论文

智能变电站中采样值传输延时的处理

黄灿1，**肖驰夫**2，**方毅**3，**郑建勇**1

1．东南大学 电气工程学院，江苏省 南京市 210096；2．温州电力局，浙江省 温州市 325000；3．扬州电力局，江苏省 扬州市 225009

摘要：

将模拟量采样值(sampled analogue value，SAV)报文准确、实时地传输至智能电子设备是智能变电站过程总线数据通信的关键内容。为此在建立SAV报文传输时序模型的基础上，提出一种采用合并单元相位校准补偿传输延时以提高模拟采样值时标的准确性，并通过测算以太网的最大传输延时验证SAV报文的实时性的方法。利用公式推导和算例计算对方法进行了理论分析，并通过OPNET modeler仿真验证了理论分析的正确性。结果表明模拟采样值延时能够为降低采样值相位误差、同步多路采样值时序、测量报文传输实时性、实现过程层网络配置提供重要依据。

关键词：

A Method to Deal With Packet Transfer Delay of Sampled Value in Smart Substation

HUANG Can1, XIAO Chifu2, FANG Yi3, ZHENG Jianyong1

1. School of Electrical Engineering, Southeast University, Nanjing 210096, Jiangsu Province, China; 2. Wenzhou Electric Power Bureau, Wenzhou 325000, Zhejiang Province, China; 3. Yangzhou Electric Power Bureau, Yangzhou 225009, Jiangsu Province, China

Abstract:

It is the key task for digital communication of process bus in smart substations to accurately propagate the message of sampled analogue value (SAV) to intelligent electronic device (IED) in real-time mode. For this purpose, on the basis of building a time series model to propagate SAV message a method, which improves the time scale of SAV by calibrating the phase delay in merging units (MU) and validates the real-time performance of SAV message by calculating the maximum packet transfer delay within Ethernet, is proposed. Theoretical analysis on the proposed method is performed by formula derivation and example calculation, and the correctness of theoretical analysis is verified by simulation based on OPNET modeler. Simulation results show that the packet transfer delay of SAV can provide important foundation for reduction of phase error of SAV, synchronization of time sequences of multi-channel SAVs, measurement of real-time performance of message communication and the implementation of network configuration for process bus.

Keywords:

通讯作者：黄灿

作者简介：

作者Email: wongcan@sina.com

参考文献：

[1] Q/GDW383 智能变电站技术导则[S]．北京：国家电网公司，2009． [2] Q/GDW393 110(66)?kV~220? kV 智能变电站设计规范[S]．北京：国家电网公司，2010． [3] IEC 61850 Communication networks and systems in substations[S]．2003． [4] 王松，陆承宇．数字化变电站继电保护的GOOSE网络方案[J]．电力系统自动化，2009，33(3)：51-55． Wang Song，Lu Chengyu．A GOOSE network scheme for relay protection in digitized substations[J]．Automation of Electric Power Systems，2009，33(3)：51-55(in Chinese)． [5] Djekic Z，Portillo L，Kezunovic M．Compatibility and interoperability evaluation of all-

扩展功能

本文信息

Supporting info

PDF(631KB)

[HTML全文]

参考文献[PDF]

参考文献

服务与反馈

把本文推荐给朋友

加入我的书架

加入引用管理器

引用本文

Email Alert

文章反馈

浏览反馈信息

本文关键词相关文章

本文作者相关文章

PubMed

digital protection systems based on IEC 61850-9-2 communication standard[C]//IEEE PES General Meeting．Pittsburgh，USA：IEEE，2008：1-5． [6] IEC 60044-8 Instrument transformers，part 8：electronic current transformers[S]．2002． [7] 阳靖，周有庆，刘琨．电子式互感器相位补偿方法研究[J]．电力自动化设备，2007，27(3)：45-48． Yang Jing，Zhou Youqing，Liu Kun. Research on phase compensation of electronic transformer[J]．Electric Power Automation Equipment，2007，27(3)：45-48 (in Chinese)． [8] 徐广辉，李友军，王文龙，等．数字化变电站IED采样数据同步插值的设计[J]．电力系统自动化，2009，33(4)：49-52． Xu Guanghui，Li Youjun，Wang Wenlong，et al. Design of a synchronization and interpolation algorithm of sampled values for digital substation IED[J]．Automation of Electric Power Systems，2009，33(4)：49-52(in Chinese)． [9] 赵应兵，周水斌，马朝阳．基于IEC 61850-9-2的电子式互感器合并单元的研制[J]．电力系统保护与控制，2010，38(6)：105-108． Zhao Yingbing，Zhou Shuibin，Ma Chaoyang. Research and manufacture of merging unit based on IEC 61850-9-2[J]．Power System Protection and Control，2010，38(6)：105-108(in Chinese)． [10] 孙军平，盛万兴，王孙安．新一代变电站自动化网络通信系统研究[J]．中国电机工程学报，2003，23(3)：16-19. Sun Junping，Sheng Wanxing，Wang Sun'an. Study on the new substation automation network communication system[J]．Proceedings of the CSEE，2003，23(3)：16-19(in Chinese)． [11] 梁永生，张基宏，张乃通．IEEE标准容限内以太网转发时延的测试与分析[J]．电子学报，2008，36(1)：46-50． Liang Yongsheng，Zhang Jihong，Zhang Naitong. Measurement and analysis of forwarding delay in Ethernet architecture within tolerances of the IEEE specifications[J]．Acta Electronica Sinic，2008，36(1)：46-50 (in Chinese)． [12] 窦晓波，胡敏强，吴在军，等．数字化变电站通信网络性能仿真分析[J]．电网技术，2008，32(17)：98-103． Dou Xiaobo，Hu Minqiang，Wu Zaijun，et al. Simulation analysis on performance of communication networks in digital substations[J]．Power System Technology，2008，32(17)：98-103(in Chinese)． [13] 董楠，朱林，段献忠．基于OPNET的变电站过程层网络的仿真研究[J]．继电器，2006，34(21)：41-45． Dong Nan，Zhu Lin，Duan Xianzhong. Study on process-level network in substation using OPENT simulation[J]．Relay，2006，34(21)：41-45(in Chinese)． [14] 王文博，张金文．OPNET Modeler与网络仿真[M]．北京：人民邮电出版社，2003：12-23． [15] 郑海峰，陈国泰，林金发，等．IEEE 802.11n自适应帧聚合机制研究[J]．微电子学与计算机，2010，27(4)：216-220. Zheng Haifeng，Chen Guotai，Lin Jinfa，et al. Research on adaptive frame aggregation mechanism for IEEE 802.11n[J]．Microelectronics & Computer，2010，27(4)：216-220(in Chinese)

本刊中的类似文章