ABB ABILITY™ ELECTRIFICATION MONITORING AND CONTROL FOR DISTRIBUTION NETWORKS

ZEE600

Product Guide

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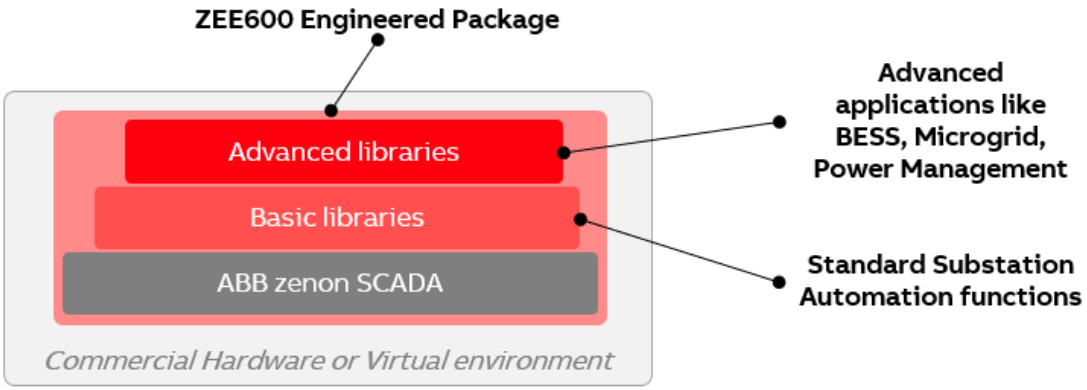
ZEE600	
Product version: 2.2	

Contents

1. ZEE600, an ABB engineered package

ZEE600 helps to realize system integration in Electrification Control System (ECS), Control and Rela Panel (CRP) solutions and can be deployed in a mix of brownfield and greenfield installations in primary and secondary distribution substations across utilities, industries, infrastructure, and renewable segments. Thus the ZEE600 Engineering Package is an enabler for the ZEE600 engineered solution.



As an engineered solution, ZEE600 offers a range of significant advantages that can revolutionize various industries and improve overall efficiency**:**

Scalability and adaptability
Designed to be flexible and adjustable, allowing for easy integration into existing systemsor seamless expansion as needs evolve. This adaptability ensures that this solution can keep up with changing requirements and accommodate future growth, saving time and resources in the long run. Allows a flexible approach to configuring the required basic and application visualization licenses as needed for customer projects (generic names for APPs like Power and Energy Management)

Safety
Safety is a paramount consideration in engineered solutions. Rigorous testing, adherence to industry standards, and thorough risk assessments are integral parts of the engineering process. This meticulous approach minimizes potential hazards and ensures the safety of both workers and end-users.

Increased productivity
By automating manual processes, streamlining workflows, and optimizing resource allocation, it eliminates inefficiencies and bottlenecks, allowing businesses to achieve higher levels of productivity and output.

Innovation
Encouraging the exploration of new possibilities, pushing the boundaries of what is achievable. By combining creativity, scientific knowledge, and technological advancements, engineered solutions drive advancements in various fields, opening up new opportunities and driving progress.

In conclusion, the advantages of an engineered solution are numerous and far-reaching. From precision and scalability to safety, productivity, and innovation, these solutions offer immense value to users across all segments. Embracing ZEE600 engineered solutions can lead to enhanced performance, improved outcomes, and a competitive edge for users in today's rapidly evolving world.

2. ZEE600 overview

The ABB Ability Electrification Management and Control for distribution, ZEE600 handles process visualization, control of digital distribution substation data management in electrification solutions for several customer segments.

- Utilities (such as power generation, sub-transmission, distribution, and renewables)
- Industries (such as food and beverage, oil and gas, chemicals, metals, electronics, and semiconductors)
- Commercial and industrial buildings (such as data centers and hospitals)
- Transportation infrastructure (such as railways, e-mobility, and airports)

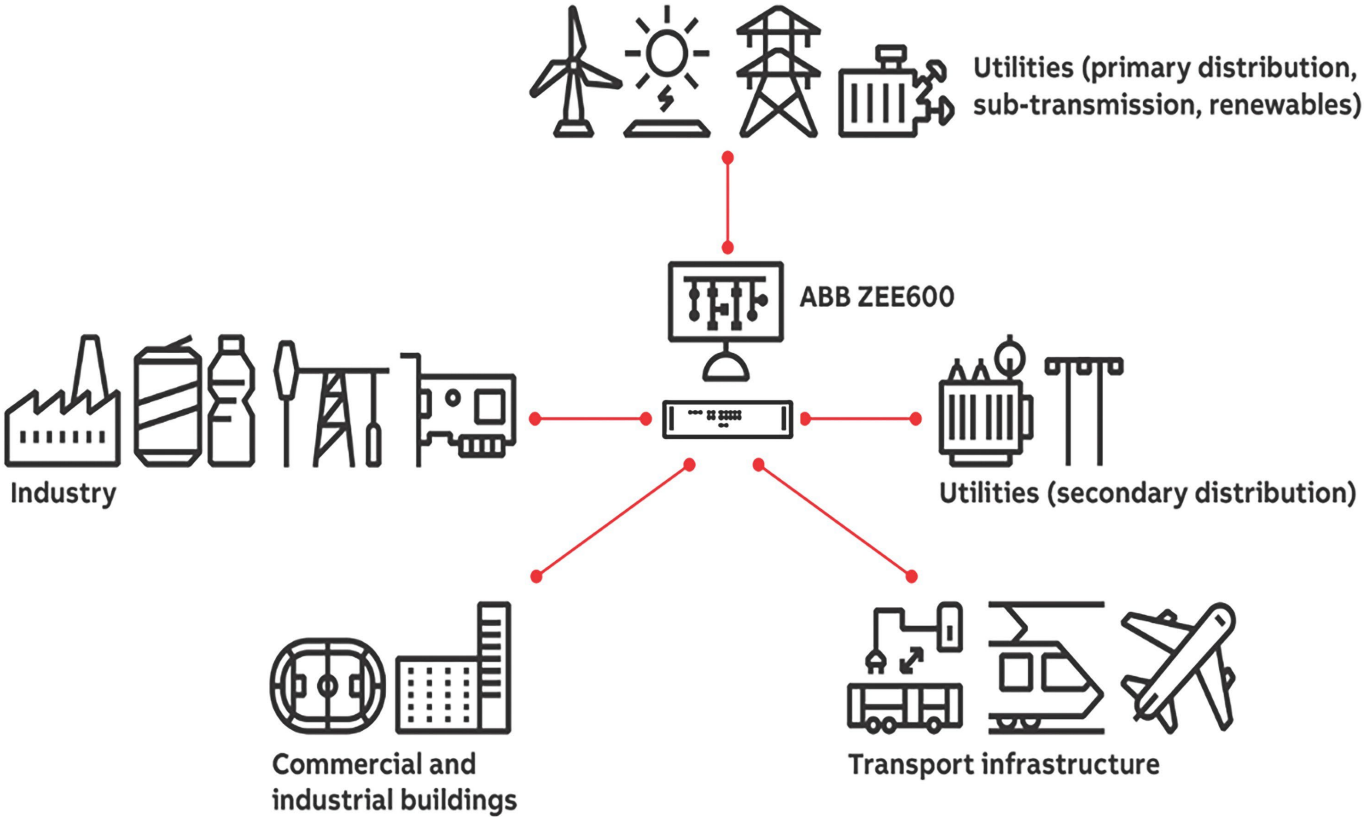


Figure 1. ZEE600 in customer segments

Following ABB's latest user experience guidelines, ZEE600 seamlessly integrates ABB's electrification products and applications, the result being a versatile, feature-rich, state-of-the-art product. ZEE600 is fully capable to integrate with on-premises asset and energy management products and applications, thereby fulfilling the need for OT-IT integration.

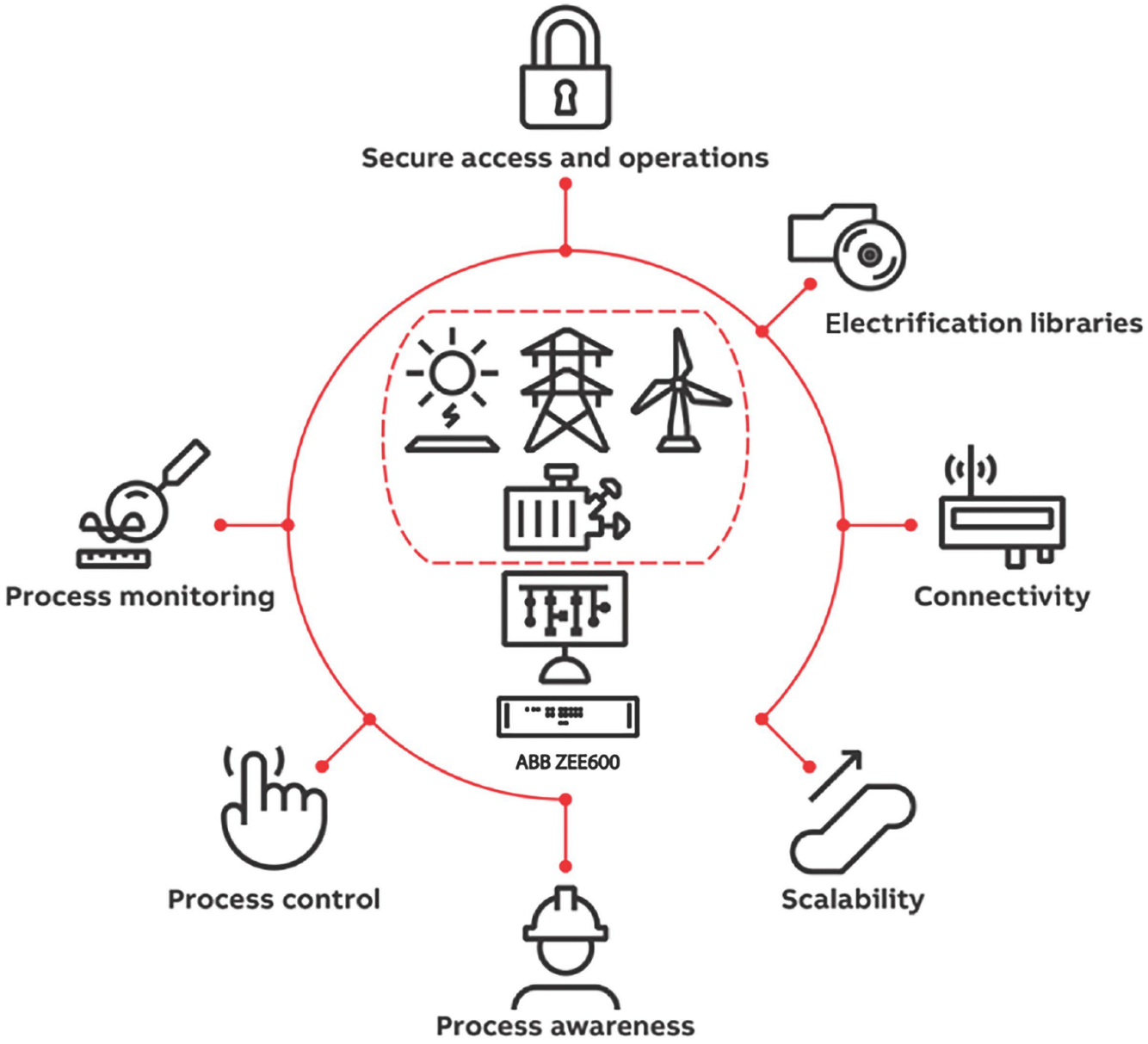


Figure 2. ZEE600 overview

ZEE600 handles several essential facets of substation and electrical process monitoring, control and data management.

- Process awareness
- Process control
- Process monitoring
- Connectivity to downstream and upstream devices or systems using standard protocols
- Secure access and operations

ZEE600 also incorporates several electrification libraries.

- Standard display faceplates for common look and feel for ABB Relion medium-voltage relays, ABB Emax 2 intelligent low-voltage circuit breakers and Switchgear condition monitoring
- Standardized IEC and ANSI substation symbols for single-line diagram (SLD) displays
- Standardized pages displaying, for example, alarms, events, and reports
- Signal engineering wizard for configuration automation

ZEE600 supports system integration in segment electrification control system (ECS) solutions by handling downstream process data acquired using Ethernet or serial communication-based protocols.

ZEE600 offers versatile functionality in combination with the protection relays, meters, programmable logic controllers

(PLC) and remote terminal units (RTU) deployed in digital electrification solutions.

ZEE600 can be used in two installation scenarios.

- In a mix of new and existing installations in primary distribution substations, as a human-machine interface (HMI), communication gateway and a data handling unit.
- In new or existing secondary distribution substations as a communication gateway and a compact HMI.

ZEE600 contributes towards the customers' generic KPIs through elucidated features and functionality by providing value for return on investment (ROI) and reduction of total cost of ownership (TCO).

- Flexible architecture allowing remote control
- User-friendly ECS engineering environment
- Graphical and customizable user interface
- Multi-user project access and synchronization
- Openness and extensibility
- Real-time energy monitoring, reporting and optimization
- Capability to execute applications
- Readiness for connectivity with external systems such as control systems and centers or cloud
- Secure operations, secure data communication and data security
- Real-time monitoring and control of plant electrification operations using contemporary, state-of-the-art user interfaces
- Comprehensive connectivity
- Scalability and modularity to suit the plant's present and future requirements
- High deployment efficiency through electrification device and application libraries

3. ZEE600 Features

ZEE600 is designed for the automation of substations and networks of substations. In addition to the default functionality of ZEE600, other optional features can be chosen as needed.

Table 1. Default ZEE600 base server features

Feature	Category
Process awareness	Alarm areas
	Automatic line coloring
Process control	Command processing
	Interlocking
	Logic Runtime
Process monitoring	Historian with SQL export
	Extended trends
	Reporting (read-only)
Process connectivity (client drivers)	IEC 60870-5-101, IEC 60870-5-104
	IEC 60870-5-103
	IEC 61850, Edition 1 and Edition 2
	DNP3 serial/TCP
	Modbus serial/TCP
	IEC 61400-25 (wind power plant monitoring and control)
	IEC 62056-21 (power quality and revenue metering)
Connectivity from Logic SoftPLC (server or client)	IEC 61850 client, Edition 1
	IEC 61850 MMS server, GOOSE publisher and subscriber, Edition 1
	IEC 60870-5-101, IEC 60870-5-104 server
	IEC 60870-5-101, IEC 60870-5-104 client
Others	Programming interface (C#) [1)]
Electrification libraries	Wizards for automated engineering, disturbance records and energy reports

1) Use may require special skills and support; not covered in this document

Table 2. Optional ZEE600 features

Feature	Category[1)]
Process awareness	Message control
Process control	Command Sequencer
Process monitoring	Process recorder
	Reporting (write access)
	Historian SQL server interface
Process connectivity (client drivers)	• OPC-UA • Profibus (Logic/SoftPLC) • Profinet (Logic/SoftPLC)
	Everywhere server (process information on smart phones and tablets)
System connectivity (server) using the process gateway	• OPC-UA • IEC 60870-5-101, IEC 60870-5-104 • DNP3 serial, TCP • Modbus serial, TCP • SNMP
Others	Load management[2)]

1) Including only the items relevant to electrification solutions
2) Use may require special skills and support; not covered in this document

4. Application overview

ZEE600 can function as a combined substation HMI, communication gateway and automation controller managing real-time, non-real time and historical data in primary and secondary.

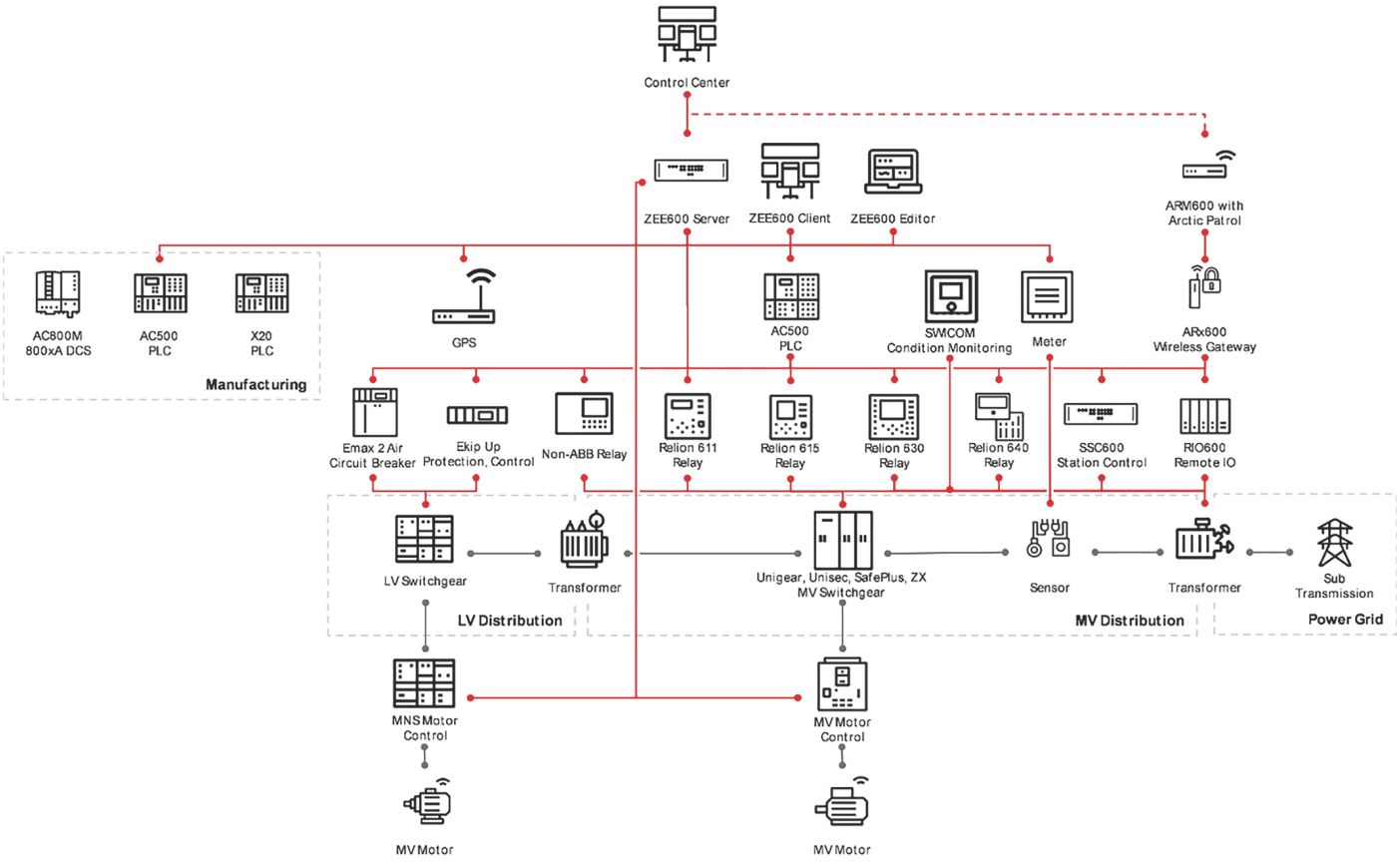


Figure 3. An integrated system with ZEE600 primary and secondary equipment

ZEE600 can be used in several installations. For example, the applicable installation could be a combination of medium- and low-voltage networks spread across single or multiple substations.

