



NOKIA Submission

To Australian 5G Innovation Initiative—round one—discussion paper

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1 About Nokia

We create the technology to connect the world. We develop and deliver the industry's only end-to-end portfolio of network equipment, software, services and licensing that is available globally. Our customers include communications service providers whose combined networks support 6.1 billion subscriptions, as well as enterprises in the private and public sector that use our network portfolio to increase productivity and enrich lives.

With an end-to-end portfolio that is unique in the industry, Nokia can work in partnership with operators, enterprises and governments to deliver "real 5G". Nokia's in house 5G mmWave Small Cells and AirScale BTS provide in-building and outdoor coverage, while our Microwave Anyhaul, Cloud native RAN, antennas, and 5G cloud-native core are part of approximately half of our agreements to date. Beyond our mobile networks portfolio, Nokia has excellent FP4 network processor-based IP routers and PSE-3 chipset powered optical networking - our customers can use the Nokia Network Services Platform to make this into full-5G-strength software defined connectivity 'smart network fabric' secured by Nokia Security Orchestration, Analytics and Response (Nokia SOAR) to ensure resilient 5G.

Nokia is a global leader in 5G standardization and technology innovation with a strategy specifically designed to support the Australian market. Nokia is proud to be a strong partner in the current roll-out of 5G in Australia, continuing our 120-year presence here.

Nokia has been selected by both Optus and VHA as a key supplier for the network deployments of 5G, including the required radio modules, as well as a major supplier to nbn for fixed network technology solutions. Nokia is also a supplier to various enterprises which have deployed private wireless networks deployed using apparatus licenses, including for example 27 mines with 10 customers in Australia. Globally Nokia has been selected by more than 100 operators to supply 5G networks.

Through our research teams, including the world-renowned Nokia Bell Labs, we are leading the world to adopt end-to-end 5G networks that are faster, more secure and capable of revolutionizing lives, economies and societies. Nokia adheres to the highest ethical business standards as we create technology with social purpose, quality and integrity.

For more information: <https://www.nokia.com/networks/5g/>

Disclaimer: This response is based on Nokia's current understanding of the market dynamics and various standards bodies; these dynamics are changing and hence our views may update with these changes

2 5G potential use cases

5G comes at a pivotal time for national economies globally, supporting a transformation throughout the entire telecommunications system to enable the 4th industrial revolution – Industry 4.0. This promises to unlock massive economic and productivity gains and set us on course for a new era of tremendous transformation and progress.

Industry 4.0 technologies — Industrial IoT, edge computing, deep analytics based on artificial intelligence and machine learning, ubiquitous networking, augmented and virtual reality, remote control and digital twinning — are maturing and promise to bring together the physical and digital economies. As they reach a critical mass of adoption, the opportunity for realizing a much bigger productivity boom is before us.

5G is going to change everything, every industry, every business, and every consumer experience. It will power massive broadband applications and it will create unprecedented opportunities. Nokia is leading 5G innovation. We have announced 5G commercial contracts with 133 customers and we have over 180 engagements in total with our customers. As an example, Nokia's 5G project in the Port of Hamburg received the GLOMO (GSMA Global Mobile) award at MWC2019. This Port became a testing ground for 5G applications in an industrial environment.

Here are some business cases Nokia considers relevant for Australia:

Smart Agriculture and Resources Management: With the focus on reducing the resource requirements while increasing the yield for agriculture 5G (and 4G) offers a key toolkit. The density and long-battery life which mMTC (5G Massive Machine Type Communications) enables the possibility to deploy large number of sensors to, for example, detect soil moisture and acidity so that the optimal amount of water is used for irrigation. Nokia has teamed up with industry leaders to offer an out-of-the-box approach with its Smart Agriculture as a Service. This approach assist farmers, take advantage of the opportunities presented by IoT in a cost-effective way with 5G and edge capabilities¹.

The Greater Sydney area is expected to grow from the roughly 4.7 million people today to more than 8 million people in the next 40 years – however, our most critical resources such as water are finite – Industry 4.0 Technologies, including 5G, will enable optimal usage, through the combination of soil moisture sensors and analytics to determine in real time how much to irrigate, for example.

Smart Mining: Nokia already provides high-performance networks using 4G that enable mining companies to use digital technologies to adapt to fluctuating demand, control operational costs

¹ <https://www.nokia.com/about-us/newsroom/articles/iot-unlocking-the-potential-of-precision-farming/>

and address growing safety and environmental concerns. This provides a starting point for bringing new levels of agility and automation to mining facilities. This enables miners to enhance and streamline operations by taking advantage of automation, robotics, digitally enhanced equipment, sensor data, predictive analytics and machine learning:

- Remove workers from the most dangerous parts of the mine
- Monitor worker health and direct them away from exclusion zones
- Optimize resource use and prevent bottlenecks at every step of the mining process
- Gain 360-degree situational awareness in remote operating environments
- Enable predictive maintenance of machines and other important equipment
- Make better decisions from the command centre to the mine face

Nokia is currently working with Sandvik Mining and Rock Technology to deploy a Nokia 5G SA industrial-grade private wireless network at its test mine in Tampere, Finland. This deployment enables new voice and video communications capability, mining automation with integrated 4K video and provide super-fast connectivity to showcase future of digitalized mining operations².

