Technical specifications 5G Business Internet

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Introduction

Geuzenet provides fixed-wireless connections for businesses in locations where fiber connections are not yet available or where redundant connectivity is required. We deliver managed connections over 5G mobile networks to ensure stable and fast internet access at any location.

Geuzenet's internet service is a turnkey solution that includes equipment, installation, configuration, management, and support. Various subscription models are available, and pricing is available upon request from our sales team.

Local network services, such as managed switches and Wi-Fi, can be added upon request.

This document contains the technical specifications of the various supported configurations.

Customer premises equipment

To provide our services, we install one or two pieces of equipment on your premises: an outdoor 5G unit and an indoor router.

The outdoor unit is mounted on the rooftop or an exterior wall of the building. We use professional-grade 5G equipment with directional antennas aimed at nearby cell sites. A

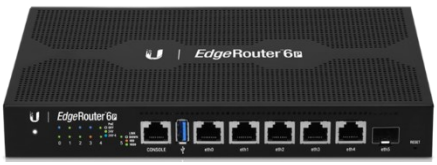
single outdoor UTP cable connects the outdoor unit to the indoor router and provides Power over Ethernet (PoE) to the outdoor unit. The maximum supported cable length is 100 meters.

The indoor unit is typically placed in a technical room or cabinet. The LAN ports on this router serve as the demarcation point of our services. Both indoor and outdoor units are installed, monitored, and managed by Geuzenet.

We can operate on any 5G network (also referred to as an MNO – Mobile Network Operator) and maintain direct agreements with most of them. Based on local conditions—such as coverage and capacity—we select the most suitable MNO or combination of MNOs for your location.

Geuzenet uses various models of 5G outdoor units that support carrier aggregation and are equipped with high-gain antennas. During installation, a 360-degree measurement of radio signals is performed to determine the optimal placement and orientation of the unit.

