Overcoming Limitations of LoRa Physical Layer in Image Transmission

Akram H. Jebril [1,2], **Aduwati Sali** [1], Alyani Ismail [1] and Mohd Fadlee A. Rasid [1]

[1]Wireless & Photonic Networks Research Center of Excellence (WiPNet), Department of Computer and Communication System Engineering, Faculty of Engineering, UPM, Serdang 43400, Selangor, Malaysia
[2]Department of Communication Engineering, Technical College of Civil Aviation & Meteorology, Esbea, Tripoli 84116, Libya

Corresponding E-mail: aduwati@upm.edu.my

Abstract

As a possible implementation of a low-power wide-area network (LPWAN), Long Range (LoRa) technology is considered to be the future wireless communication standard for the Internet of Things (IoT) as it offers competitive features, such as a long communication range, low cost, and reduced power consumption, which make it an optimum alternative to the current wireless sensor networks and conventional cellular technologies. However, the limited bandwidth available for physical layer modulation in LoRa makes it unsuitable for high bit rate data transfer from devices like image sensors. In this paper, we propose a new method for mangrove forest monitoring in Malaysia, wherein we transfer image sensor data over the LoRa physical layer (PHY) in a node-to-node network model. In implementing this method, we produce a novel scheme for overcoming the bandwidth limitation of LoRa. With this scheme the images, which requires high data rate to transfer, collected by the sensor are encrypted as hexadecimal data and then split into packets for transfer via the LoRa physical layer (PHY). To assess the quality of images transferred using this scheme, we measured the packet loss rate, peak signal-to-noise ratio (*PSNR*), and structural similarity (SSIM) index of each image. These measurements verify the proposed scheme for image transmission, and support the industrial and academic trend which promotes LoRa as the future solution for IoT infrastructure.