

Case study

Delivering 5G in Australia:

Telstra's cloud-native journey



ERICSSON



Delivering 5G in Australia: Telstra's cloud-native journey

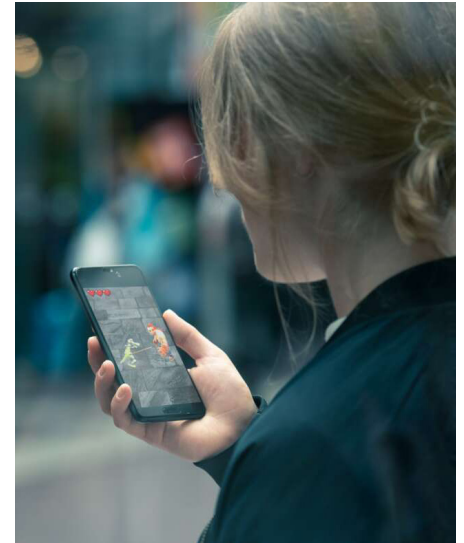
Case study:
Telstra

Industry:
Telecommunications

Executive summary

Every step in Telstra's journey toward a cloud-native 5G Core (5GC) network and 5G standalone (5G SA) is designed to provide concrete benefits to customers while continuously strengthening the network to support future technologies. The journey started with the introduction of 5G non-standalone (NSA) support in Telstra's Evolved Packet Core (EPC) network, which made it possible for Telstra to offer 5G services quickly. The next step was to introduce some cloud-native based elements in the EPC network, which enabled Telstra to gain early insights about how to build and run a cloud-native

network. In the steps that followed, Telstra started to build a parallel cloud-native dual-mode 5GC network with a greenfield approach, to accommodate both the growing 5G NSA traffic and 4G traffic while preparing the network for a smooth migration into a single-core network. The final steps will be the introduction of 5G SA support to the single-core cloud-native based platform, and the migration of all traffic from the legacy EPC system, which will lead to a significant reduction in operational expenditure and speed up the time-to-market of new advanced 5G services.



Delivering 5G in Australia: Telstra's cloud-native journey

In December 2019 Telstra Corporation Limited became one of the first mobile operators in the world to deploy cloud-native-based applications in a mobile core network. According to David Aders, Group Engineer for Mobile Development & Product Engineering at Telstra, that deployment represents a major step forward in the company's journey to build a complete cloud-native core network for both new 5G and existing 4G services.

Telstra is Australia's leading telecommunications and technology company, offering a full

range of communication services and competing in all telecommunications markets. For example, it provides 18.8 million retail mobile services, 3.8 million retail fixed bundles and standalone data services and 960,000 retail fixed standalone voice services.

As of June 2021, three-quarters of all Australians can access Telstra 5G where they live. Telstra has deployed over 3,700 5G sites delivering 5G coverage to more than 200 towns and cities across the unique landmass of Australia, and there are more 1.5 million 5G devices live on its network with thousands

more being added every week as Telstra continue switching on more 5G sites across the country.

As 4G will also continue to play a crucial role in the future, Telstra has continued expanding its 4G footprint as well, and it now covers more than two million square kilometers of the Australian continent.

A LONG HISTORY OF TECHNOLOGY LEADERSHIP AND INNOVATION

With more than 50 international and Australian firsts, the Telstra-Ericsson partnership has pioneered groundbreaking innovations

