Silvair Gateway

User guide

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1. Overview

The Silvair Gateway connects Bluetooth mesh networks that have been commissioned using the Silvair Commissioning tools to the Silvair cloud. This allows the scheduling of events and delivery of services based on the data generated by these networks.

1.1 Functions

The Silvair Gateway enables the following functions in the Silvair web app:

- Scheduling (available by default)
  - Scheduling changes in scenes and lighting control scenarios (for example occupancy sensing, daylight harvesting) for specific times or days.
- Energy and occupancy monitoring (additional paid service)
  - Visualizing energy use and occupancy via the Silvair web app.
  - Downloading energy and occupancy via the Silvair web app and cloud-based API.
- Remote monitoring and control (additional paid service)
  - Low-latency monitoring of the status of devices in the network via API.
  - Low-latency control of devices in the network via API.
- System diagnostics
  - Monitoring of the status of Bluetooth mesh networks.
  - Remote troubleshooting of networking issues.

1.2 Features

- Future-proof Linux operating system.
- Simple commissioning using the Silvair Commissioning tools.
- Automatic connection to the Silvair cloud.
- Secure provisioning with secure IDs and encrypted keys.
- High level of hardware and software security (secure boot and encrypted file system can only be accessed with the management platform).
- Automatic security updates.
- Prompt releases of OS updates and fixes to vulnerabilities.
- Low-latency transfer of network, luminaire, and sensor status data to the Silvair cloud.
- Schedule caching.
- Automatic remote firmware updates.
- Display of gateway and network performance metrics (requires the Silvair web app).

2. Technical specifications

Features and application	An IoT gateway for the connection, monitoring, and management of Bluetooth mesh networks in commercial building applications via the Internet. Requires networks to have been commissioned using the Silvar Commissioning tools. Uses a LED for status reporting.
Capacity and performance	The hardware configuration allows the Silvair Gateway to process up to approximately 450 Bluetooth mesh network messages per second.
Project requirements	One Silvair Gateway can serve approximately 200 Bluetooth mesh devices. One Silvair Gateway serves one Area in the Project (as configured in the Silvair Commissioning platform).
Security	Secure boot with encrypted operating system Secure communication with the Silvair Cloud over Internet (TLS) Secure communication with devices over qualified Bluetooth mesh
Power supply	4.5–5.5 V DC, 2 A Power over Ethernet 36–57 V DC (IEEE 802.3af)
Operating system	Ubuntu Core
Processor	i.MX6ULL (Y2), 32-bit ARM 800 MHz
Memory	512 MB DDR3L SDRAM 8GB eMMC
Communication protocols	Bluetooth mesh (2.4 GHz Bluetooth Low Energy) Wi-Fi 802.11a/b/g/n/ac (2.4/5 GHz) 4G LTE Cat 1 with 2G/3G (only for Cascade-500-W and Cascade-500-X gateways)
Ports	1 x RJ45 10/100 Ethernet 1 x USB 2.0 Type-A 2 x external dipole antenna, 5 dBi (only for Cascade-500-W and Cascade-500-X gateways)
Required ambient temperature	0°C to 60°C 32°F to 140°F
Enclosure dimensions	127 mm x 127 mm x 30 mm (5 inch x 5 inch x 1.2 inch)
Mounting position	Wall or surface mounted. As close to the geometrical center of the lighting network as possible, but as far as possible from potential sources of interference.
Certifications	
Cascade-500	FCC / ISED / CE-RED / RCM / MIC (Japan) / WPC / SUTEL / MOC & SII / IMDA / NTC / TRA / UKCA / NCC (Nigeria) / CRA / ICASA / NCC (Taiwan) / ANATEL / CMIIT / SIRIM / ICT (Qatar) / NBTC / MIC (Vietnam) / KCC
Cascade-500-A	FCC / ISED / CE-RED / UKCA / RCM
Cascade-500-W	FCC / ISED / CE-RED / UKCA / RCM / GCF / PTCRB / AT&T
Cascade-500-X	FCC / ISED / CE-RED / UKCA / RCM / In progress: PTCRB / GCF / AT&T

