Big Control in the Industrial Internet

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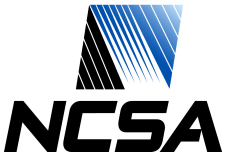

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The Industrial Internet (II) connects equipment to advanced analytics through system platforms that support business process and value creation.

General Objective

One major category of II applications is wide-area control, or Big Control. Big Control applications monitor, predict, and decide how fleets of distributed assets are orchestrated to deliver reliable, resilient, and optimized performance. However, the needs and risks associated with of Big Control applications are broader than in traditional commercial applications.

Big Control applications need access to computational resources at varying scales and predictable network performance. Specifically, there is a pressing need to drive down costs and increase speed and capability by interconnecting data in three locations: edge, cloud, and high performance computing (HPC). Bridging these resources is key to allowing for optimal use of the best characteristics of each: 1) edge is fast and readily available, 2) cloud has scale and cost advantages, and 3) HPC addresses scale, complexity, and speed.

The II will usher in Big Control applications within and across industries that require high-levels of assurance. Assurance related to time, security, composablity and trust are required in each of the building blocks of Big Control. Additionally, continual operation (even under degraded conditions) will be hallmarks of Big Control applications. A significant requirement for achieving system cyber security will be resilience to cyber attacks, requiring the detection, isolation and characterization of attacks, as well as control capabilities to restore corrupted software controlled system functions. Attaining such capabilities will require sufficient system monitoring to enable derivation of responses to overcome disruptive cyber attacks.

Domain Specific Testbed - Energy

An energy testbed covers a variety of prime mover technologies that may be networked together via a model transmission and distribution (T&D) system. An energy delivery system may be connected to physical locations with accompanying data streams where a higher degree of model fidelity is needed and connected by the II. The testbed could be used for virtual primer mover simulations (e.g. gas turbine (GT) simple cycle, combined cycle), to model transmission and delivery networks (e.g. point-to-point, network, smartgrid), and hardware-in-the–loop power equipment (e,g, wind turbine control system, battery storage, GT control system). The benefits of such a demonstration testbed are 1) feasibility of high speed remote monitoring and control, 2) efficiency of real-time power source selection, 3) reliability of real-time risk sharing across complex energy prime mover, and 4) resilience of T&D upset recovery, including responses to cyber attacks.

A focus on the II, and accompanying technologies and standards, will have broad industrial sector benefits and will drive wide ranging economic gains. The II will change how people work and how systems are controlled.