

# Optimizing mesh network performance

Best practices for Relay nodes, EnOcean adapter and Mobile device proxy

Application note

Date: July 09, 2020	Rev. 6.2
---------------------	----------

## LEGAL NOTICE DISCLAIMER

This document and the contents of all materials available from this document (the “Content”) are subject to copyright (including patent protection) by SILVAIR, unless otherwise indicated. Copyright is not claimed as to any part of the intellectual property owned by Bluetooth SIG, Inc. Product names and markings noted herein may be trademarks of their respective owners. Accordingly, the Content may not be republished in any way without the prior written consent of SILVAIR. In doing so, you may not remove or alter, or cause to be removed or altered, any copyright, trademark, trade name, service mark, or any other proprietary notice or legend appearing on any of the Content. Modification or use of the Content except as expressly provided herein violates SILVAIR’s intellectual property rights. Neither title nor intellectual property rights are transferred to you by access to this document.

The information provided in this document is provided “AS-IS” and SILVAIR specifically disclaims any and all express, implied or statutory warranties, including the implied warranties of fitness for a particular purpose, and of merchantability and against infringement. No person is authorized to make any warranty or representation on behalf of SILVAIR concerning the performance of the described services or information. The user of the document assumes all responsibility and liability for proper and safe handling of the goods and services. Further, the user indemnifies SILVAIR from all claims arising from the handling or use of the goods and services. It is the user’s responsibility to take any and all appropriate precautions with regard to electrostatic discharge and any other technical or legal concerns. Users handling electrostatic discharge installation must have appropriate electronics training and observe good standards of engineering practice. Except as expressly indicated in writing, SILVAIR services are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the SILVAIR service could result in personal injury or death. The information contained in this document may not be used contrary to applicable law or any purpose other than specified in the document i.e. for a lighting control solution.

Unless otherwise specified in the writing, to the maximum extent permitted by applicable law. SILVAIR SHALL NOT BE RESPONSIBLE OR LIABLE TO ANYBODY FOR ANY DIRECT or INDIRECT, SPECIAL, INCIDENTAL, PUNITIVE, OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, LOSS OF REVENUES, LOSS OF PROFITS OR LOSS OR INACCURACY OF DATA, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR INCURRED IN USING THIS DOCUMENT OR SILVAIR’S SERVICES AND/OR PRODUCTS. SILVAIR’S CUMULATIVE LIABILITY FOR ANY AND ALL DAMAGES IS LIMITED TO THE AMOUNTS PAID TO SILVAIR BY THE USER IN THE LAST 12 (TWELVE) MONTHS FOR THE PARTICULAR PRODUCTS AND/OR SERVICES WITH RESPECT TO WHICH A CLAIM IS MADE. SILVAIR HAS AGREED WITH THE USER THAT THESE LIMITATIONS WILL SURVIVE AND APPLY EVEN IF ANY LIMITED REMEDY SPECIFIED IN THIS AGREEMENT IS FOUND TO HAVE FAILED OF ITS ESSENTIAL PURPOSE.

The parameters provided in this document may vary over time. All operating parameters, including typical parameters, must be validated by each customer’s technical experts.

Except as expressly indicated in writing, no license, express or implied, to any intellectual property rights is granted by this document or by any conduct of SILVAIR.

The document and information provided in this document is proprietary to SILVAIR, and unless otherwise indicated in writing, SILVAIR reserves the right to make any changes to the information in this document or to any products and services at any time without notice.

The document as well as the rights and obligations of SILVAIR and of the user of the documentation and/or SILVAIR'S services hereunder shall be governed by Polish regulations. The user of the document and SILVAIR agree to submit to the exclusive jurisdiction of, and venue in, the courts of Krakow, in any dispute arising out of or relating to this agreement. The application of the "United Nations Convention on Contracts for the International Sale of Goods" is hereby excluded. All required or permitted notices to Silvair under this document will be made in writing, make reference to this document, and be delivered by hand, or dispatched by prepaid air courier or by registered or certified airmail, postage prepaid, addressed as follows:

SILVAIR Sp. z o.o.  
ul. Jasnogórska 44  
31-358 Kraków  
Poland

# Overview

This document describes practical tips for mesh network settings, i.e.:

- Appropriate Relay nodes placement in the mesh network.
- Mobile device proxy and EnOcean adapter behavior.

