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Critical Infrastructure System Risks and SCADA

In this writing we will uncover the various risks to critical infrastructure systems. After that, I will explain how SCADA applications are used to mitigate risks to critical infrastructure systems.

Critical Infrastructure System Risks

In a writing called Critical Infrastructure Sectors, cisa.gov para. 1 states, “There are 16 critical infrastructure sectors whose assets, systems, and networks, whether physical or virtual, are considered so vital to the United States that their incapacitation or destruction would have a debilitating effect...” 16 different sectors all of which have the same types of risks. Infrastructure systems have a lot of moving parts that need monitoring 24/7. Most of these processes would be too impractical for a technician to be standing there controlling them efficiently without errors. Factors like fatigue, or complacency will eventually set in and negatively impact the system. Another risk would be natural disasters knocking out power grids, mass transportation, petrochemical plants, etc. Should a natural disaster occur, the infrastructure could be down for a lengthy period while repairs are being made. Another risk is catastrophic failure of systems/processes within an infrastructure. Lack of communication between large geographical locations of infrastructure systems also create risk of deterioration and prevents rapid response to any failures in the systems along with health and safety issues.

SCADA Application and Risk Mitigation

SCADA is software and standards used to monitor and help run critical infrastructures. A myriad of sensors like flow, temperature, humidity, pressure, etc., are used to monitor and provide real time data to the SCADA system and displayed on what is called a Human Machine

Interface (HMI). This alleviates the need for more manpower and possibility of human error when trying to monitor all the processes going on in the infrastructure. SCADA applications automizes these processes, monitor and control them in real time. If a pipe is over pressurizing, the sensors will pick it up and the data received by the Remote Terminal Units (RTU) or Programmable Logic Controllers (PLC) will tell the RTU or PLC to shut off or correct the pressure automatically. These huge complex systems using SCADA increases efficiency by automating hundreds and thousands of processes in the infrastructure. Natural disasters pose a huge threat every year but with SCADA, backups of processes are made. In the event of a process failing, the back-up will kick in and prevent the process from stopping while the damaged components can be repaired in the meantime. Even if one section of infrastructure goes down, automated processes can halt or prevent other sections of the infrastructure from collapsing, closing off the damage and isolating it. The data collected and presented to the HMI operator gives an overall report of how the system is operating. They can see the damage and make decisions to mitigate further damage and figure out how to fix any issues provided by the SCADA system. SCADA applications also provide alarms for any occurrences outside normal tolerances/parameters. For instance, if a nuclear reactor begins to lose its cooling and overheats, sensors will pick this up and the RTU's will sound an alarm and begin to halt the operation of the reactor if possible, preventing catastrophic failures. Because SCADA is interconnected to entire infrastructure systems, providing real time data and information, rapid response and communication over large areas can be accomplished efficiently and accurately. This can help stop any further damage and destruction of assets and keep people safe from harm.

Conclusion

Supervisory Control and Data Acquisition systems are vital to the operation of critical infrastructures. Because of the interconnectedness through SCADA systems, it allows automation of a myriad of processes, increasing efficiency and decreasing possible human error. Because SCADA implements backups and disaster recovery, in the event of natural disasters or catastrophic failures, services and processes can continue, and damage can be mitigated to only the affected areas without spreading. Finally, SCADA provides communication over vast geographical areas of critical infrastructure, allowing information to be obtained from anywhere necessary including more remote areas. This allows for safety of not only the assets, but the people.

Reference:

- Critical Infrastructure Sectors:

<https://www.cisa.gov/topics/critical-infrastructure-security-and-resilience/critical-infrastructure-sectors>