Honeywell

Product Information Note

Experion's Integrated Electrical Automation Solution with IEC 61850

Common Platform Approach for Process and Electrical Automation

Monitoring and control of electrical equipment is just as important as for the process equipment it powers. Honeywell delivers a unique electrical automation solution providing the power and electrical management information directly to the operator, and the power control information directly to the process controllers. Experion® PKS Orion provides a common platform approach delivering the highest level of reliability, safety and security at reduced cost of ownership.

Key Benefits

- **Integrated Process and Electrical Automation** – Reduced cost of ownership with a single system to install and maintain.
- **Maintain an Optimized Production Level While Optimizing Energy Usage** – Operators have the full picture of both power and process impacts on their scope of responsibility.
- **Consistent Operations** – Faster decisions, fewer errors.
- **Reduced Downtime** –Better Intelligent Electrical Device (IED) diagnostic and predictive data improves reliability and safety. Faster maintenance of electrical equipment with extensive remote operations capabilities. Fewer points of failure.
- **Improved Data Visualization, Analytics and Processing Capability** with the Experion HMI. Better visualization allows the system to become a "smart grid" to help customers make better decisions to optimize their power system.
- **Flexible Architectures to Suit All Needs** – By providing both a direct controller level interface and a direct supervisory interface, Experion provides the most efficient and cost effective solution that is further supported by the ultimate in scalability with the Honeywell patented Distributed System Architecture (DSA™).
- **Standards-driven Benefits** allowing selection of best in class devices across manufacturers, providing high speed, high reliability redundant TCP communications, while significantly reducing engineering, installation and cost.
- **Accelerates and Reduces Capital Project** Risk– Broadens the benefits of LEAP™. Honeywell's paradigm shift in the way automation projects are implemented

IEC 61850, **Communication Networks and Systems in Substations**, is a standard for the design of electrical substation automation defined by the International Electrotechnical Commission (IEC). The objectives set for the standard are:

- The protocols used will be open and will support self descriptive devices
- It should be possible to add new functionality
- The complete communication profile be based on existing communication standards
- Be based on data objects that relate to the needs of the power industry
- High interoperability of Intelligent Electrical Devices (IEDs) from different manufacturers

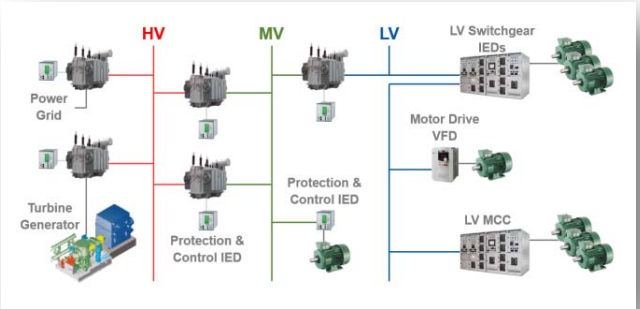

Figure 1, Powering the Process

Integrated Process and Electrical Automation

Electrical power management equipment in substations and motor control centers (MCC) have for a long time been connected to process control systems. These systems have an inherent role to power and protect process equipment.

- Process operators need to have related status information and see alarms, particularly during start-up and shut-down.
- Process controllers require status information for interlocking strategies and are involved in load shedding applications.
- Energy use in industrial plants is a significant operating cost. There are numerous opportunities to improve the power usage, reliability and quality by having access to real time data from power management devices.

