GE
Grid Solutions

DS Agile SCADA/HMI using zenon®

Digitized Control System

GE's DS Agile is a field proven and certified digitized control system for transmission and sub-transmission substations. DS Agile has been deployed through more than 3,000 projects across 70 countries over the past 15 years.

To meet the ever-growing scalability challenges faced by the power industry, and increase our capability to deliver larger-scale automation projects to our customers, we collaborate with COPA-DATA, a long-established SCADA/HMI automation software solutions provider in the energy infrastructure business. This partnership allows for a brand-new offering that enables users to continue using our highly intuitive user interface with the extra benefits of our new integration.

DS Agile using zenon - Energy Edition Package

The zenon Software Platform is developed by our partner company, COPA-DATA, whose technologies have been widely used for over 30 years for on-site operation (HMI) and at control center levels (SCADA).

The Energy Edition package coming with zenon includes key functionalities:

- Substation automation (Effective and secure operation of substations – locally or remotely)
- Renewable energy management (from a small hydro power plant to a wind or solar park)
- Energy storage (Reporting and Advanced Analytics for continuous process optimization)
- Public transportation (automation of substations on railways, subways, control of tunnel-infrastructure systems.

High-performance HMI

- Library of objects, intuitive widgets, HTML5 insights for web clients
- Situational awareness features (zooming, decluttering, panning overview, one-click focus)
- Multi-language online translations
- Enhanced color palettes and themes
- Multi-touch actions for touch screens
- Programming interface by scripting

Sophisticated security features

- Command processing (Direct Execute (DE) and Select Before Operate (SBO) operations with normal and enhanced security, double signature, dual hands)
- Automatic line coloring with electrical model for single line diagrams
- Topological interlockings (based on ALC electrical model)
- Interlockings by tags (Bay-wise interlocking PLC)
- Bypass functions

Advanced Engineering Tools

- HMI project upload online
- Runtime software upgrade online
- IED servers simulation by PLC automation
- Supports automatic engineering (SCL files)

Key Functionalities

DS Agile is integrated with the zenon Energy Edition package to have the following features out-of-the-box.

Advanced communications

Built-in zenon drivers for more than 300 industrial protocols such as:

- IEC61850 Edition 1, 2 and 2.1
- DNP3
- IEC 60870-5-101, 103, 104
- Modbus RTU, TCP
- SNMP

Integrated substation level automation

IEC61131-3 software PLC with:

- IEC61850 client & server (MMS & GOOSE)
- IEC60870 master & slave

Alarm handling

- Up to 128 levels of alarms
- Filtered by groups, areas, equipment modelling

Data processing

- Secure and powerful data historization & archiving
- Powerful historian storage capabilities
- Archives export in multiple standard formats (CSV, XML, SQL)
- Flexible data analysis & reporting with real-time and historical trends, and customizable reports out of the box

Advanced features

In addition to the default modules proposed using zenon, optional modules can be integrated to deliver more capabilities and greater functionality, including:

- **Web server(s)**: based on a standard web browser, the HMI screens could be transferred from a secure remote locations. All screens, users, password administration, information, etc., are available online, with the same look, feel, and functionality. Any request made on the web client are instantly executed in the server and updated for all users. For control authority purposes, web clients are available as "control & monitoring" and "monitoring only" versions.
- **Process recorder**: Playback process data.
- **Command sequencer**: to create sequences of commands to perform automatic operations such as busbar switching.
- **Message control**: transmission of defined events and alarms via SMS and/or e-mail.
- **Load management**: the short-term forecast, load shedding automation, and optimization of energy consumption of a billing period.
- **GIS editor and control**: geographical localization of electrical faults in a regional map on electrical lines.
- **Historian SQL server interface**: to allow for the transfer of archived data to a compatible database.

Scalability

For DCS projects deployed in large IT organizations, with SCADA functionalities present in multiple areas and levels (control rooms, headquarters, dispatching, and maintenance centers), DS Agile using zenon offers major scalability based on numerous Operating Workstations (OWS) and web client connections.