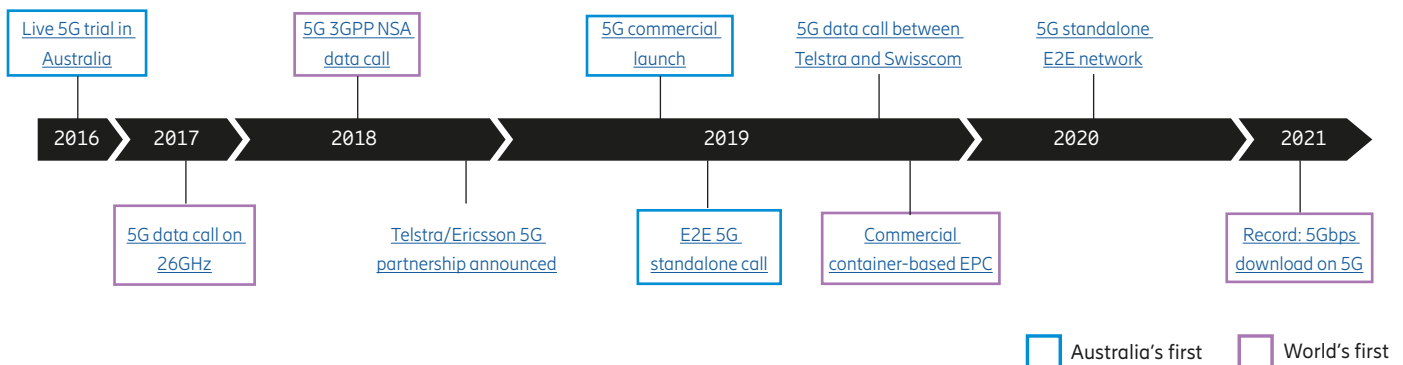


Figure 1 – Telstra and Ericsson's 5G leadership journey

and achieved many industry accolades. In 2016 the company started its 5G journey in partnership with Ericsson (First 5G trial in Australia) and since then it has achieved several new milestones, including a number of new national and international firsts.

The challenge

Like many other leading communication services providers, Telstra has seen its average revenue per user (ARPU) flatten out in recent years. To ensure long-term growth and profitability, Telstra's strategy is to continue expand its role in the communication services value chain beyond connectivity by offering new applications and services for both consumers and enterprises as well as providing early support for emerging use cases.

"5G is a key enabler for us to support the increasing digitalization of enterprises, industries and an emerging B2B2X (business-to-business-to-X) segment that we believe is going to be significant," Aders explains. "To do that, we need to have adaptable technology and a platform that allows us to deliver innovation quickly from product discovery and ideation through to a delivery and trialing with customers."

Telstra's decision to invest in Ericsson's dual-mode 5G Core was primarily driven by the company's desire to overcome four key challenges: increasing network complexity, rising costs to handle traffic growth, delays in the innovation process and service introduction, and limited ability to automate and orchestrate legacy deployments.

Increasing network complexity

The launch of 2G, 3G and 4G network services in the past led to continuously increasing network complexity, higher operational expenditure and operational inefficiencies. With the introduction of 5G services, Telstra knew that its network would become even more complex. Overcoming this challenge would require a core network optimization.

Rising costs to handle traffic growth

As 4G traffic continues to grow and 5G penetration increases, more equipment is needed to handle all the traffic in the network. The impact is especially visible in the user plane domain. Telstra realized that it needed a more efficient user plane solution to reduce network complexity and optimize capital expenditure while simultaneously delivering the low latency required by 5G use cases.

Push the boundaries of innovation and service introduction

Increased network complexity inevitably can slow down the process of creating and deploying new services, causing delays between ideation, delivery and monetization of new services. Telstra knew that, and to capture the new business opportunities enabled by 5G, it needed to have the ability to deliver innovation faster and gaining that ability would require core network adaptations.

Limited ability to automate and orchestrate legacy deployments

Legacy EPC network architecture is by its nature limited in its ability to support the kind of network and process automation that Tel-

stra needs to quickly deploy new services, as well as to reduce operational expenditure. As 4G and 5G will coexist for a long time, Telstra decided that a single core network built on capabilities such as cloud-native and Kubernetes would be the best way to cope with the

Key goals of Telstra's cloud-native journey

1. Reduce operational inefficiencies caused by increasing network complexity
2. Optimize CAPEX related to traffic growth
3. Speed up innovation and ability to deliver new services
4. Enable automation and orchestration end-to-end in the network

Ericsson solutions included in this case

- **Ericsson Evolved Packet Core (EPC):** Existing physical/virtual network upgraded to support 5G non-standalone services (NSA)
- **Ericsson cloud-native EPC:** First step into cloud native with Ericsson Packet Core Controller (MME) and Packet Core Gateway
- **Ericsson's dual-mode 5G Core:** A common cloud-native platform combining EPC and 5GC network functions deployed in steps:
 - Step 1** - parallel to EPC network, supporting 4G and 5G NSA
 - Step 2** - expanded with 5GC NFs for 5G standalone support
- **Ericsson Cloud IP Multimedia Subsystem (IMS):** Supporting voice services, initially with EPS fallback and later voice over NR
- **Ericsson NFVI:** cloud infrastructure including Ericsson Cloud Contained Distribution (CCD) to support Kubernetes



