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Basic / Advanced / Expert

Application note

Optimization of visualization in complex projects

How to aggregate spaceLYnk's visualization in complex projects



Schneider Electric

Safety Information

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1 Introduction

This application note describes solution how to effectively set up visualization of Wiser for KNX (W4K) and spaceLYnk (sL) in big projects. In view the fact that W4K and sL are free programmable logic controllers it is not easy to say how much they can handle to comply with recommended values of CPU load. There are many circumstances which can have influence on performance. We have been facing questions how many users can access visualization in the same time and how can integrator de crease CPU load.

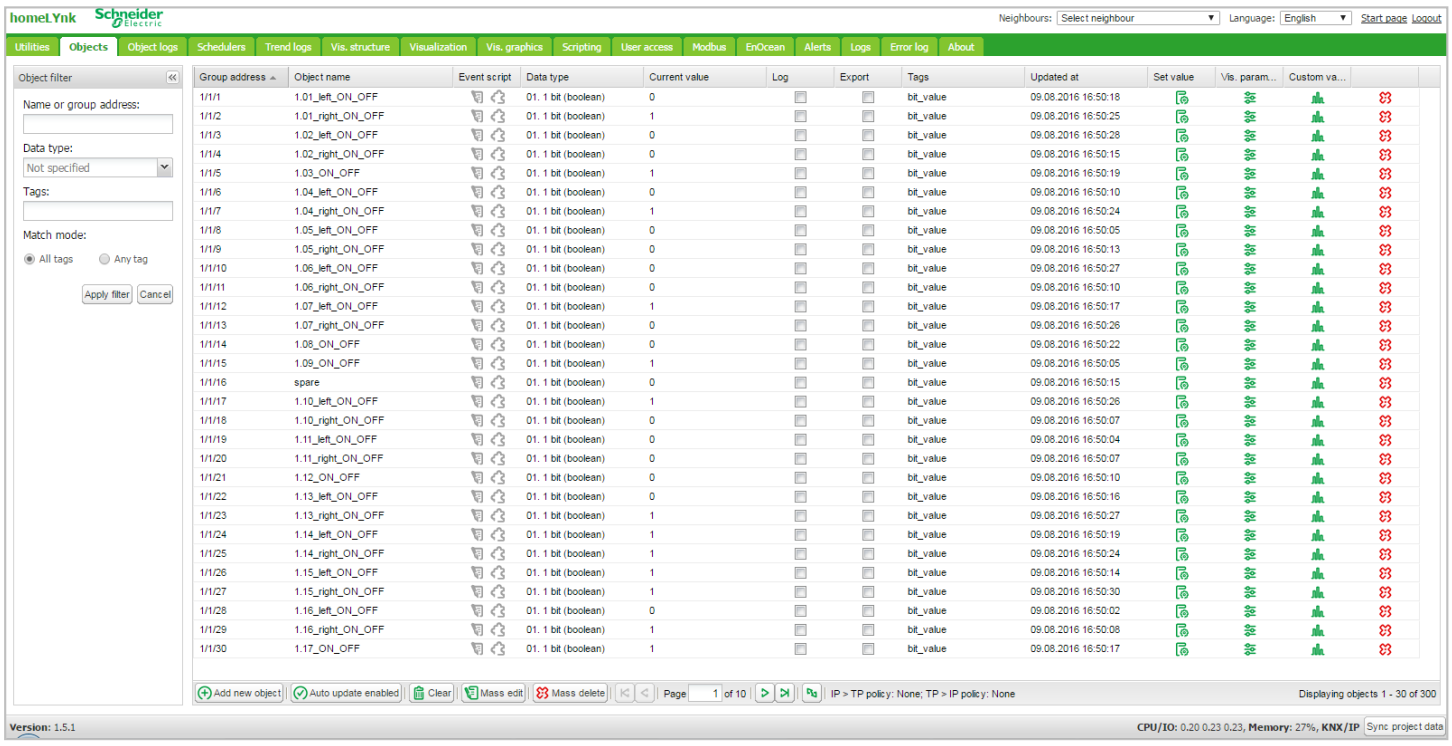
For testing purposes a test bench was built with 20 pcs of W4K controllers and 1 pcs of sL controller. One Wiser for KNX contains several rooms and represents a local controller. spaceLYnk is preferred by Facility manager for data aggregation from all W4Ks.

For simulation of real scenario there was KNX bus traffic generator running in each Wiser for KNX. KNX bus traffic simulates real-time work comes KNX devices and people in building.

