

6G Future Network Services

Dutch innovations in 6G mobile networks



Mobile networks are a key driving force for the digitalisation of our society and the earning power in all economic sectors, from industry and energy to logistics and healthcare. Dutch companies have identified large opportunities in 6G network technology and applications that will enter the market from 2030 onwards. In addition, the targeted development of 6G can strongly contribute to the Dutch and European ambitions in the areas of digital autonomy and sustainability.

Objective

The multi-year public-private Future Network Services (FNS) programme focusses on creating a leading international position for the Netherlands in 6G. The focus is on specific and connected topics in 6G: intelligent radio components and antennas, intelligent networks, and leading applications in key sectors. The investment in FNS research, innovations, and human capital in the period 2024-2030 will create a strong Dutch 6G ecosystem:

- The Netherlands will have a leading international position in knowledge, development, intellectual property, and production of intelligent 6G antenna technology and semiconductor components.
- The Netherlands will have a leading knowledge and industrial position in new algorithms, methods, and software modules for composing and controlling intelligent networks.
- Large companies and SMEs will benefit from the new capabilities of 6G networks in an early stage; start-ups and scale-ups will trigger new activities, for example in the control of smart grids in the energy sector.
- New technologies will minimize the energy consumption of 6G networks in the Netherlands and other countries and the networks will optimally contribute to the sustainability transitions in the energy, logistics, and high-tech industry sectors.
- The new 6G networks reduce the societal vulnerabilities for human and technical error and for risky strategic dependencies in the 6G supply chain.

Dutch strengths in global 6G development

The development of 6G has already turned into a race between world regions (China, Europa, United States). Because of the strong economies of scale in the mobile industry, a few companies dominate the global market for chips, antennas, and network components. The Netherlands has its own strong players (like NXP in radio components for antennas), Europe as well (Ericsson and Nokia in networks), but in the development of 6G, the cards are being reshuffled.

The FNS programme leverages the Dutch strengths in three crucial parts of 6G: radio components, network software, and mobile applications.

- The Dutch companies NXP and Ampleon are global market leaders in key radio components for today's 4G and 5G mobile networks.
- The Netherlands has advanced expertise on (network) software at universities, SURF, and at young companies like Solvinity. The networks of KPN, Odido, and VodafoneZiggo are always ranked high in the international benchmarks on mobile network quality.

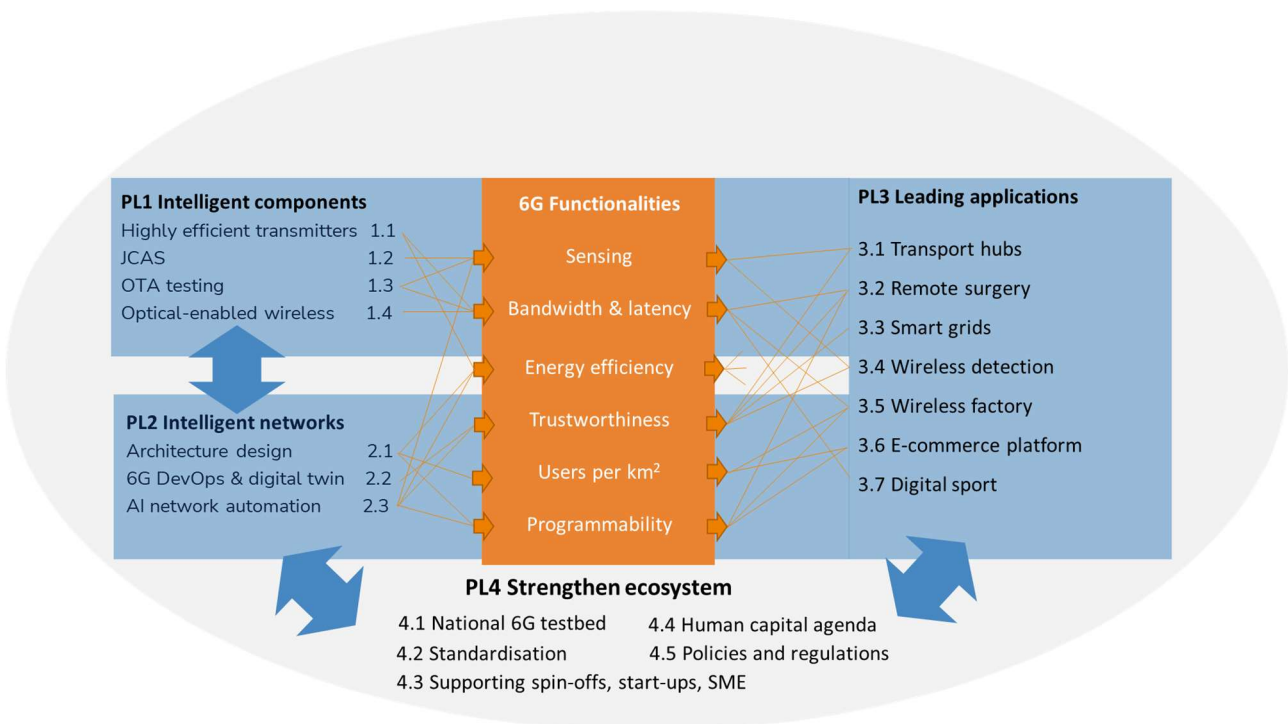
- The Netherlands consistently has a high ranking in the European DESI index for connectivity and in the DESI index for integration of digital technology in business and societal sectors.