ZEE600 can be used as part of a system comprising several medium- and low-voltage ABB and non-ABB devices.

- Medium and low voltage protection and control relays (ABB's Relion product family with 611, 615, 620 and 630 series, REX640, SSC600 and ABB Ekip Up series, third-party devices or legacy relays)
- Switchgear condition monitoring (ABB SWICOM)
- PLC and IO devices (AC800M, AC500 or RIO600)
- Intelligent circuit breakers (Emax2)
- Multifunction meters (M2M, M4M or third party, for example, SATEC)

The application can be based on switchgear or panel installations. The system communication can use Ethernet or serial interfaces and may require connectivity to higher-level systems such as control centers or distributed control systems (DCS) based on ABB and non-ABB systems using IEC protocols such as IEC 60870-5-101/104, DNP3, Modbus or OPC.

When ZEE600 Runtime is the server or client, the most commonly used communication protocols are IEC 61850 MMS (Edition 1, Edition 2), IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, Modbus TCP or Modbus RTU and DNP3 TCP or DNP3 serial.

Communication with downstream devices can also be initiated from the SoftPLC engine within ZEE600 using the protocols IEC 61850 MMS, IEC 60870-5-101 or IEC 60870-5-104.

As a client or server, ZEE600 Runtime can communicate with other devices or systems based on OPC-UA, DNP3 TCP client, IEC 60870-5-101, IEC 60870-5-104, Modbus TCP or Modbus RTU or SNMP.

Client or server communication can also be initiated from the SoftPLC engine using IEC 61850 GOOSE, IEC 60870-5-101 or IEC 60870-5-104.

ZEE600 supports IEC 62349 parallel redundancy protocol (PRP) to handle and resolve identical communication messages from two separate LAN networks. To adapt to a high-availability seamless ring (HSR) network, an external redundancy box is required.

Additionally, ZEE600 supports a scalable architecture comprising a single server and multiple clients or multiple servers with multiple clients.

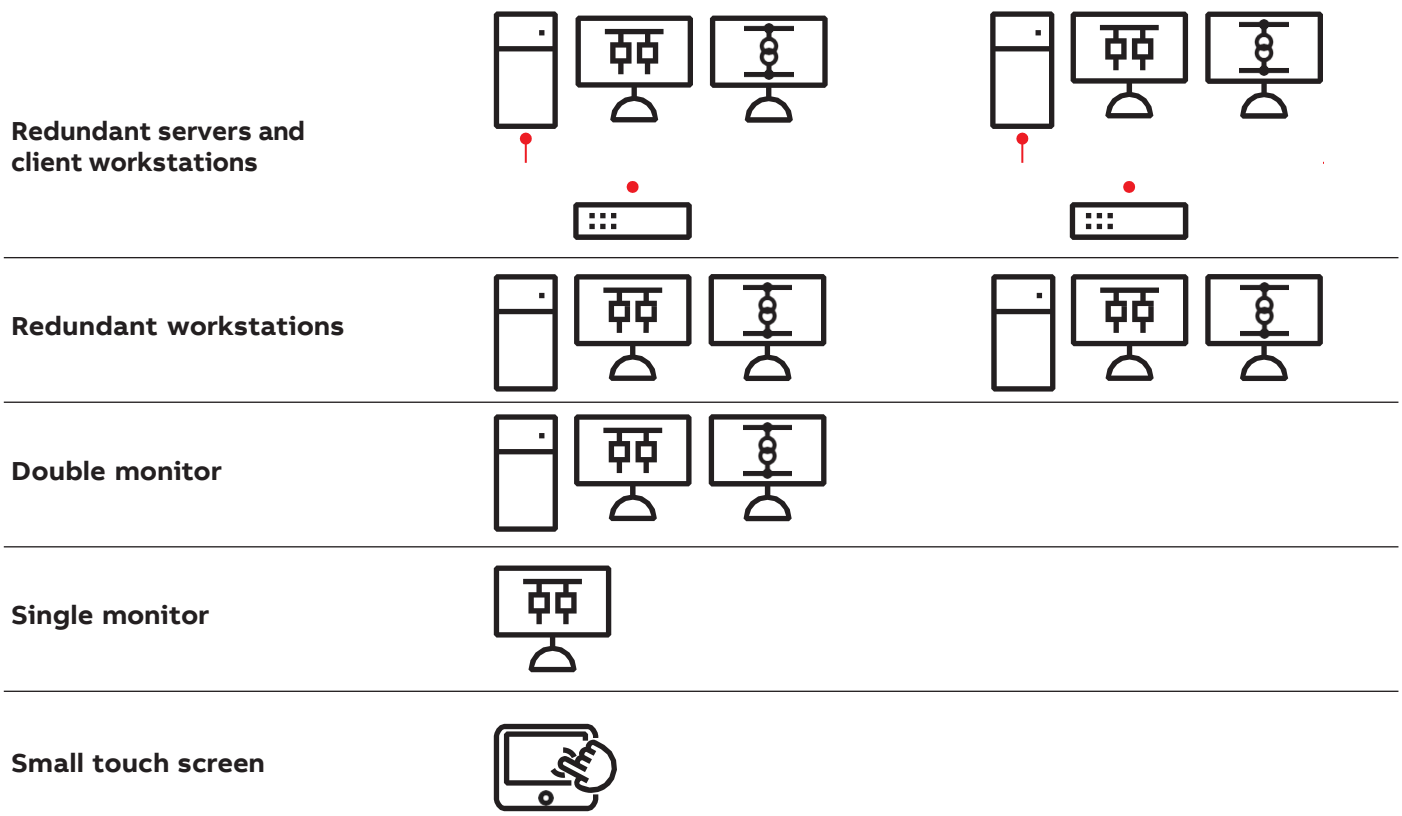


Figure 4. ZEE600 scalable and flexible deployment architecture

5. Process awareness

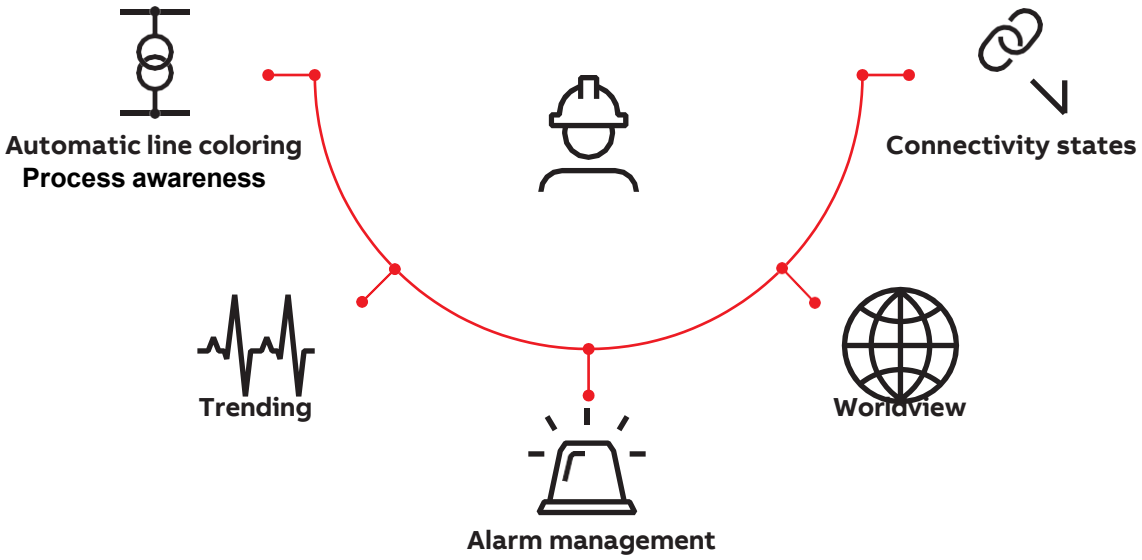


Figure 5. Process awareness with ZEE600

Alarm management

Alarm administration informs the operator of abnormal situations or faults in the electrical power network or equipment, such as limit value violations and protection trips. A sophisticated alarm management is crucial to safe system operations. As alarm management is a native feature in ZEE600, it can be set up quickly and it allows optimum handling and usability while being also fully integrated with ZEE600's redundancy functions.

Alarms can be defined by setting value limits for variables, by using reaction matrices or by influencing the alarm properties.

ZEE600's object-oriented approach ensures that alarms can be configured in a few minutes, even for large projects.

The limit values can be defined at the data variable or data type levels. Defining thresholds prevents a flood of alarms caused by oscillating values. The thresholds can be adjusted even during ZEE600 Runtime and the changes are also recorded in the chronological event list. With a reaction matrix, there are many options to define global alarm conditions and then apply those to different variables.

Alarm areas allow the creation of applications that lead from a summarized alarm indication to the detailed screen of the alarm, thus providing visual alarm guidance. It is also possible to create an aggregated visualization of the number of active alarms, active/acknowledged alarms and inactive/unacknowledged alarms.

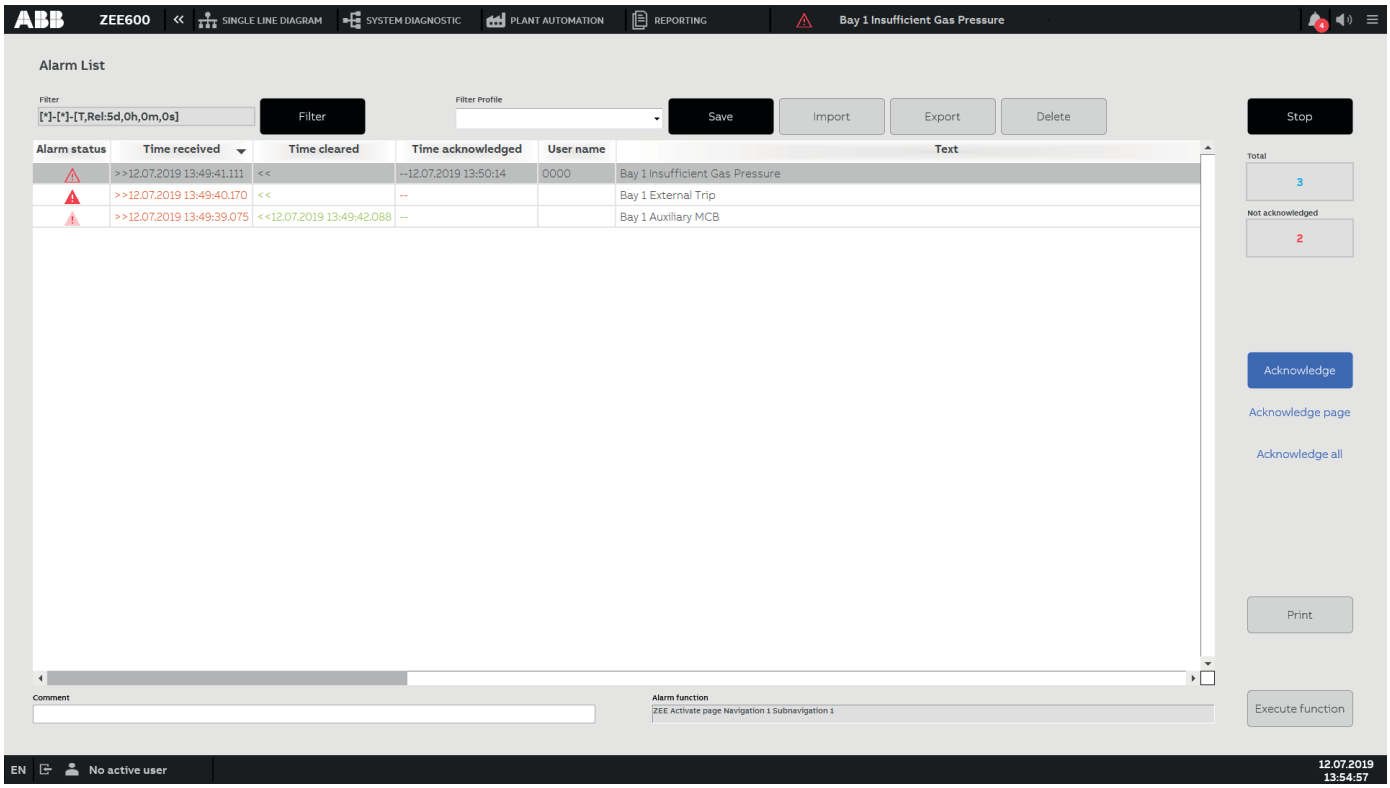


Figure 6. ZEE600 alarm list

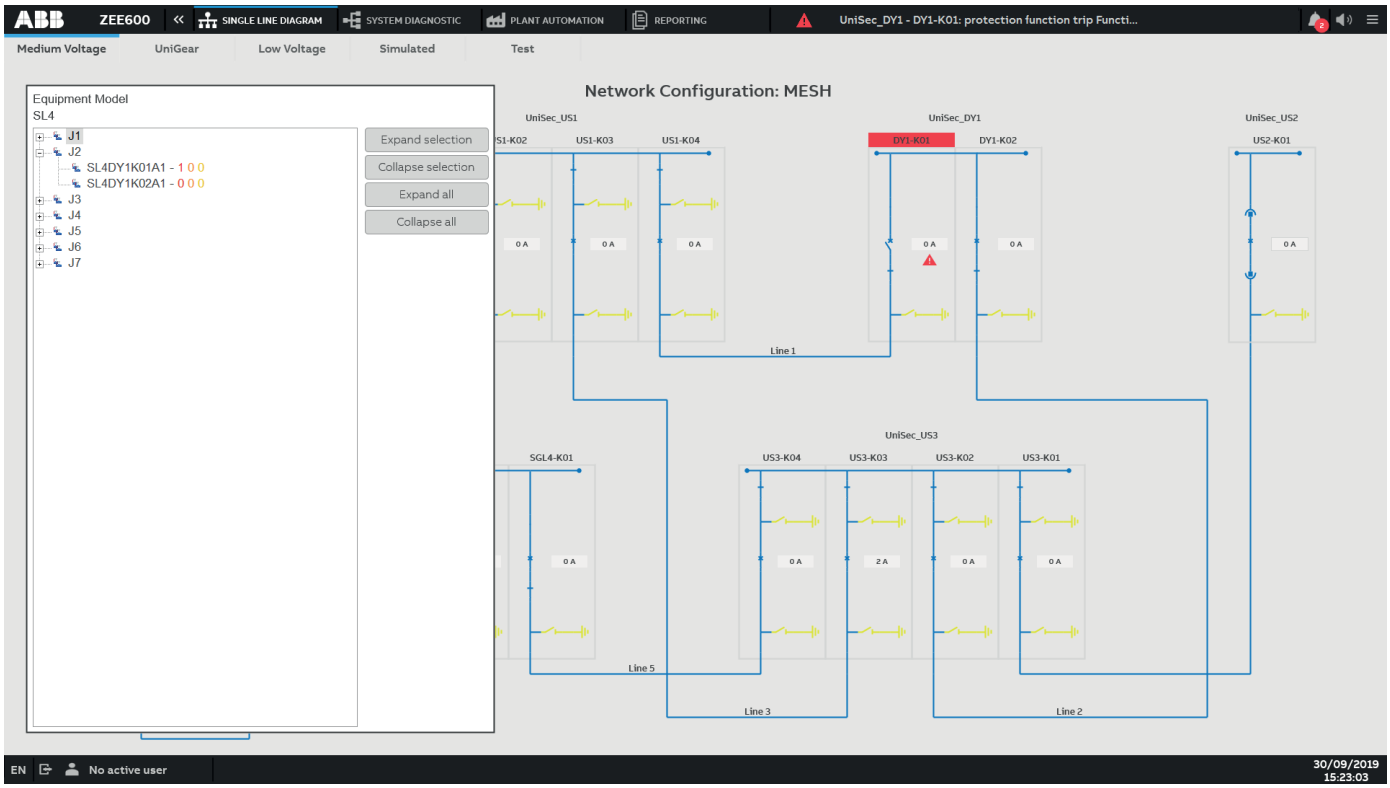


Figure 7. ZEE600 aggregated alarming and equipment modeling

The ZEE600 equipment modeling recreates the equipment structure in ZEE600 Editor. The upper levels enable details from the lower levels to be classified correctly and to be linked with each other. The lower levels refer to specific equipment and can be compiled for process control and process monitoring. Since the substation object hierarchy is defined according to the IEC 61850 standard and implemented by engineering tools such as PCM600, the ZEE600 equipment modeling feature can be used to
configure aggregated alarm handling without the need for alarm areas.

Automatic line coloring

The automatic line coloring or topology coloring feature allows the operator to have an immediate overview of the powered, unpowered, grounded and faulty parts of the electrical network depending on the power status of the lines. This feature increases awareness of critical operations and enables rapid error detection.

Different colors can be selected for representing different voltage levels being connected through a transformer. The statuses of the lines are influenced by the status of the circuit breakers. Undefined or faulty switches cause different line coloring.

The calculated topological model can also be used for command interlocking. The topology engineering is handled when constructing the SLD in ZEE600 Editor.

To allow screen-overlapping models, the entire topology design and configuration are always project-wide. Therefore, a single topological model is defined per project, which is used for the calculation of the circuit breaker or disconnector switch statuses and ultimately for the coloring of the lines and transformers.

