

Shipboard power systems (SPS) are increasing their reliance on communication systems. Communication enables system-level controls to coordinate the usage of the SPS and provide significant improvements (e.g., size, weight, cost). Communication is commonly divided into layers (application, transport, network, data link, physical). While the lower layers have not had significant changes, the application layer is constantly in flux. New protocols are often introduced, providing new capabilities to facilitate communication.

Real-time simulation (RTS) is a tool that has been effectively utilized to study SPSs. Many models and techniques exist. Similarly, the simulation of computer networks exists. However, leveraging these Real-time simulation tools/facilities for evaluating protocols has received little attention. Currently, a co-simulation environment of the SPS electrical system and its computer network provides a way to evaluate the operation of SPS models and assess their capabilities. Protocols are typically defined in the communication system. Yet not much is known about the potential impact of these protocols.

This work proposes a method to evaluate application layer communication protocols in the communication system of system-level SPS controls using RTS. Using this evaluation framework two protocols were compared, Modbus TCP and Data Distribution Service (DDS), with network utilization and scalability as metrics to characterize the impact on network performance.