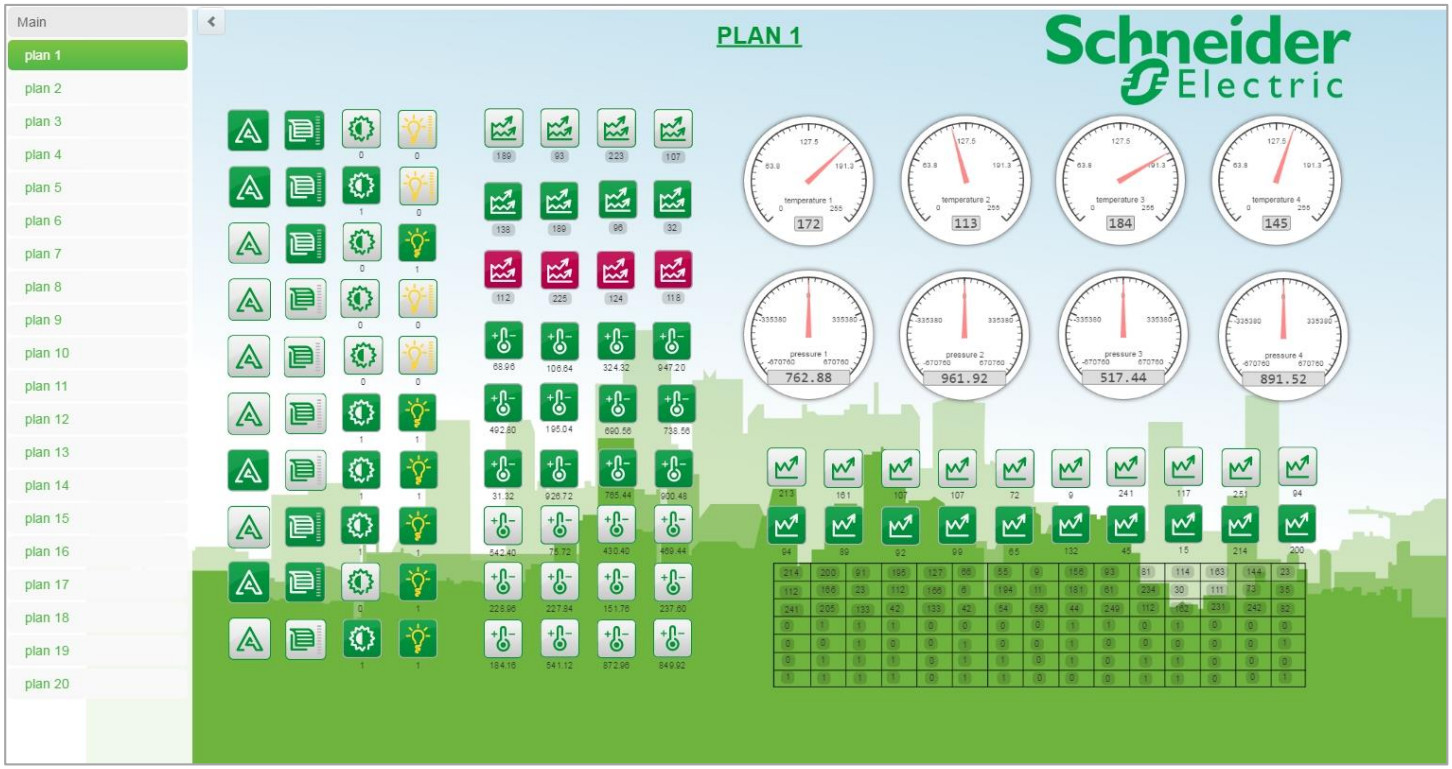
Structure of objects is following:

Each Wiser for KNX contains 300 objects (128x 1-bit objects, 32x 4-bit objects, 88x 1-byte objects, 52x 2-byte objects) which are randomly changed every 5 minutes to simulate real traffic on KNX network.

From these 300 objects are visualized 209 objects (100x 1-bit objects, 77x 1-byte objects, 24x 2-byte objects 4x 1-byte gauges and 4x 2-byte gauges) in each plan.



Picture 1: Objects in Wiser for KNX (300 objects in total)



Picture 2: Visualization (209 objects in total)

Target of this application note is to find out best way how to visualize big projects. We have created 2 different scenarios for this task.

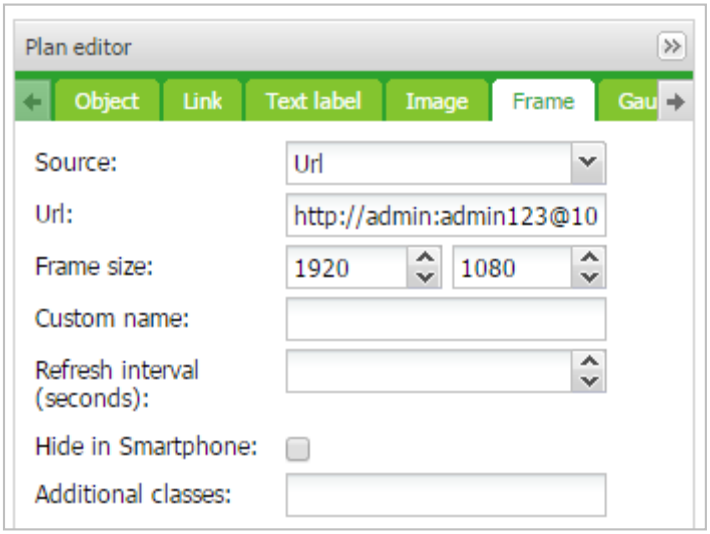
Scenario 1:

> 20 W4Ks are used as local controllers with running KNX traffic generator inside and sending values stored in objects to sL with visualization from each W4K over KNX/IP. sL in this scenario serves as an objects aggregator as well as a visualization machine. Objects from all clients (W4Ks) are imported to master spaceLYnk (6000 objects in total).

Scenario 2:

> 20 W4Ks are used as local controllers with running KNX traffic generator inside. Each Wiser for KNX has one own visualization plan. sL in this scenario serves as a visualization aggregator only. This means that master sL does not contain any imported objects from Wiser for KNXs as it is in Scenario 1. Visualization is done via frames for each Wiser for KNX's visualization. This scenario distribute CPU load to Wiser for KNXs.

Note: Frames can display any web page when parameter URL is set. You can add frame to your visualization via *Configurator -> Visualization -> **Frame***



Picture 3: Adding frame

Users viewing the visualization have significant affect to CPU load of W4K, sL controller. Overloading of CPU causes unavailability of controller as well as its rebooting. That is the reason why it is important to specify how many users can be connected to visualization in the same time and which way is better for complex projects.

A glossary is available in the appendix chapter of this document. Please refer to it whenever necessary.

Competencies

This document is intended for readers who have been trained on Wiser for KNX, spaceLYnk products. The integration should not be attempted by someone who is new to the installation of either products. In addition we recommend that you be familiar with:

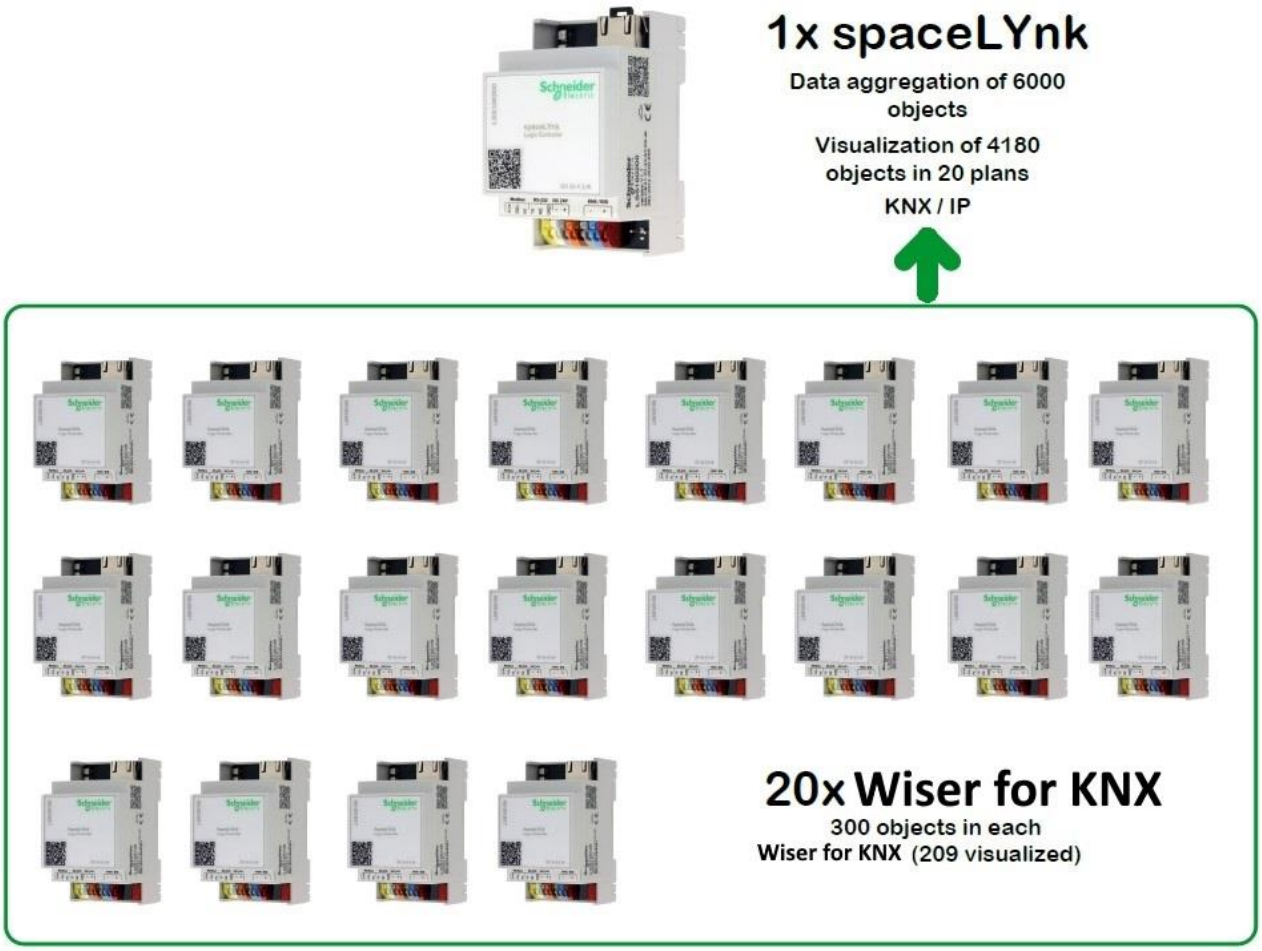
- The concepts of KNX

System prerequisites

Software	Version	Download
Wiser for KNX	2.1 and newer	http://www.schneider-electric.com
spaceLYnk	2.1 and newer	http://www.schneider-electric.com

Table 1: Software versions of used software

2 Architecture



Picture 4: Testing architecture

3 Tests description and results

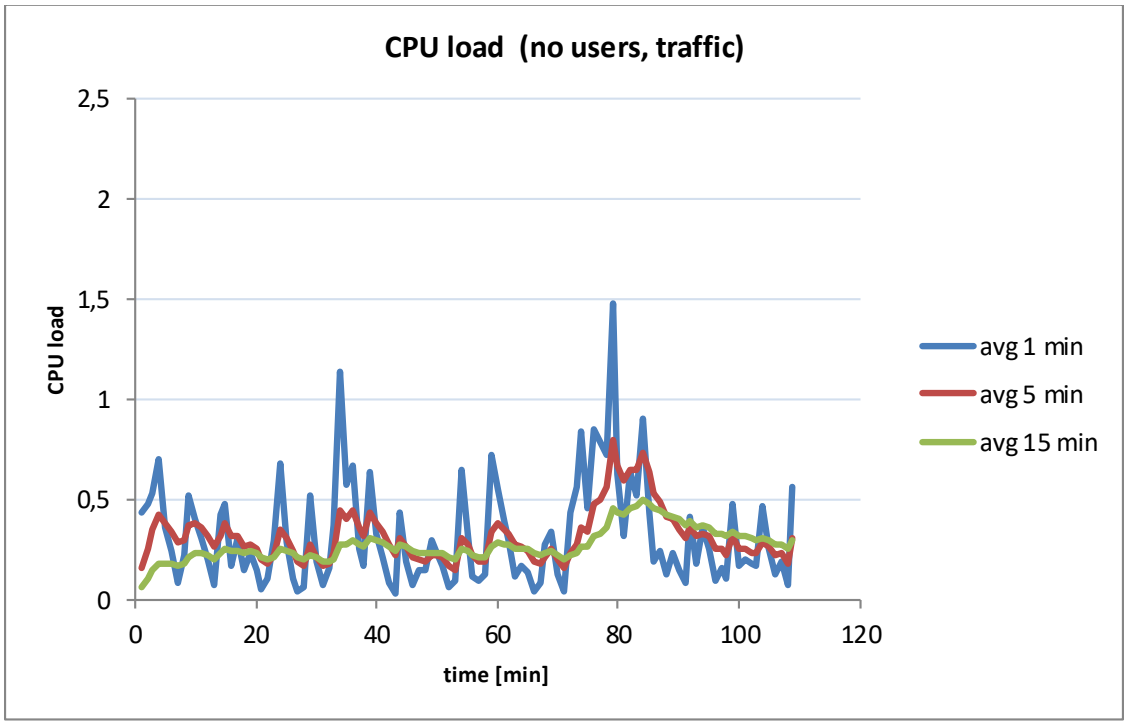
3.1 Scenario 1 – Communication via KNX/IP without open visualization

20 Wiser for KNXs serve as local controllers. Each Wiser for KNX contains 300 KNX objects. Objects are periodically send to master spaceLYnk over KNX/IP. Master spaceLYnk aggregates all 6000 objects. There are no running scripts in the Wiser for KNXs except random KNX traffic generator. All objects values are changed randomly every 5 min. There are 209 objects in visualization as you can see in the Picture 2.