3. Requirements

3.1 Gateway

- Gateway must be connected to a power supply.
- Gateway must be connected to the internet.
- Gateway must be installed as close as possible to the geometrical center of the network (that is, within radio range of as many nodes as possible).
- Gateway must be placed as far away as possible from potential sources of interference (for example, high power electrical equipment, transmitters, or building features that could block the radio signal).
- Gateway must be assigned only to one project.
- For scheduling only, one gateway can schedule events in multiple areas.
- For monitoring / remote control, one gateway must be used per area.
- For energy/occupancy monitoring, one gateway can serve approximately 200 devices.
- Radio communication between all areas in a project must be maintained for services to work correctly. The devices must be positioned so that after they are commissioned into a network there is a radio connection between them.

3.2 Network

For the correct connections to be created, the Silvair Gateway requires an IP address configured via DHCP or with a static IP. Also, DNS servers must be used to resolve hostnames. The local admin must also add the hosts and ports listed in the following table to the list of allowed hosts and ports.

> ⚠️ Only the hosts must be added, not their resolved IP addresses, because IPs can change over time.

> ⚠️ Networks that use SSL or TLS Man-in-the-Middle (MiTM) traffic decryption must be configured to NOT decrypt traffic to the gateways. Decryption will prevent correct update and gateway management.

Host	Protocol	Port	Notes
`0.ubuntu.pool.ntp.org`	UDP	123	Time server
`ntp.ubuntu.com`	UDP	123	Time server
`geoip.ubuntu.com`	TCP/HTTPS	443	Determine local timezone
`login.ubuntu.com`	TCP/HTTPS	443	Software updates
`api.snapcraft.io`	TCP/HTTPS	443	Software updates
`dashboard.snapcraft.io`	TCP/HTTPS	443	Software updates
`storage.snapcraftcontent.com`	TCP/HTTPS	443	Software updates
`canonical-lgw01.cdn.snapcraftcontent.com`	TCP/HTTPS	443	Software updates
`canonical-lcy01.cdn.snapcraftcontent.com`	TCP/HTTPS	443	Software updates
`canonical-lcy02.cdn.snapcraftcontent.com`	TCP/HTTPS	443	Software updates
`canonical-bos01.cdn.snapcraftcontent.com`	TCP/HTTPS	443	Software updates
`provision.rigado.com`	TCP/HTTPS	443	Provisioning
`serial-vault.rigado.io`	TCP/HTTPS	443	Provisioning
`api.azure.rigado.com`	TCP/HTTPS	443	Posting logs
`api.rigado.com`	TCP/HTTPS	443	Posting logs
`diagnostics.azure.rigado.com`	TCP/HTTPS	443, 80	Error reporting
`diagnostics.rigado.com`	TCP/HTTPS	443, 80	Error reporting
`mqtt.azure.rigado.com`	TCP/MQTT	8883	Metrics and diagnostics
`a2fyo1pewinh1f.iot.us-west-2.amazonaws.com` `a2fyo1pewinh1f-ats.iot.us-west-2.amazonaws.com`	TCP/MQTT	8883	Metrics and diagnostics
`api.platform-prod.silvair.com`	TCP/HTTPS	443	Silvair Commissioning API communication
`silvair.eu.auth0.com`	TCP/HTTPS	443	Silvair Commissioning authentication
`gateways-rabbitmq-tls.platform-prod.silvair.com`	TCP/AMQPS	5671	Energy and occupancy information database Silvair Monitoring API (beta) Silvair Remote Control API (beta)

3.3 Installation

For information about how to physically install the Silvair Gateway, see [Rigado documentation](#).