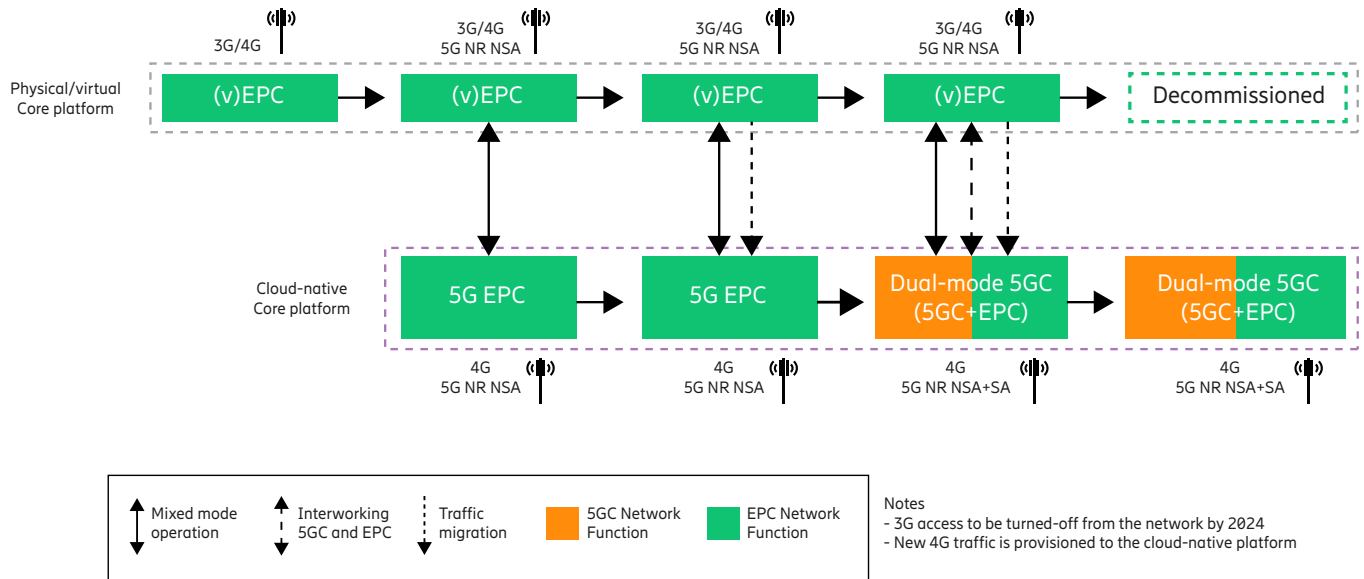


Figure 2 – Telstra’s path to the cloud-native dual-mode 5G Core

automation and orchestration needs related to both existing 4G traffic and new 5G traffic. Telstra planned to use 5GC not only to provide 5G but also to modernize its entire network by bringing 4G and 5G non-standalone along on the journey.

THE DEPLOYMENT PROCESS

Telstra’s first step into a cloud-native 5G Core was taken in 2019 when the company launched 5G NSA-based services in its network by leveraging its legacy Ericsson Evolved Packet Core (EPC) solution. This was achieved via a software upgrade to enable NSA support.

Telstra’s approach to rolling out 5G was to launch 5G NSA on the legacy EPC, combining physical and virtual infrastructure, which made it possible for the company to hit the market early and offer 5G without touching its existing traffic.

The next step was to start deploying the cloud-native EPC packet gateways and the Mobility Management Entity (MME) elements in the same network. This early adoption of cloud-native technology provided Telstra with an effective way to start getting familiar with the new technology and gain practical insights about how to run a cloud-native network early on.

At the start of 2020 Telstra began the process of preparing its core network for a full migration to cloud native by deploying Ericsson’s dual-mode 5GC in parallel to the existing EPC network that supports its 4G and 5G NSA customers.

The dual-mode 5GC was delivered into production initially to accommodate the 5G NSA and 4G traffic – that is, both new traffic and traffic to be migrated from the legacy EPC network. The next step will be to commercially launch 5G standalone toward the end of 2021, with a single software platform managing both the EPC and the new 5GC network functions (NFs). “We’re really looking forward to taking advantage of the dual-mode 5G Core and supporting New Radio standalone services,” Aders says.