The target of this test is to assess CPU load of master spaceLYnk when data from Wiser for KNXs is send over KNX/IP when there is a traffic on KNX and nobody is operating the visualization.

Note: This test is dedicated only for Scenario 1, because spaceLYnk does not act as a data aggregator in Scenario 2.

Result:



Picture 5: CPU load without connected users and simulated traffic from 20 Wiser for KNX clients

Average CPU load over time: 0.32

Maximum CPU load over time: 1.48

Conclusion:

It is possible to send up to 6000 objects over KNX/IP with object change rate 5 minutes. Master spaceLYnk CPU load is in long term under 0.7. Short term performance peaks do not have influence on functionality of W4K, sL controller.

There was no open connection to visualization in master spaceLYnk!

3.2 Scenario 1 – Communication via KNX/IP with open visualization

There are 20 users created in the master spaceLYnk with access to different parts of visualization. The visualization consists of 20 identical plans. Each user has access only to his own visualization.

Each plan shows data from one of the Wiser for KNX controller with simulated traffic (changing all objects every 5 min).

There are 100x 1-bit objects, 77x 1-byte objects, 24x 2-byte objects 4x 1-byte gauges and 4x 2-byte gauges in each plan (209 objects in total).

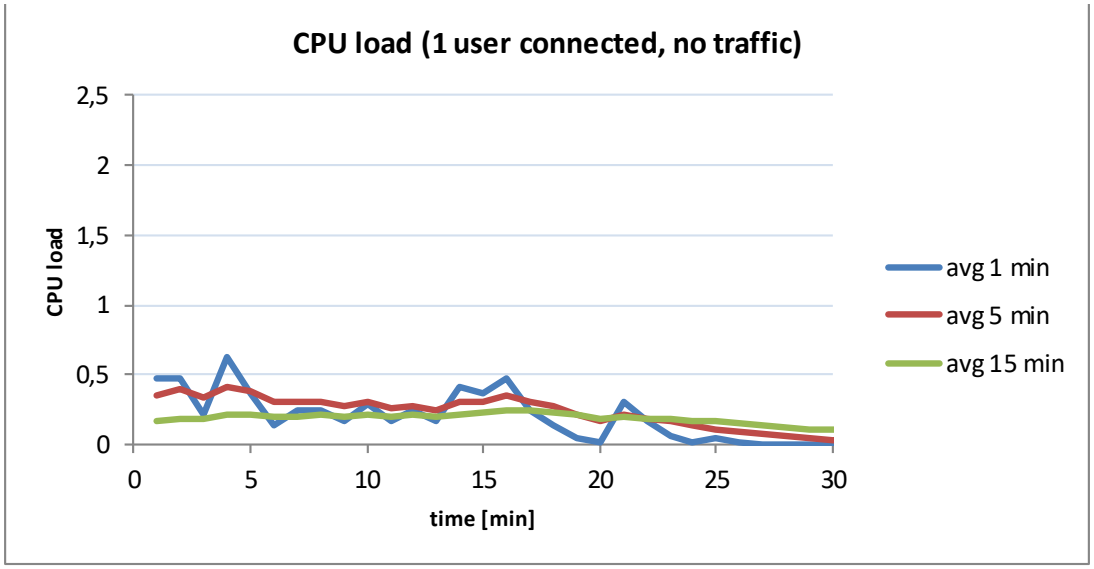
Option 1: Without KNX bus traffic generated by 20 W4K clients

Option 2: With KNX bus traffic generated by 20 W4K clients

The target of the test is to specify how many users can access visualization in the same time from PCs .

Results:

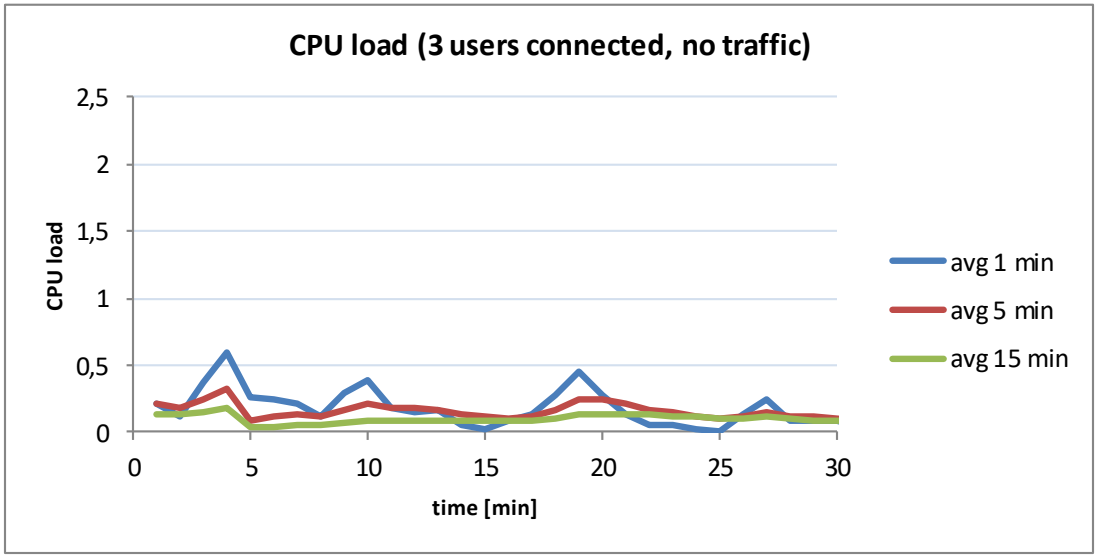
Option 1: Without KNX bus traffic generated by Wiser for KNX clients



Picture 6: CPU load without traffic when 1 user is connected to the visualization