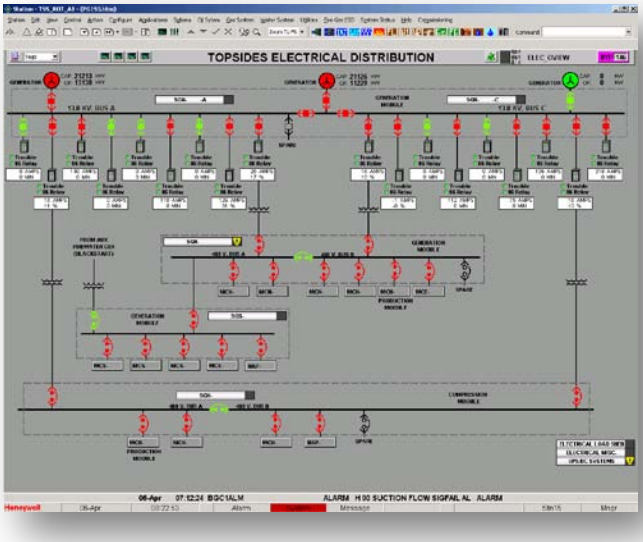

Figure 2, Single- Line Diagram in Experion Station

Traditional Methods

Traditional methods have involved an expensive mix of hardwired inputs and outputs complimented by communication links. Protocols like Modbus only provide a subset of all available information and are error prone when configuring data mapping. Other alternatives involve proprietary protocols making interoperability impossible. Some solutions may even require a separate HMI, separate historians, duplicated data acquisition and additional PLCs for power management with inconsistent user experience for operators and significant additional costs to engineer and maintain.

Power Management with IEC 61850

IEC 61850 is fast becoming the de facto standard for substation automation due the following benefits.

- A robust industry standard designed for interoperability
- Access to best in class devices across multiple manufacturers
- Standard data structures designed for the industry
- Instantaneous communication allowing device to device co-ordination of breaker trips, load shedding and other capabilities.
- Traditional hardwired I/O is replaced by high speed, high reliability redundant TCP communications, significantly reducing engineering, installation and cost.

Experion supports the IEC 61850 standard across the automation hierarchy with both a SCADA interface connecting Experion's HMI to electrical substations (R311 and newer), and a control level 'Series C' interface to connect process controllers directly to IEC 61850 devices (R431 and newer).

One System, One Platform Approach

By providing the power and electrical management information directly to the operator and the power control information directly to the process controllers, Experion, in combination with IEC 61850 substations, becomes a single process and power automation solution. Whether you prefer separate operator consoles for power and process or a single console managing both, Experion delivers:

- Reduced cost of ownership with a single system to install and maintain. No more duplicated servers or functions. One system to learn. One system to configure. One system to operate.
- Consistent engineering processes and teams for design, configuration, test, installation and commissioning.
    - Take advantage of **LEAP**, a paradigm shift in the way automation projects are implemented.

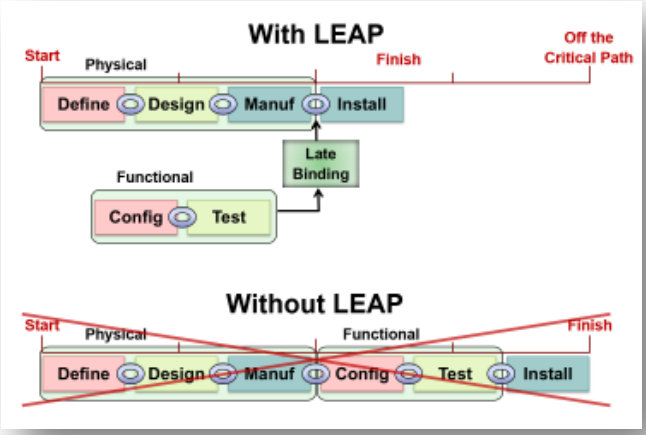

Figure 3, Projects with Experion LEAP

- Consistent operations processes with operators and maintenance teams learning and using a common HMI system, yet providing for the unique data structures of both electrical and process.
    - Operators have the full picture of both power and process impacts on their scope of responsibility, allowing them to make better decisions and run closer to the operational objectives of the site. Maintain an optimized production level while at the same time optimizing energy usage.
- One data and event history across power and process. Individual operators or consoles can still have their own views and separation through Experion's scope of responsibility configuration, thereby providing the right data and events to the right people.
- Experion configuration is as simple as connecting to the device (IED) and reading its definitions, or if not connected yet, importing into Experion the device definition and configuration files provided by those who configure the substations. File types supported by Experion are ICD, CID, SCD and IID.
- Faster maintenance of electrical equipment with remote access and control of all device parameters and setpoints as if a technician were in front of the substation bay. Better IED diagnostic and predictive data can help bring more reliability and safety.
    - The self description nature of IEC 61850 devices and data objects designed for the power industry means Experion can access all device information.
- A more sophisticated data visualization, analytics and processing capability with the Experion HMI. Better visualization allows the system to become a "smart grid" to help customers make better decisions to optimize their power system.
    - Experion HMI incorporates features developed from extensive consideration of human factors by the Abnormal Situation Management® Consortium.
    - Use of the Experion Equipment display to better organize and display data in both summary and detail across the hundreds of power devices in a plant.
    - Standard Experion point detail displays and faceplates for IEC 61850 devices.

