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WIDE AREA CONTROL OF POWER SYSTEM THROUGH DELAYED NETWORK COMMUNICATION

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ABSTRACT:
The growing trend towards restructuring the power industry and the ever increasing demand for power ex- change calls for employing wide area measurement systems (WAMS) for almost real-time measurements that could be used to maintain or improve the stability of the system. Conventional SCADA (supervisory control and data acquisition) / EMS (energy management systems) stability control systems do not provide efficient solutions in the case of cascaded outages as these systems are designed to act locally, based on set operational parameters. These systems do not provide for dynamic coverage of a wide area power network. WAMS, on the other hand, provide for a dynamic coverage of the network and are able to handle cascaded outages through coordinated and optimized stabilizing actions.
Keywords*: mmc storage media, data security, information storage, system programming.*

1. INTRODUCTION

Traditional point-to-point communication methods are increasingly unable to meet the requirements of modern power systems. In the late 1990s, the emergence of satellite time service systems and phasor measurement units (PMUs) together with the development of electric power communication networks laid the foundation for wide-area measurement systems (WAMSs). PMUs sample AC waveforms with a sampling rate of several thousand hertz. By the discrete Fourier transform, PMUs calculate in real time the phases and amplitudes of the AC wave-forms, and then the data packets including the phases and amplitudes are sent out through LAN/WAN at a speed from dozens up to 100 frames/s. Such a closed-loop system is referred to as a networked control system (NCS), whose control loops are closed through real-time networks.

2. BACKGROUND OVERVIEW

We mainly focus on addressing the interference problem that degrades the system performance of the cyber-physical WBANs system. WBANs must function well even in a dense network environment, such as in a shopping center, a school or a hospital. However, one WBAN may interference with another if they are close to each other. The excessive interference called inter-WBANs interference will severely degrade the system's performance including depleting the system's power quickly. Especially, in many medical applications, the collected health data are critical and must be delivered to the data center reliably. Thus, the inter-WBANs interference must be dealt with in an appropriate manner. In a dense WBAN environment, each user carrying WBAN is more likely to be close to others, and they will interfere with each other due to using same frequency bands.

3. The Proposed System

A. Block Diagram

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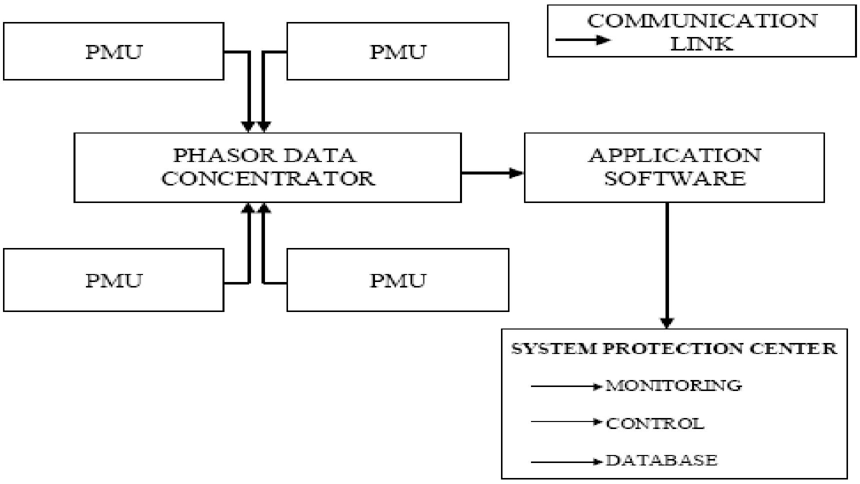

B. Explanations of Blocks

- **PMU:**

The PMUs measure voltage, current, and frequency phasors using the discrete Fourier transform (DFT) and can detect transients or surges within milliseconds of their occurrence. PMUs use the IEEE 1344 data format for communication with the central monitoring station.

