FED4.0 – Stage 1
## Testing low latency Industry4.0 applications using Fed4FIRE+

GOALS

- STONESHIELD LDA is an engineering SME specialized on the design and manufacturing of machines for industrial applications in the automotive sector and its suppliers

- The main goal of Stage 1 of this experiment is to assess the perceived bi-directional delay for the remote control of a robotic arm using Wi-Fi connectivity in industrial environments.

CHALLENGES

- We are interested in understanding how WiFi network impairments affect the immersiveness into the remote environment.

- Several coexistence and radio interference scenarios were deployed in the STONESHIELD industrial facilities using the wireless portable testbed provided by IMEC in Fed4FIRE+.

DEMO SETUP
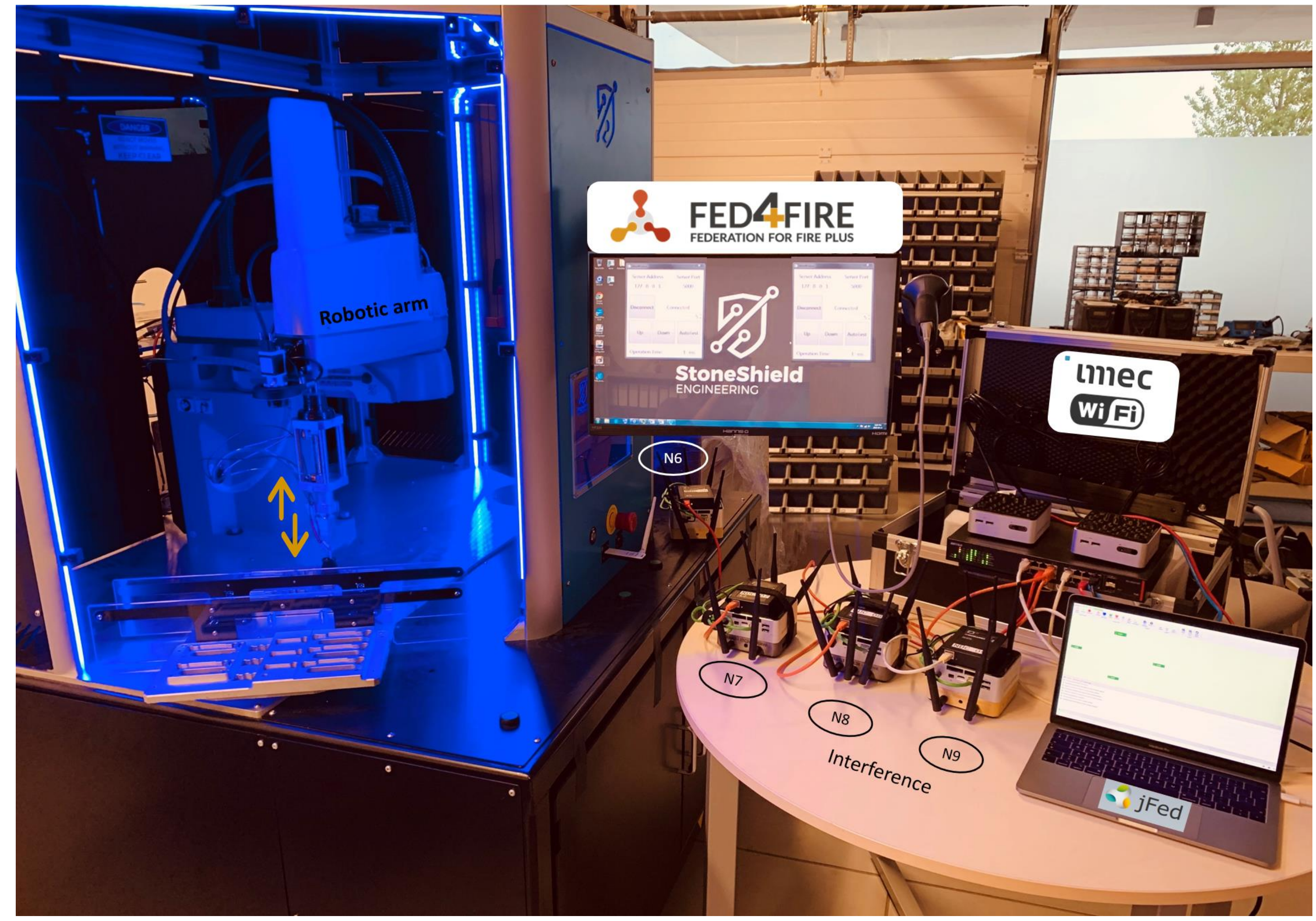
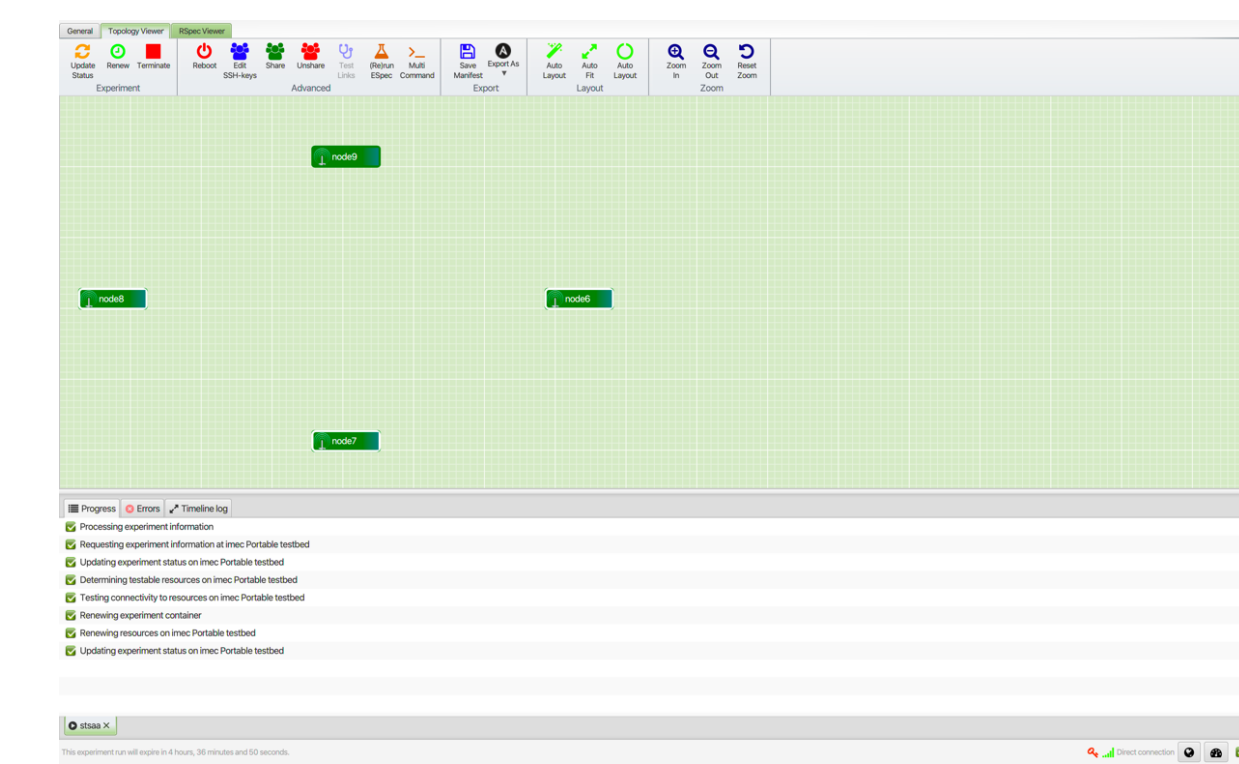## DEMO SETUP