Smart Factories: More businesses are seeking to boost the productivity and flexibility of their production or provision of services while securing a safer workplace. They want to deliver more personalised offerings to better meet fast-changing consumer demands, which requires higher degrees of automation. For manufacturing-based industries, 5G can facilitate more machine-type communications (MTC), real-time control of machines, robot-human interactions and edge cloud analytics to create "smart factories". We have applied these principles to our 5G "factory of the future"³ in Oulu factory where 99 per cent of our factory is already automated, even the packaging. Sensors around the factory measure humidity and temperature to ensure products are in optimum condition. Small autonomous vehicles roam the factory delivering parts and components, while we are using indoor location technology to track equipment. We have also virtualised the entire factory to create a 'Digital Twin'. This allows us to carry out training or simulate changes to operations using Virtual Reality (VR). Manufacturing is on the cusp of transformation—not just by robotics and 3D printing, but by the emergence of smart manufacturing more broadly: a fundamental rethinking of the production and design processes that substantially boost productivity and demand. That, in turn, could create a new set of manufacturing-related jobs.

Ports: 5G can help foster the creation of "connected ports", one where humans can interact with and share real-time information with devices and machines. For instance, with lower latency, loading and unloading operations can be made more efficient via the automated remote control of unmanned ground vehicles. Not only can this help streamline operations at ports to reduce

² <https://www.nokia.com/about-us/news/releases/2020/07/21/nokia-5g-standalone-private-wireless-network-selected-by-sandvik-to-advance-digital-transformation-in-mining/>

³ <https://www.nokia.com/about-us/news/releases/2019/07/03/nokias-digitalization-of-its-5g-oulu-factory-recognized-by-the-world-economic-forum-as-an-advanced-4th-industrial-revolution-lighthouse/>

harbouring times, it can reduce the risk of human injuries and fatalities when carrying out such operations. In cooperation with The Hamburg Port Authority (HPA), and Deutsche Telekom, Nokia have tested new features of the 5G standard with different applications⁴:

- Sensors were installed on three ships. These sensors enable the real-time monitoring and analysis of motion and environmental data from large parts of the port area.
- The Port Road Management Centre of the HPA remotely controls the traffic flows in the port of Hamburg via a traffic light connected to the mobile network. This should help to guide trucks faster and more safely through the port area.
- With the help of the new standard, 3D information is transmitted to an augmented reality application. The 3D glasses allow maintenance teams on site to call up additional information or receive remote interactive support from an expert.

This project received the GLOMO (GSMA Global Mobile) award at MWC2019.

SMEs: Meanwhile, SMEs can benefit from 5G coupled with Machine Learning and Artificial Intelligence improving the efficiency of back-end operations by leveraging more sophisticated cloud technologies.

3 5G Innovation Initiative structure and criteria

Project size and scope

Nokia welcomes the initiative as a straightforward mechanism. However, the Government could consider introducing more flexibility related to the size of projects into the Initiative. While individual small-scale projects are valuable, collaboration and cooperation could be encouraged between proponents of similar projects, resulting in a higher quantum of funding for these larger projects. This would better help achieve the aims put forward in the discussion paper.

Nokia would also like to see more overt cooperation between Federal and State Governments (and where relevant, local governments) in recognition of the importance of 5G to the economic future of Australia. Enhanced coordination between levels of government – for example by additional funding for projects, supporting communications campaigns on 5G on projects or by expediting any necessary approvals and regulatory requirements – will be crucial to the success of the Initiative.

Security

The Australian government has developed an ambitious cybersecurity strategy to protect national security and sovereignty. This strategy, which includes new laws, rules and guidelines for businesses and sectors, is currently being rolled out. Businesses in a broad range of sectors will be required to

⁴ <https://www.supplychaindigital.com/technology/hamburg-port-rolls-out-5g-initiative-deutsche-telekom-and-nokia>

make cyber security a priority, by investigating and understanding their potential vulnerabilities (including from their communications networks) and developing robust mitigation plans. They will also be subject to new principles encouraging them to examine the security and resilience of their supply chains and consider actions to avoid supply failures or potential malicious interference.

Nokia is very supportive of the Australian Government's efforts to protect national security and sovereignty. Our view is the benefits of technologies like 5G won't be realized unless communities and businesses have trust and confidence in its underlying security. Because of this, we believe the Initiative should be more overtly aligned with government cybersecurity priorities by requiring projects seeking funding to demonstrate their security credentials, across both their supply chains and in their infrastructure and data elements. The Government could therefore consider including an additional criterion on the safety and security of project proposals.

Spectrum and technologies

Nokia sees real economic value in the possibilities for enterprises to invest in private wireless networks using 3GPP technologies on their premises. Additional investment in private networks by private enterprises will significantly speed up 5G uptake overall.

The Initiative should promote the different types of license available. Australia has the opportunity with its unique type of licences and the large amount of spectrum either on mid-band or mmwave to explore new usages for all new type of actors based on their specific needs. Therefore, we encourage an equal allocation based on the type of available licenses (Spectrum/Class/Wide Area Apparatus) unlike some initiatives from countries - such as Singapore - where only an operating spectrum license is allocated and it is made mandatory to involve a telecom service provider in all use cases projects.

Finally, in addition to the spectrum and sharing equal importance in the criterion, the Initiative could also support trials of new types of access such as O-RAN and be more flexible on the results and use case for less mature but promising technologies.

Nokia thanks the Australian Government for the opportunity to responds to the 5G II discussion paper and we look forward to supporting this initiative as it moves from the page to the field.