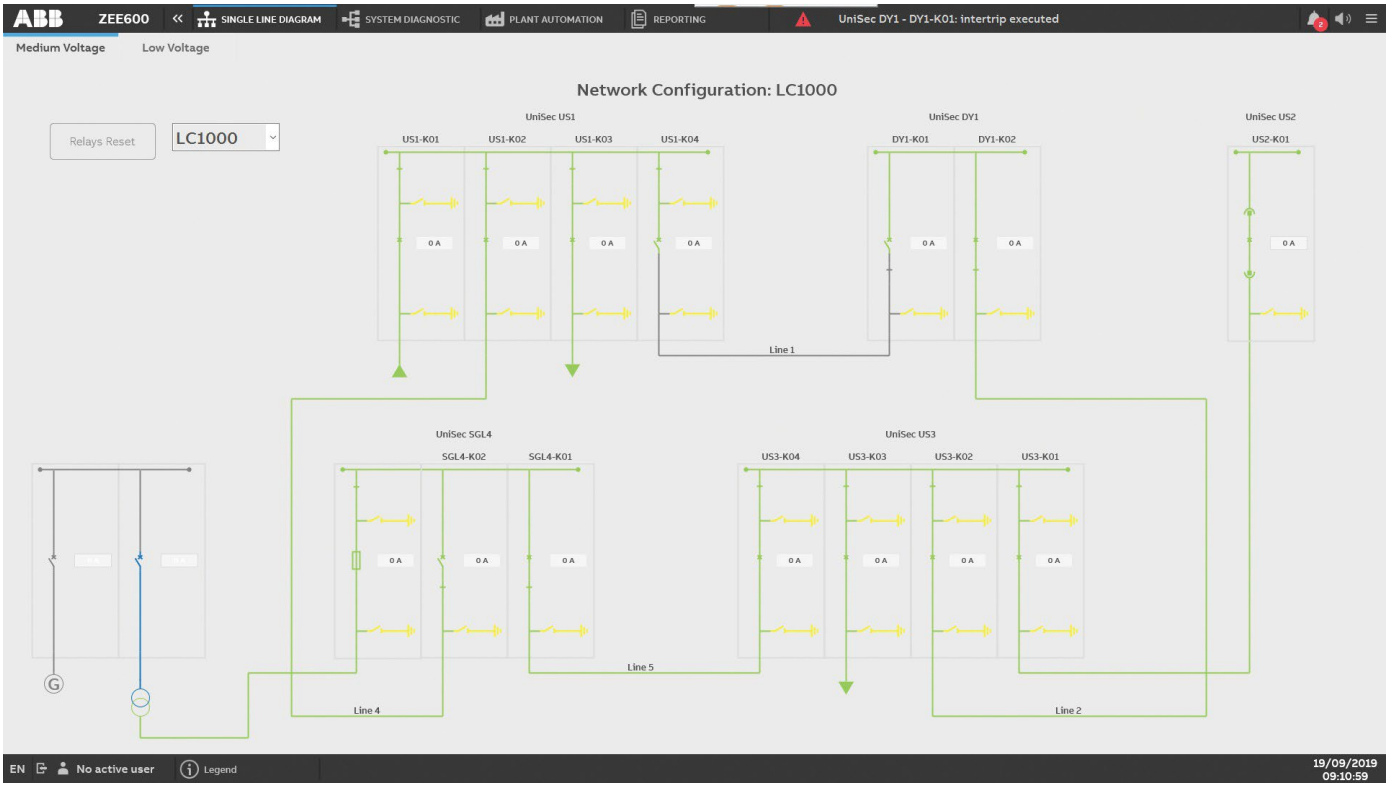


Figure 8. ZEE600 single-line diagram

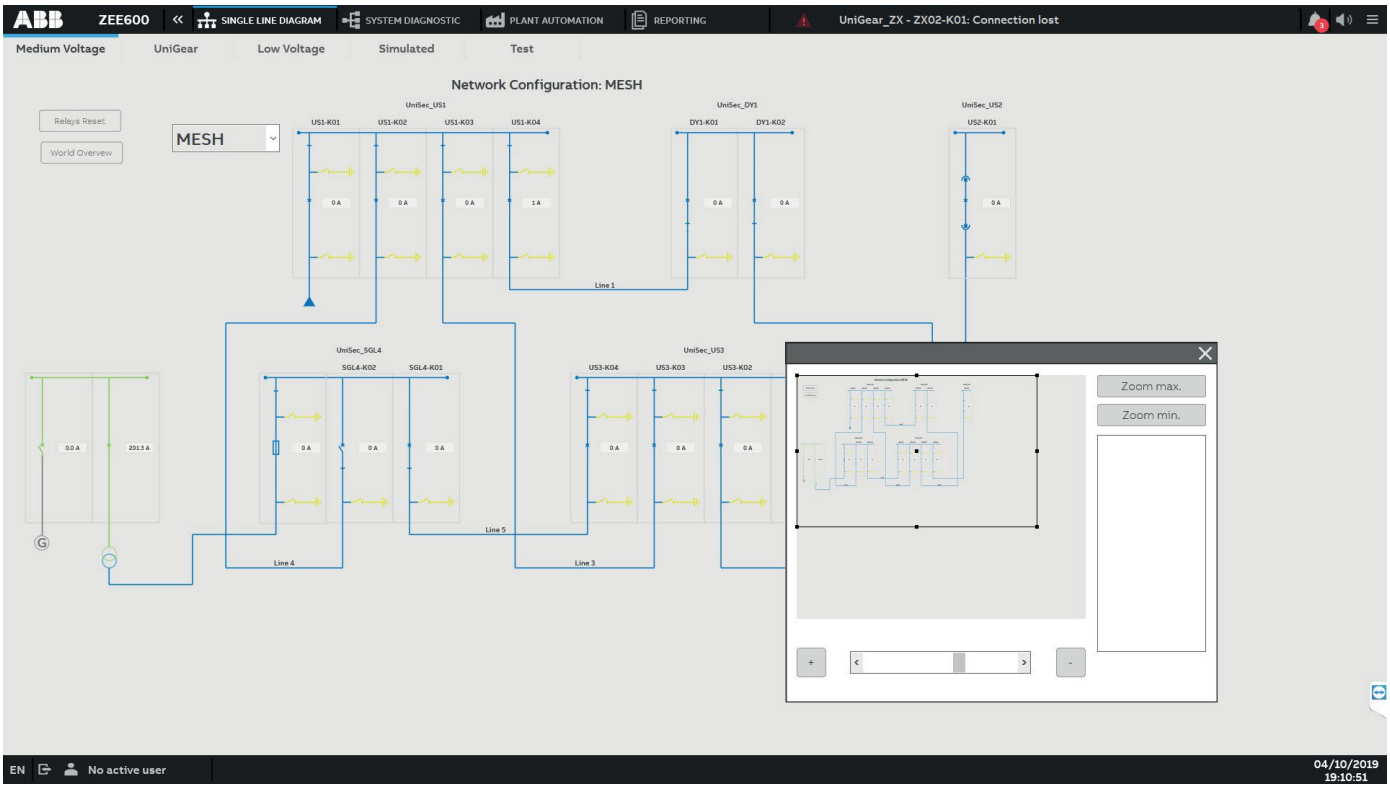


Figure 9. ZEE600 worldview

Worldview

The worldview functionality displays the entire power network including, for example, power sources, switching equipment and cable or line feeders. It is possible to zoom in and out on the power network components at any level of details providing the operator with system views and insights for an informed decision.

Functions such as zooming, scrolling, panning and decluttering of screen items are natively incorporated and can be activated with a mouse click.

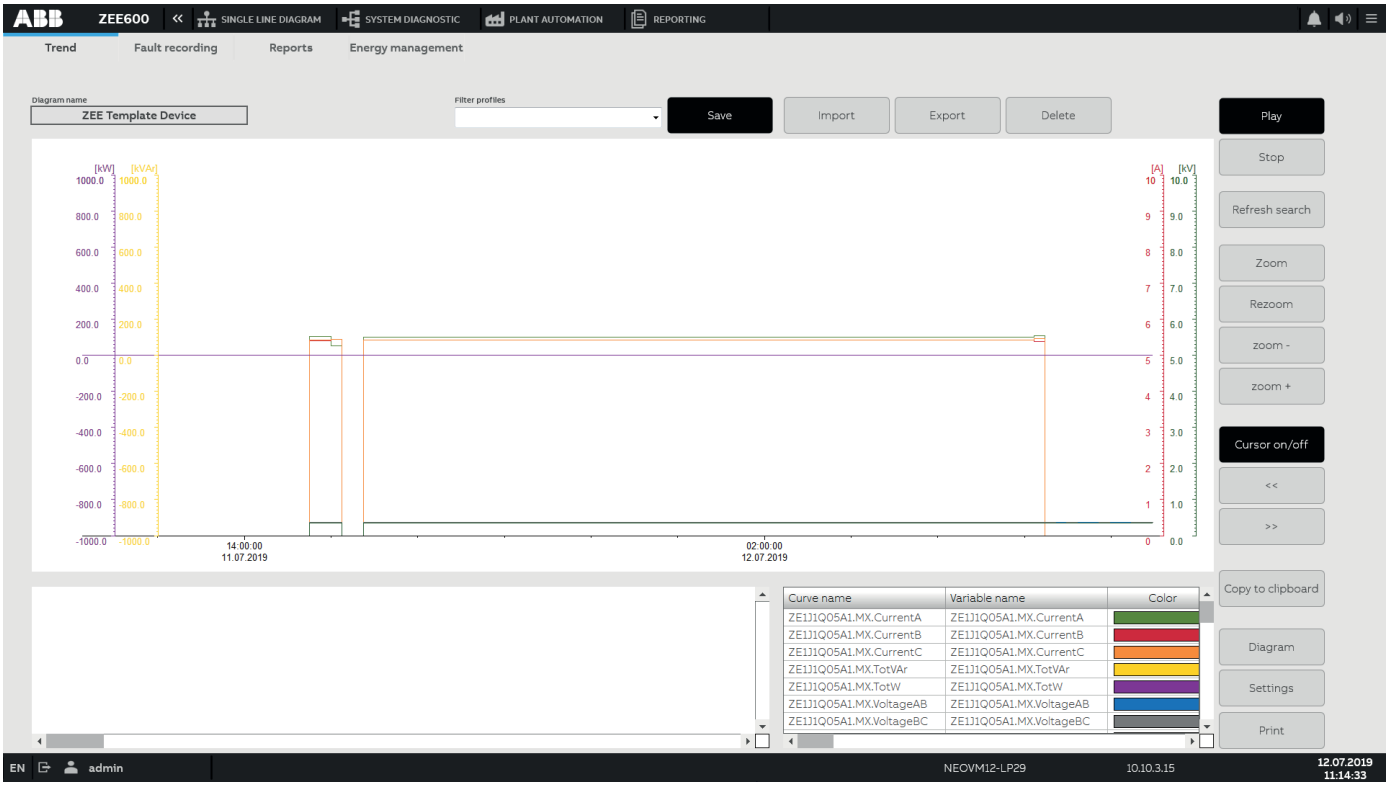


Figure 10. ZEE600 trending

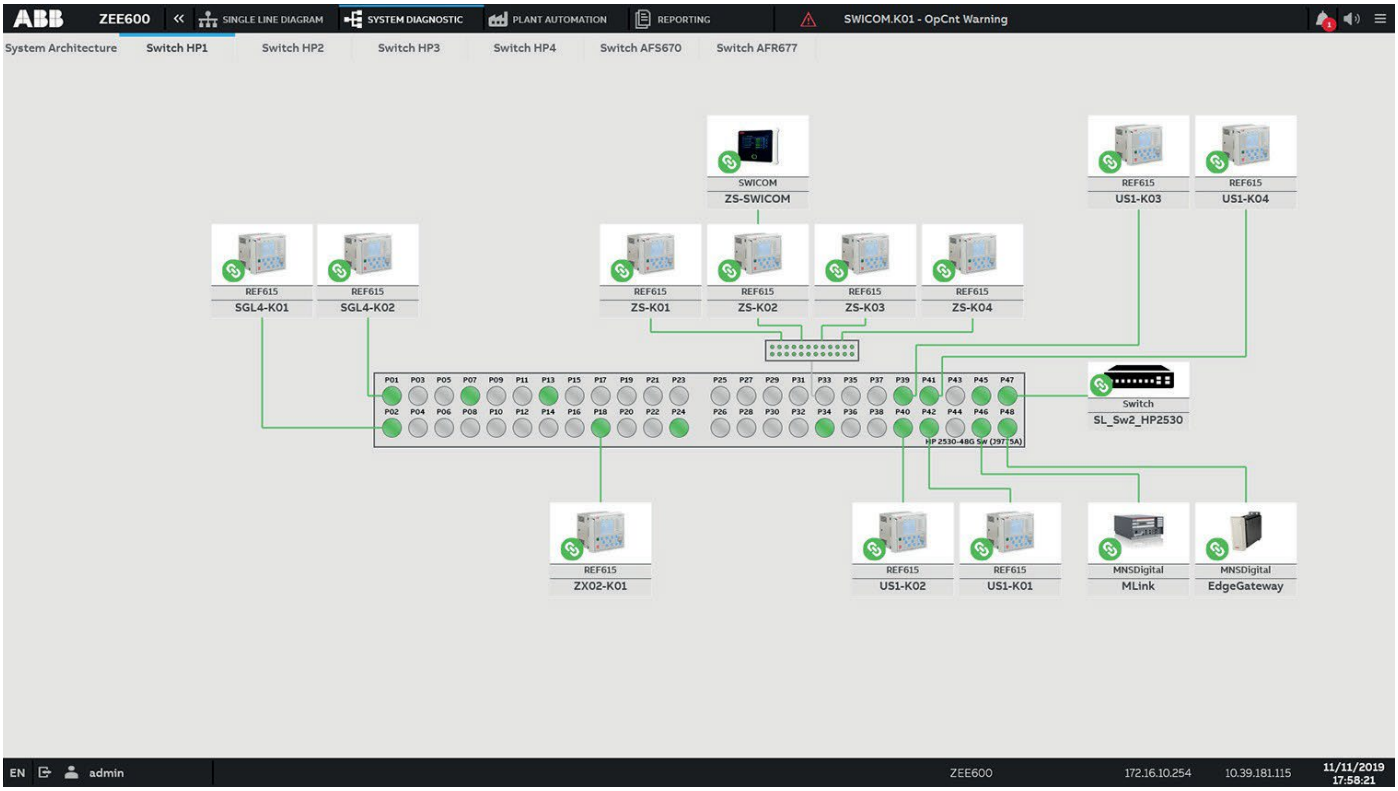


Figure 11. ZEE600 connectivity states

Trending

Extended Trend is used for representing process variables' online or historical values (from Historian) and calculated process variables in the form of curves. This makes it possible to read historical data at any point in time.

The scrolling feature provides a ruler and zoom function together with a trend analysis. It is also possible to zoom, browse, query and scale online values and values from archives.

Connectivity states

Using SNMP management in the Ethernet switch or the individual protocol's communication status feature, the communication network can be monitored on a real-time basis from ZEE600.

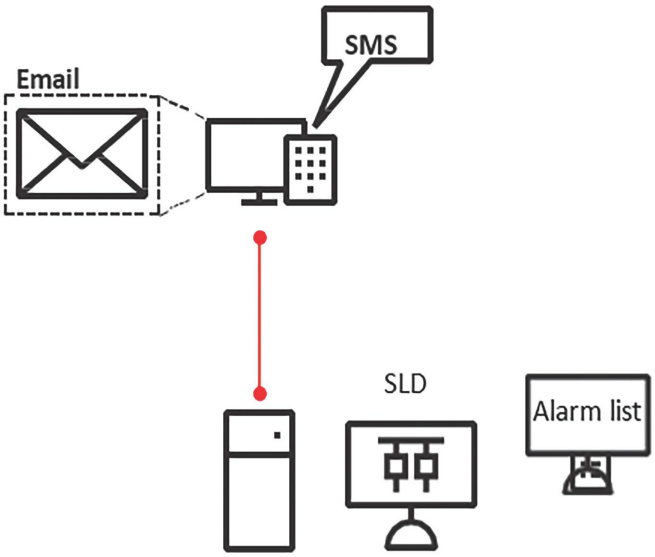


Figure 12. Message control

Message control (optional)

The message control feature ensures that alarms and messages can be automatically sent and acknowledged via email, SMS or voicemail, for example. The message sending is triggered with a function that can be linked to an event. The status of this transmission is logged in the chronological event list.

Message control also enables secure access to current power network data anytime and anywhere making it easier to respond quickly to faults or incidents. For more information, see Selection and ordering data.

Web Server (optional)

Web Server offers another option to access the electrification or substation process, or operations and it provides an optimal solution for Web-based desktop clients and mobile devices based on iOS, Android or Windows technologies (Web browsers)

Web Server brings projects to the intranet or Internet. Without any additional engineering, the projects are available for visualization via Web Client or as HTML5 applications for the Web engine. All screens, users, password administration and so on are available online with the same look and feel as well as functionality.

Any project changes made on Web Server are instantly executed in Runtime and available to all users (desktop and mobile or tablet-based Web clients) so that the project team can work on the project from anywhere.

The basic Web Server only acts as a viewer, that is, no operations are possible except for screen switching and logging in or out. Several features are supported.

- Data packet forwarding from the primary server to Web Client via Web Server
- License handling
- Installation on a separate computer (than the project server), such as in a DMZ
- Network encryption
- HTTP tunneling
- Multi-client support, depending on the license

Note that projects that are operated using the web client may have certain limitations. All screen types are not supported with the HTML5 web engine. Functionalities such as command processing and project simulation are not supported using the web client. For more details, see the related documentation.

Web Server Pro has the same functionality as the basic Web Server except that it allows active user actions with ZEE600. For more information, see Selection and ordering data.