The tight interworking between the dual-mode 5GC and the EPC system shown in Figure 2 ensures a seamless end-user experience without any traffic disruption when users move in the network and transition between the two systems.

IMPACTS IN MULTIPLE DOMAINS

The journey to build a cloud-native 5GC

network platform stretches across several network domains, as exemplified in Figure 3. According to Aders, Telstra had to deal with impacts in all of them.

Cloud-native infrastructure and 5G Core

One of the main focus areas in Telstra’s journey to build a cloud-native 5GC was to ensure that the underlying Network Functions Virtualization infrastructure (NFVi) was ready to support cloud-native deployments and the new processes the company wanted to put into place. Telstra needed to have a cloud-native layer that could work over the top of its existing telco-cloud and run parallel to it, as well as enabling support for the CI/CD pipeline of development, pre-production and production environments.

Telstra started out running its Kubernetes environments using Ericsson’s Cloud Container Distribution (CCD) on top of virtual machines. “That gave us an easy way to

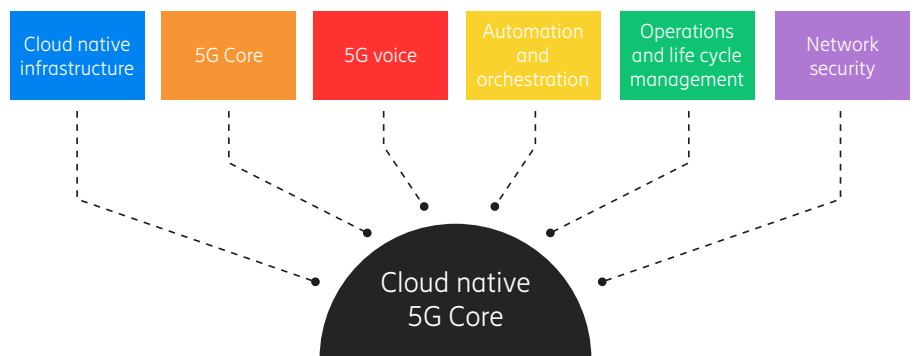


Figure 3 – Key areas to consider when building a cloud-native 5G Core (Ericsson’s recommendation)

be able to support a quick deployment and build pipelines that could work within those secure frameworks. We also needed to continually increase the software capabilities of the underlying telco-cloud stack to be able to support capabilities such as the cloud-native Packet Core Gateway running single root input/output virtualization for high throughput needs.”

Several automation extensions were also required to get the IP networking to work all the way through the NFVI through to the data center (DC) gateways layer to enable the cloud-native functions to be deployed faster.

5G voice

Voice services at Telstra were significantly impacted by the introduction of a dual-mode 5GC network. At the application level, Telstra had to make modifications to voice services, initially starting with voice-over-EPS fallback and later moving to voice over NR.

Automation and orchestration

The CI/CD pipeline plays a vital role in making it possible for Telstra to increase automation and deploy services quickly. Telstra spent a considerable amount of effort developing the CI/CD pipeline, which included combinations of on-premises capabilities as well as cloud native SaaS (Software as a Service) toolsets to be able to not only build but also observe and run the network effectively. “As we’ve moved into cloud native we’ve had to modernize a lot of the toolsets that run the network and build observability and monitoring into our automation from the start.”

Operations and life cycle management

Telstra had to make some adjustments to its OSS/BSS stacks to support both the existing network and the new 5GC, and to gain the ability to migrate customers and traffic between the two. For example, it was necessary to ensure accurate updates to the charging files irrespective of whether a user is on a 5G SA, 5G NSA or even 4G access. This required changes in the charging environment using service based interfaces (SBI).

In order to be able to deploy and migrate services between the new stacks, Telstra also had to adjust its provisioning systems and make some changes related to IPs and support for change management in a continuous delivery environment. “We’ve invested a lot in knowledge management toolsets and figuring out how to share repeatable, usable infrastructure solutions across the different teams that are building the environment.”

Network security

Security was top of mind from the beginning, embedded in the automation itself as opposed to being an afterthought. “We take security very seriously at Telstra. It’s something that we’ve invested heavily in, to be able to bring that into our pipelines and the way we run.”

