

Overview of IED Hardware and Software in Power Systems

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Summary

The recording discusses the architecture and functionality of Intelligent Electronic Devices (IEDs) used in power systems. The speaker explains the use of multiplexers and A to D converters for data acquisition, emphasizing the importance of sampling and holding signals for accurate conversion. The discussion covers the role of microprocessors and DSP chips in implementing filters and algorithms, highlighting the need for multiple processors for different functions like computation, communication, and operator interface. The speaker also addresses cybersecurity concerns, noting the difference between IT and OT security, and mentions upcoming standards and courses on the topic. Self-testing of IEDs is discussed as a crucial feature for ensuring reliability, with various tests for memory, power supply, and A to D conversion accuracy. The speaker outlines the general-purpose hardware approach, where modular components allow for flexible IED configurations. The concept of synchro phasors is introduced, emphasizing the need for synchronized sampling across the power grid using GPS to improve situational awareness and prevent blackouts. The session concludes with instructions for students to compare their assignment solutions with provided answers and submit feedback via email.

Action Points

- Students to compare their assignment solutions with the provided solutions and send feedback via email.
- Post the solution for assignment number two.
- Discuss synchro phasors in the next lecture on Wednesday.
- Post today's lecture materials for students.

Key Topics

Introduction to Multiplexers and A to D Converters

The speaker introduces the concept of using multiplexers and A to D converters in IEDs for data acquisition. The role of sample and hold circuits is explained, and the importance of synchronized sampling for accurate data conversion is emphasized. The discussion highlights the trade-off between cost and conversion time when using multiplexers.

Microprocessors and DSP Chips in IEDs

The speaker discusses the use of microprocessors and DSP chips in IEDs, focusing on their role in implementing filters and algorithms. The need for multiple processors to handle different functions such as computation, communication, and operator interface is highlighted. The discussion also touches on the efficiency of DSP chips in performing multiply-accumulate operations.

Cybersecurity in IEDs

The speaker addresses the growing importance of cybersecurity in IEDs, distinguishing between IT and OT security. The need for dedicated processors to handle cybersecurity functions is mentioned, along with upcoming standards and courses on the topic. The speaker plans to provide a brief overview of cybersecurity in future sessions.

Self-Testing and Reliability of IEDs

The importance of self-testing in IEDs is discussed, with various tests for memory, power supply, and A to D conversion accuracy outlined. The speaker explains how self-testing increases the reliability of IEDs and reduces the need for manual testing by technicians. The concept of self-monitoring is introduced as a way to ensure IEDs are operational.

General-Purpose Hardware for IEDs

The speaker introduces the concept of general-purpose hardware for IEDs, where modular components allow for flexible configurations. The discussion covers the advantages of using standardized hardware blocks for different IED applications, reducing costs and increasing efficiency. The speaker mentions the adoption of this approach by various manufacturers.

Introduction to Synchro Phasors

The concept of synchro phasors is introduced as a means to improve situational awareness in power systems. The speaker explains the need for synchronized sampling across the grid using GPS to accurately measure voltage and phase angles. The discussion highlights the potential of synchro phasors to prevent blackouts by providing operators with real-time system data.

Assignment Instructions and Course Logistics

The speaker provides instructions for students to compare their assignment solutions with provided answers and submit feedback via email. The importance of self-assessment and understanding the material is emphasized. The speaker also mentions the posting of assignment solutions and upcoming topics in the course, including synchro phasors and cybersecurity.