

DeSCI (Dependable Survivable Critical Infrastructure)

Dependable Survivable Critical Infrastructure (DeSCI) – DeSCI provides overarching capabilities to promote and oversee the transformation of our energy system and to ensure broad public benefit. The requirements of reliability, flexibility, and efficiency are often in conflict in large distributed control systems (e.g., SCADA systems) because the infrastructure is built and tuned independently to meet those individual requirements. Reliability requirements translate into the ability to tolerate and recover from failures and provide a priori (quantifiable) assurances for long-term stability. To realize a self-healing ability, the system must be flexible enough to dynamically adapt through reconfiguration. However, the capacity to be flexible could make the system prone to design or runtime errors and the overhead of flexibility may take away from the performance efficiency of both the control and data planes. To address these conflicting requirements at the outset, the approach must coordinate the creation and distributed layout of control software in the form of autonomous software components or agents specifically designed to meet a priori service quality level needs for large complex system control. ORNL is developing more survivable distributed control architectures that resolve conflicts among the different control loop performance requirements. ORNL is applying innovative graph theoretic algorithms (based on formal models) to decide how to optimally structure our approach: (1) reduce/abstract the size/scale of the National Power Grid problem to realistically manage the problem of validation/assessment, and, (2) make structural/architectural decisions (e.g., identify vulnerabilities/ weaknesses and containment zones, as well as map agents to the grid hierarchy) - Sheldon

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