

## Private networks in Finland

### Report summary

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## Abstract

This report examines the current state and future prospects of the market for private networks in Finland and related technological development. The study is based on semi-structured interviews with representatives of five Finnish companies offering private networks and a survey aimed at private network users. A private network is a mobile network tailored for a company or other user group that can be implemented with 4G or 5G technologies. Private networks can be implemented either on frequencies specifically assigned to them, or in cooperation with commercial mobile operators on frequencies available for their networks.

The reported main benefits of private networks are security, performance and reliability. Their use is becoming more common, especially in industry, ports and healthcare. Private networks are a way of promoting users' business operations and development related to digitalisation. The growth of the market is slowed down by long sales cycles, a lack of awareness about the benefits of the technology and challenges related to availability of terminal equipment. 5G technology is expected to offer new opportunities for utilising private networks in the future.

At the moment, frequency bands 2300–2320 MHz and 24.25–25.1 GHz are available to local 4G/5G networks with a radio license from Traficom. Licenses for short-term testing may also be granted for other frequency bands. There is a need for a new sufficiently wide frequency band from mid-band spectrum (2–7 GHz), which would enable both a larger coverage areas and sufficient capacity and data rates. The growing spectrum needs of private networks have also been identified in international spectrum work. This should be considered in future European spectrum strategies, also taking into account the new opportunities and capabilities offered by 6G technology.

Traficom actively influences European harmonisation efforts and considers findings of this report in its international and national development work.

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# 1 Introduction

In early 2024, the Finnish Transport and Communications Agency Traficom carried out a study on the current state and future of the market for private networks and related technological development. For the report, Traficom interviewed representatives of five companies offering private networks in Finland. The interviewees work in leading positions with tasks related to private networks. The semi-structured qualitative interviews lasted 45 minutes on average.

In addition to the interviews, the study included a background analysis based on public information sources and a survey of network users, with responses by six companies that had procured a private network. This summary focuses primarily on the key findings of the qualitative interviews, complemented by the observations made from the user survey.

A private network refers to:

1. Local private mobile networks
  - a. On local mobile network frequencies OR
  - b. On mobile operators' frequencies
2. Online service implemented with network slicing in the mobile operator's 5G network

A private network is a mobile network tailored for a company or other user group that can be implemented with 4G and 5G technologies. Key features and benefits of private networks include the ability to tailor the network to the user's needs, information security (critical data is controlled by the user in the user's network), network performance (fast, low-latency connections), reliability (reliable connections) and user safety (allowing hazardous work stages to be performed remotely). Reliability is also a key factor for implementing a network with mobile technology instead of WLAN/WiFi.

Private networks can be implemented and operated by mobile operators, third-party service providers and end users themselves. Networks can be implemented either on frequencies specifically assigned to the networks, or by commercial mobile operators or in cooperation with said operators on frequencies available for mobile networks.

In Finland, the frequency bands 2300–2320 MHz and 24.25–25.1 GHz are currently available for local private networks. Additionally, to support a uniform European market and hardware, the European Commission has entrusted the European Conference of Postal and Telecommunications Administrations (CEPT) with the task of defining harmonised technical conditions for the shared use of the 3800-4200 MHz frequency band by low and medium power private networks providing local-area network connectivity. This work will be completed by the end of 2024 at the earliest, but probably not until 2025.

The purpose of the report was to examine the current situation and uses of private networks in Finland and to assess how their use is developing and

expanding. The aim is to use this information for purposes such as the development of regulation, planning the use of frequencies and assigning frequencies for the use of mobile networks.

In 2023, Traficom's Cyber Security Center has produced a guideline on the cyber security and risk management of local mobile communication networks<sup>1</sup> for organizations considering local mobile communication networks in their operations.

## **2 Use cases and benefits of private networks**

Local private networks are currently used in places such as factories, ports, airports, power plants and mines. They are particularly useful in use cases and situations where the services of commercial mobile networks or WLAN/WiFi-solutions do not meet all the end user's operational needs and requirements related to reliability, security and network performance. A private network offers potential for process, automation and business development and is often set up as part of an organisation's digitalisation process.

