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Stochastic Edge Based Anomaly Detection for Supervisory Control and Data Acquisitions Systems: Considering the Zambian Power Grid

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Abstract : In Zambia recent initiatives by various power operators like ZESCO, CEC, and consumers like the mines to upgrade power systems into smart grids target an even tighter integration with information technologies to enable the integration of renewable energy sources, local and bulk generation, and demand response. Thus, for the reliable operation of smart grids, its information infrastructure must be secure and reliable in the face of both failures and cyberattacks. Due to the nature of the systems, ICS/SCADA cybersecurity and governance face additional challenges compared to the corporate networks, and critical systems may be left exposed. There exist control frameworks internationally such as the NIST framework, however, there are generic and do not meet the domain-specific needs of the SCADA systems. Zambia is also lagging in cybersecurity awareness and adoption, therefore there is a concern about securing ICS controlling key infrastructure critical to the Zambian economy as there are few known facts about the true posture. In this paper, we introduce a stochastic Edged-based Anomaly Detection for SCADA systems (SEADS) framework for threat modeling and risk assessment. SEADS enables the calculation of steady-steady probabilities that are further applied to establish metrics like system availability, maintainability, and reliability.

Keywords : anomaly, availability, detection, edge, maintainability, reliability, stochastic
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