

# Simulating 6TiSCH stack for Avionic Wireless Sensor Networks in OMNeT++

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## Abstract

Wireless Sensor Networks (WSNs) have gained widespread adoption across many fields of industry, science and commerce thanks to the ubiquitous connectivity they offer over large, infrastructure-less areas. IEEE 802.15.4 is a technical standard specifying the architecture of the two lower layers—physical and Medium Access Control (MAC) for communication inside a WSN. The standard underwent several revisions to support demanding requirements of safety-critical applications involving automation, healthcare monitoring, etc. For example, Wireless Avionics Intra-Communication (WAIC) aims to improve flight quality, safety and decrease maintenance costs using an in-cabin sensor network. To support applications with diverse Quality of Service (QoS) requirements, we opted for IPv6 over the Time Slotted Channel Hopping (TSCH) mode of IEEE 802.15.4 (6TiSCH) protocol stack, which combines IPv6 features with the reliability of IEEE 802.15.4, in particular its TSCH mode. For a detailed investigation of its performance and scalability, 6TiSCH was implemented and further improved using OMNeT++ with INET framework. Following the modular architecture of the latter, our 6TiSCH implementation consists of multiple replaceable blocks, together responsible for routing, scheduling and MAC operation. The de-facto standardized Minimal Scheduling Function (MSF) is implemented as a default solution for dynamic schedule management and used as a baseline for the development of a cross-layer scheduling function, which focuses on meeting diverse QoS requirements in multihop convergecast WSNs.

## References

- [1] ComNets. *Wireless Avionics Intra-Communications (WAIC) simulation model for OMNeT++, utilizing IEEE 802.15.4 Time Slotted Channel Hopping (TSCH)*. 2022. URL: <https://github.com/ComNetsHH/omnetpp-tsch/tree/6tisch>.
- [2] Yevhenii Shudrenko et al. “A Novel Approach to Enhance the End-to-End Quality of Service for Avionic Wireless Sensor Networks”. In: *ACM Transactions on Internet Technology (TOIT)* (2022).