Imec portable testbed

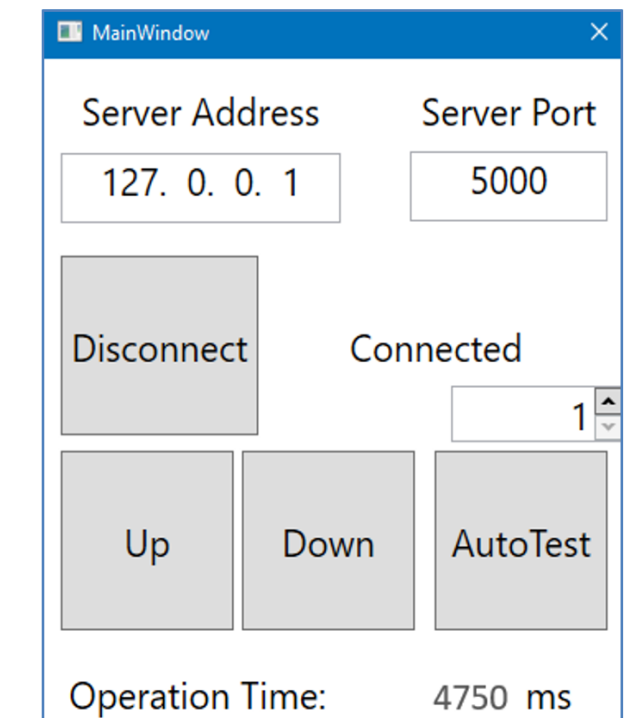Figure 1: jFed toolkit used to setup the experiment.

