



New Standards Initiatives on Ultrawideband

The IEEE 802.15 Working Group on Wireless Specialty Networks is a working group of the IEEE 802 LAN/MAN Standards Committee of the IEEE Computer Society. It is chartered to develop interoperability standards addressing wireless networking for emerging Internet of Things applications. Among the many standards the working group has been developing, IEEE 802.15.4, IEEE Standard for Low-Rate Wireless Networks, is one of the popular ones whose technology is used for many different higher-layer standards, such as ZigBee, Wireless Highway Addressable Remote Transducer (HART), and 6LoWPAN. IEEE 802.15.4 defines the physical layer (PHY) and medium access control (MAC) sublayer specifications for low-data-rate, low-power, and low-complexity wireless connectivity with fixed, portable, and moving devices with no or very limited battery consumption requirements [1]. In addition, it defines operating modes that support precision ranging capability, which can be accurate to 1 m.

IEEE 802.15.4z-2020 is an amendment to IEEE 802.15.4. It enhances the ultrawideband (UWB) PHYs with additional preamble and coding options and brings significant improvements to increase the integrity and accuracy of ranging measurements [2]. It also provides unique capabilities

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IN ADDITION, THERE ARE NEW APPLICATIONS THAT CALL FOR ADDITIONAL FLEXIBILITY AND SCALABILITY, VARYING THE SIZE, SHAPE, AND NUMBER OF DEVICES IN A NETWORK FROM A FEW DEVICES WITHIN LESS THAN 1 M TO HUNDREDS OR MORE DEVICES WITH DISTANCES OF UP TO 100 M.

of precise ranging, localization, and sensing by defining MAC support of time-of-flight ranging procedures and the exchange of ranging-related information among participating ranging devices. This results in support for many different emerging applications, such as automatic remote control with enhanced ranging accuracy, and consumer products that require highly secure and high-precision location awareness services.

While IEEE 802.15.4z-2020 significantly broadens the application of UWB based on its unique capabilities of precision ranging and localization, a growing number of applications target the use of the technology beyond ranging. This is particularly true for the very-wide-bandwidth feature available uniquely to UWB for supporting low-latency data communications that would result in less interference among different devices and increased integrity due to a smaller on-air transmission time window for any attack. In addition, there are new applications that call for additional flexibility and scalability, varying the size, shape, and number of devices in a network from a few devices within less than

1 m to hundreds or more devices with distances of up to 100 m.

IEEE 802.15 Study Group NG-UWB Enhanced UWB Features as well as IEEE 802.15 SG4ab has recently been established to build on IEEE 802.15.4z to address the aforementioned needs by expanding available data rates to both lower rates with greater distances and higher rates at short distances, considering flexible network scenarios and topologies, and expanding performance tradeoff options among range, data rate, device density, and energy consumption [3]. It is expected that the task group that results from this study group will be formed in the fourth quarter of 2021 to start the project development.

References

- [1] *IEEE Standard for Low-Rate Wireless Networks*, IEEE 802.15.4-2020. [Online]. Available: https://standards.ieee.org/standard/802_15_4-2020.html
- [2] *IEEE Standard for Low-Rate Wireless Networks—Amendment 1: Enhanced Ultra Wideband (UWB) Physical Layers (PHYs) and Associated Ranging Techniques*, IEEE 802.15.4z-2020. [Online]. Available: https://standards.ieee.org/standard/802_15_4z-2020.html
- [3] *Wireless Personal Area Networks*, IEEE P802.15, 2021. [Online]. Available: <https://mentor.ieee.org/802.15/dcn/21/15-21-0047-05-nuwb-draft-csd-ng-uwbd.docx>

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