around adoption of human skills and operations to the new technology.

Ambitions for tomorrow

TPG Telecom plans to migrate around 5 million 4G subscribers from the current EPC network to the cloud-native EPC, so that all 4G and 5G traffic will be operating through the dual-mode 5G Core. TPG Telecom are also looking forward to implementing capabilities such as network slicing and enterprise use cases using the consumer-focused infrastructure as a base, and is planning to further explore these opportunities in 2023.

The journey to fully automated software pipelines is one of many steps, and through the recent developments in the network, TPG Telecom has laid the foundations for an automated future. TPG Telecom plans to build on the automation capabilities that are now in place through the cloud-native core to eventually create a fully automated software pipeline, in which CI/CD ways of working are a reality. This will enable automatic network upgrades that can be tested and deployed with minimal intervention and at a reduced cost. In addition, TPG Telecom is planning the introduction of a bare metal cloud infrastructure to further simplify operations and reduce costs.

Ericsson will play a key role in TPG Telecom's ongoing evolution journey, building on the existing successful partnership to create even stronger networks and explore new possibilities.

> "Network automation is definitely on our radar. We are looking at the adoption of algorithms in order to make our network more efficient, and also to support us with rapid troubleshooting and corrective actions at the service level for our customers. We are actively engaging with Ericsson in order to achieve those additional capabilities that will significantly benefit us."
>
> Giovanni Chiarelli,
> Chief Technology Officer,
> TPG Telecom

> "The partnership with Ericsson really helped us immensely to become the first to launch 5G SA commercially in Australia. This is the result of a true spirit of partnership."
>
> Giovanni Chiarelli,
> Chief Technology Officer,
> TPG Telecom

Key learnings and insights

- Technological change can bring complexity that should not be underestimated. However, while innovation carries risks and should be weighed carefully, the direct benefits to customers can be huge.
- Holding on to old ways of working will actively hinder progress; it's necessary to evolve the business mindset and skillsets, within the whole organization, in parallel with the technology transformation.
- Early-movers naturally experience greater complexity as they navigate new ground, however this can become an opportunity, as benefits and flexibility can be harnessed early to mitigate unforeseen risks. For example, having completed virtualization before 2020, TPG Telecom could be more flexible in moving and managing application workloads during the unforeseen global post-COVID-19 silicon/semiconductor shortage.
- Using an established reference architecture is fundamental for cloud-native transformation. It is critical to stick to industry-standard architecture and APIs (such as ETSI or TM Forum) especially when you have a multi-vendor network. TPG Telecom and Ericsson designed a VNF Certification Acceptance (VCA) process with rigorous and automated testing before putting the various workloads into the private cloud.

About Ericsson

Ericsson enables communications service providers and enterprises to capture the full value of connectivity. The company's portfolio spans the following business areas: Networks, Cloud Software and Services, Enterprise Wireless Solutions, Global Communications Platform, and Technologies and New Businesses. It is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's innovation investments have delivered the benefits of mobility and mobile broadband to billions of people globally. Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York.

www.ericsson.com

Ericsson
SE-164 80 Stockholm, Sweden
Telephone +46 10 719 0000
www.ericsson.com

48/21341-FGB1010909