KEY BENEFITS OF THE 5G CORE ENABLEMENT

The new 5GC and NR SA will bring many new capabilities and benefits to both Telstra and its customers, enabling more efficiency in managing the network and making it possi-

ble to create and launch more advanced 5G services more quickly. The four key benefits of 5G are that it enhances the user experience, simplifies operations and service agility, improves network capabilities and serves as a future-proof network architecture, as highlighted in Figure 4.

Telstra sees the evolution toward cloud native as a critical step in future network development, by bringing automation capabilities enabled by Kubernetes and other software-industry innovations to the telco environment. The fact that Telstra had previous experience of bringing some cloud-native EPC elements into production traffic back in late 2019 made it possible to gain early insights into how to run a cloud-native network.

“The main advantage of the approach we took is that it gave us the opportunity to try out new ways of running, building and life-cycling the network,” Aders explains. “Those experiences gave us confidence that we could actually challenge the way we’d been building networks up until to that point.”

By taking a greenfield approach to deploying its cloud-native dual-mode 5GC, Telstra had more freedom to try out new ideas with respect to things like cloud-native toolsets, CI/CD pipelines, test automation and continuous deployment activities. With cloud native, Telstra now has the ability to deploy software to deliver new features in a very intuitive manner.

Knowledge management toolsets have also been beneficial. To be able to build in auto-

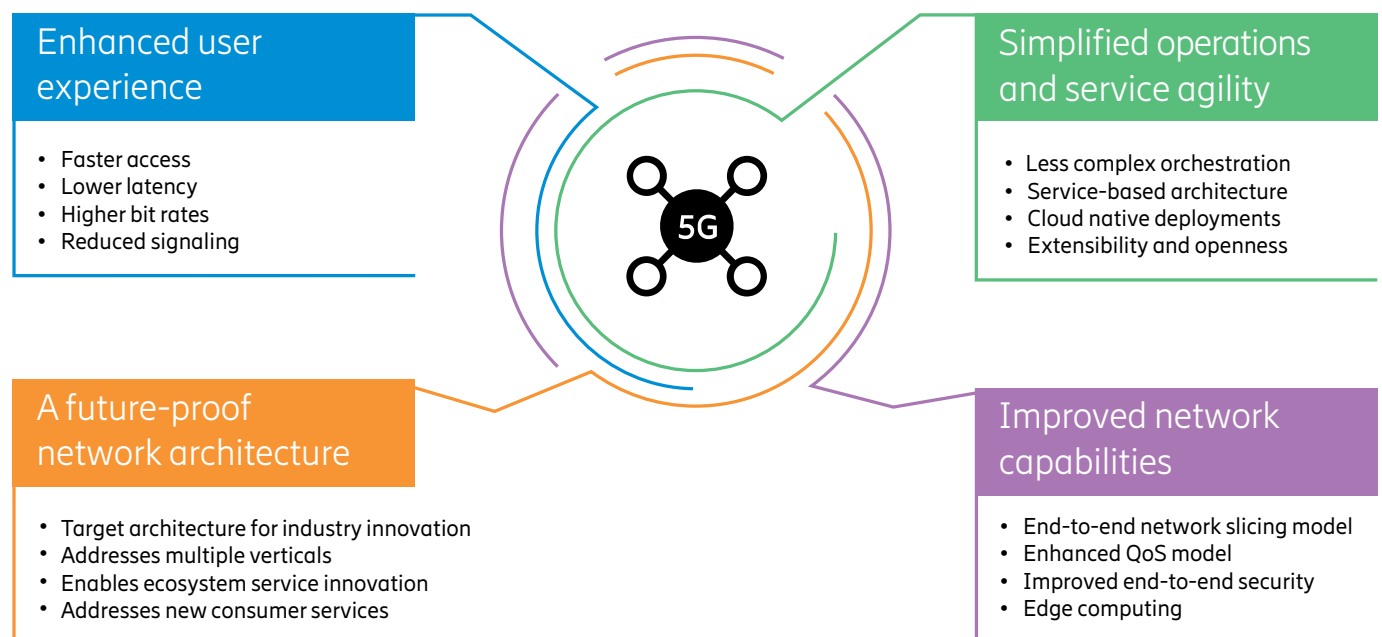


Figure 4 – Benefits of cloud-native 5GC and NR SA



mation from the start, Telstra had to modernize a lot of the toolsets used to run the network.