Examples of outdoor units



Examples indoor unit

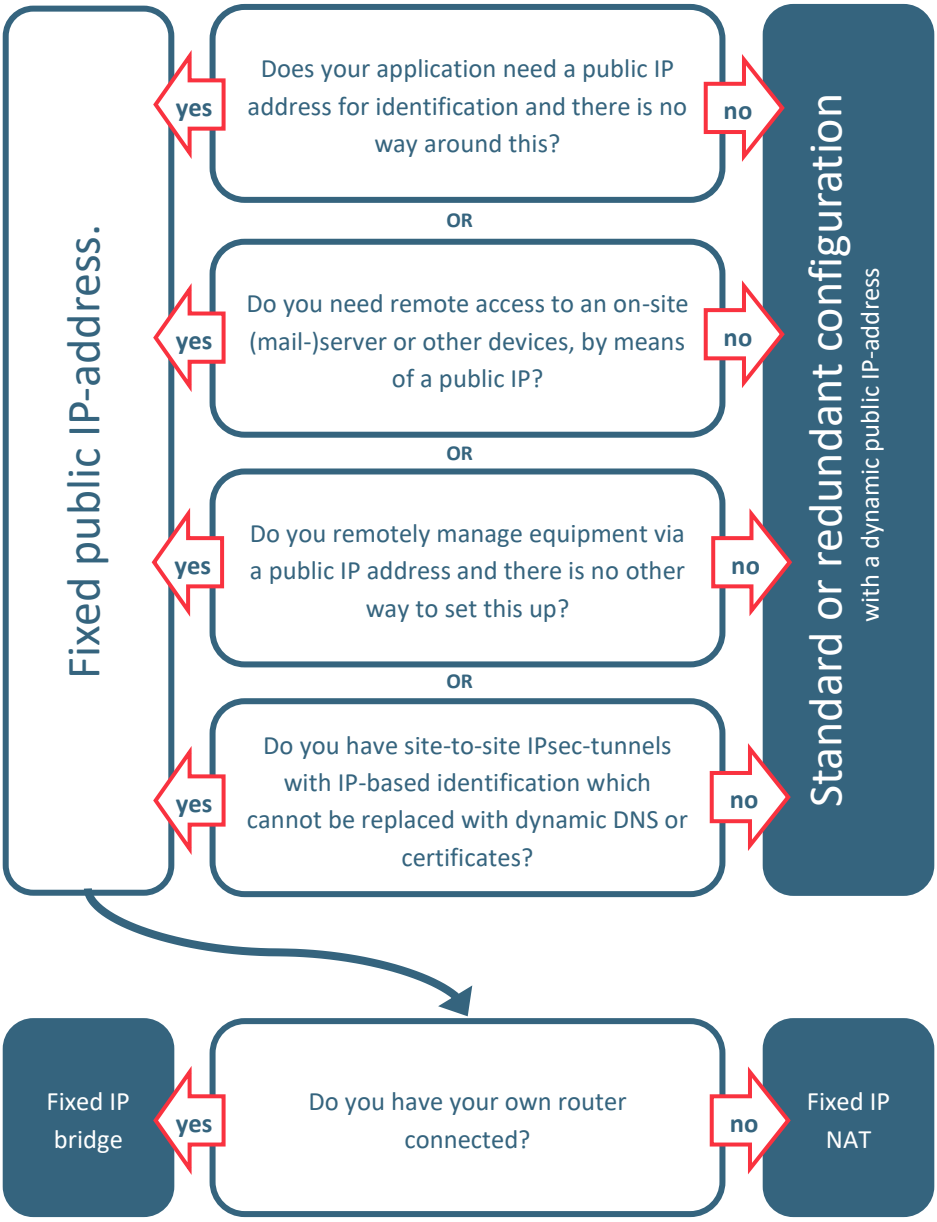
Available configurations

The service is available with the following technical configurations:

- Standard configuration with a dynamic IP address and NAT.
- Advanced configuration with a public IPv4/IPv6 address and NAT.
- Advanced configuration with a public IPv4/IPv6 in bridge mode.
- Advanced configuration with VLAN(s) in bridge mode.
- Redundant configuration with two 5G units on two different networks.

Fixed IP address selection guide

Since IPv4 addresses are scarce and our way of providing fixed IP addresses requires a tunnel with some overhead, it is recommended to use fixed public IPs only when necessary. To help you determine the need for a fixed public IP address and then choose the best-fit configuration, we have created the selection guide below.



Basic Internet Access

Each service from Geuzenet comes with a standard configuration that provides basic internet access. This configuration includes a dynamic public IP address assigned by the

Mobile Network Operator (MNO), and all incoming connections are blocked by default for security.

If needed in the future, this setup can be remotely upgraded to an advanced configuration with a fixed public IP address, or on-site upgraded to a redundant configuration with multiple MNOs.

The default LAN subnet is 192.168.1.0/24, with 192.168.1.1 as the gateway. DHCP is enabled. This LAN-side configuration can be customized upon request.

Interfaces on the Edgerouter:

- **eth0, eth1, eth2, and eth5**: Part of the LAN switch.
  Note: Use of **eth5** requires an additional SFP fiber module to connect a fiber cable.
- **eth4 (5G)**: Connected to the outdoor 5G unit.
- **eth3 (ALT)**: Reserved for a second 5G unit or another WAN connection in a redundant configuration.

Basic Internet Access with Only an Outdoor 5G Unit

If basic internet access meets your current and future requirements, a configuration with only an outdoor 5G unit offers a simple and effective solution.

However, this setup does not support advanced features such as fixed public IP addresses, VLANs, redundancy, Layer 2 bridging, or the addition of LAN components like Wi-Fi or switching. It provides a single physical interface, supporting either 1 Gbps or 2.5 Gbps, depending on the model of the unit.

Adding a Fixed Public IPv4 Address

If you are running applications that require access from the internet or rely on authentication based on a specific external IP address, a fixed public IPv4 address may be necessary.

Geuzenet can add a fixed public IPv4 address to your basic configuration. To enable this, we establish a Layer 2 tunnel between the indoor unit and our datacenter, through which we provide one or more public IPv4 addresses. These IP addresses are assigned by Geuzenet and are independent of the 5G operator being used.

