World Academy of Science, Engineering and Technology
International Journal of Computer and Systems Engineering
Vol:17, No:08, 2023

Energy-Efficient Internet of Things Communications: A Comparative Study of Long-Term Evolution for Machines and Narrowband Internet of Things Technologies

Authors : Nassim Labdaoui, Fabienne Nouvel, Stéphane Dutertre

Abstract : The Internet of Things (IoT) is emerging as a crucial communication technology for the future. Many solutions have been proposed, and among them, licensed operators have put forward LTE-M and NB-IoT. However, implementing these technologies requires a good understanding of the device energy requirements, which can vary depending on the coverage conditions. In this paper, we investigate the power consumption of LTE-M and NB-IoT devices using Ublox SARA-R422S modules based on relevant standards from two French operators. The measurements were conducted under different coverage conditions, and we also present an empirical consumption model based on the different states of the radio modem as per the RRC protocol specifications. Our findings indicate that these technologies can achieve a 5 years operational battery life under certain conditions. Moreover, we conclude that the size of transmitted data does not have a significant impact on the total power consumption of the device under favorable coverage conditions. However, it can quickly influence the battery life of the device under harsh coverage conditions. Overall, this paper offers insights into the power consumption of LTE-M and NBIoT devices and provides useful information for those considering the use of these technologies.

Keywords : internet of things, LTE-M, NB-IoT, MQTT, cellular IoT, power consumption
Conference Title : ICDAIT 2023 : International Conference on Data Analytics in Internet of Things
Conference Location : Paris, France
Conference Dates : August 24-25, 2023