PARTNERSHIP WITH ERICSSON

“Ericsson has been a fantastic partner in this journey,” Aders says. “Throughout the entire process they’ve worked very closely with us, helping us to figure out exactly what we need in terms of features, capabilities and interoperability.”

He explains that the ability to work with both local teams and the product units enabled a faster paced, more agile way of working. “The time frame between finding out what our customers want and being expected to deliver on it is getting shorter and shorter, so Ericsson’s ability to be agile, open and flexible is invaluable for us.”

As the network becomes increasingly complicated with more layers to manage and more slices to implement, Aders believe the ability

ing new areas available to us with 5G. That’s going to be crucial for us when we get into gaming, and go into the slices, the industry verticals, and so on.”

From Telstra’s point of view, cloud native is crucial to deploy the software that is needed to deliver 5G features in an intuitive manner. “I look forward to when we are running so many containers that we just need the machines to run them and I have no idea how many are there in that network anymore.”

“Another thing I’m really looking forward to with cloud native is the ability for the network to be able to continue to adapt and modify and work with other technologies such as AI,” he adds. “We can use AI to help the network adapt to traffic needs or even predict what the traffic needs are so that it can self-heal, move around and re-deploy across the compute continuum that we’ll continue to build.”

“The time frame between finding out what our customers want and being expected to deliver on it is getting shorter and shorter, so Ericsson’s ability to be agile, open and flexible is invaluable for us.”

to collaborate with suppliers in an agile way will only become more important for Telstra.

FUTURE VISION / WHAT’S NEXT?

“The sky is the limit, with this highly programmable architecture,” Aders says. “But I think we need to disrupt ourselves as an industry, to actually get out there and be able to realize new services and move into all of the promis-

Last but not least, Aders thinks that automation is going to be a major benefit of 5G. “The ability for us to treat the network as infrastructure is going to make it possible for us to deliver new products and services so much more quickly.”

KEY LEARNINGS AND RECOMMENDATIONS

Aders has several recommendations to other service providers that are planning their journeys toward a cloud-native core. The first is to use the cloud-native transformation to drive the modernization of the rest of the business too. “The investment in the network itself and the company’s ability to bring new products and solutions to market faster should be regarded as being of equal importance to investments in all the areas that play a role in launching products and services or in operating the whole business end-to-end.”

One very important thing that Telstra learned, and recommends to other operators, is to invest in CI/CD. “You need to invest in your automation and the ability to be able to realize a continuous delivery model. At Telstra, we aspire to deliver software constantly 24/7 in our network. To do that, we are fully leveraging cloud-native techniques and what Kubernetes and other automation capabilities deliver for us.”

Other operators and service providers should also be aware that the deployment of block storage requires considerable investments. “As we moved from virtualized network functions to containerized functions, we found that we needed to leverage the block storage capabilities that comes with Kubernetes a lot more. So that’s an important part of an operators’ planning to be ready for.”

According to Aders, the importance of people and culture cannot be overstated when planning the transition to 5G. “An organization needs to have a willingness to disrupt itself to be able to change its capabilities. It’s been essential for us to bring our people along on this journey – give them the room to change the way we’ve all been working for so many years in the telco space.”

The power of the cloud-native toolset is something that Telstra highly recommends that every operator take advantage of. “The key thing is to think about how you can use it in different ways – consider all the different models and where they might be appropriate to your business.” Toolsets provide the teams operating the network what they need without having to develop from scratch all the time.

“I’m very excited about the cloud-native journey that Telstra has embarked on,” Aders concludes. “We think 5G is a game changer, which is why we’re investing so much in making it happen.”

About Telstra

Telstra is Australia's leading telecommunications and technology company, offering a full range of communications services and competing in all telecommunications markets. In Australia Telstra provides 18.8 million retail mobile services, 3.8 million retail fixed bundles and standalone data services and 960,000 retail fixed standalone voice services. Telstra has also an international presence spanning over 20 countries.

About Ericsson

Ericsson enables communications service providers to capture the full value of connectivity. The company's portfolio spans Networks, Digital Services, Managed Services, and Emerging Business and is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's investments in innovation have delivered the benefits of telephony and mobile broadband to billions of people around the world. The Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York. www.ericsson.com

