

Comparisons process-to-bay level peer-to-peer network delay in IEC 61850 substation communication systems

ABSTRACT

This paper presents the application of IEC 61850 protocol in electrical power engineering industry for data communication systems between substations. This IEC 61850 protocol presents new challenges for real-time communication performance between Intelligent Electronic Devices (IEDs) within substation because of the Generic Object Oriented Substation Event (GOOSE) messages. The analyses of substation Ethernet and WLAN (wireless LAN) communication delay, its impact factors, various methods and different network topologies which can improve the real-time performance are discussed. For basic analysis of data flow within a substation, the Optimized Network Engineering Tool (OPNET) software is used. The process-to-bay level network simulation model is performed by using the OPNET software. The Ethernet delay and WLAN peer-to-peer performance of the process-to-bay level network simulation results are analyzed which is based on AP (access point), switched, shared Ethernet network or peer-to-peer network.

Keyword: IEC 61850; Substation automation system (SAS); Real-time peer-to-peer network delay; Power system communications; OPNET Modeler; Access point (AP)