In general to ensure optimal performance, it is strongly recommended to have **at most one mesh network option** (Relay, Mobile device proxy, EnOcean adapter) enabled on one mesh device at one time.

## Relay nodes

- Relay nodes in a bluetooth mesh forward received packages. In small zones all nodes can be installed within range of each other (a range of 10m - 15m between nodes is reasonable) and there's no need to have Relay enabled nodes.
- Larger zones of more than 20-30 mesh devices usually require flagging some nodes as Relays in order for the mesh network to function reliably. In larger installations, it is recommended that approximately 10% of the total nodes should be enabled as Relays in order to maintain reliable message delivery between nodes.

## Mobile device proxy

Mobile device proxy (or “proxy”) allows the mobile device running the Commissioning mobile app to connect to the mesh network and to configure devices.

- When proxy is enabled in the particular device the mobile app can send and receive messages from the mesh network.
- One proxy device can support only one simultaneous mobile device (iPad / iPhone) connection. If you need to use 2 mobile devices simultaneously there need to be at least 2 mobile device proxy enabled in the mesh network, each in the range of the mobile device.
- In order to maintain the mesh network (projects) at least one device in a mesh network must have the proxy enabled. Without a proxy device in the network the mobile app will not be able to connect to the network and manage devices. The mobile app prevents removing or disabling the only proxy device in the network before removing remaining devices or enabling proxy in other devices.

Proxy devices are configured automatically by the commissioning mobile app. In some specific cases users may need to adjust the default automatic settings.

## Automatic proxy (Silvar firmware version > 2.17, projects version > 202005)

The automatic proxy feature allows each device supporting it to automatically become a proxy on-demand whenever the Silvar mobile app is around and requests connection to the mesh network. It's automatically configured and handled in the background by the mobile app and devices.

**NOTE:** Silvair firmware v. 2.17 and project version 202005 is required. To use this feature in already commissioned projects with firmware version < 2.17 - firmware update and recommissioning is required.

### **Static proxy (Silvair firmware > 2.17 or project version > 202005)**

- In case when device(s) and project version does not support automatic proxy feature standard static proxy feature is used where selected devices are constantly operating as proxy devices allowing mobile apps to communicate with the mesh network.
- Static-proxy is automatically configured by mobile app during the commissioning in order to provide access to the network in the whole project.
- Although it's **not recommended**, static-proxy configuration can be adjusted manually (enabled or disabled in selected devices),
- Do not enable the static-proxy and relay or EnOcean functions in the same node
  - In the above situation, after switching on the EnOcean switch, the node which has proxy and Relay enabled will respond instantly, while other nodes will be switched on with one second delay.

**NOTE:** Static-proxy is used / can be used only when auto-proxy is not supported.

### **EnOcean adapter**

- The EnOcean adapter option allows for the manual control of Bluetooth mesh lighting systems using EnOcean Bluetooth wireless switches.
- Do not turn on the Relay or Static-proxy option on a device with EnOcean adapter enabled.
- One EnOcean switch can be registered to simultaneously control two or more zones.
- We recommend having 2 EnOcean adapters enabled for each switch to mitigate the single point of failure issue (in case when the EnOcean adapter device fails). Please remember that increasing the number of EnOcean adapters increases the network traffic coming from the switch and may affect the quality of the mesh network.
- For more information regarding EnOcean adapter/switch see “SN-203: Application note EnOcean switch” in our [Knowledge Base](#).

