Evaluating WiFi HaLow 802.11ah as new IoT standard

Jurre De Weerdt, Joris Dieltiens, Jasper Henne, Patrick Pelgrims, Nick Steen
Thomas More, Sint-Katelijne-Waver
Department Research & Technology

Abstract

Wireless communication is being implemented in devices that are getting smaller by the day. Some need an internet connection to perform their primary task, for others this is less of a concern and rely primarily on local communication. The Internet of Things is transforming how devices interact with each other, e.g. a household setting using automations to increase comfort in daily routines. Most wireless standards rely on a separate gateway to allow interaction of these devices. This is where WiFi HaLow tries to facilitate deployment and ease of use, since a direct connection to the cloud becomes a standard feature of all equipped devices.

The WiFi HaLow 802.11ah standard is still in development, several modules are already on the market but inter-vendor communication is a work in progress. We have been building demo setups and testing out the technology to evaluate the possibilities and market-readiness for hardware and product designers. The main features of this arising standard are classic IP-based communication and thus direct cloud connectivity as stated, low power consumption and security, using WPA3 as security protocol.

By building our hardware platform around a NewRacom NRC7292 based SoM, we have been able to perform power measurements and distance tests with promising results. Power consumption is clearly a work in progress, but the promised long-distance communication can be reached without major issues, with initial tests indicating a little less than 1km for single device communication using a default transmit power of 17dBm, standard omnidirectional antennas and line-of-sight. Throughput tests show that, depending on the bandwidth used, the 802.11ah standard is perfectly capable of speeds of several Mbps. This capability needs more verification to further test inter-vendor communication and check the performance and long-term stability of these connections, as well as the network stability with an increasing number of clients connected to one access point.

All in all, WiFi HaLow is a promising technology with several key features missing in other wireless standards to date. The long range and throughput capability, on top of the extra security offered by WPA3 allows end devices to communicate with the cloud directly and securely, as commonly used WiFi standards are offering today, but with an extra power saving feature as necessary addition for battery powered devices.