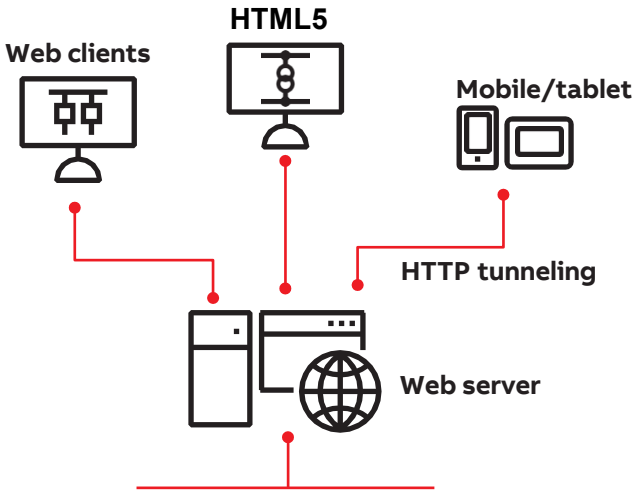


Figure 13. Web Server

6. Process control

Features

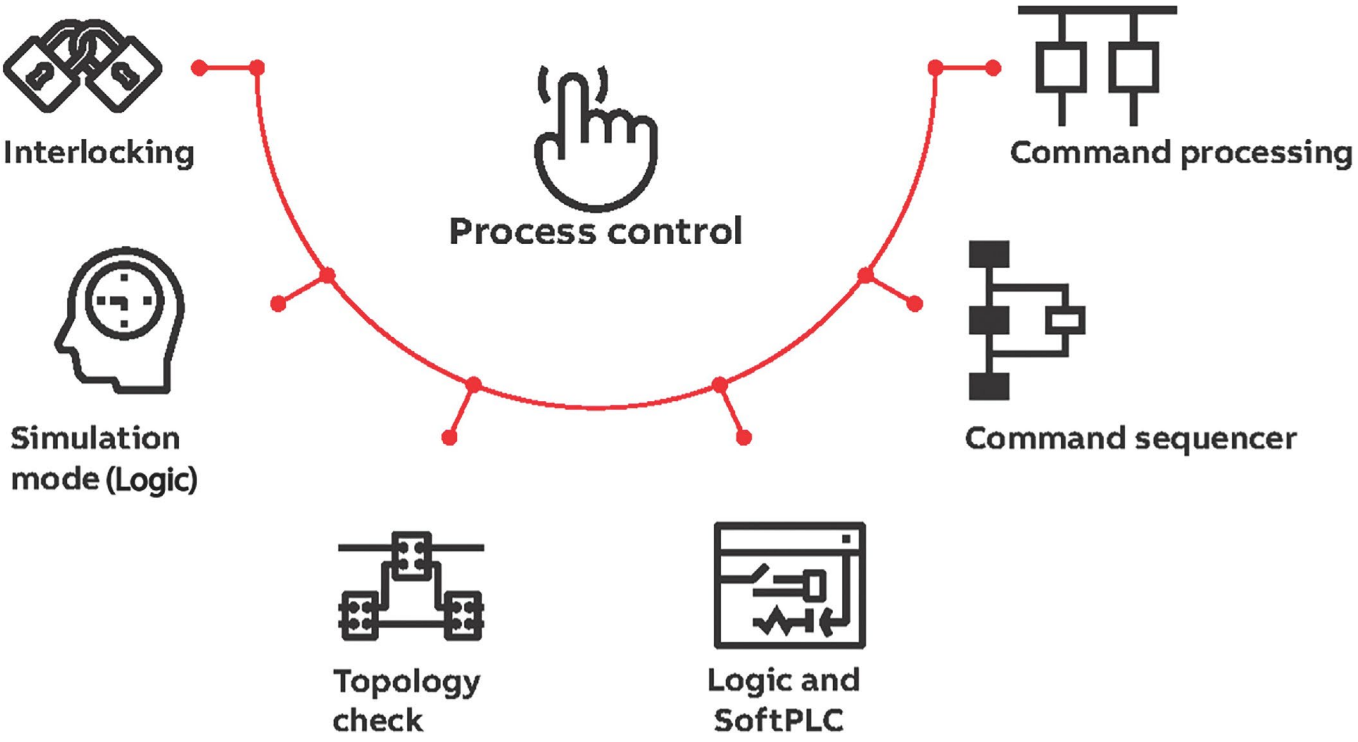


Figure 14. Process control with ZEE600

Command processing

To ensure secure switching operations, ZEE600 supports error-proof command processing (integrating select- before-operate for IEC 61850, DNP3 and IEC 60870), circuit breaker tripping detection, interlocking and switch locking (lockout-tagout).

In addition to single-stage commands, ZEE600 also processes secure commands. A two-stage command as well as two-hand commands are supported including the protocol specific features such as select and execute (IEC 60870) or select-before-operate (IEC 61850). The two-hand operation or command requires the use of an additional button for unlocking commands when making safety critical actions. This operation ensures that accidental touches do not result in false switching operations or in value changes.

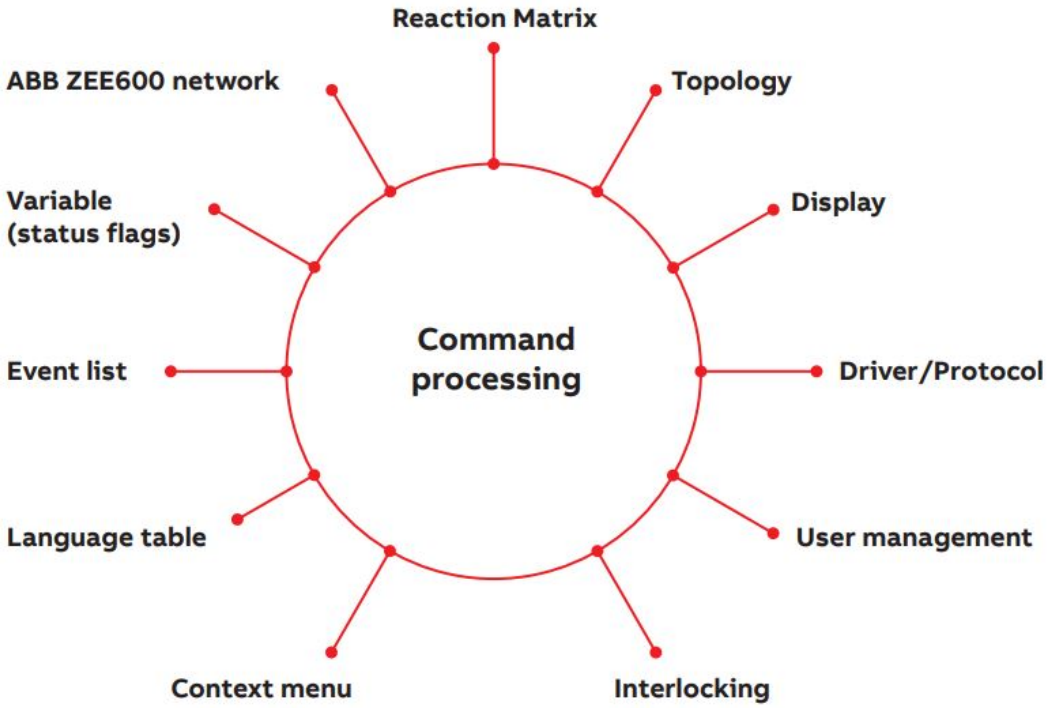


Figure 15. Command processing

Interlocking and topology check

To prevent operations from creating any hazardous conditions to the plant personnel or equipment, ZEE600 allows the definition of interlockings for each command. The interlocking logic can be calculated using the switch status or by considering the topological status of the power network. The command processing function offers additional features such as circuit-breaker tripping detection, switch locking and tag management.

Interlockings control the access to certain substation objects (such as circuit breakers) in ZEE600 using variables.

Operation can be blocked or released depending on the variables. Depending on process statuses, operations can be activated or deactivated. It is also possible to create and use various interlockings within one project. In each interlocking, several parallel interlocking conditions are possible.

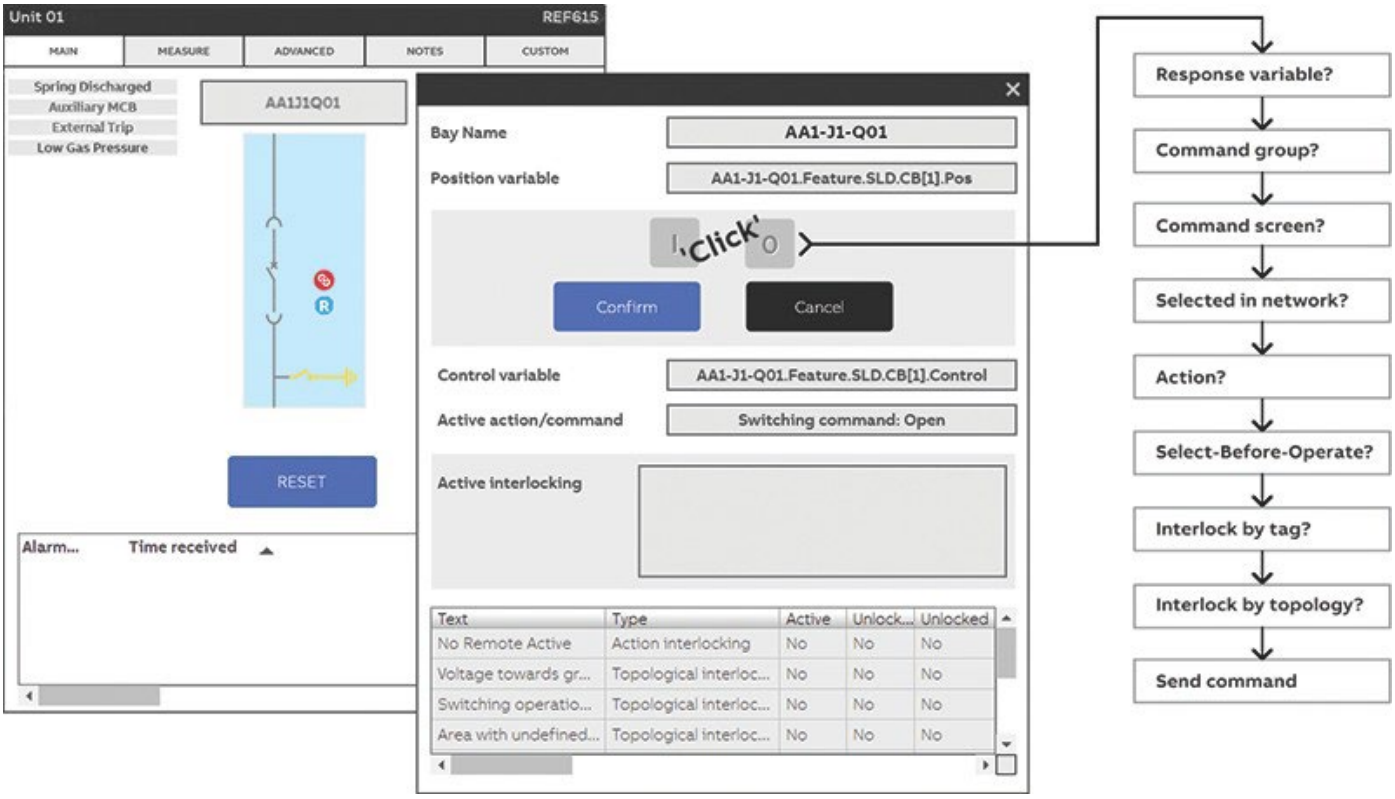


Figure 16. Secure command processing (interlocking and topology check)

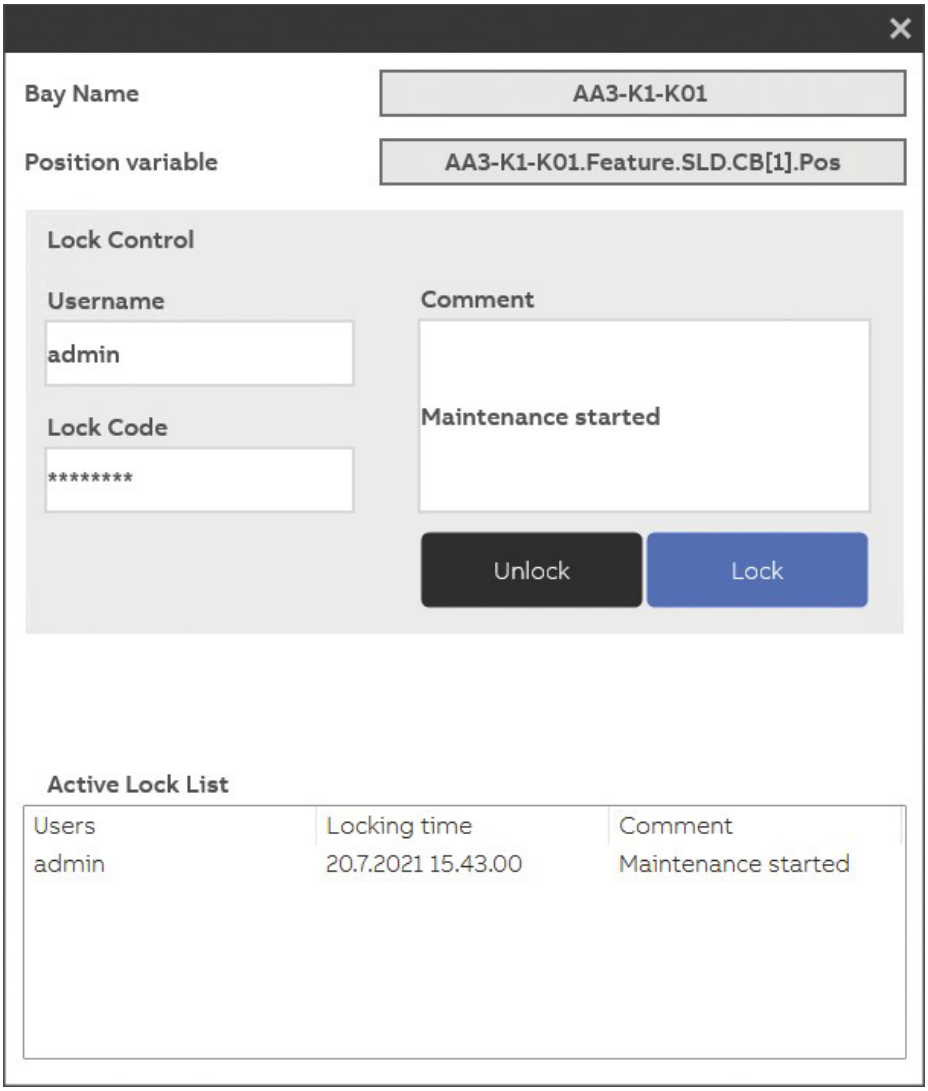


Figure 17. Bay lockout/tagout (command processing)

Logic and SoftPLC

ZEE600 comes with a built-in IEC 61131-3 programming environment: Logic (workbench) and associated Runtime (SoftPLC). The ZEE600 Editor, Runtime and Logic use a shared database and thereby have a consistent integration. Variables can be generated and maintained in Editor and can be used in Logic.

With the Logic workbench, SoftPLC can be engineered and programmed in five defined programming languages as specified in the IEC 61131-3 standard.

Logic Runtime serves as SoftPLC for executing near-real time or non-real time applications, such as interlock checks or calculations, and communicating the calculated data with protection relays, IO devices and external systems using protocols such as IEC 61850 GOOSE and IEC 60870-5-101/104.

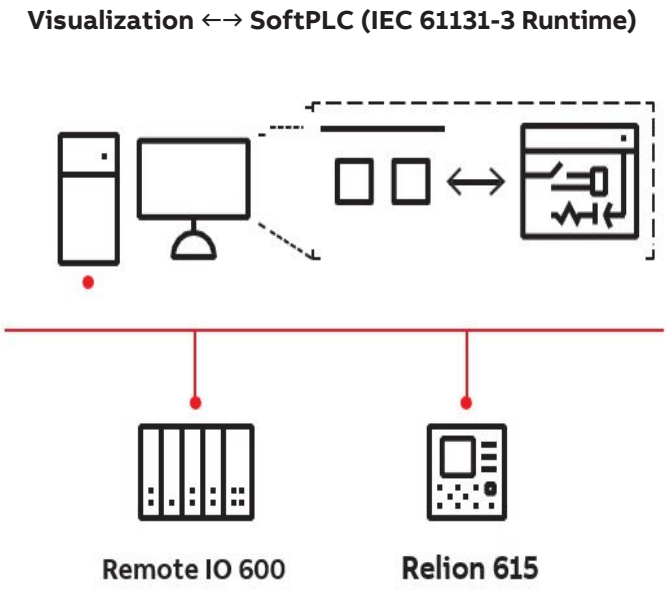


Figure 18. ZEE600 SoftPLC

When working together with ZEE600 process visualization, monitoring and control (HMI), the same variables associated with the main communication drivers are also used for Logic. This not only helps to prevent errors but also speeds and simplifies engineering and maintenance.

Note that although SoftPLC can work in a standalone mode (independent of ZEE600 HMI/ECS main application) acquiring and delivering its data directly using its own native/ direct drivers in real-time and supporting operational redundancy, it is recommended that for critical real-time applications, such as automatic bus transfer or sequence operations, the logic be implemented using protection relays or a dedicated PLC in electrification and substation solutions in projects deploying ZEE600.

Simulation using Logic
All variables can be displayed and their values can be simulated on the screen even before they are connected to the process. Therefore, the test operations can be initiated without setting up the entire automation system.

When an operator or system engineer wants to test the power network behavior due to a change in the status of a switch (circuit breaker or disconnector), they can take a process image and run a workstation in simulation mode enabling the handling of all switches without affecting the real process.

The simulation results can be seen by the coloring of the lines using the topological model calculation in the background. Additionally, it is possible to design a training simulator with a workstation.

To eliminate errors and risks, Logic can be used for simulation testing emulating SoftPLC Runtime before deployment in the field and in the process.

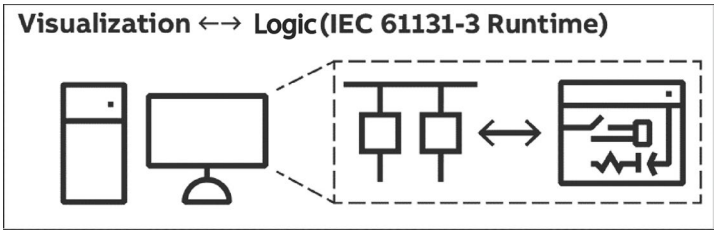


Figure 19. ZEE600 simulation based on Logic

The process behavior is defined by using Logic. The command sequences can be run in the simulation mode, the sequence can be recorded by performing the switching commands using the SLD and the results can be verified. After testing, the sequences can be passed on to the workstations for active use.

Command Sequencer (optional)
ZEE600 offers a Command Sequencer tool for user- friendly command processing in a substation. The substation's operational command sequences can be configured, edited, tested and executed using a graphical editor where the steps of a command sequence can be arranged consecutively without the need of SoftPLC programming. Even complex sequences with parallel executions or conditional actions can be arranged by dragging the objects in Editor. Visualization of these sequences and, if needed, user interventions are also supported. All common protocols, such as IEC 61850, DNP3 or Modbus, are supported for communication with the protection relays.

This functionality automates the command processing and helps to save time and costs, avoid errors, improve efficiency and flexibility. For more information, see Selection and ordering data.