Flexibility

For centralized and decentralized automation architectures, project engineers can select a standard "top-down approach" (system configuration) or a "bottom-up approach" of configuration by integrating non-IEC61850 IEDs like metering, smart sensors, and condition monitoring units at the SCADA/HMI level through different processes and protocols across the substation.

Interoperability

Based on an IEC61850 edition 2.1 protocol, DS Agile using zenon SCADA/HMI can be used for a brownfield substation migration project, with existing IEC61850 edition 1 equipment and interoperable extension based on IEC61850 edition 2.0 IEDs.

Security

Minimize system risks

Hardening, whitelisting scripts, and other security solutions are available for DS Agile using zenon. Answering to data and communications security according to IEC62351 standard, ethernet messages are encrypted between SCADA servers and clients. The communication between IED servers and SCADA can also be encrypted, according to IED server capability.

Role-Based Access Control, Microsoft Active Directory, RADIUS, and Open LDAP user management solutions are also available.

System performance

DS Agile using zenon increases the limits of our DS Agile system by improving the performance and maximizing the system's potential in terms of data acquisition.

Engineering efficiency

Dedicated wizards offer comprehensive solutions to meet engineering needs for lower project costs and efficient time management. These include:

- IEC61850 variable list imports (SCL files)
- Energy driver creation (IEC61850, DNP3, IEC60870, IEC61400)
- Drivers simulation (to validate projects by simulating equipment like SNMP and IEC61850 IEDs)
- Project template creation and reproduction (with DS Agile best practices, color palettes, themes)
- A complete project dashboard to monitor system information without external tools

The integration of SCADA and PLC automation creates powerful substation level automation using common variables. The capacity to download the UI project, without SCADA downtime, significantly improves the engineering stage through fast project modification during the customer validation phase.

Situational awareness & operator efficiency

DS Agile using zenon SCADA/HMI collects data from protection and control equipment, monitoring, measurement and metering IEDs through multiple industrial protocols, and presents relevant information in an easy way to increase operator efficiency. This includes:

- SLDs (see Figure 2 and Figure 5)
- Real-time and historical event lists
- System topology overview (see Figure 4)
- Alarms areas lists
- Datapoint states lists (see Figure 3)
- Advanced filters (with wildcards)
- Custom reporting services
- Device measurement trending
- Operator, system, and security logs
- Alarm cause predefined list
- Operator comments

DS Agile using zenon meets the needs of customers who want to upgrade their SCADA/HMI system to a modern, digitalized IEC61850 solution with the latest cybersecurity requirements. Thanks to the HMI customization capability, utilities can keep the same user interface as their current HMI to limit training costs and improve grid operator availability.

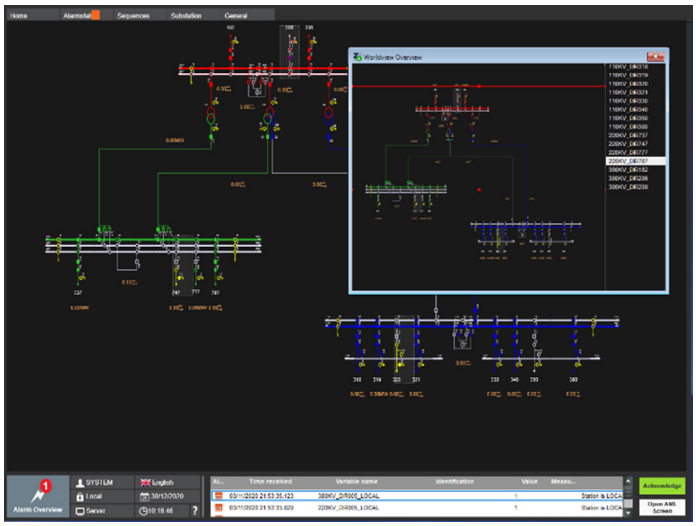

Figure 2: Situational awareness functionalities used to navigate a transmission substation project SLD