- **System protection center**

In WAMS, PMUs are strategically placed throughout a wide coverage area. The PMUs form part of local de- vices called system protection terminals (SPT). SPTs are able to run complete or parts of distributed control algorithms and can communicate directly with other SPTs, substation equipment and system protection centers (SPC), which are responsible for monitoring and control of the power grid.

- **Application Software**

WAMS provide for improved stability and reliability based on the operational features of the PMU. With nor- mal dedicated communication circuits operating at 4800 or 9600 baud, a continuous data stream of one phasor measurement every 2-5 cycles (33.3 - 83.33 msec) can be sustained.

C. Features

1. **State estimation:**

State estimation is the most important part of monitoring a power system. PMUs can relay information on a continuous basis to the data acquisition centers

1. **Instability prediction:**

The system covers the more area. Hence cleans area efficiently.

2. **Adaptive relaying:**

The problem with this technique is that the actual conditions may vary as compared to the simulations that were performed for stability testing due to power swings.

D. Implementation

PMUs or other measurement devices represented by a sampling block are time-driven, while the discrete controller and the zero-order hold (ZOH) are event-driven.

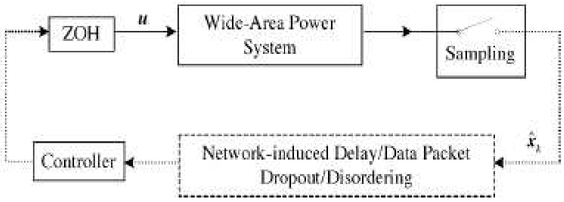

Fig.1: NCS model for WAMS-based power system control

If PMUs send out the data packets at the speed of 100 frames/s, then we have 10 ms.

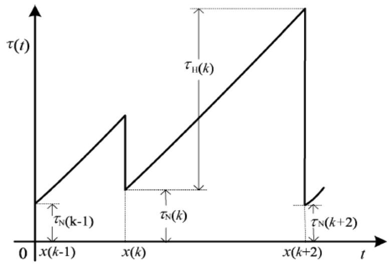

Fig.2: Time delay in real networks

If data packet x(K+1) is lost, then the packet xK, will be held until the next packet x(K+2) arrives; if packet disordering takes place, for example, the new packet x(K+2) reaches the destination before the old one x(k+1), then x(K+2) will be used instead of x(K+1). The process of xk being held is equivalent to increasing T (t) with, t resulting in a time-varying delay, the interval between and denotes two successive Updating periods. Is the period of being held, and are network-induced delays experienced by the data packet and respectively.

E. Seminar Development Methodology or Steps

The following will be development steps so as to achieve the working Prototype Model of the above proposed system…

1. Introduction- In this section all the basic introduction about the system is given.
2. Literature survey- It will give the complete details about the history of the proposed seminar i.e. overview of the system till today is being given.
3. System design- The different layers are explained which have important contribution for the successful execution of the system.
4. Conclusion- Finally, we conclude the report with the suggestions for possible future research and extensions to the present work. Also this chapter deals with some case studies and related results evaluations.

4. Conclusion

The control of WAMS-based closed-loop power systems. A detailed NCS model is developed to describe the network constraints in WAMS communication. Based on this model, controllers are designed to be robust against network constraints. To be specific, the following conclusions can be drawn from our research work: in WAMS-based closed-loop power systems, the delays in feedback signals induced by network effects and PMU packet periods are typically time-varying; such delays have significant (negative) impact on the system performance, and should be considered in feedback control design; the controllers designed by traditional methods ignoring delays are sensitive to network effects such as network-induced time delays, data packet dropout, and disordering, while controllers designed based on the NCS model proposed in this paper are robust against these effects, and are suitable for WAMS based control.

5. Enhancements

A. Advantages:

a. Dynamic wide area measurement
b. Higher measurement accuracy

c. Fast system wide measurement and data exchange Algorithms for fast coordinated control and actions

B. Applications:
   a. Wide area protection
   b. Dynamic transaction limits monitoring
   c. Dynamics performance monitoring.

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