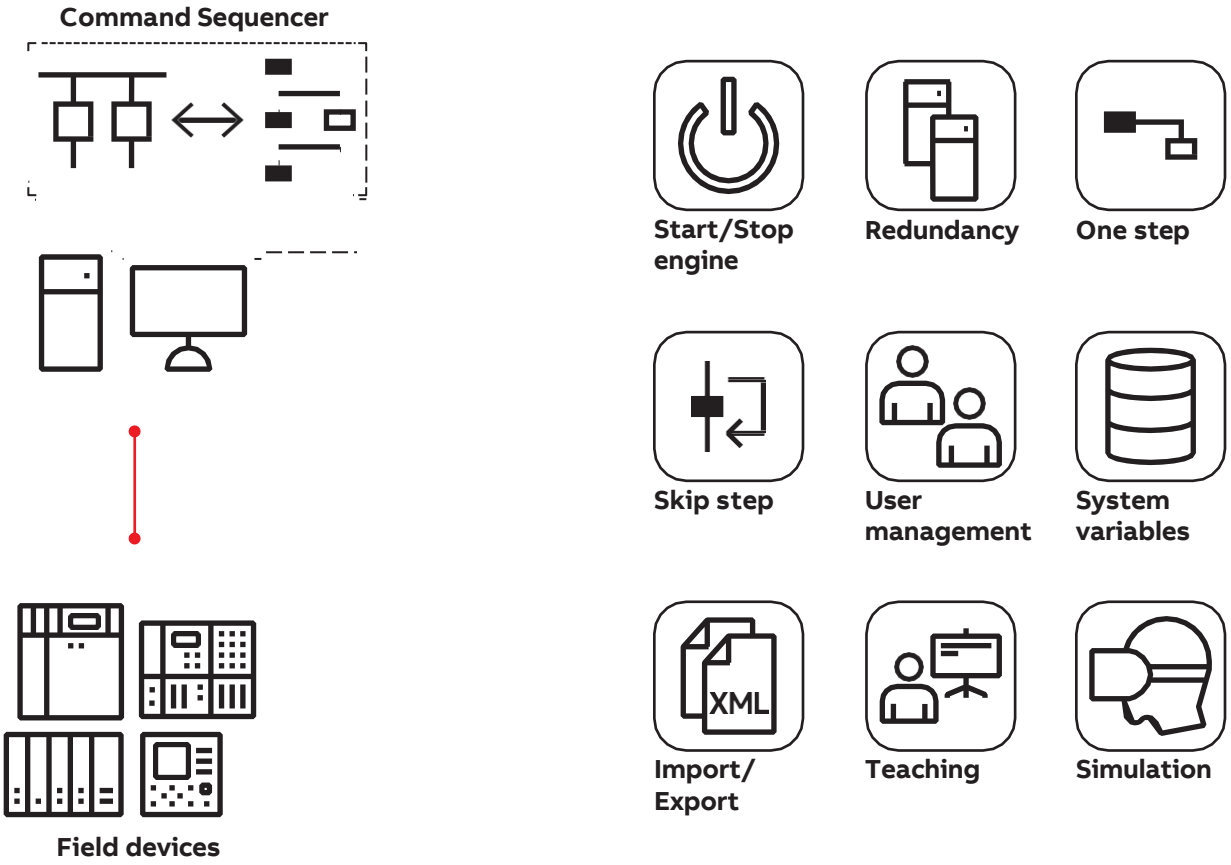


Figure 20. ZEE600 Command Sequencer

Load management (optional)

This functionality is meant for energy supply management in small and medium-sized utility, industrial or infrastructure segments, whose energy supply is based on special contracts for power consumption.

This module provides support in two cases.

- Short-term forecast to avoid load peaks and automate load shedding through downstream devices such as Relion PML630, AC800M, AC5000 PLCs and Relion protection relays
- Optimization of energy consumption in a billing period

7. Process monitoring

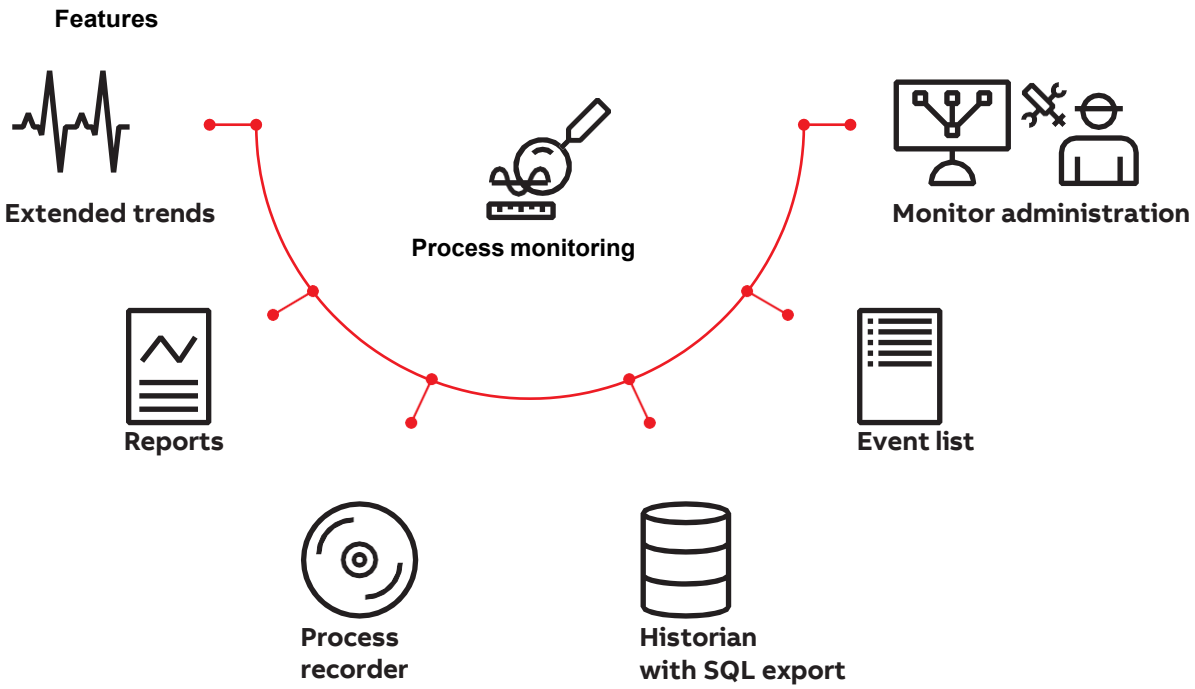


Figure 21. Process monitoring with ZEE600

Event list

The chronological event list keeps an automatic and chronological account of all operations and displays all process, system and predefined messages. Both system events and user inputs can be logged in the chronological event list.

- alarm acknowledgment
- alarm deletion
- setting values
- data archival
- user or network actions and so on

All entries are made in the language in which Runtime is executed. The event list display can be adapted or filtered for contextual (for example, bay or substation level) analysis and reports without additional programming.

The event list audit trail benefits from full redundancy compatibility and simple administration. The event list is stored in the system in a binary format to prevent content tampering. Further, the operator can add comments on the list entries for efficient traceability.

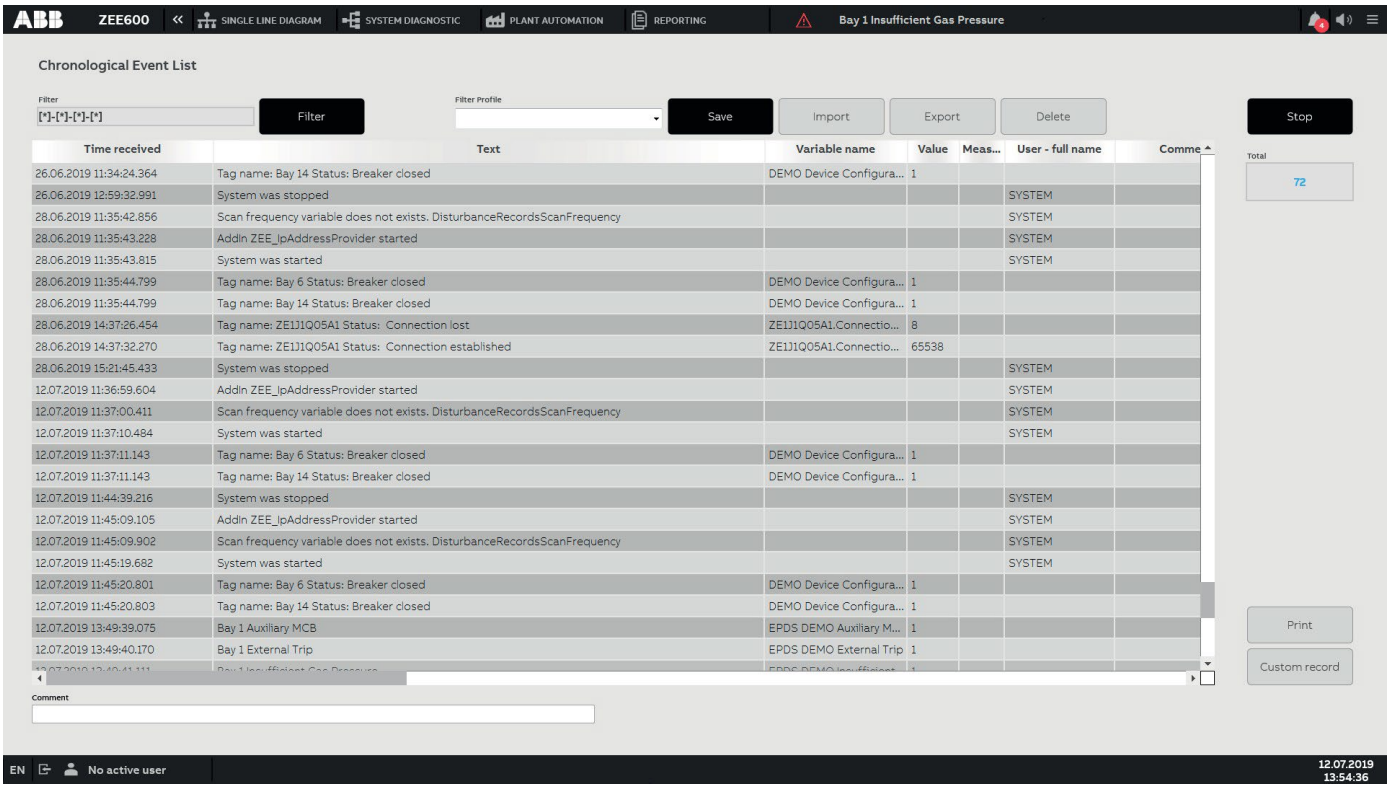


Figure 22. ZEE600 chronological event list

Historian with SQL export

Historian enables quick and easy archive engineering. It saves process data and supports archived data export. Therefore, data is available for subsequent processing and evaluation even externally to ZEE600.

Historian has several features.

- Cascaded data aggregation
- Lot recording
- RDA archiving
- SQL evacuation
- User-defined start and stop of recording
- Function execution when starting and closing the archive
- Automatic data evacuation
- Automatic creation of substitute archives
- Data export via a function (for example, to XML)
- Manual revision of archive data

Historian allows easy data storage within a short time including up to several thousand changes per second. Three archiving or recording methods are available: cyclic, event-triggered or on-change data logging.

Process data is recorded on a lasting basis and archived without any numerical limitation. An archive can contain any number of type-independent variables: binary variables, numerical variables or string variables. Each set of archived data has its value, status and time stamp in milliseconds through real-time data acquisition (RDA).

The archive files are saved in binary data format (ARX) to enable easy synchronization with redundant systems and to facilitate easy administration while preventing external manipulation of data. The data can be sorted at any time and exported into any other format for analysis such as CSV, dBase, XML or in an SQL database. When saving into an SQL database, the data is stored in clear text and is still readable from Runtime.

The saving cycles for the created archives are user-defined. To prevent an archive from becoming very large, aggregated archives can also be created. The number of archive files that can be stored is limited to 65535. For example, for a storage duration of 5 hours (300 minutes) with a cycle of 15 minutes, 20 archive files can be stored.

Evacuation of the archived files can also be configured. The storage duration can be defined in hours, days, months or years. The archived data can be evaluated and further processed with Extended Trend, Report Generator or Report Viewer.

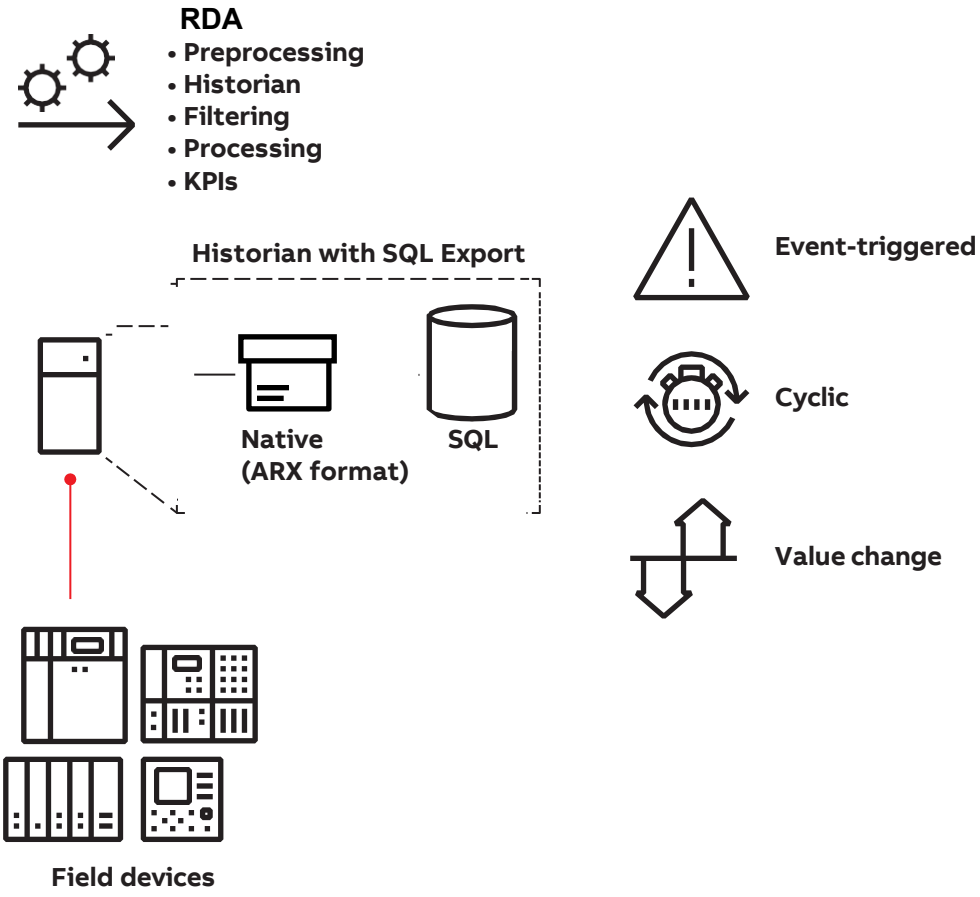


Figure 23. ZEE600 SQL interface and export

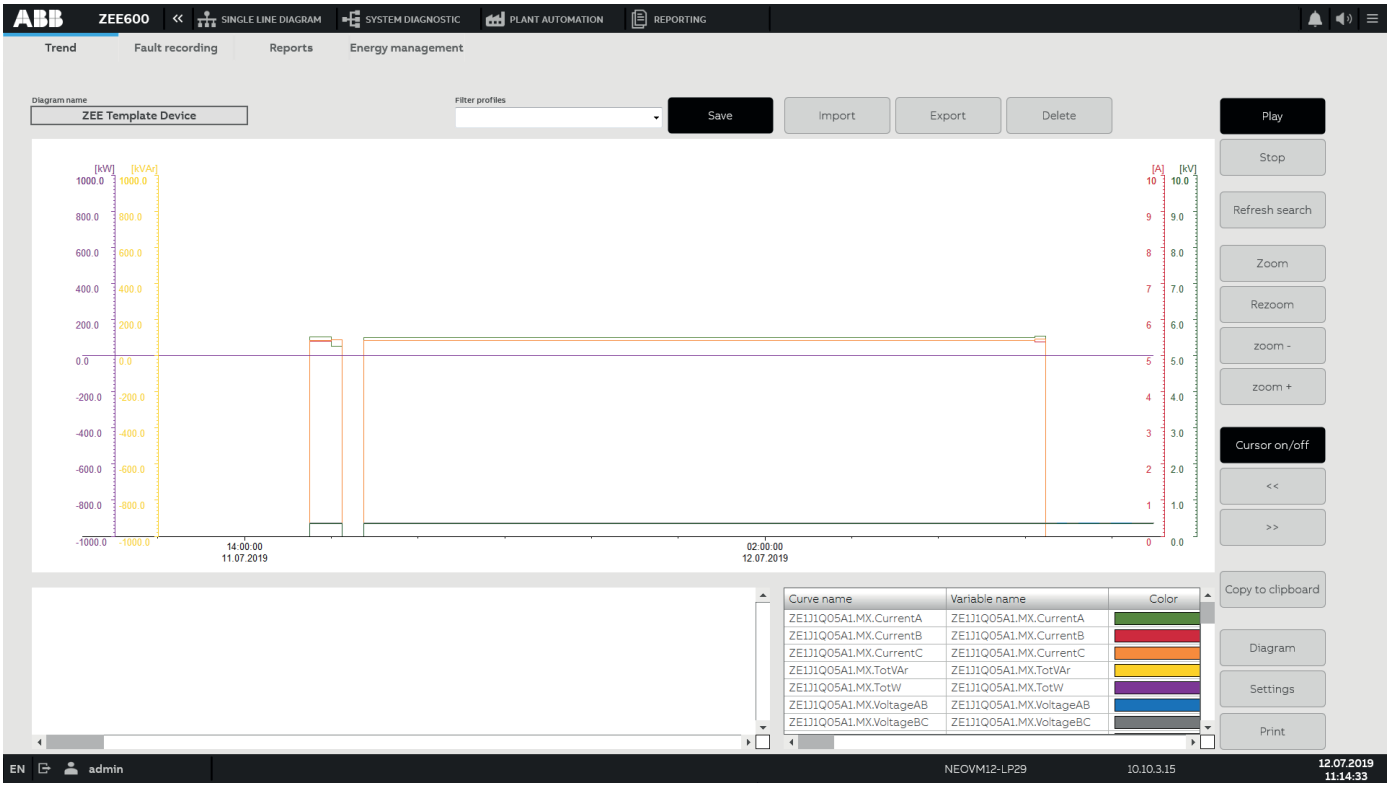


Figure 24. ZEE600 extended trends

Extended trends
With extended trends, the electrification process data can be compared and analyzed in detail.

- Free curve settings
- Linear or logarithmic display
- Free zooming and scrolling
- Transparency levels for curve filling
- Configurable axes
- Grid display
- Interpolated display
- Surface display also for non-equidistant values

Extended Trend is used for the representation of online and archived values of process variables and derived process variables in the form of curves. It makes it possible to re-read historic data. Trends can be copied as a vector graphic and printed locally or in the network.

