

Simulation Studies of Resilient Communication Network Architecture for Monitoring and Control Wind Power Farms

Shahid Hussain*, Young-Chon Kim**

*ETRI (Electronics and Telecommunications Research Institute), Korea

*Department of Computer Engineering, Chonbuk National University, Jeonju 561-756, South Korea

** Smart Grid Research Center, Chonbuk National University, Jeonju 561-756, South Korea

*shahiduop@jbnu.ac.kr, **Corresponding author: yckim@jbnu.ac.kr

Abstract— Real time monitoring and control of wind power farms (WPFs) require a high reliable communication network infrastructure. The WPFs monitoring and control can be guaranteed through the communication network by using redundant resources and quality of service (QoS) for different applications. In this paper, we study and simulate resilient network architecture for monitoring and control WPFs. The communication network architecture consists of three different levels: data generation level, data aggregation level and control center level. Each level is based on its function, physical location, type of communication channel and redundant resources. In accordance to IEC 61400-25 standard, the wind turbine monitoring traffic is classified into critical and non-critical data according to different QoS requirements. Due to lower cost, nonproprietary standard and guaranteed real-time services, the Ethernet technologies are currently used in various industrial applications. Several network failure scenarios based on Ethernet technology are used to simulate the network architecture through OPNET. The performance of the network architecture is evaluated in view of the amount of received data, end-to-end delay and data loss at control center. The simulation results show that the communication network architecture can guarantee the transmission of WPFs critical data.

Keyword— *Communication Networks; IEC61400-25; Monitor and Control; Reliability and Resiliency; Wind Power Farms*



Shahid Hussain: He received his B.Sc in mathematics 2002 and M.Sc in computer science 2005 from University of Peshawar, Peshawar Pakistan. He worked as Network Administrator at Pakistan Oilseed Development Board (PODB), Agricultural Research Institute (ARI) Tarnab Farm Peshawar, Pakistan from July, 2005 to Oct. 2008. Then he joined CSD zonal office Peshawar Pakistan as Network Engineer. He also worked as visiting lecturer at department of computer science, university of Peshawar, Peshawar Pakistan. He is currently working toward his MS in Computer Engineering at the Chonbuk National University, South Korea. His research interests include wireless sensor networks, and communication networks for next generation wind power farms.



Young-Chon Kim: He received the B.S., M.S., and Ph.D. degrees from Korea University, Seoul, South Korea, in 1980, 1982, and 1987, respectively. He joined the Department of Computer Engineering at Chonbuk National University, Jeonju, South Korea, in 1986 and is now a Professor in the School of Information Technology at Chonbuk National University. From 1989 to 1990, he was a post-doctorate fellow at the University of California, Irvine. Also, from 1998 to 2000, he worked as a visiting researcher at the Network Research laboratory at the University of California, Davis. He was awarded Best Professor from the College of Engineering, Chonbuk National University, in 2002. He was also awarded the Motorola Academic Excellence award in 2003. His research interests include high-speed optical communication networks, next generation IP networks, and broadband wireless communication networks