Average CPU load over time: 0.20

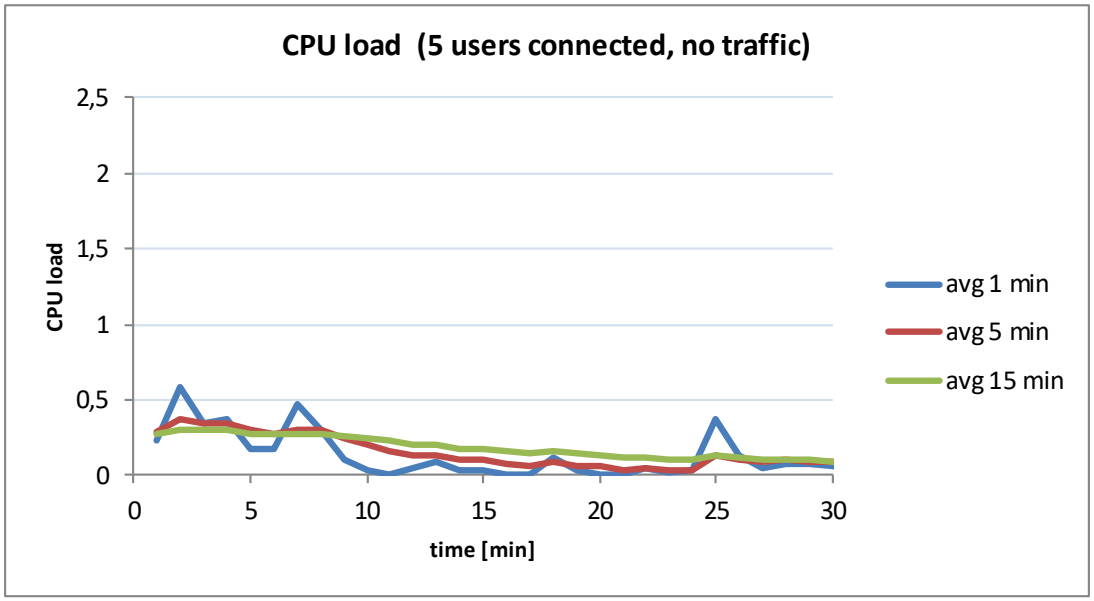
Maximum CPU load over time: 0.63



Picture 7: CPU load without traffic when 3 users are connected to the visualization

Average CPU load over time: 0.19

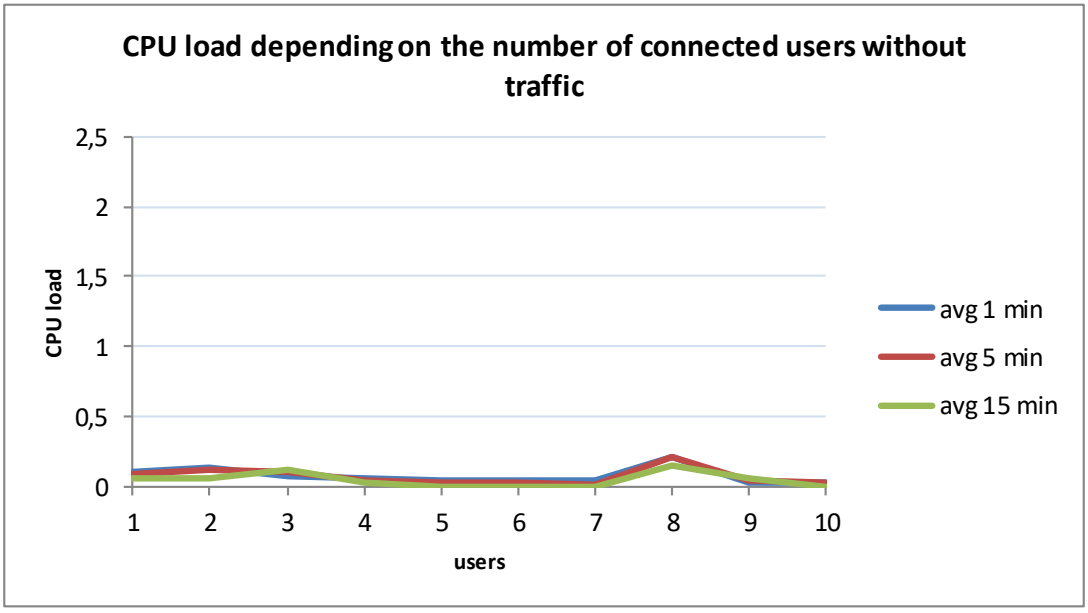
Maximum CPU load over time: 0.60



Picture 8: CPU load without traffic when 5 users are connected to the visualization

Average CPU load over time: 0.13

Maximum CPU load over time: 0.59

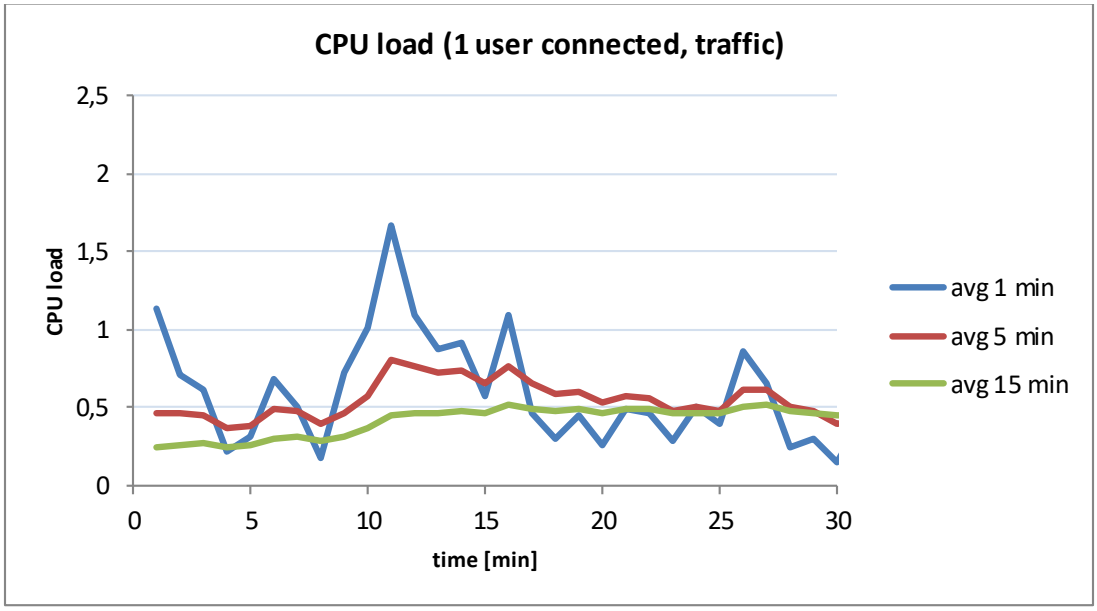


Picture 9: CPU load depending on the number of connected users without traffic

Conclusion:

There are no significant CPU load changes depending on the number of users if there is not traffic from Wiser for KNX clients. The average CPU load is under maximum recommended value (0.7) regardless the number of the users.