Reports
ZEE600's integrated reporting functionality serves as documentation, evaluation and presentation (chart or tables) forms of the RDA process and archived data. The reporting feature offers various reporting options from simple KPIs and dashboards to complex calculations using archived data without the need of any additional software.

- Full graphical reporting based on Microsoft reporting technology and Report Definition Language (RDL) files
- Simple report displays and flexible usage
- Individual reports with graphic alarm statistics
- Real-time production analyses or KPIs
- Automatic reporting with individually compiled KPIs
- Reporting directly in Runtime

The reporting functionality is implemented by Report Generator and Report Viewer. Report Generator documents, evaluates and presents process data based on the RDA process and archived data. It works on a cell-orientated (spreadsheet) basis where each cell can be assigned certain functions and formats. Report Viewer can be used to display RDL reports of archive, alarm message list and chronological event list data as well as online values. Two historical time ranges can be compared using two configurable time ranges.

With extended trends and the reporting feature, a relationship can be established between energy usage data and production output. When used in conjunction with energy tariffs, it is possible to analyze the data against KPIs such as energy costs per unit produced.

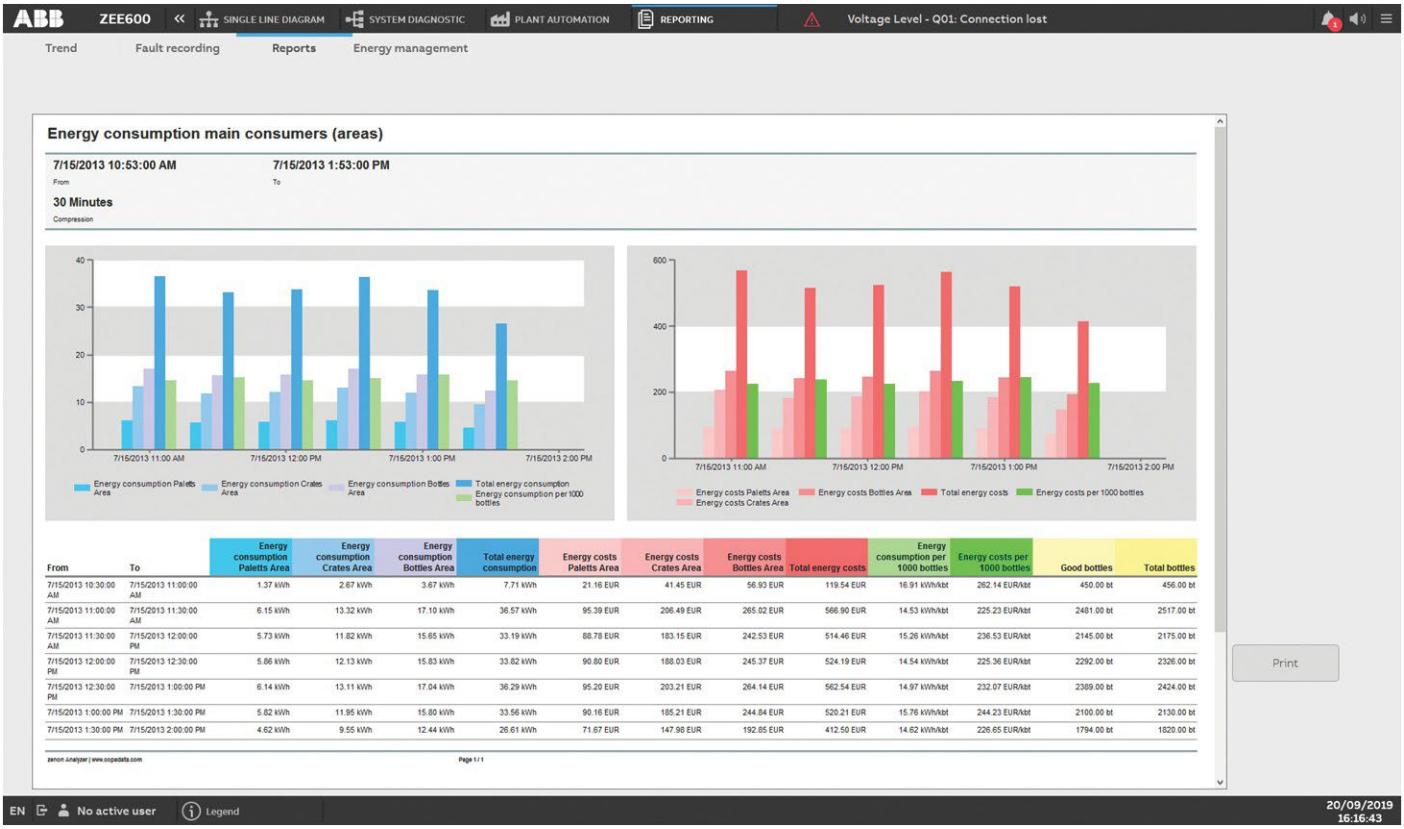
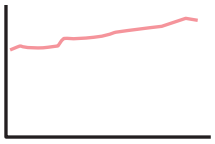
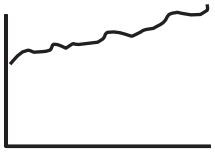


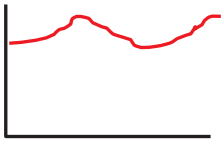
Figure 25. ZEE600 reports



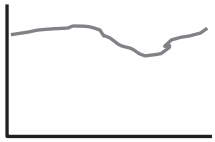
Energy usage



Production output



Costs per unit produced



Energy costs

Figure 26. ZEE600 reports coverage

Process recorder (optional)

The process recorder functionality offers the possibility to continuously record process data during productive Runtime. The recorded data can be played back using a project simulation client to visualize and analyze the errors that may have occurred in the past. The time and time period of this playback can be configured.

Process recorder uses reporting and Historian. Recording is carried out in the event of value changes, limit violations and so on. The process recorder feature can be used together with the disturbance recorder files from multiple protection relays to study the power network's behavior after a fault condition and to perform a comprehensive post-fault analysis.

When combined with the alarm message list and the chronological event list, the process recorder increases the users' visibility and decreases the response time to errors. The process recorder functionality can also be used for training and simulation. It also supports redundancy configuration. For more information, see Selection and ordering data.

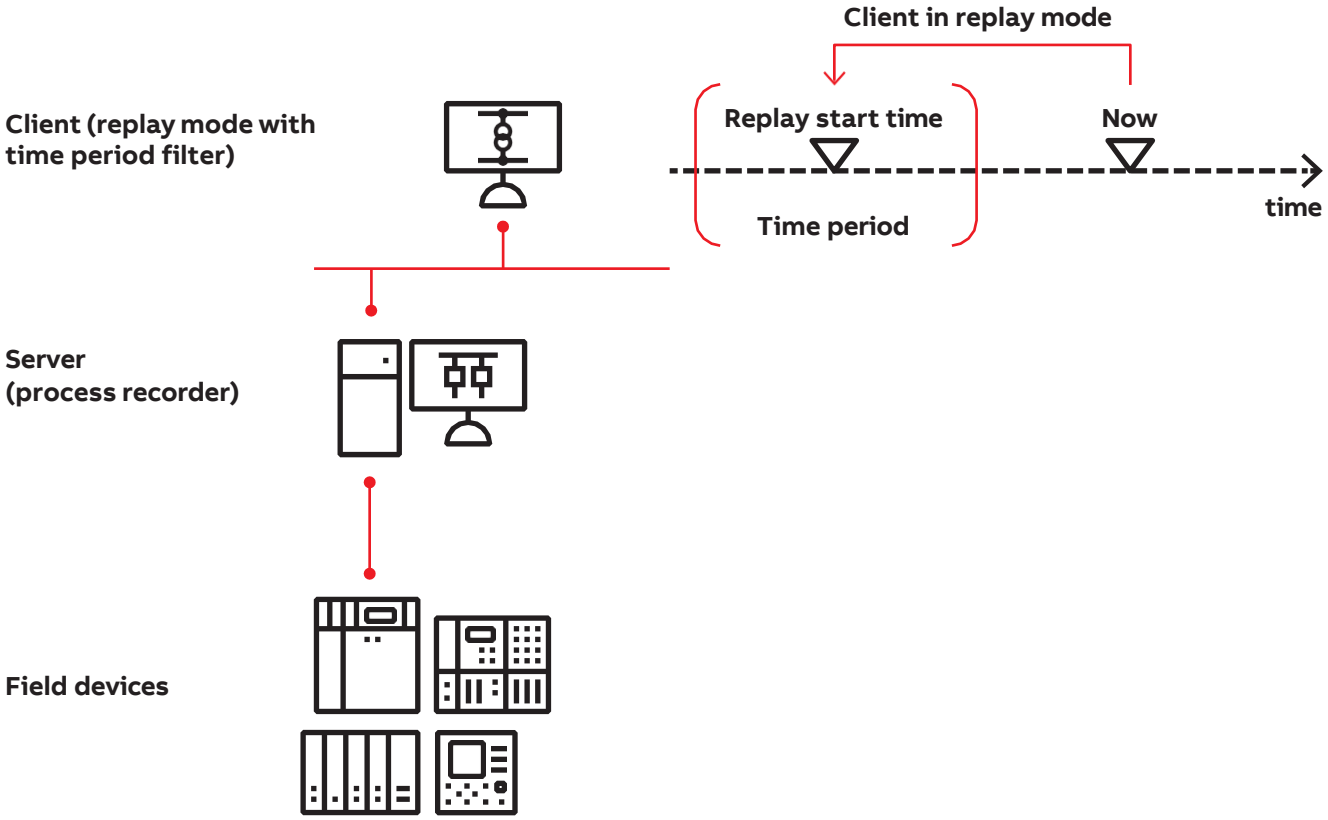


Figure 27. ZEE600 process recorder

Monitor administration

Projects for single or multiple monitors can be easily configured with the monitor administration feature. The project screens can be allocated to match multiple monitors. Also, multi-monitor projects can be displayed on a single-monitor system without additional engineering. Monitor administration is configured and administered separately in Editor for each project.

Monitor administration has three tasks.

- Mixed operation of single-monitor and multi-monitor systems. For example, in a project with three monitors, two can be used as clients in the substation control room and the third as the client on a maintenance engineer's laptop computer.
- Free assignment of a screen output on any monitor and changing of the assignment of a screen to a monitor in Runtime.
- Resolution adjustment by inclusion of computers with different resolutions in one project.

8. Secure access and operation

Features

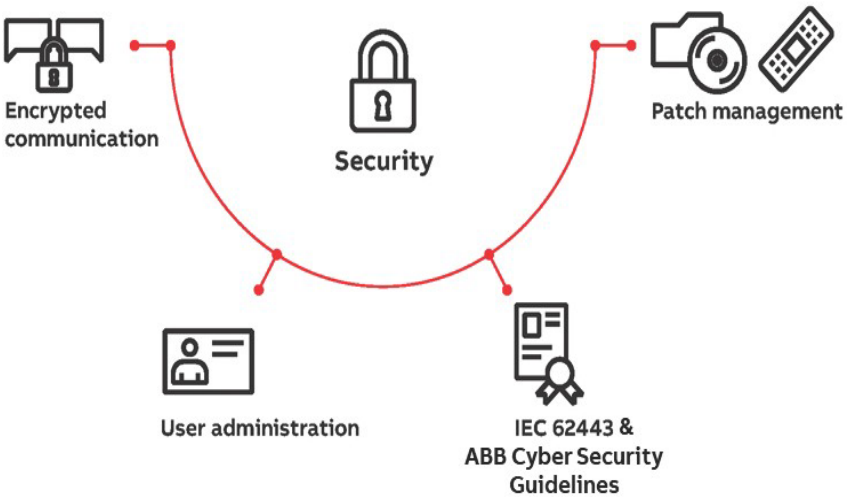


Figure 28. Operational security with ZEE600

User administration

The role-based user administration feature protects against cybersecurity threats. Up to 128 different access levels can be defined in Editor and Runtime in Active Directory (optional) without any limit on the number of users. The access levels can be defined for each user depending on the role requirements. Changes to Runtime can be synchronized with Editor remotely in real time.

Different users have different operating rights (authorization levels and function authorizations) and the rights are issued regardless of user types (normal user, power user and administrator). Only an administrator can create new users, unblock users, or deactivate users.

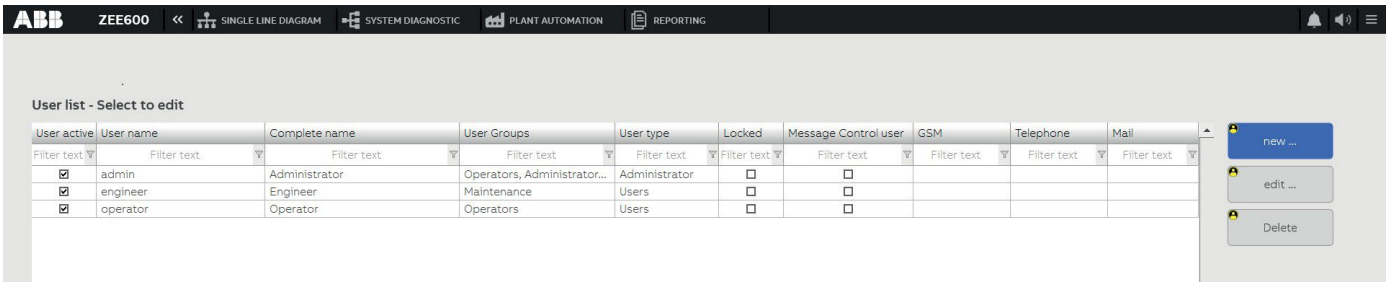


Figure 29. ZEE600 user administration

Built-in security features

The core of ZEE600 is developed in conformance to the ABB Minimum Cybersecurity Requirements for Products and in line with the IEC 62443 standard for Industrial Network and System Security. Windows OS compatibility testing and certification is a continuing process and consequently, ZEE600 also complies with all the latest Microsoft® security standards such as the Active Directory services.

Combined with sophisticated security settings, ZEE600 projects are protected from data loss or unauthorized access. Additionally, ZEE600 is a compiled system, meaning only a few binary files reside on the panel or with Runtime, so a Runtime database is not needed. Therefore, it is almost impossible to tamper with any of the ZEE600 files.

Other security measures include configurable communication ports and a 128-bit encryption for network communication. Editor also comes with file signatures and a seamless change history, which enables complete documentation of the engineering phase. All changes to the project such as a change, deletion, creation and so on can be logged.

Because ZEE600 can be connected to an enterprise system or IT infrastructure, cybersecurity threats need to be handled in a proactive manner. This implies that security gaps need to be detected and closed without impacting the electrification or substation operations.

Patch management feature ensures that updates to the ZEE600 core system can be done without a server system shutdown. It only needs a restart of Runtime.

Additionally, Web Server supports HTTP tunneling and network encryption between itself and Web clients.

9. ABB electrification libraries

Features

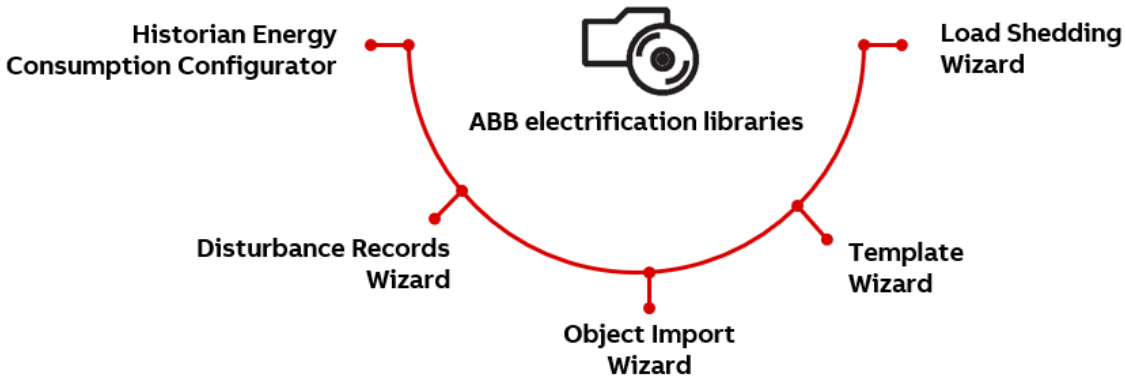


Figure 30. ABB electrification libraries

The ABB electrification libraries are built into ZEE600 to adapt it closely to the ABB standards. These adaptations influence ZEE600 engineering and operational aspects.

Engineering using ZEE600 wizards

As a part of the ZEE600 setup wizard installation, five wizards are installed to increase engineering efficiency. The wizards are part of the ZEE600-LIB license.

- Template Wizard
- Wizard manager
  - Object Import Wizard
  - Disturbance Records Wizard
  - Historian Energy Consumption Configurator
  - Load Shedding Wizard

With ZEE600 Template Wizard all necessary settings are made to an empty project and all necessary elements are imported to create an ZEE600-compatible project within Editor. Template Wizard influences the selected project (and sub-libraries or packages, if applicable), language setting (CN, RU, PT, FR, IT, EN, DE), definition of number of SLDs, system diagnostic and plant automation pages (maximum 12 for each category) as well as customer logo and information.

Object Import Wizard is used to import devices which are supported by the ZEE600 library (Relion RE_611, Relion RE_615, Relion RE_620, Relion RE_630, Relion REX640, SSC600, Emax2, SWICOM and the M2M and M4M meters). Except for the SWICOM/M2M/M4M device types (Modbus communication), all other device types are based on IEC 61850 communication.

Object Import Wizard is designed to maximize automation of engineering steps for IEC 61850 devices. For each system configuration (SCD), it is possible to select the device

instance and type, the RCB data to be brought into the ZEE600 IEC 61850 client, object control enabling. It is also possible to make bay or feeder type and voltage level definitions, communication definitions, measurement window selection, alarm and event treatment and appearance settings, and define bay dialog box alarms, trends and measurement limits.

The selections can be stored as a template and reused for other instances of the same device type. Only a few steps, such as a new device name, bay description and communication settings, need to be defined for each new device. Once a device configuration is completed, all HMI engineering steps for that bay or feeder are completed automatically: driver settings (including RCBs), variable creation, equipment model configuration, Historian trends, functions for switching and set point command operations linked to bay displays, bay symbols and SLD, and switchboard wide SLD creation including automatic line coloring (ALC) configuration.

Historian Energy Consumption Configurator Wizard can be used to fill an existing archive with the energy consumption values of up to 100 devices with up to four measuring points per device.

Disturbance record files from the protection relays are automatically downloaded during the runtime of the visualization if this has been enabled by Disturbance Records Wizard in the specific project settings. The files can then be loaded into ABB Wavewin (COMTRADE Viewer).