Figure 2: GUI of the remote application developed to control the vertical movement of the robotic arm and measure the execution time.
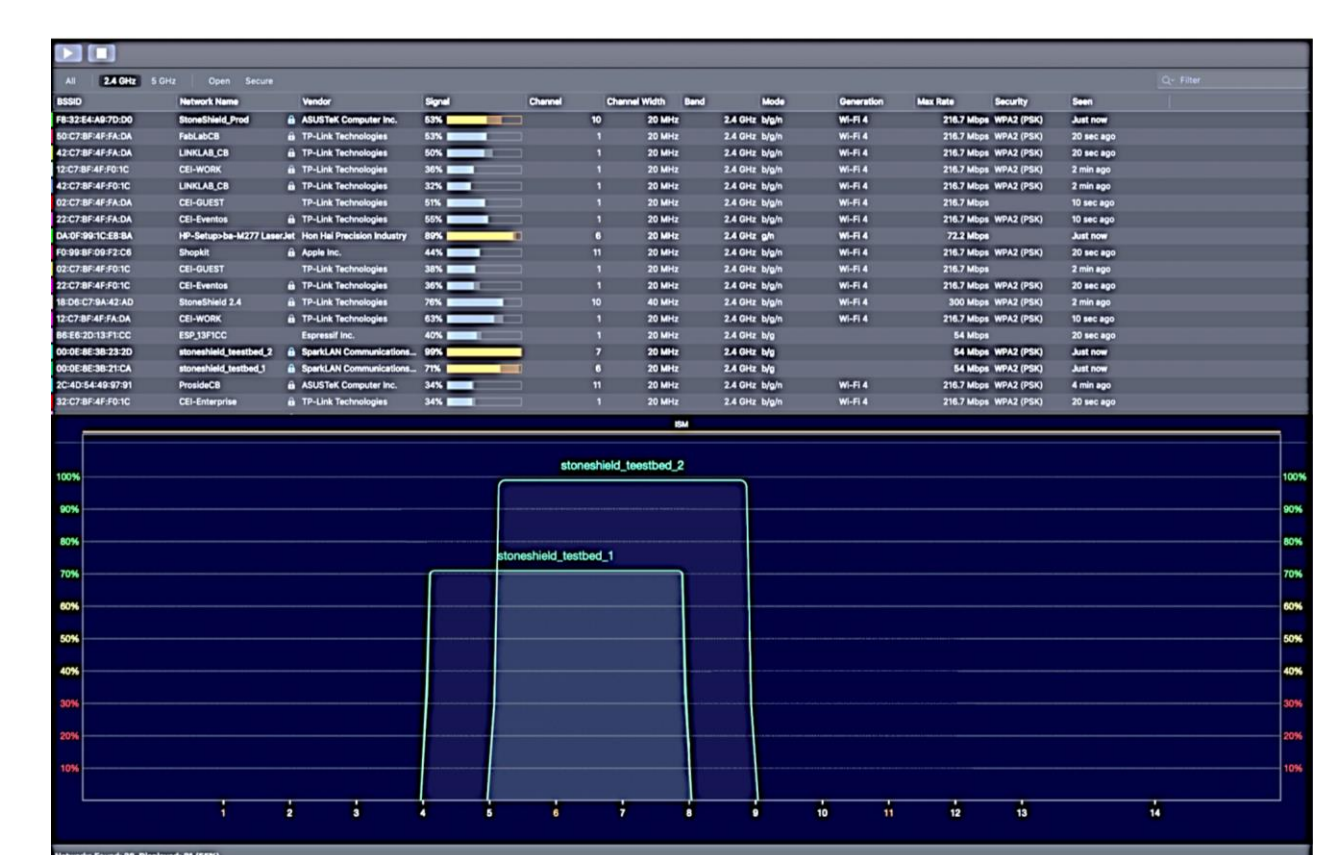

Figure 3: WiFi channels allocation for the adjacent channel interference scenario.