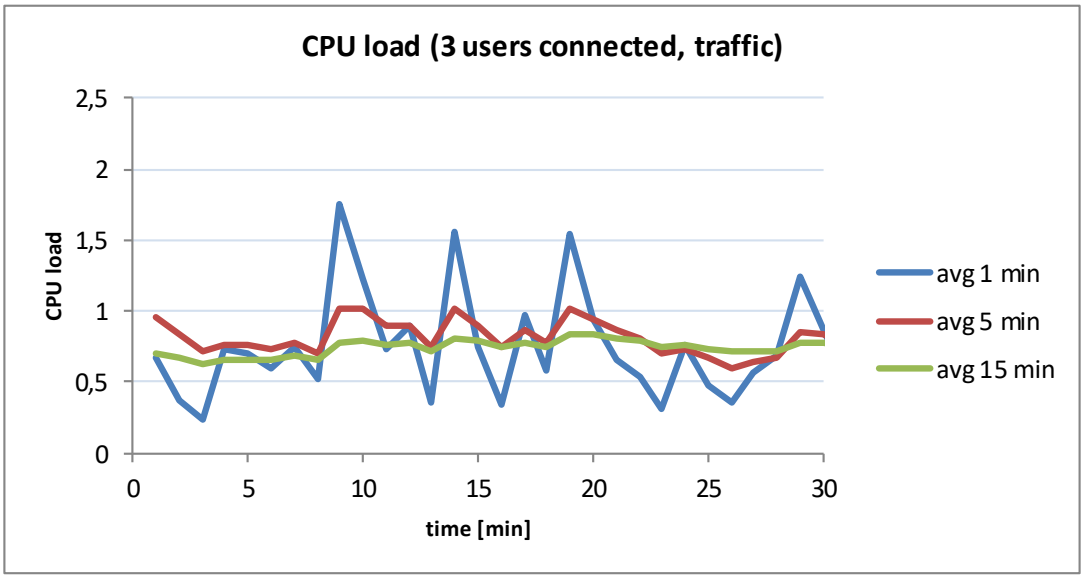
Option 2: With KNX bus traffic generated by Wiser for KNX clients



Picture 10: CPU load with traffic when 1 user is connected to the visualization

Average CPU load over time: 0.59

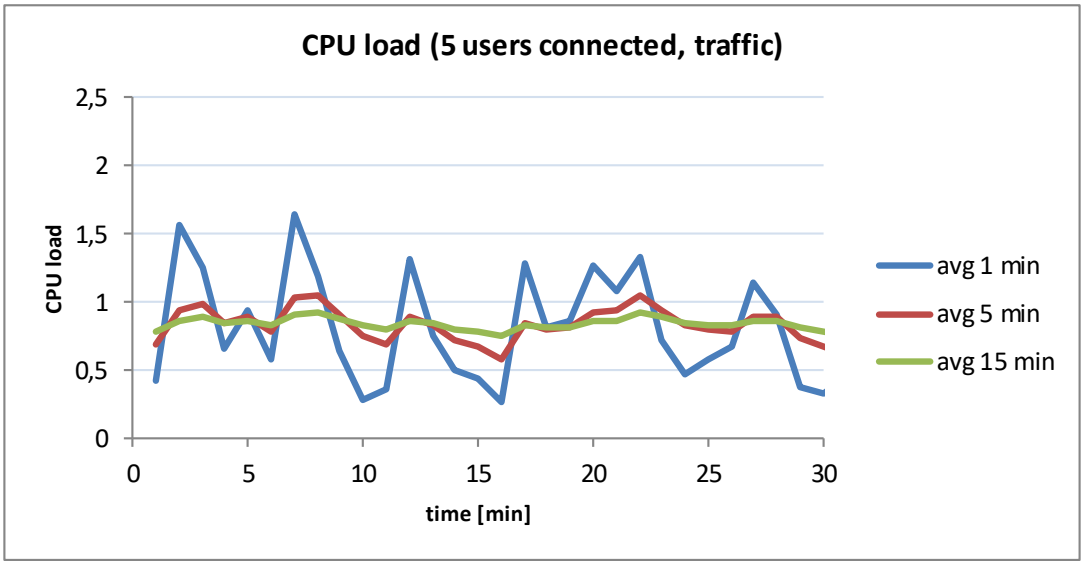
Maximum CPU load over time: 1.67



Picture 11: CPU load with traffic when 3 users are connected to the visualization

Average CPU load over time: 0.74

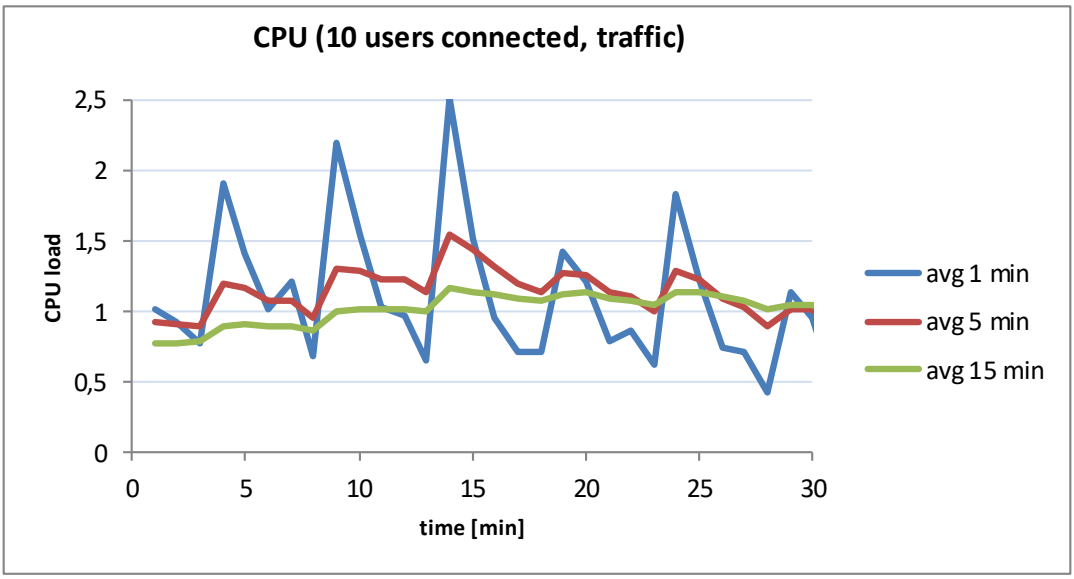
Maximum CPU load over time: 1.75



Picture 12: CPU load with traffic when 5 users are connected to the visualization