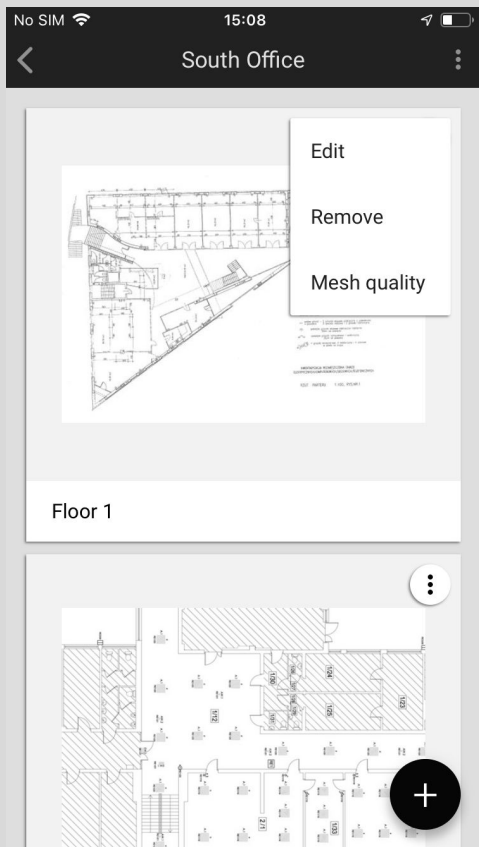
# Automatic mesh network configuration


- The Silvair mobile application offers an automatic mesh network configuration feature that facilitates Relay and Mobile device proxy configuration during commissioning process
- In projects using Auto-proxy feature all devices are configured to become proxy on-demand when requested by the mobile app. In other projects static-proxy are configured during commissioning to provide connectivity to the mesh network in the whole project, by enabling static-proxy in devices not supporting auto-proxy feature if there are no other proxy devices nearby.
- The mesh network is automatically configured while the user adds a new device to a zone. This mechanism runs in the background and sets approx. 10% of all devices added to the zone(s) as Relays.
- In a situation when some network issues occur, we recommend to check Relay network settings and to add, or change position of existing Relays manually. Click [here](#) to read more on manual network settings.
- After reconfiguring any network settings, it is recommended to check the lighting behavior in the selected zones, e.g., by observing if the preset options and settings work correctly, or by running the connection quality test.


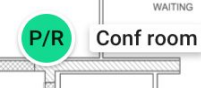


**NOTE:** Never set up “Static-Proxy” and “Relay” or “EnOcean” functions on one device.

## Mesh quality test

- The test can **only** be done in the Silvair mobile application.
- The mesh quality test allows users to check the availability and quality of the mesh connection between zones and shows the result as a visual mesh network connection quality map.
- We recommend testing mesh network quality in your zone, or linked zones in the following cases:
  - after commissioning the zone/s, or making changes in linked zones,
  - after discovering some unexpected lighting behavior in your zones (e.g. the lamps do not light up in one of linked zones),
  - after changing something that may affect the radio propagation environment in the commissioned zones which may adversely affect mesh network performance.
- To start the test, follow the below steps:



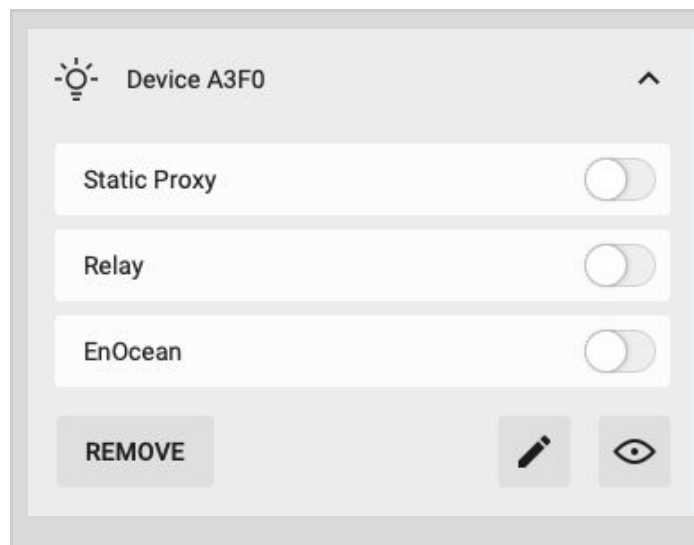
- Open the Silvair mobile app, and go to the projects list to select a floor.
- From the menu , select “Mesh quality”
- Press the **START TEST** button.
- Once it finishes, you will see the mesh connection quality test result.

