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LTE Delay Assessment for Real-Time Management of Future Smart Grids

Ljupco Jorguseski, Haibin Zhang, Sylvie Dijkstra-Soudarissanane, Michal Golinski

Abstract. This study investigates the feasibility of using Long Term Evolution (LTE) cellular networks for the real-time smart grid state estimation. The smart grid state estimation requires measurement reports from different nodes installed in the smart grid. Therefore, the uplink LTE radio delay performance is selected as key performance indicator for the collection of the desired measurements. The analysis is conducted for two types of measurement nodes, namely Smart Meters (SMs) and Wide Area Monitoring and Supervision (WAMS) nodes, installed in the (future) smart grids. The SM and WAMS measurements are fundamental input for the real-time state estimation of the smart grid. The LTE delay evaluation approach is performed via 'snap-shot' system level simulations of an LTE system where the physical resource allocation, modulation and coding scheme selection and retransmissions are modelled. The impact on the LTE delay is analyzed for two different LTE resource allocation approaches, namely, simple random scheduler with fixed LTE physical resource allocation per user, and time-based LTE scheduler with flexible LTE physical resource allocation per user. The results show that time- delay prioritized scheduling in combination with flexible PRB assignment greatly reduces the maximum delay when compared to simple random scheduling and fixed PRB assignment. This type of scheduling approach and flexible PRB allocation is recommended for supporting time critical smart grid applications within LTE.1

Haibin Zhang
TNO
Anna van Buerenplein 1
2595 DA, Den Haag
The Netherlands
Phone: + 31-(0)88 866 73 73
Fax:
Email: haibin.zhang@tno.nl