Load shedding wizard helps the engineer creating user interface for load shedding management. This function works in combination with AC500 EAU libraries. (Refer: Power Management AC500 V3 and ZEE600 Compact Load-Shedding Solution, Application and Engineering Manual. Doc ID: 2NGA000633)

Operations using ZEE600

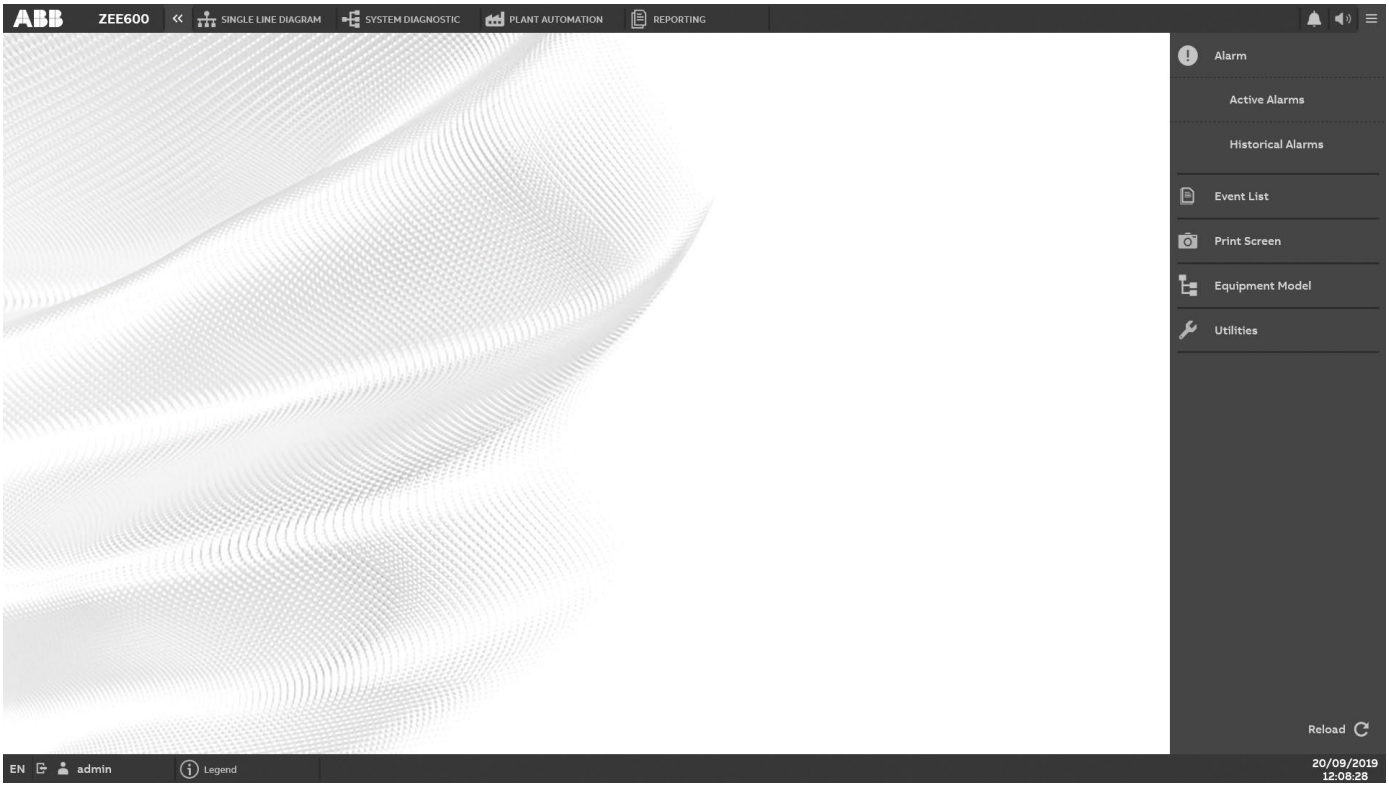


Figure 31. ZEE600 libraries: operation screen overview

The use and feel of ZEE600 is completely in accordance with ABB's latest user interface and experience guidelines.

The main screen comprises the navigation bar, the vertical menu, the content window in which content is displayed based on the selections made on the navigation bar, and the task bar. The navigation bar offers access to the Single-Line Diagram, Diagnostic, Plant Automation (application display pages) and Reports pages and to the latest alarm messages.

The vertical menu is used to access the lists of active or historical alarms and chronological events. It also supports printing of the display screen contents. The task bar contains elements for language selection, active user login and logout, customer logo display, IP addresses and name of the ZEE600 computer, time and date.

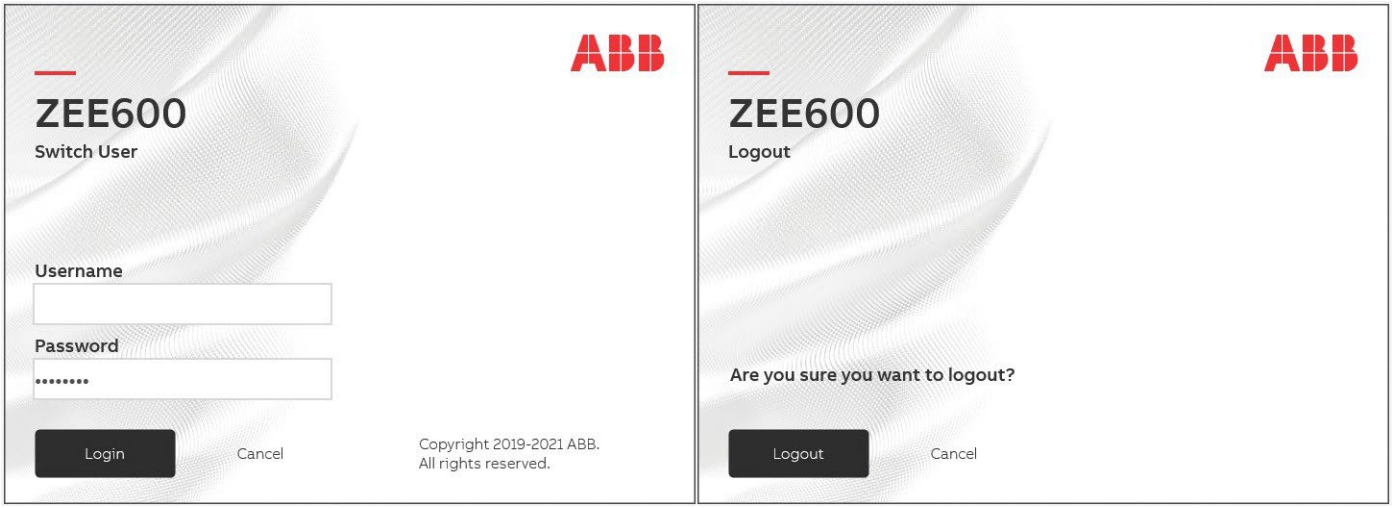


Figure 32. ZEE600 libraries: login and logout

The automatically created SLD pages (maximum 12) include the plant-specific switchboards and bays. The content of the pages is plant specific and not part of the ABB electrification library. The automatic line coloring calculates the coloring depending on the position of the connected elements and according to their connected power supply. Thus, it is possible to follow circuit topologies and energy distribution. If different supplies are connected, the one with the highest priority is displayed.

If a bay has been integrated into the visualization, it is possible to open a device-specific dialog box by selecting the corresponding bay on an SLD page. The bay dialog box displays information on several tabs: Main, Measurement, Advanced (includes Trends and Web HMI access to the Relion protection relay's Web server), Notes (notebook to record operation information which is retained even after Runtime restart) and Custom (to map additional user-defined variables or symbols).

i. Description (for example, Unit 1)
ii. Device type (for example, REF615)
iii. List of predefined, device-specific alarm texts
iv. Bay name
v. Bay control field with line coloring, controllable elements and selection status
vi. Control and status elements for selected elements, open and closing commands as well as local/remote indicator
vii. Alarm list with automatic filter for the selected bay

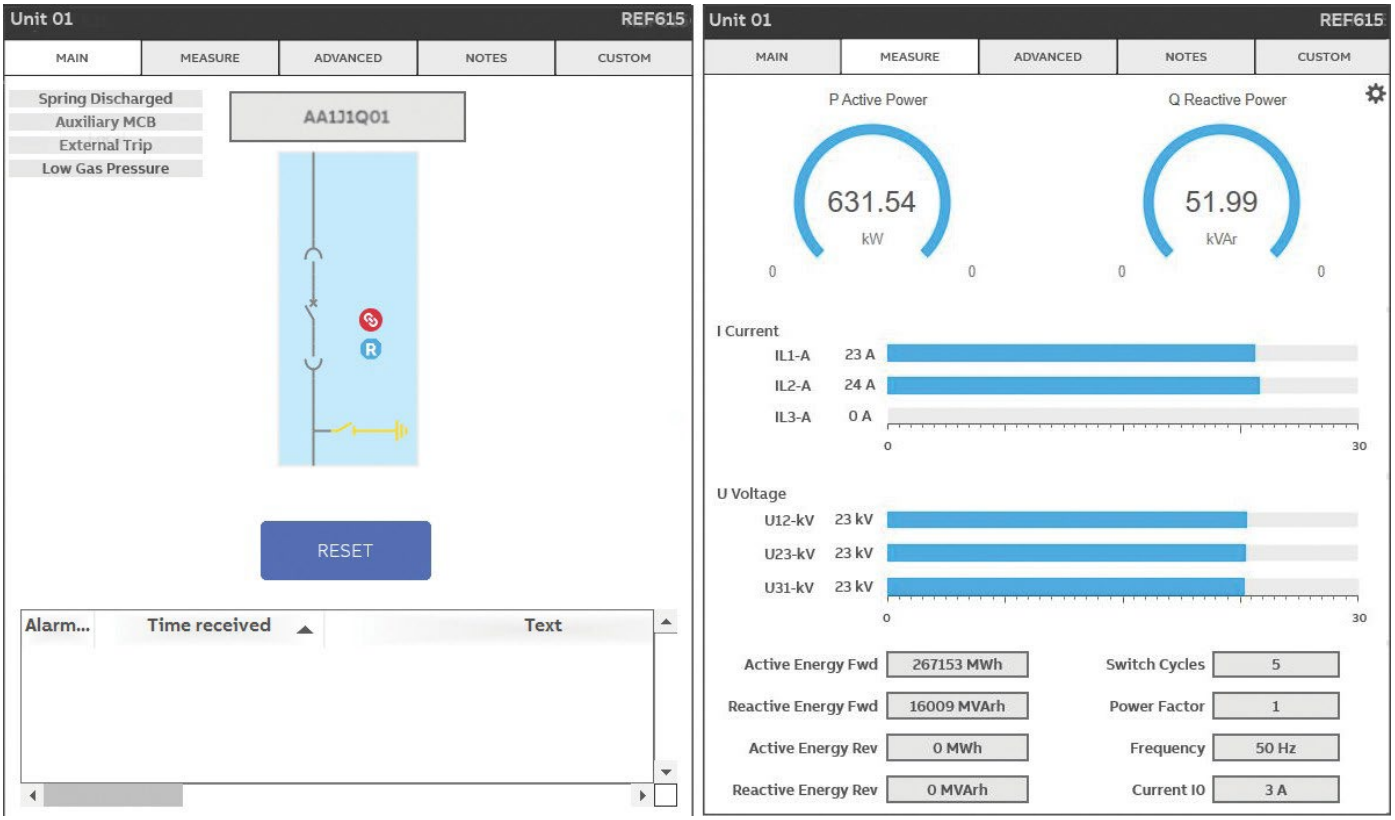


Figure 33. ZEE600 libraries: bay operation screens overview

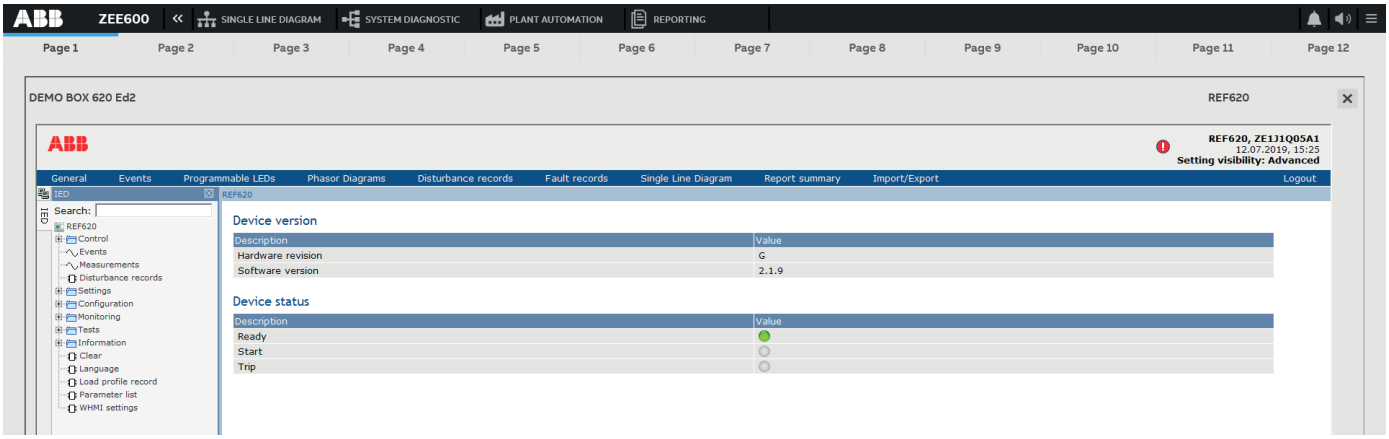


Figure 34. ZEE600 libraries: Relion protection relay Web HMI access

The System Diagnostic page is not automatically created by wizards and therefore it needs to be handled using library faceplates to display various devices in a network. Along with the device instance object, the device details can also be accessed. The Plant Automation area is provisioned for the future for use with special automation library display pages.

Reporting covers real-time and historical trend across multiple bays, disturbance record viewing (via ABB WaveWin™ integration) using uploaded COMTRADE files from downstream protection relays, report viewing for display of project-specific reports which can be printed or exported, and energy management that allows access to the historical data of up to 100 devices for up to four measurements per device.

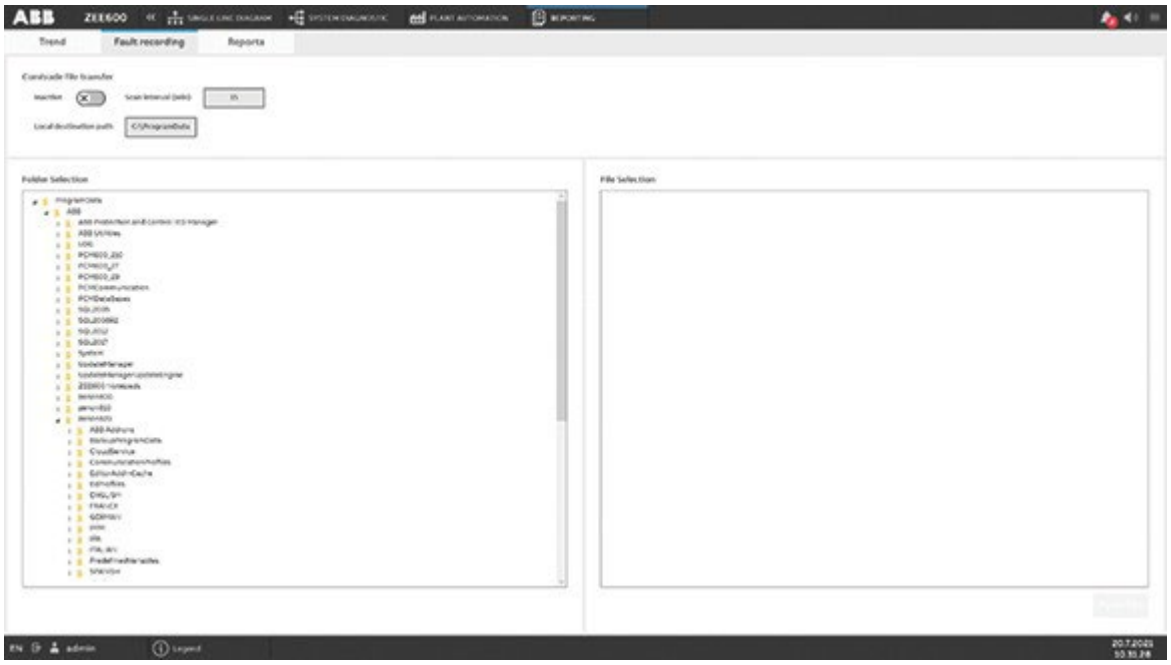


Figure 35. ZEE600 libraries: disturbance record overview

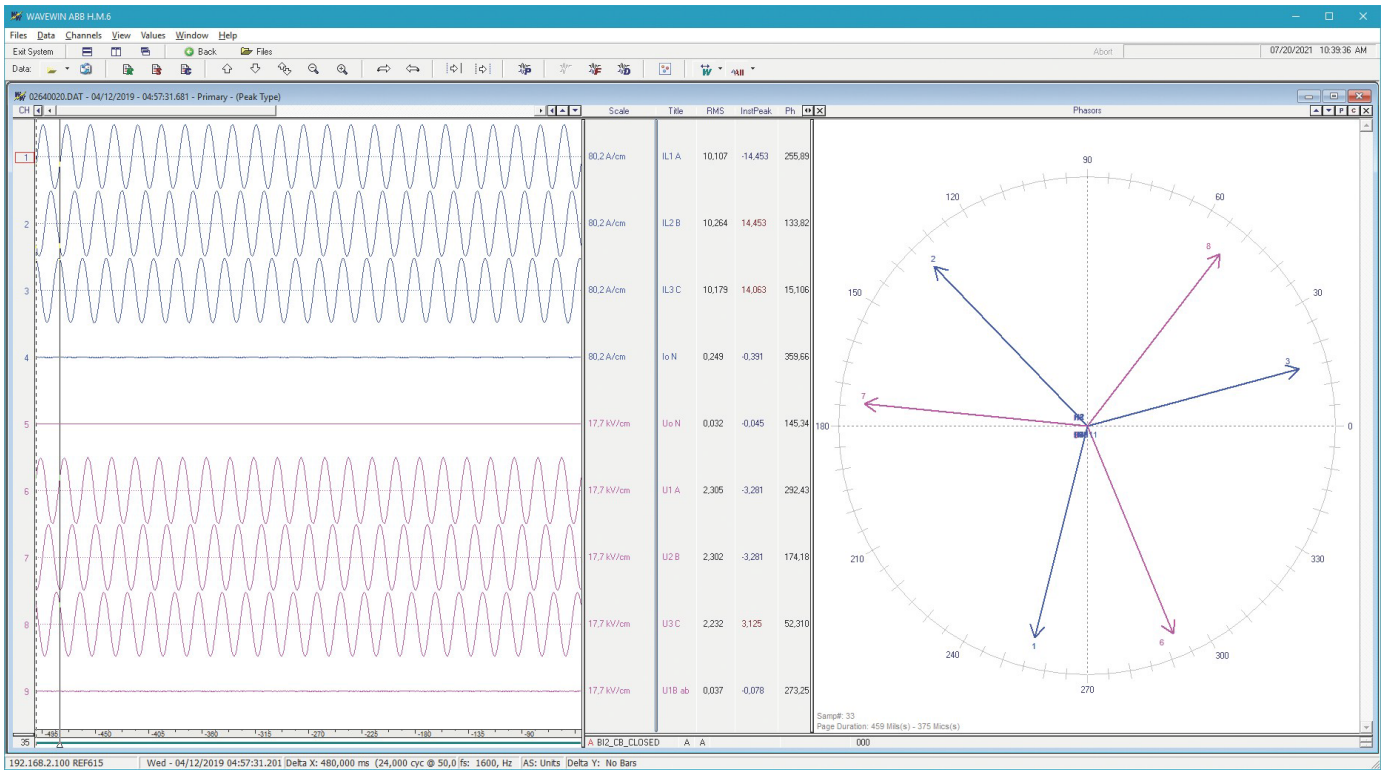


Figure 36. Wavewin: disturbance record viewer

The ZEE600 utilities feature facilitates siren management, user management (administration), performance dashboard, printer setup, bay name management, system shutdown, background color (theme) selection for display screens, selection of electrical symbol standard and system maintenance to view the status of selected project variables.