	<p>Mobile device proxy connection.</p>
	<p>Mobile device proxy / Relay connection.</p>
	<p>Relay connection.</p>
	<p>Potential connection problem.</p>

- Additionally, the test shows mesh network indicators on your project’s floorplan such as: Relays, Mobile device proxy, and places between zones that require network improvements (this can be done by e.g. [manual network settings](#)). The quality of connection in the network is indicated by circle’s colors:
  - Green - the connection is good. This was tested by sending 3 messages to 3 nodes, and all the messages were accepted.
  - Red - the connection requires attention, as there is a potential problem. This was tested by sending 3 messages to 3 nodes, and at least 1 of 3 messages was not accepted.

- **NOTE:** If the tested zones do not have any devices added, it will not be possible to run the connection quality test.

## Manual mesh network settings



To enable **relay** manually:

- Go to the “DEVICES” tab.
- Select the device.
- Tap toggle labelled “Relay” to enable it

To enable **static proxy** manually:

- Go to the “DEVICES” tab.
- Select the device.
- Tap toggle labelled “Static Proxy” to enable it

To maintain fast and efficient performance of the mesh network, use the following best practices:

1. Do not flag more than 10% of your nodes as Relays. Doing so causes a huge increase in mesh network traffic and will slow down and severely degrade the overall performance of the mesh network and lighting control.
2. If possible, position Relay nodes evenly across the mesh.
3. If issues such as erratic, uneven, or delayed lighting control arise within the mesh network, try adding or removing Relay nodes from the network.

### When to add a Relay node:

- Depending on the zone topology, the lighting control behaves in an erratic, uneven or delayed manner.  
If the Zone is large, and nodes are placed far apart, problems may occur when transferring the message further into the zone. In such cases, some distant nodes should be enabled as “Relays” using the Silvair mobile app.
- Consider the topology of your mesh network and the distance between individual nodes; check the below schematics for reference.



## Placing Relays



fig.1 Correct placement of Relays and EnOcean adapter options

**NOTE:** Don't flag more than 10% of your nodes as Relays. Doing so causes a huge increase in mesh network traffic and will slow down or severely degrade the overall mesh performance.