In 6G, *intelligence* will be the axis connecting these different parts. The 6G intelligence resides in the technical components that make up the software antennas, in the networks that use AI software to provide tailored connections, storage, and compute, and in the software for digital applications. It is by connecting the intelligence through the software layer of 6G that the large added value of 6G and the grip on reliability and security of those networks is created.

Approach

The FNS programme follows an iterative and integral approach in which the intelligent components, intelligent networks, and leading applications are developed in coordination. The research cooperation between experts in components, networks, and applications needed for this goes hand-in-hand with the build-up of the knowledge and expertise in university and post-secondary education, and at the companies required to develop 6G innovations. In the FNS programme, all relevant Dutch parties join forces to take up a leading position in the development of 6G. This integral and proactive approach breaks away from the fragmentation experienced earlier with 4G and 5G.

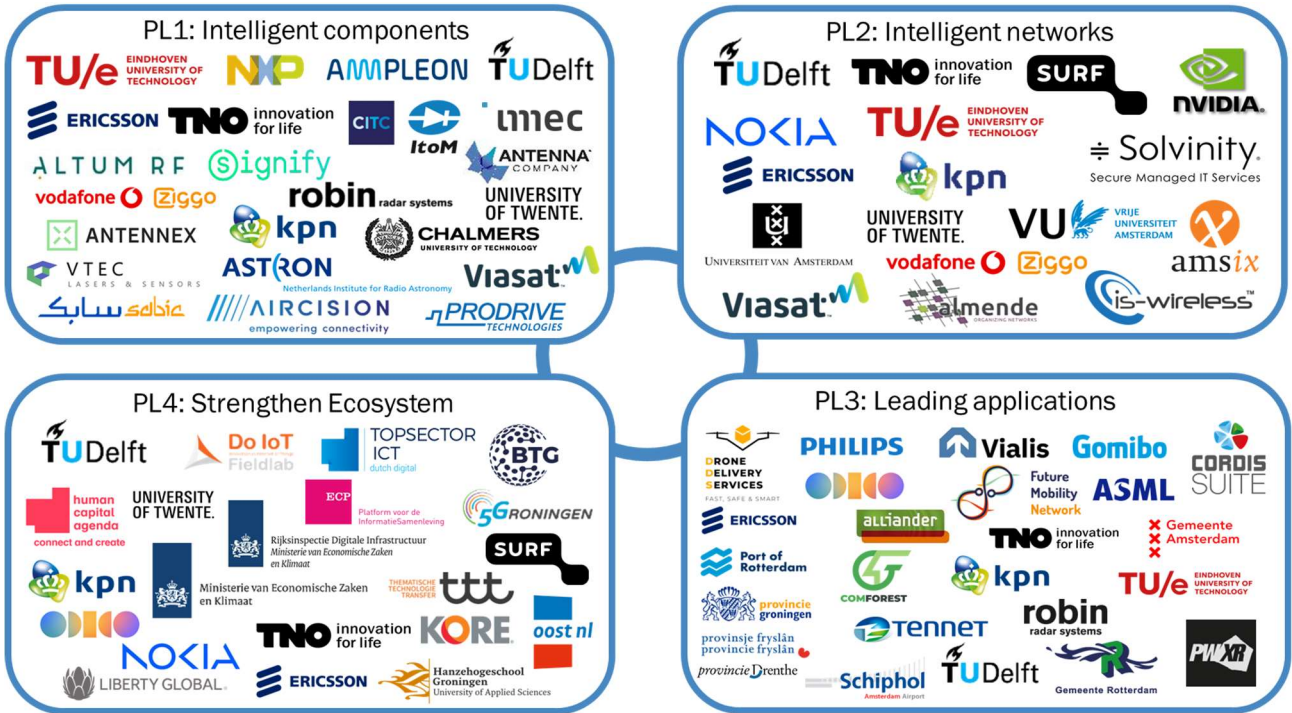
In FNS, three technical programme lines are linked by a fourth programme line aimed at strengthening the ecosystem: through, among others, a unique national 6G testbed infrastructure, a detailed Human Capital agenda, stimulation of activity in start-ups and SMEs, and alignment with policy and regulation.



Mobile communication and the underlying technologies by their very nature are developed in the global market. The FNS programme is therefore strongly committed to bring Dutch innovations to the international 6G standards in the making in the 3rd Generation Partnership Project (3GPP). The FNS partners are well positioned to do this in an early stage of the development, because of their experience and track record in 3GPP. On the route to standardisation, FNS aligns closely with the European 6G research and innovation programmes and with international industry fora for software development.

Public-private cooperation

The FNS programme's ecosystem is led by the Dutch research organisation TNO in close collaboration with the Technical Universities at Eindhoven and Delft, and is made up of a core consortium of strong, committed partners. During the second phase of the programme, further organisations can join via open calls for new technologies and additional innovative applications of 6G. With the parties connected now and later on, and through its focus on open interfaces, standards, and software, the FNS programme stimulates the creation of novel combinations around the intelligence in 6G.



The long-term public-private cooperation in the FNS programme provides a unique opportunity to create a single powerful and open Dutch ecosystem for 6G. For the first time, the three sub-ecosystems from the technical programme lines (PL1-3) are closely linked and intertwined in PL4.

By now, € 61 million has been allocated from the National Growth Fund for the first phase of the FNS programme, from January 2024 to June 2026. Together with partner contributions, this gives the FNS programme for this phase a size € 90 million for building structural and sustainable economic growth in the Netherlands around 6G. In case of a positive evaluation of the results of this first phase in 2026 and a positive opinion on the proposal for the second phase until 2030, follow-up funding of € 142 million may become available. The anticipated total size of the second phase including partner contributions is €225 million.



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