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3.4 Configurations

The gateway supports the following network configurations:

- Cable Ethernet via DHCP (default)
- Cable Ethernet with a static IP address
- Wi-Fi supporting WPA2-PSK via DHCP
- Wi-Fi supporting WPA2-PSK with a static IP address
- 4G LTE Cat 1 with 2G/3G (only for Cascade-500-W and Cascade-500-X gateways).

3.4.1 Cable Ethernet with a static IP address

To configure the static IP connection using cable Ethernet, continue as follows.

1. Connect the gateway to the internet via Ethernet DHCP or a specifically configured mobile hotspot (contact Silvair Support for details).
2. Create a request to Silvair Support with the following information:
   a. Gateway S/N
   b. Static IP
   c. CIDR subnet mask
   d. Static gateway address
   e. DNS server address.

> ⛔ If your subnet mask, gateway address, or DNS changes, the connection will stop working. In this case, send us the new information so that we can configure the connection on each gateway again.

3.4.2 Wi-Fi via DHCP

To configure the Wi-Fi connection via DHCP, continue as follows.

1. Connect the gateway to the internet via Ethernet DHCP or a specifically configured mobile hotspot (contact Silvair Support for details).
2. Create a request to Silvair Support with the following information:
   a. Gateway S/N
   b. SSID of your network
   c. Wi-Fi password for your network
   d. Wi-Fi region (China, India, Indonesia, Israel, Korea, Taiwan, or Worldwide).

> ⛔ If your SSID or password changes, the connection will stop working. In this case, send us the new information so that we can configure the connection on each gateway again.

3. After we let you know that your Wi-Fi connection has been configured, disconnect your gateway from Ethernet.

3.4.3 Wi-Fi with a static IP address

To configure the Wi-Fi connection with a static IP address, continue as follows.

1. Connect the gateway to the internet via Ethernet DHCP or a specifically configured mobile hotspot (contact Silvair Support for details).
2. Create a [request to Silvair Support](#) with the following information:
   a. Gateway S/N
   b. SSID of your network
   c. Wi-Fi password for your network
   d. Wi-Fi region (China, India, Indonesia, Israel, Korea, Taiwan, or Worldwide)
   e. Static IP
   f. CIDR subnet mask
   g. Static gateway address
   h. DNS server address.

   ⛔ If your SSID, password, subnet mask, gateway address, or DNS changes, the connection will stop working. In this case, send us the new information so that we can configure the connection on each gateway again.

3. After we let you know that your Wi-Fi connection has been configured, disconnect your gateway from Ethernet.

3.4.4 4G LTE Cat 1 with 2G/3G

To configure the cellular connection, continue as follows.

1. Prepare a micro-SIM card with access to the internet and no PIN.
2. Make sure that your data plan is sufficient for the number of devices. For example, if the gateway serves 200 devices, a data plan of up to 75 GB per month may be required.
3. Activate your SIM card with your cellular provider.
4. Connect the gateway to the internet via Ethernet or Wi-Fi.
5. Put your SIM card into the slot so that the chip is facing down when the top of the gateway is facing up.
6. Create a [request to Silvair Support](#) with the following information:
   a. Gateway S/N
   b. APN assigned to you by your cellular provider.
7. After we let you know that your cellular connection has been configured, disconnect your gateway from Ethernet / Wi-Fi.

ℹ️ You are responsible for any billing charges.

ℹ️ Cellular connectivity can be your gateway's primary or backup connectivity option. If multiple connectivity options are available, the gateway will prioritize Ethernet, Wi-Fi, then cellular.

4. Operation

4.1 Boot sequence (status LED)

After connecting the gateway to a power supply, the status LED will go through the following sequence:

Color	Activity	Meaning
🟡	Solid	Gateway is booting.
🟡	One flash per two seconds	Gateway is connecting to the management portal.
🟡	Two flashes per second	Gateway is authenticating in the management portal.
🟢	Solid green	Gateway is connected and authenticated.

