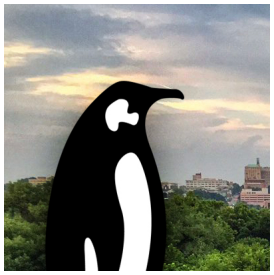

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TSCH@Zephyr: IEEE 802.15.4 SubG IIoT in the Making

Wednesday, 15 November 2023 15:10 (35 minutes)

Zephyr's native IEEE 802.15.4 L2 is a hidden treasure: It supports a much larger variety of SoCs, vendors and PHYs than its more popular OpenThread counterpart. Native L2 not only runs the common 2.4G O-QPSK modulation but also has rich SubG support on all regional bands, from legacy BPSK all the way to SUN O-QPSK, FSK and OFDM and even initial support for HRP UWB. The latter is increasingly hot as mobile manufacturers converge around 802.15.4z/FiRa for precision UWB indoor localization. When I realized this huge potential I immediately wanted to leverage it for industrial use cases. That's when the TSCH@Zephyr project was born in late 2022.

TSCH is IETF/IEEE's open contender to the proprietary WirelessHART standard (and to some extent to ISA 100.11a): a reliable and available wireless (RAW), low-power, deterministic real time protocol, relevant to wireless industrial automation, TSN and distributed battery-driven IIoT sensor networks.

This BoF presents the current state of affairs wrt TSCH, SubG and distributed clocks @ Zephyr. We'll run through solved and unsolved challenges on the way to support a precision TDMA protocol on Zephyr's TI CC13/26xx driver, look at related driver API changes and at some of the underpinning conceptual work re precision distributed clocks. The latter are a cornerstone of an embedded RTOS that wants to provide re-usable primitives for all kinds of precision timing applications like ranging, PTP, 15.4 superframes/DSME/LE, TSN/DetNet, industrial ethernet/SERCOS/Profibus/… or the upcoming 5G/6G RAW extensions.

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