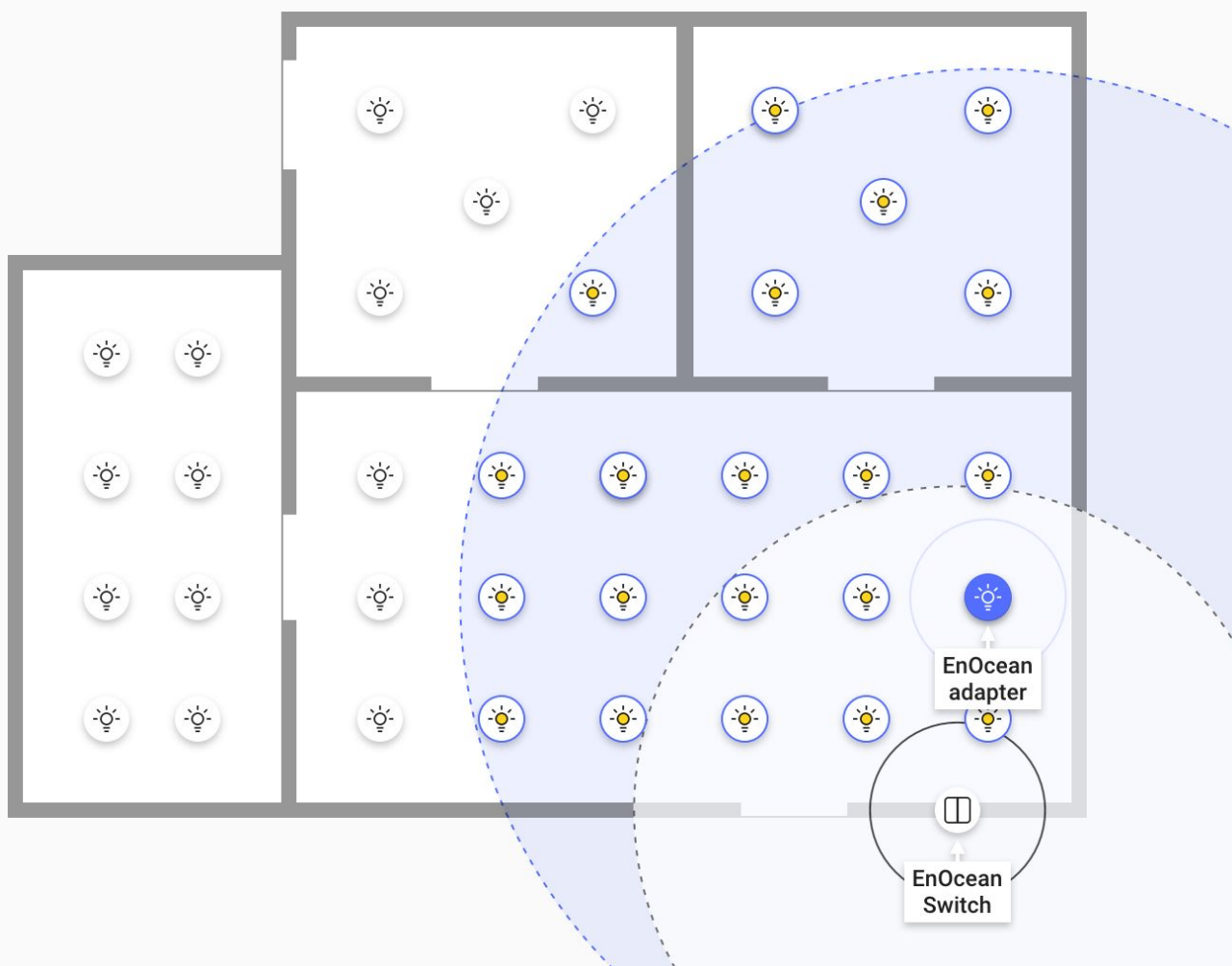



fig.2 Incorrect placement of Relays and EnOcean adapter options

**Remember** that there isn't one answer to the "How many Relays should be placed in a mesh network?" question. The actual number of Relay nodes is based on the topology of each individual mesh network.

If enabling Relays does not fix your mesh network issue, contact support for further troubleshooting and for advice on the proper use of the advanced settings available in the Silvair web application.

# Troubleshooting

If your mesh network is not responding correctly:

- Ensure that there is at least one proxy device set per network.
- Try to identify the proxy device in your zone (by tapping the  icon in the mobile app) and observe if the device is responding (blinking).
- Try to enable Mobile device proxy on another device in the zone (Select the desired device in the zone in the Commissioning mobile app, expand the settings, and tap “GATT Proxy” ).
- Lastly, once you have more than one Mobile device proxy,
  - Select the device that is not responding.
  - Change the switch “GATT Proxy” to disabled, and then enable it again.

## Contact Information

---

Support: [support@silvair.com](mailto:support@silvair.com)  
Business development: [business@silvair.com](mailto:business@silvair.com)  
For more information please visit: [www.silvair.com](http://www.silvair.com)

### Our Offices:

#### Europe

ul. Jasnogórska 44  
31-358, Kraków  
POLAND

#### North America

717 Market Street, Suite 100  
San Francisco, CA 94103  
USA