ℹ️ The first boot can take up to 5 minutes. If the gateway is stuck in one of the flashing yellow states, it can indicate a network issue.

ℹ️ If the connection to the management portal is lost, the LED flashes yellow quickly.

4.2 Gateway status in the web app

After adding the gateway to a project, the web app will show the following statuses:

Status	Description	Meaning
🟢	OK	Gateway is online, configured, up-to-date, and ready to use.
🟡	No areas	There are no areas in the project or the gateway is not assigned to any of the areas. To use gateway-enabled services, the gateway must be assigned to at least one area.
🟡	Configuring	Gateway configuration is in progress (for example, gateway is being provisioned to the network, or assigned to an area).
🟡	Updating	Gateway software update is in progress.
🟡	Removing	Gateway is being removed from the project. • When completed, the gateway will be removed from the gateways list. • To add a gateway to a different project, first remove the gateway from the current project.
🔴	Offline	Gateway is not powered, cannot connect to the internet, or some necessary ports are blocked.
🔴	Error	There is an issue with the gateway and/or backend services while configuring or removing the gateway. To resolve the issue, follow the troubleshooting section.

ℹ️ It can take a few minutes for the gateway status to update.

4.3 Access level

The level of access to the gateways in the Silvair web app depends on the assigned role:
- All user roles (Installer, Manager, Owner, End User) can see the **Gateways** tab and the list of gateways that have been added to a project.
- Only the Installer, Manager, and Owner can add, remove, or reconfigure a gateway.

4.4 Adding a gateway to an existing project

1. Make sure that the gateway status LED is solid green.
2. In the Silvair web app, open the project and click **Gateways**.
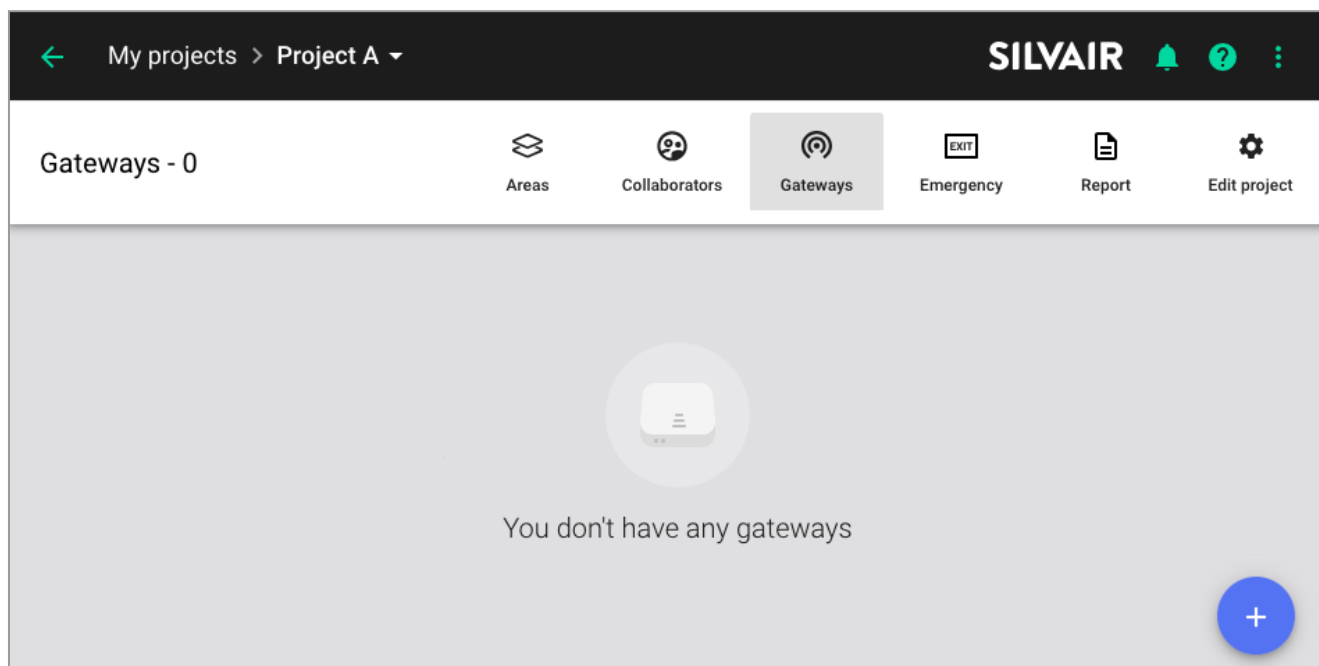
3. Click **+** to add a gateway.
4. If asked, enter the latitude and longitude of your project.