The private network providers were in wide agreement on the customer benefits of private networks – security, network performance and reliability were highlighted as key benefits.

Reliability and performance make it possible to use a private network as a foundation for features that require high and steady network performance, such as automation, remote control or remote management. According to two interviewees, a private network makes it easier to arrange coverage in a larger area. Setting up a private network may also be more cost-effective for larger areas compared to WLAN/WIFI networks.

Interviewees also brought up security and occupational safety. Occupational safety can for example be improved by carrying out dangerous work stages by remote control or automation, while in terms of security, a private network offers privacy to protect the customer's data.

The responses to the user survey supported the interview results. The uninterrupted or reliable operation of a private network and keeping data in the customer's own network were important reasons for procuring a private network.

The qualitative interviews also highlighted the benefits of private networks as a digitalisation platform for companies. For the customer, a private network is often an investment in the future, creating a platform for building up technological solutions. When a customer orders a private network, they may only need it for transferring data from one device to another, but in the long term, they may need it for more demanding solutions, such as remote management and process automation. Customers see investing in a private network as an opportunity for long-term business development and maintaining and improving the competitiveness of the company.

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<sup>1</sup> <https://www.kyberturvallisuuskeskus.fi/fi/julkaisut/ohje-paikallisten-matkaviestinverkkojen-kyberturvallisuudesta-ja-riskienhallinnasta> (available only in Finnish)

The interviews revealed that the reasons for purchasing private networks vary. Companies may need their own network for high-capacity operations such as remote management and automation. On the other hand, customers' user needs are often limited to transferring data and transmitting speech, for example. According to one of the interviewees, the current use cases are usually fairly simple and particularly related to data transfer and enabling communication.

In fact, some of the interviewees felt that most of today's usage needs could be met with 4G technology. However, 5G technology is expected to become more common in the coming years. 5G technology in private networks enables technology such as advanced camera-based solutions. The options offered by 5G technology include higher peak speeds and the possibility of slicing the public network. Some of the interviewees pointed out that network slicing also makes it possible to implement less intensive and cheaper private network solutions.

The telecommunications companies that use radio licences granted by Traficom (frequency bands 2300–2320 MHz and 24.25–25.1 GHz) in the private networks they built were asked whether the limited availability of frequencies has contributed to the growth of the private network market. The interviewees highlighted needs for low frequencies (under 1 GHz) and mid-band frequencies (e.g., 3.8–4.2 GHz).

In the user survey, some respondents pointed out that the current 2.3 GHz frequency band for local mobile networks is too narrow (20 MHz) to enable all services and sufficient capacity. The 26 GHz band was considered too high to be suitable for industrial use. The responses also mentioned needs for moving networks (e.g., a network that moves with a drone).

Local private networks are already used in many sectors in Finland. Private networks seem to be most commonly used in industry, especially in mining and heavy industry. Other industrial sectors mentioned in the interviews included the process industry, manufacturing industry and energy industry. Ports are also typical utilisers of private networks.

In mining and heavy industry, a private network enables for example the use of remotely controlled devices and machines and advanced automation of processes. The equipment enables making operations more efficient and having machines do work stages that are dangerous for humans. In ports, private networks can be used to build various logistical solutions. Cameras can be used to produce a real-time situational picture of the port area to ensure safety and functional logistics. In healthcare, a private network may be used to replace old DECT telephone connections in hospitals to ensure voice connections.

### **3 The private network market in Finland**

Although private networks have been set up in Finland for some years, the interviewees felt that the private network market is still in its early stages. Interest in private networks has increased in the market and will continue to grow in the future as the technology becomes more well known and prices decrease. Potentially growing sectors mentioned in the interviews included health and social services, logistics and the event sector.