When using a public IPv4 address, we recommend limiting its use to specific applications, while routing all other internet traffic directly through the 5G connection. This setup is known as policy-based routing. To support this, we offer a dual internet connection from the indoor unit, enabling you to define routing policies in your own router to optimize network performance.

Several configurations are possible, for example:

- Public IP on **eth0** (untagged), with basic internet access on **eth1** and **eth2**

- Public IP on **eth0** (untagged), with basic internet access as a **tagged VLAN** on **eth0**
- Basic internet access on **eth0** (untagged), with the public IP address available in a **tagged VLAN** on **eth0**

Public IPv4 in NAT or Bridge Mode

The configuration with a fixed public IPv4 address can be set up in NAT mode or bridge mode, depending on your requirements.

In **NAT mode**, the Geuzenet router handles network address translation (NAT). Port forwarding can be configured upon request. The default LAN subnet is 192.168.1.0/24, with 192.168.1.1 as the gateway, though this can be changed if needed.

In **bridge mode**, the Layer 2 tunnel is bridged directly to your router or firewall. In this configuration, Geuzenet does not apply any filtering or block any traffic or ports. Therefore, you are responsible for providing a router or firewall and configuring your own firewall rules, port forwards, and routing policies.

Adding IPv6 Addresses

Similar to IPv4, we can also provide IPv6 addresses as part of your configuration.

Site-to-Site VPN Connectivity

If you require site-to-site VPN connections to your main office or datacenter, Geuzenet can offer customized configurations tailored to your needs. For example, we can set up an IPsec connection to a central VPN concentrator, routed directly over the 5G network. This type of setup can improve performance and simplify the on-site hardware requirements, as the VPN is managed as part of the integrated service.

Technical parameters

Configuration	Fixed public IP	MTU	Latency[1]
Basic configuration	no	1500	≈ 30 ms
Public IPv4 in bridge	yes	1424	≈ 40 ms
Public IPv4 with NAT	yes	1424	≈ 40 ms
Layer-2 bridged	n/a	1424	≈ 40 ms

[1] The latency mentioned is a typical value based on our experience, but not guaranteed. Latency in 5G networks is usually in the range of 25 to 50 ms, but can vary over time and vary by country, location, or network.

The outdoor units deployed by Geuzenet support a wide range of frequency bands for both LTE (4G) and NR (5G) technologies. Each unit supports at least 4x Carrier Aggregation (CA) and is equipped with 4x4 MIMO antennas for enhanced performance. The physical network interface supports speeds of 1 Gbps.

Supported LTE Bands: B1 (2100 MHz), B3 (1800 MHz), B7 (2600 MHz), B8 (900 MHz), B20 (800 MHz), B28 (700 MHz), B32 (1400 MHz)

Supported 5G NR Bands: n1, n3, n28, n77, n78

High Availability and Redundant Configurations

For scenarios where high availability is critical, we recommend a configuration with two 5G outdoor units. Multiple redundancy options are available, including failover and load-balancing configurations, depending on your requirements.

Each 5G unit is configured to operate on a different 5G network, ensuring maximum redundancy and the highest possible service availability—even in the event of a network outage or degradation.

4G or 5G Network?

Most mobile networks today combine 4G and 5G technologies, often in what is known as an NSA (Non-Standalone) configuration. In this setup, both 4G and 5G radio cell sites operate using the existing 4G network core. Over time, networks are migrating to SA (Standalone) configurations, where 5G radio sites connect to a dedicated 5G core. This transition unlocks the full potential of 5G, including higher data throughput, lower latency, and enhanced reliability.

Geuzenet's hardware supports 4G, 5G NSA, and 5G SA. As mobile networks evolve and increase in capacity, our customers will automatically benefit from these advancements—without the need for hardware changes.

Site Surveys and Location Scans

For every new service location, Geuzenet conducts a **location scan** that assesses the nearest 5G cell sites, available mobile network operators, supported frequency bands, and any potential obstacles or obstructions in the area.

In certain cases—either upon request or when deemed necessary by Geuzenet—a physical site survey is carried out. This includes a comprehensive 360-degree scan of the 5G networks to determine the optimal installation position and expected signal quality.