> ℹ To find the latitude and longitude, use Google Maps or OpenStreetMap.

> ℹ Enter the values with at least two decimal places. The more decimal places you use, the more accurate the calculated sunrise and sunset times will be.

5. Enter the serial number (S/N) of the gateway.

> ℹ Find the serial number on the back of the gateway.

6. For monitoring / remote control, select one area to be monitored / controlled by this gateway. For scheduling only, select one or more areas to be scheduled.
7. Click **Add**.

4.5 Adding an area to a project with a gateway

1. In the Silvair web app, open the project and click **Gateways**.
2. In the gateway field, click ⋮ **> Edit**.
3. Select the area and click **Save**.

ⓘ The gateway status icon changes to yellow to indicate that network configuration is in progress. After the gateway is configured, the status icon changes to green to indicate that the gateway is ready to use.

4.6 Removing a gateway from a project

1. Make sure that the gateway status LED is solid green.
2. In the Silvair web app, open the project and click **Gateways**.
3. In the gateway field, click ⋮ **> Remove**.
4. If you want to add the gateway to a different project, follow Adding a gateway to an existing project.

ⓘ To remove an offline gateway from a project, contact support@silvair.com.

4.7 Troubleshooting

If the gateway status LED is solid green and the gateway status in the web app indicates an error, continue as follows.

1. Make sure that all the requirements are met.
2. In the Silvair web app, open the project and click **Gateways**.
3. In the gateway field, click ⋮ **> Retry configuration**.
4. If the issue persists:
    a. Remove the gateway from the project.
    b. Add the gateway to the project again.
5. If the issue still persists, contact support@silvair.com.

5. Document revisions

Revision	Date	Editor	Changes
5.0	16 November 2023	GM	Merged with the *SGW-101 Silvair Gateway product card* document. Added an image of the "Gateways" page. Simplifications and clarifications. Minor edits.
4.4	17 April 2023	GM	Added a note about the required LTE data plan for 200 devices.
4.3	4 April 2023	GM	Added hosts and ports required by the AWS cloud management. Corrected an external link. Minor edits.
4.2	17 November 2022	GM	Added all supported configurations with configuration procedures.
4.1	25 October 2022	GM	Added the Cellular connectivity section. Changes in the Configurations section.
4.0	15 September 2022	ES, GM	Updated Gateway requirements section. Updated the list of hosts and ports. Redrafted the document. Improved procedures. Removed duplicate information. Some corrections. Removed „Silver Gateway Services" already included in the product card (SGW-101). Implemented Template v.1.2.
3.2	27 June 2022	AS	Updated 2. Gateway Requirements.
3.1	26 January 2022	ES, AS	Updated the 3. Gateway Operations section.
3.0	5 July 2021	PF, ZZ	Added new remote host in 2.1 Network Requirements.
2.9	28 June 2021	ZZ	Updated the 3.4 Gateway Statuses section.
2.8	11 June 2021	ZZ	Added an important note in the 2.2 Custom Network Configurations section.
2.7	5 May 2021	ES, ZZ	Added the Document Revision section and made general updates of the document.

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