Flexible Architectures to Suit Your Needs

To deliver all the operations, maintenance and configuration data and events required to holistically manage systems today, a single IEC 61850 device can have hundreds of data parameters. Some data is required in the control layer, but most of it is only required in the HMI and system journals. By providing both a direct control level interface and a direct HMI interface, Experion can provide the data balance you require. For smaller systems, you may choose to bring all the data through the control layer and on to HMI. For larger systems, it may make more sense not to burden the control layer with all the additional processing and route data for HMI directly from the devices. Ultimately, this provides a balanced and robust standards driven solution.

IEC 61850 Definitions:

- **IED**, 'Intelligent Electronic Device': any device incorporating one or more processors with the capability of receiving or sending data/control from or to an external source. For example, electronic multifunction meters, digital relays, controllers
- **Interoperability**: ability of two or more IEDs from the same vendor, or from different vendors, to exchange information and use that information for correct execution of specified functions
- **Self-description**: a device contains information on its configuration. The representation of this information has to be standardized and has to be accessible via communication (in the context of this standard).
- **ICD, CID, SCD, IID**: File types that contain IED and/or complete substation description and configuration
- **SAS**: Substation Automation System

For sites that prefer more separation between power and process, separate Experion servers can be installed. With the power of Experion Distributed System Architecture (DSA), these servers act as one without any duplicated configuration. Data and events can be seamlessly shared between each. Your choice - one server or two.

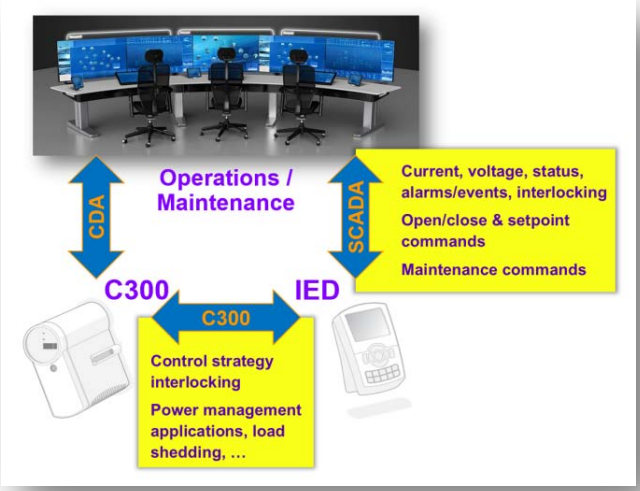

Figure 4, Experion's Flexible Architecture

Still have electrical devices on other protocols? Not a problem: in addition to IEC 61850, Experion offers standard integration of a range of protocols used in the power industry including DNP3,

IEC 60870 and Modbus, all in serial or TCP, plus Profibus-DP. In addition, OPC can be used to offer integration to non-IEC 61850 electrical devices.

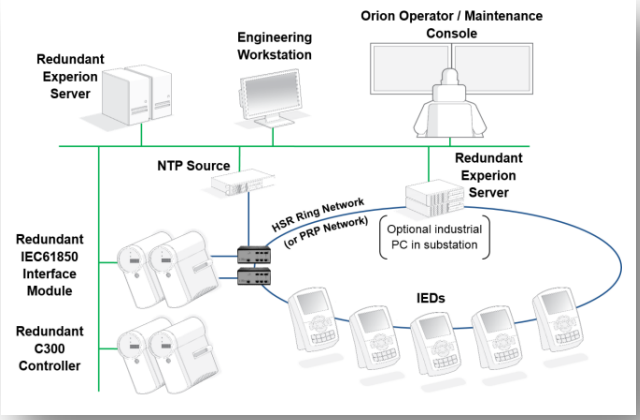

Figure 5, Experion: One Platform Approach

Power Management Applications

The Experion portfolio performs in a range of duties across the spectrum of applications from electrical demand-side, distribution, transmission and generation. Some examples include:

Electrical Control Systems (ECS) and Electrical Load Shedding Systems (ELSS)

ECS and ELSS are used to monitor and control electrical power distribution for industrial plants to ensure a reliable and stable energy supply for energy-intensive applications operating in highly-demanding, hazardous or extreme environments such as oil & gas, petrochemical, metals, and pulp & paper. The ELSS balances energy requirements with the available energy supply and the ECS prevents disturbances of operations, or even blackouts. ECS enables better control of energy costs and enhances safety. The main functions of ECS include:

- **SCADA**: The remote control, monitoring and supervision of circuit breakers, disconnectors, earthing switches, transformers and generators.
- **Load Shedding**: The Load Shedding application has to ensure the availability of electrical power to all critical loads in the plant or mill at any time. This is achieved by switching off non-essential loads in case of a shortage of power due to faults in local generator assets, from the grid, or a mixture of both.
- **Active and Reactive Power Control**: The Power Control function optimizes the active power exchange with the Public Power Company to an adjustable set point based on contractual obligations such as the maximum 15 minutes peak value. The Reactive Power Control of a plant/mill is based on a well balanced control of the transformer load tap changers and the control of the generator exciters.
- **Mode Control**: The Mode Control function changes the control mode of the tap changers, governors and excitation systems of the generators according to the status of the electrical network.
- **Re-acceleration**: The Re-acceleration functionality allows for automatic restarting of motors and other loads after a load shedding action has taken place or after the return of the voltage after an under-voltage has occurred.
- **Synchronization**: Before closing a synchronizing circuit breaker, synchronization is performed and checked by the system. Depending on the network conditions, the generators to be used for synchronization can be selected, either automatically or by operator.

Electrical Power Management System (PMS)

The PMS provides an integrated set of control, supervision and management functions for power generation, distribution and supply in industrial assets with on-asset power generation such as offshore oil platforms and remotely located plants.

- Generator control, including gas turbine and steam turbine capacity and spinning reserve calculations, integration with governor controller and excitation controller, voltage control, frequency control and synchronization.
- SCADA electrical functions including intelligent electrical circuit schematics, Single Line Diagrams (SLD), integration with all electrical devices such as switchgear, transformers and so on.
- Circuit breaker control including integration with protection relays, event monitoring, time synchronization with 1ms resolution.
- Synchronization between all combinations of electrical islands/circuits and generators.
- Transformer and tap-changer control.
- Motor control including integration with motor control centers (MCC), synchronization, automatic sequential re-start and re-acceleration.
- Network Determination calculations, unbalance detection and network schematic displays.
- Power Control including tie-line control, peak shaving and load balancing between generators.
- Pro-active Load Shedding calculations and tripping; including both fast, slow and frequency based.
- Trending and alarming.
- Similar support for emergency generators and emergency switchboard systems and UPS.

Substation Automation Systems

Substation Automation Systems (SAS) integrate data from different substation equipment, such as incoming feeders, transformers and outgoing feeders, optimizing and managing

capital assets to enhance operation and maintenance efficiencies with minimal human intervention.

Experion's flexible architectures mean supplementing this use can be as simple as dedicating and locating an Experion server to each substation. This provides independent standalone functionality for local substation maintenance use, but at the same time allowing the substation to act as a data collector for the broader Experion system seamlessly through DSA.

Medium Voltage Automation Systems

Medium voltage automation systems provide for real time monitoring of the protection relays and integration with the plant distributed control system of the power plant for diagnostics and status monitoring.

Figure 6, Typical Switchgear with IEDs in a Substation

For More Information

Learn more about Experion's integrated Electrical Automation Solution with IEC 61850 at our website www.honeywellprocess.com or contact your Honeywell account manager.

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