Average CPU load over time: 0.82

Maximum CPU load over time: 1.64



Picture 13: CPU load with traffic when 10 users are connected to the visualization

Average CPU load over time: 1.10

Maximum CPU load over time: 2.50

Conclusion:

More than 5 users connected to the visualization at the same time overload W4K, sL CPU. The average CPU load is above maximum recommended value (0.7).

3.3 Scenario 2 – Communication via KNX/IP with open visualization provided via frame

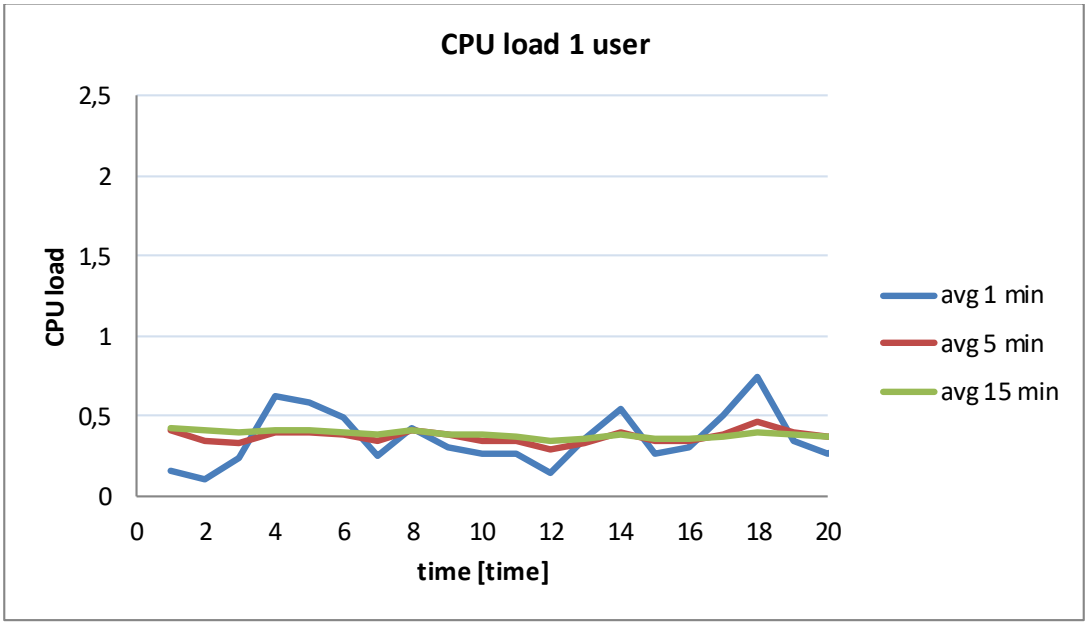
There are 20 Wiser for KNXs as local controllers with running KNX traffic generator inside connected to the master spaceLYnk. The visualization of master sL consists of 20 identical plans. Each Wiser for KNX has visualization with 1 own plan.

sL in this scenario serves as a visualization aggregator so there are not imported objects from clients (W4Ks). This scenario distributes CPU load to Wiser for KNXs.

Visualization in the master sL is the same as in scenario 1, but running on each Wiser for KNX. SpaceLYnk visualization works as a visualization aggregator when each visualization from Wiser for KNXs is provided via frame URL of specific Wiser for KNX as you can see in picture 3.

The target of the test is to specify how many users can access visualization in the same time from PCs when master spaceLYnk serves as a visualization aggregator provided via frames.

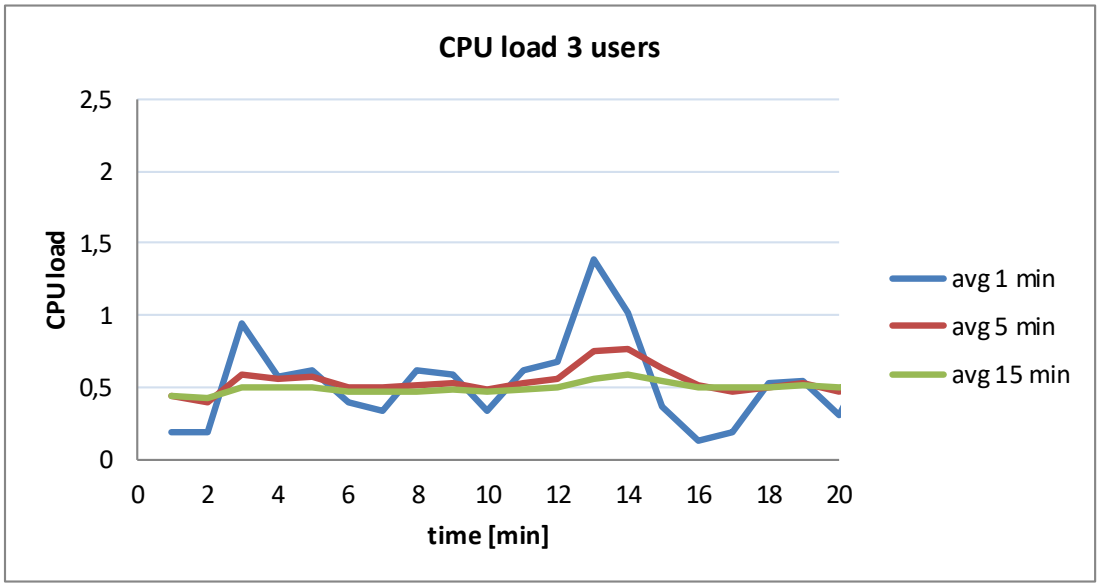
Results:



Picture 14: CPU load with traffic when 1 user is connected to the visualization

Average CPU load over time: 0.36

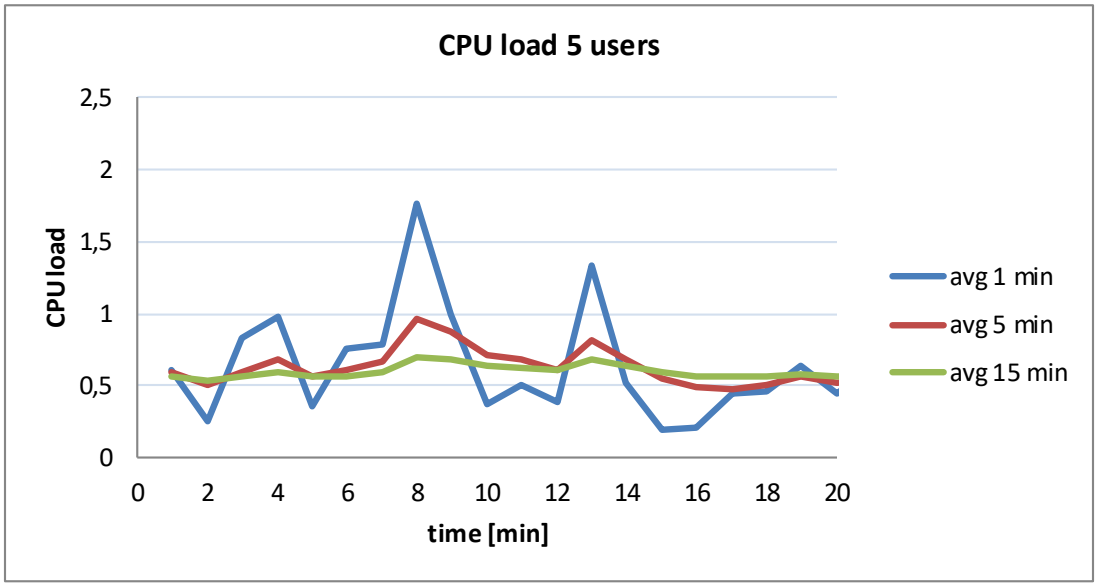
Maximum CPU load over time: 1.24



Picture 15: CPU load with traffic when 3 users are connected to the visualization

Average CPU load over time: 0.57

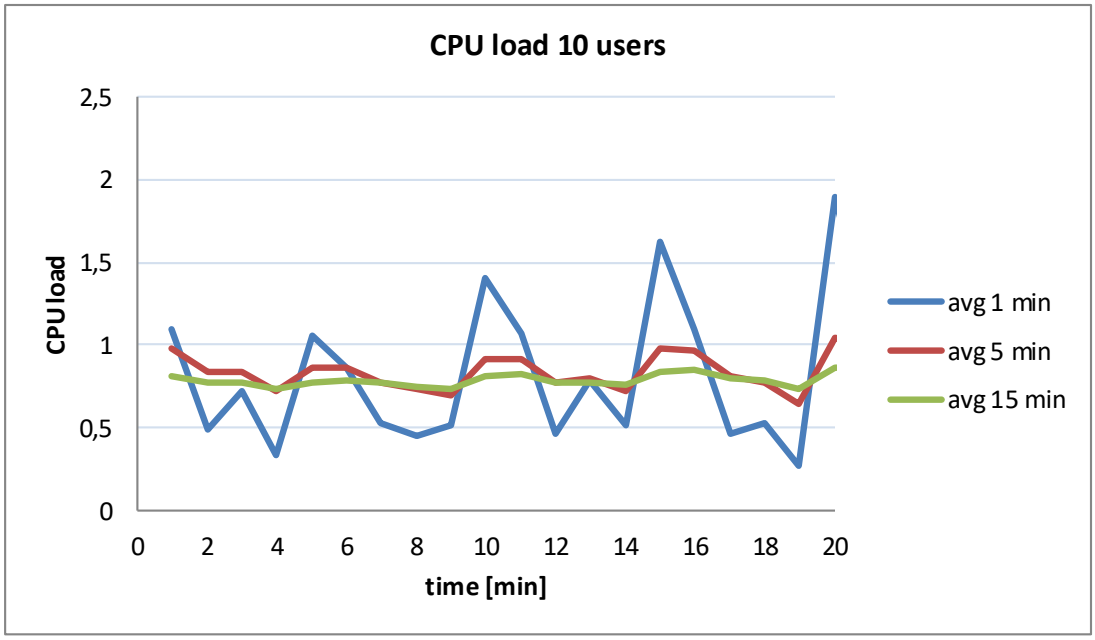
Maximum CPU load over time: 1.38



Picture 16: CPU load with traffic when 5 users are connected to the visualization

Average CPU load over time: 0.64

Maximum CPU load over time: 1.76



Picture 17: Picture 18: CPU load with traffic when 10 users are connected to the visualization

Average CPU load over time: 0.82

Maximum CPU load over time: 1.89

4 Conclusion

Following table compares CPU load when master spaceLYnk serves as a data aggregator with complete visualization inside and when spaceLYnk serves as a visualization aggregator only.

Multiuser access to visualization with simulated traffic on KNX bus	CPU load when master sL serves as a data aggregator with visualization (Scenario 1)	CPU load when master sL serves as a visualization aggregator only (Scenario 2)	Performance increase
1 user	0,59	0,36	1,63x
3 users	0,74	0,57	1,29x
5 users	0,82	0,64	1,28x
10 users	1,10	0,82	1,34x

Table 2: Test conclusion

We found that CPU load in scenario 2 is significantly lower. In the projects where is used many logic controllers it is better to spread CPU load to local controllers with own visualization and aggregate these visualizations in master controller via frames.

When master spaceLYnk serves as a data aggregator with visualization as it is described in Scenario 1 it is not possible to simultaneous access visualization with more than 3 users.

When master spaceLYnk serves as a visualization aggregator only it is possible to simultaneous access with 7-8 users and keep 0.7 limit for CPU load.

5 Appendix

5.1 Glossary

The following table describes the acronyms and defines the specific terms used in this document.

Abbreviation	Description
W4K	Wiser for KNX
sL	spaceLYnk
CPU	Central processor unit

Table 3: specific terms

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