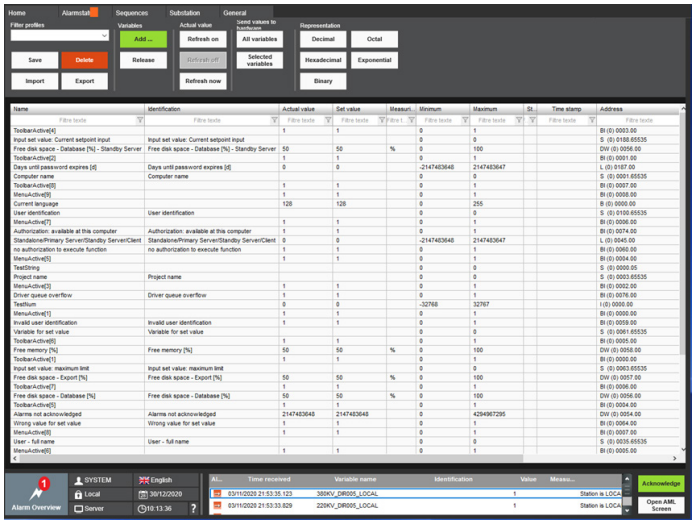

Figure 3: List of variable states with advanced filters and customizable menus

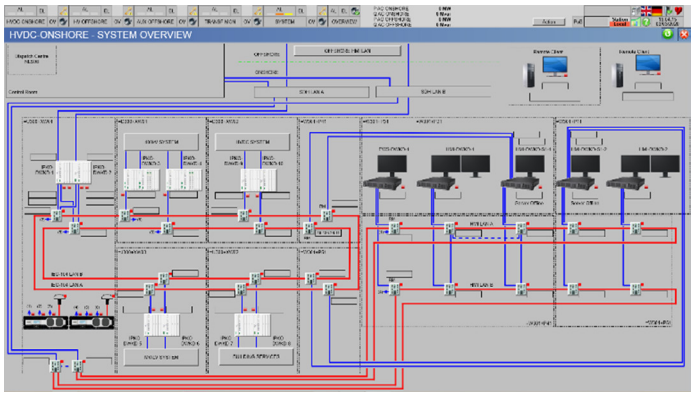

Figure 4: The IT system topology overview in a large offshore wind farm project

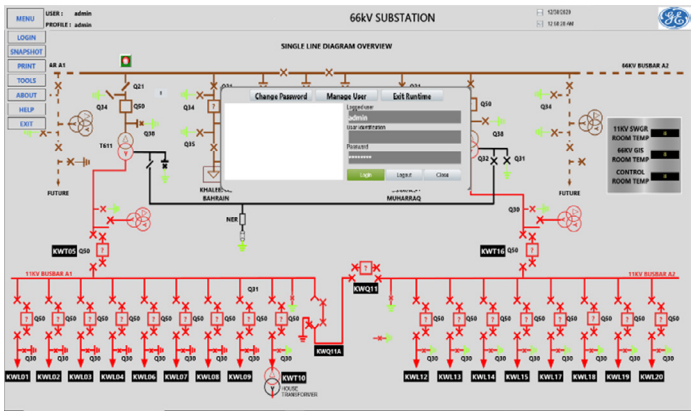

Figure 5: An SLD on a 66kV/11kV-substation projectPixel-based UI customization

Flexible data analysis & reporting

Based on flexible report customization solutions, reports can be set to meet to the exact end customer requirements. Lists of events, trends, and charts can also be added to improve the presentation of results.

High availability SCADA/HMI

DS Agile using zenon ensures a robust design, addressing multiple failure modes and limiting the risk of data loss, data duplication, loss of functionality, and degradation of performance. Based on DS Agile using zenon recommendations, the high availability (HA) level can be up to 4 nines (99.99%).

Communication availability is of paramount importance as the network carries protection tripping signals. DS Agile using zenon components support redundancy protocols IEC62439-3 PRP and HSR, to achieve 0ms recovery in case of a single ethernet link failure (see Figure 6).