Some of the interviewees felt that the key task of private networks will be to offer a platform for companies' wider digitalisation processes. Although private networks will be used for increasingly demanding use cases in the future, traditional data transfer and secure network operations will continue to be key reasons for procuring a network.

Although the interviewees saw the development of the private network market in a positive light, they also highlighted challenges that are slowing down market growth. The restrictions mentioned most often in the interviews were long sales cycles, poor awareness of private networks and problems related to availability and functionality of terminal equipment.

The sales cycles of private networks are long because the investments are large and customers often find the technology difficult to understand. This means that making the investment decision may take a long time, or it might not get made at all. Having private networks constructed is still fairly expensive for now, so not all companies are able to invest in them. However, as technology and equipment develop further, prices are expected to fall in the future, which will make private networks more eligible in the future.

Because private networks are not well known and because of the conservative attitudes of some sectors, the potential of private networks has so far not been utilised fully. According to one of the interviewees, you might find the traditional challenge of the telecommunications sector in the background: stakeholders in the sector value technical development in itself, which may lead to forgetting what end-user customers need for their operations. From the customer's point of view, the technology as such is not essential, but its usage potential and benefits for business. Still, interest in private networks has grown with the increase in awareness. In some sectors, such as the mining industry and ports, the potential of private networks is already well known.

Several of the interviewees also highlighted various problems with the reliability, availability or support of terminal devices. This has contributed to slowing down market development.

## 4 Summary

Although private network implementations have so far been carried out moderately and the development of the market is still in the early stages, the private network market is seen as developing and growing. Private network implementations are especially prevalent in industry, but potential is also seen in sectors such as healthcare and logistics. Interest is growing, but the plans of interested parties have not yet been translated into concrete practical implementations. The development of the market is slowed down by the perceived high price of the technology and a lack of awareness. Still, there is confidence that private networks will become more common as the technology and the benefits it enables become better known and implementation prices decrease.

The most significant perceived benefits of private networks are their customisability, security, performance and reliability. Although user needs are

often related to improving connectivity and collecting and utilising data, a private network also serves as a platform for a wider digitalisation process in an organisation. This way, private networks also enable more technologically advanced solutions, such as automation, remote control or remote management. A private network offers a platform that allows an organisation to maintain and improve its competitiveness and develop its business in the future.

Private networks are built using both 4G and 5G technology. 4G partially meets today's needs, and the technology is currently cheaper. Mentioned benefits of 5G include peak data rates, uplink data rates and the possibility of network slicing. As network technology develops, potential future opportunities include shorter latency, wider coverage and larger capacities. Applications could include data connections for drones, remote control and camera-based artificial intelligence.

At the moment, frequency bands 2300–2320 MHz and 24.25–25.1 GHz are available to local 4G/5G networks with a radio license from Traficom. Licences for short-term testing may also be granted for other frequency bands. According to the study, the current 2.3 GHz frequency band for local mobile networks is too narrow (20 MHz) to enable all services and sufficient capacity. The 25 GHz band is high and wide, which enables very high-speed connections, but the coverage of a single base station is small. The equipment stock is also too limited at the moment. There is a need for a new sufficiently wide frequency band from mid-band frequencies (2-7 GHz), which would enable both a larger area of coverage and sufficient capacity and connection speeds.

The growing spectrum needs of private networks have also been identified in international spectrum work. This should be considered in future European spectrum strategies, also taking into account the new opportunities and capabilities offered by 6G technology. The need for private networks with extensive/national coverage should also be a factor in these efforts. These needs can be met by measures such as slicing commercial networks or enabling private networks in lower spectrum bands.

Traficom actively influences the ongoing European harmonisation efforts of 3.8–4.2 GHz mobile communications technologies. This brings new opportunities for the use of local networks. The interviewees also highlighted the needs for lower frequency bands (under 1 GHz), moving networks and drone use to meet the evolving needs of the future. For example, drone use is currently mainly not possible on local network frequencies due to the risk of interference between networks.

Traficom will take the needs identified in this report into account in its international and national development work.

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