

Towards wi-fi-based Time Sensitive Networking using OMNeT++/NeSTiNg simulation models

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**Abstract**

The Internet of Things (IoT) has varied applications in industry, where its networks are uniquely characterised by a stringent requirement for reliability. Many technologies, such as PROFINET and EtherCAT, arose to fill this need for reliable networks. Developed to run on standard Ethernet components, most of these are proprietary in nature. A recent emergence is the Time Sensitive Networking (TSN) standard, a collection of Ethernet standards by the IEEE TSN Task Group. TSN allows communication between standard-conformant devices, regardless of the vendor. The resulting technology produces deterministic networks with low jitter and latency. However (and as factoryfloor layouts become more dynamic), wireless infrastructure is favourable compared to wired Ethernet in situations that require increased mobility and range. Carrying over the determinism and reliability of TSN from wired infrastructure to these wireless networks would be advantageous as many of these wireless networks struggle to offer the same determinism as is present in TSN. There isn't as yet any TSN-compliant wireless implementation. This paper seeks to explore how TSN could be carried out over the 802.11ac Wi-Fi standard. The paper also looks at the factors that stand in the way of wireless TSN and develops a TSN emulation model that tries to operate in Wi-Fi. The resultant model's performance was studied in iterative experiments to aid in analysing wireless TSN. The work has revealed that TSN traffic can be supported over an interferencefree Wi-Fi channel, although the channel use efficiency of such a network is limited to a few percent. Thus, Wi-Fi may require further enhancements to its mode of operation to make it better suited for time-sensitive applications in industry.