A Method for Controlling Scan Rate Based on Estimated Retransmission Rate of Background Traffic

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Abstract—For efficient network scan to narrow-band wireless networks, this paper proposes a method for controlling a scan rate based on the estimated retransmission rate of background traffic from a scan response delay obtained at a scan rate. This proposed method is aiming to select the highest scan rate that can keep the estimated retransmission rate of the background traffic below a predetermined retransmission threshold. First, through computer simulations considering a Wi-SUN sensor network with two different network situations and multiple scan rates, we derive a regression function between the mean of scan response delay and COR (Channel Occupation Rate) of the background traffic, and that between the COR and the retransmission rate of the background traffic, for each the network situation and the scan rate using the least-squares method. Then, we propose a method for estimating the retransmission rate of the background traffic at a different scan rate using three kinds of estimators; network situation estimator, COR estimator, and retransmission rate estimator. After that, we propose a control scheme of scan rate based on the estimated retransmission rate of the background traffic. We evaluate the estimation accuracy of the retransmission rate of the background traffic using the proposed estimation method. We confirm that the proposed estimation method can estimate the retransmission rate of the target network with the average error lower than 0.058 regardless of the situation of the target network and the scan rate. Moreover, we evaluate the performance of scan rate control using proposed method. We confirm that proposed method can scan faster by 0.18–pps and decrease the retransmission rate of the background traffic by 0.015 compared with a fixed scan rate.

Keyword—Network scan, Wi-SUN, Scan rate control, QoS estimation, Network simulation

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