DS Agile using zenon ensures the central data archiving role. High availability of data, or data high availability is based on a symmetrical hot/standby redundancy for server and historian. A fail-safe is achieved by defining a “secondary” server, taking the role of the “standby” server. The connection between the servers is monitored by a watchdog. In order to avoid data loss in the time between server failure and the detection of the failure, the standby server always buffers all data. This data buffering also takes place if the standby server is not the “primary” server. After a server failure, this buffer merges with the latest data from the server and the new incoming data (consolidation), so no data is lost or duplicated. The control system thus guarantees seamless redundancy.

Depending on the configuration of the redundancy modes (non-dominant, dominant, or rated), the primary server starts as either a “hot” or as a “standby” server after restarting. The operator workstation(s) will automatically switch from one server to the other one, after a delayed failure detection time, to always be synchronized by the latest updated information transmitted via the operational network (OT).

In terms of reliability, DS Agile using zenon is based on a client-server model, with a scalable architecture. The SCADA server, workstation clients, and data storage can be easily and quickly replaced. By following DS Agile recommendations, the system’s Mean time before failure (MTBF) and the maintainability can be improved in a notable way.

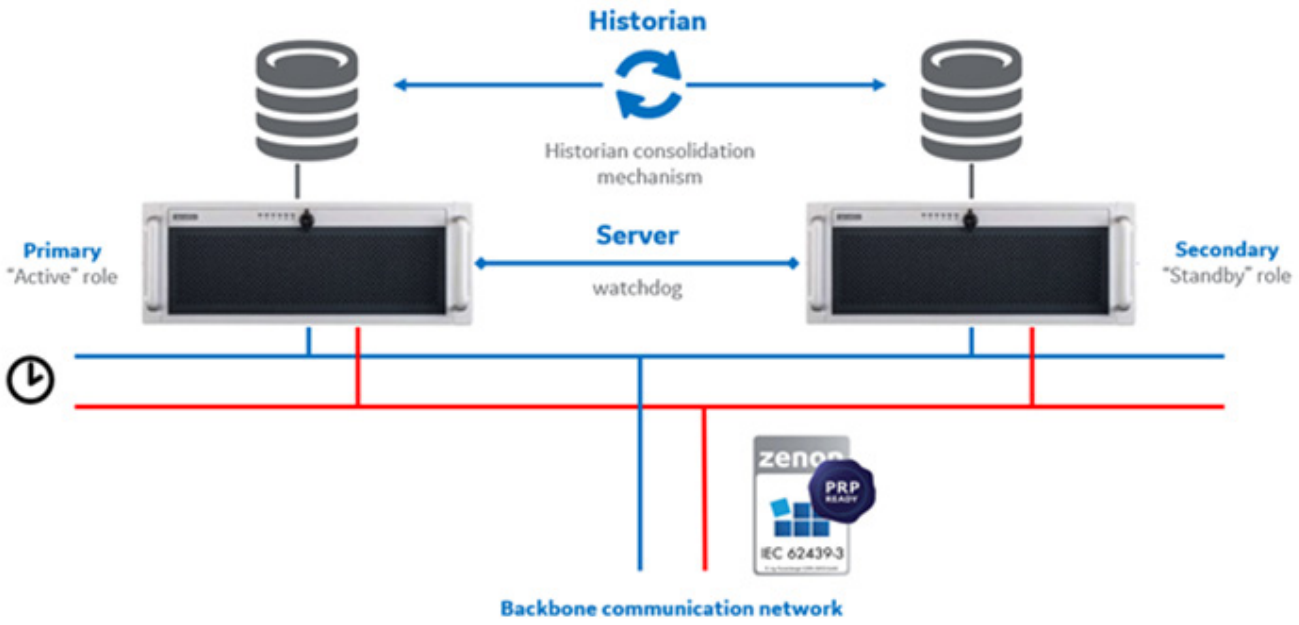

Figure 6: Server and data historian redundancy mechanisms, ensuring the high availability of data

Engineering Workstation (EWS)

DS Agile using zenon is an easy and intuitive project management system that can maximize on engineering time through:

- System Configuration Editor (SCE) application to create and update the system SCL files.
- zenon standalone editor license to maintain and upgrade the HMI project.
- GE and third-party IED vendor configuration tools.
- Reporting services (exported reports lists, trends, snapshots, PDF files).

GE

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