RESULTS

- The results have shown that in the worst-case scenario of co-channel interference there is an average increase of 124 ms in the end-to-end latency compared with the local control of the robotic arm.

Figure 4: Local control of the robotic arm. The execution time includes the robotic mechanical movement plus the E2E communication latency.

- WiFi connectivity is not suitable for the control of critical industrial applications. However, with the right channel planning of the industrial WiFi network it can be used to no-critical applications such as some remote maintenance tasks.
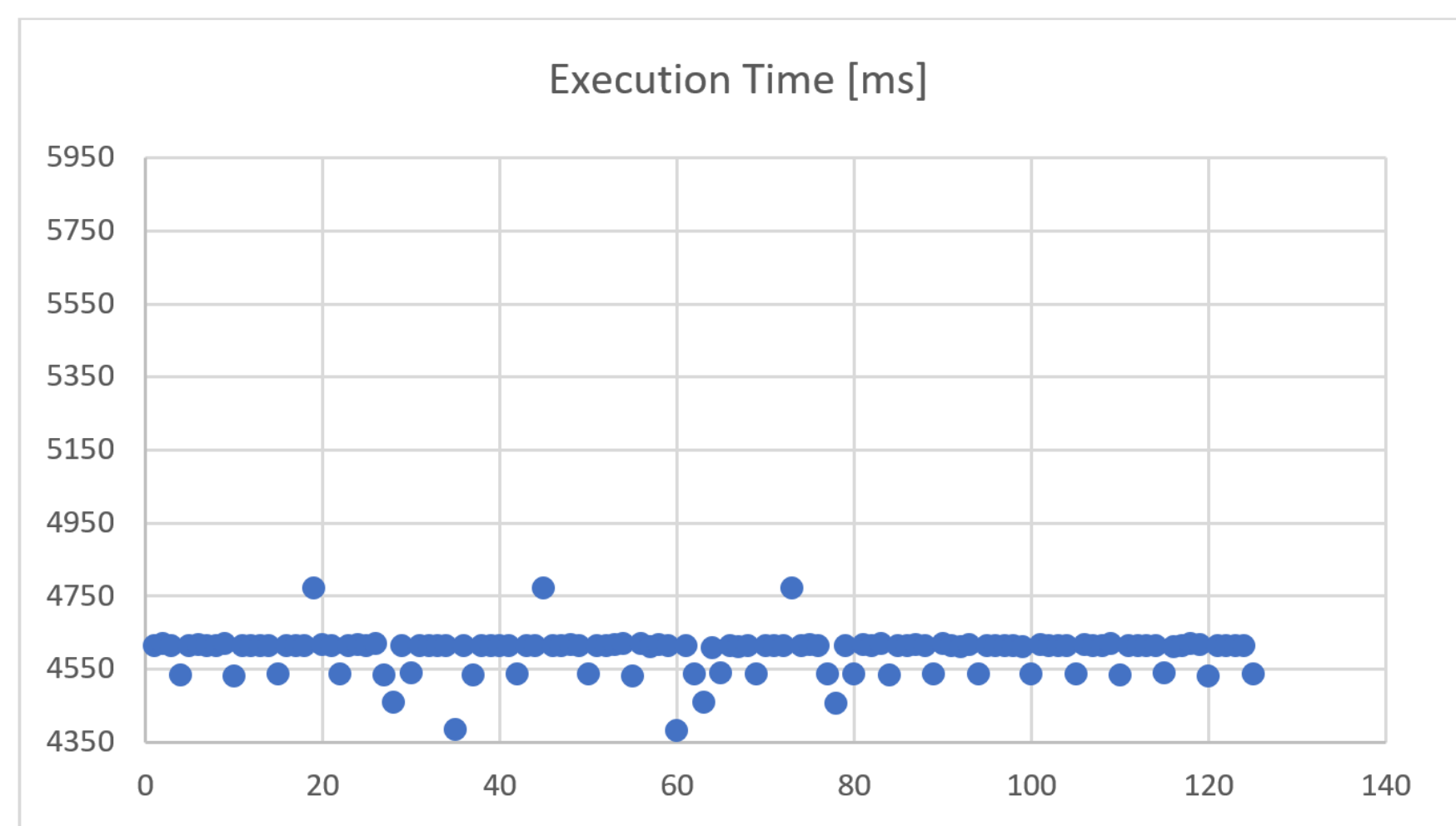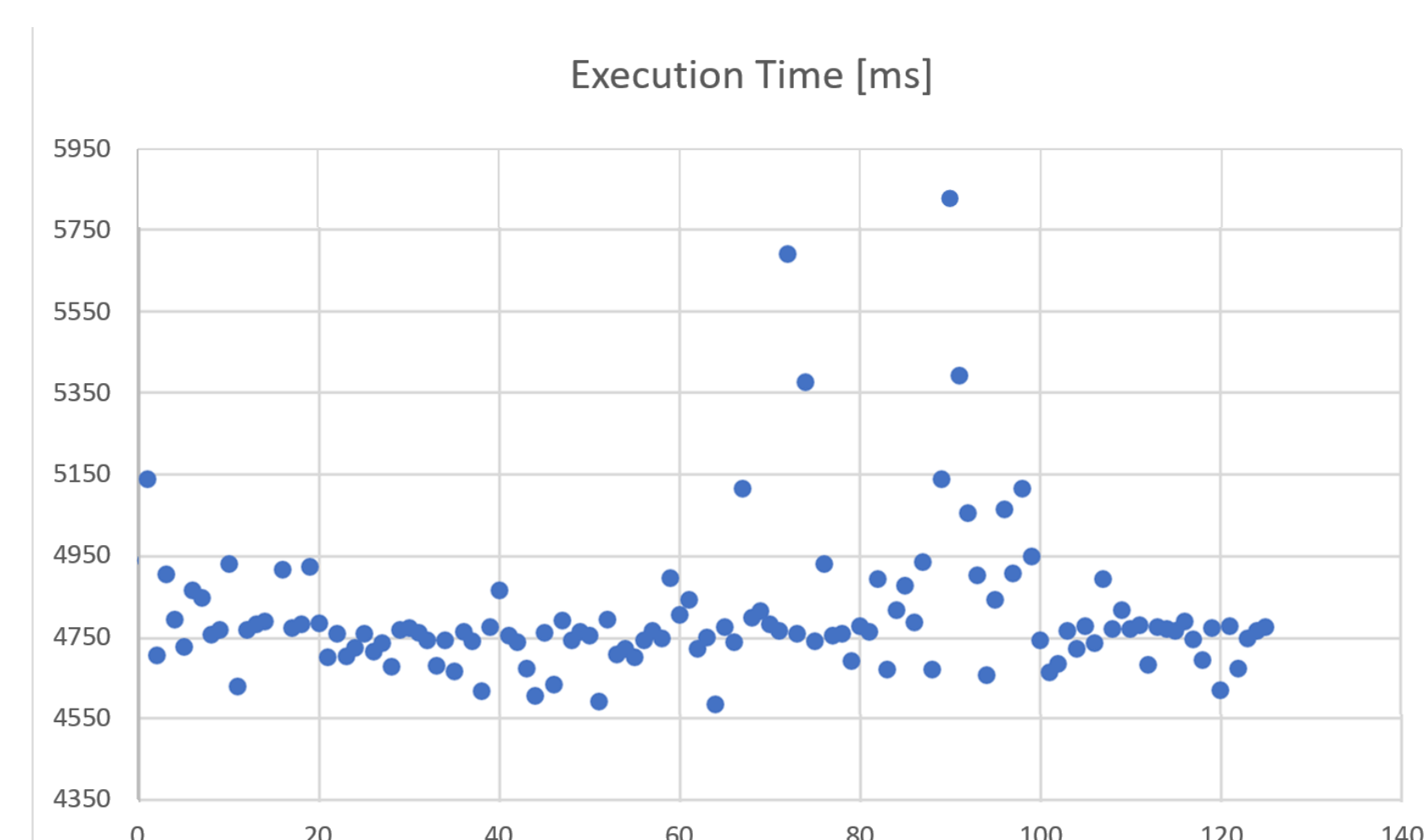

Figure 5: The co-channel interference scenario leads to an increase of the network latency.

CONCLUSIONS

- Thanks to this experiment we have a better understanding of WiFi connectivity constrains, measured in industrial environments. This will help STONESHIELD to be more prepared to address these challenges towards a commercial exploitation of innovative Industry4.0 applications such as remote maintenance with strong business impact on the company.

POST MORTEM

- In Stage 2 of this Fed4.0 experiment we will test wireless connectivity solutions to support an Augmented Reality (AR) application for remote training and more effective maintenance operations of machines produced by STONESHIELD and installed in factories from a broad range of international clients.

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