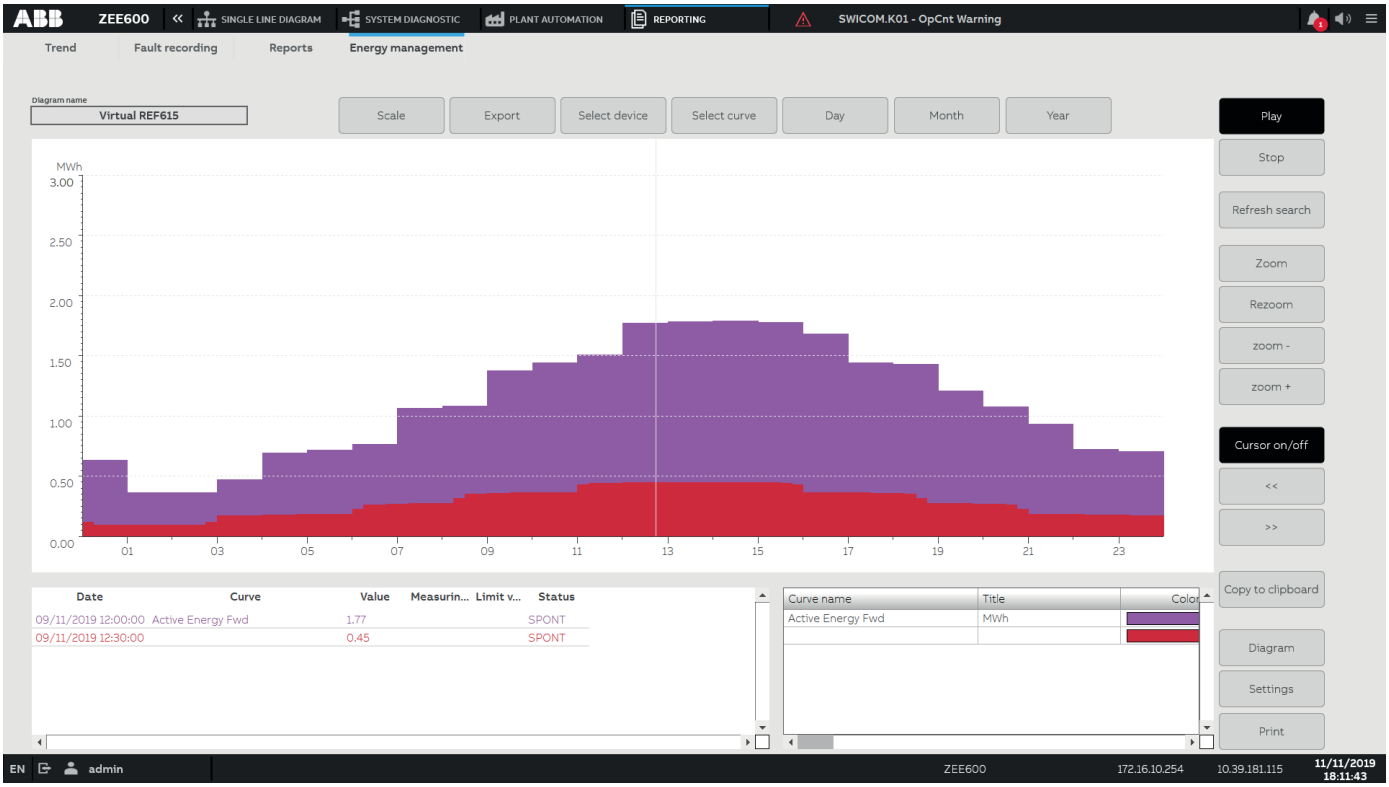


Figure 37. ZEE600 libraries: Energy management

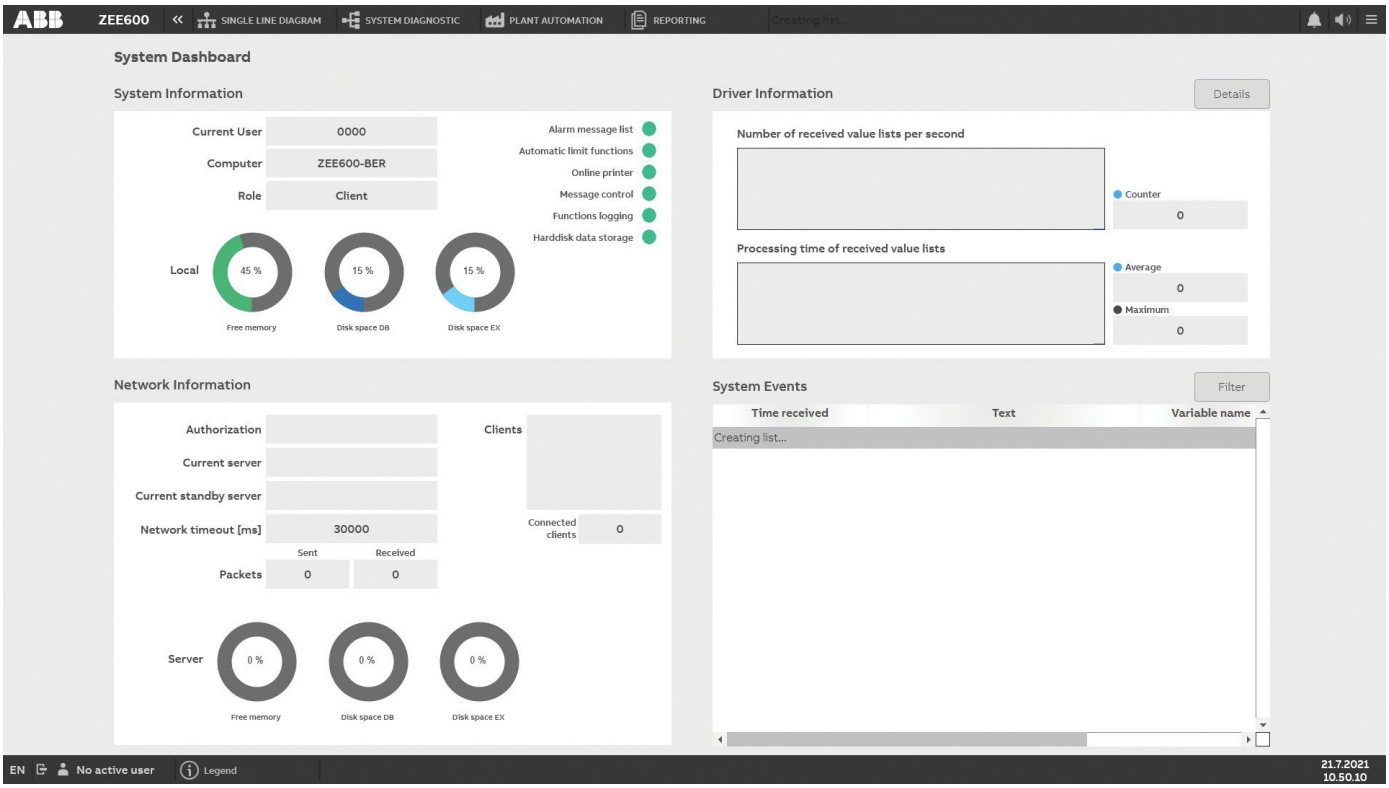


Figure 38. ZEE600 libraries: Performance Dashboard

10. Network handling

Server redundancy for reliable and high-availability process ZEE600's redundancy features enable users to significantly improve network reliability and have constant access to projects without interruptions, downtime or data loss. Depending on the project requirements, three types of redundancy modes are available for servers.

viii. The dominant mode establishes traditional primary standby roles for defined machines.

ix. Non-dominant mode provides full redundancy without traditional primary and standby definitions; either server machine can handle either role.

x. Rated mode is based on connection status and other calculated data; the servers decide which machine is the primary server. This mode involves analyzing and rating the quality of the data flow. If the defined criteria are not adhered to, the standby server that can ensure higher data quality immediately takes over.

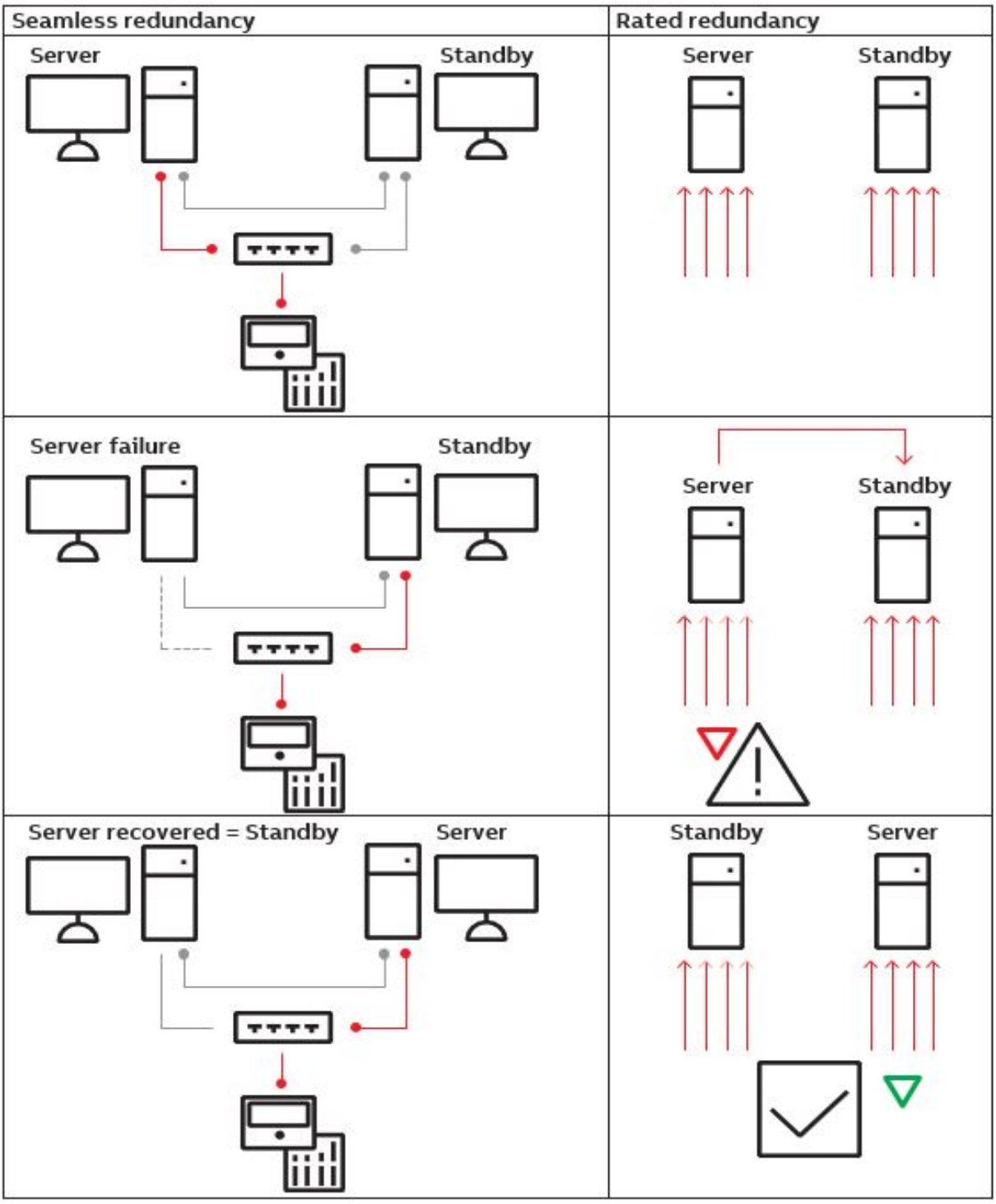


Figure 39. ZEE600 server redundancy

The seamless redundancy in ZEE600 guarantees continuous data recording, thus preventing data loss even in the time between a server outage and switchover to the standby server. This functionality combines seamless redundancy and circular redundancy to form a highly fail-safe system.

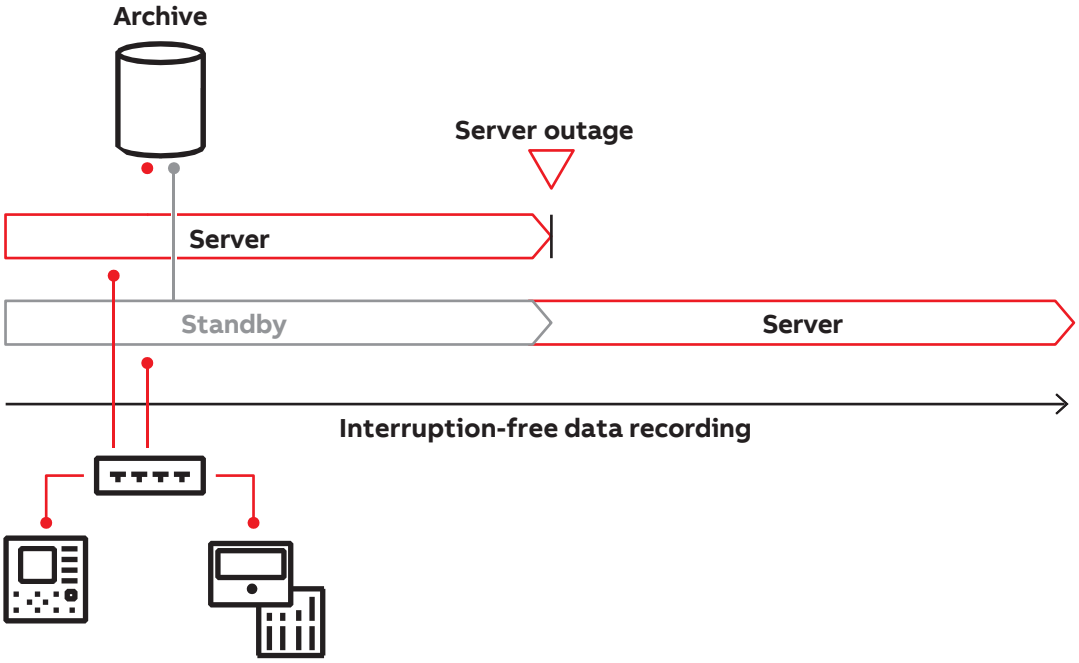


Figure 40. ZEE600 hot-standby takeover operation

In the event of a server failure, seamless redundancy transfers all tasks and data to a standby server. This records all historical data in parallel when connected to the substation or electrification process and thus ensures that no data loss occurs between the server failure and switchover to the standby server.

The SoftPLC/Logic also supports redundancy.

Note that when using redundant ZEE600 for HMI/ECS functionality with SoftPLC functionality (non-critical applications), it is recommended to fully synchronize the two redundancy functions using a watchdog function from the HMI/ECS application towards the SoftPLC/Logic.

Client and server

ZEE600's client/server network technology provides a platform-independent solution that enables the user to improve network reliability and have constant access to projects without interruptions, downtime or data loss.

With ZEE600, creating a network for projects is easy and secure. Even the most complex topologies can be clearly and effectively configured to create stable, secure and robust networks without any additional engineering.

Roles of server and standby server and client can be assigned to the computers, thus allowing the user to create both simple client-server structures and secure complex multi-hierarchical models.

ZEE600 monitors all network conditions to guarantee effective performance and provide reliable protection against data loss. High-quality encryption and client authentication in the network provide secure communication.

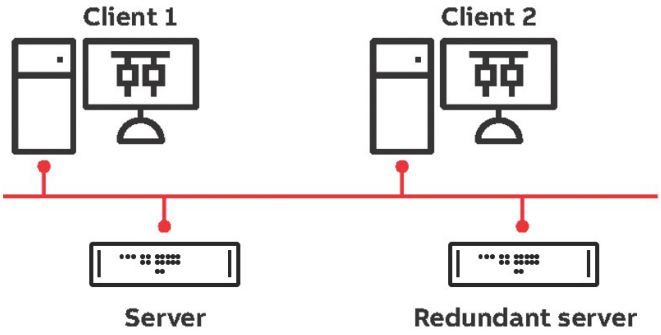


Figure 41. ZEE600 client-server

Runtime can start one or more projects on one computer depending on the project configuration. The computer on which Runtime is started assumes the role of primary server, standby server or client for the respective projects.

With network projects, all computers in the network must be time-synchronized. In a topology with several Primary Servers, it is recommended that time synchronization be implemented using an external time server or Windows resources. In this case, the automatic time synchronization in ZEE600 must be deactivated. By default, the Runtime server has a built-in client.

Decentralized servers

Multi-project administration makes decentralized solutions possible. Sub projects can be distributed to different computers. The individual computers in turn can be the Primary Server, Standby Server or Client for the respective sub projects.

The following is possible with the help of multi-project administration:

- Several projects in one workspace can be edited in the Editor at the same time
- Several projects can be started at the same time and thus variables, functions, archives etc. from other projects can be accessed directly throughout projects

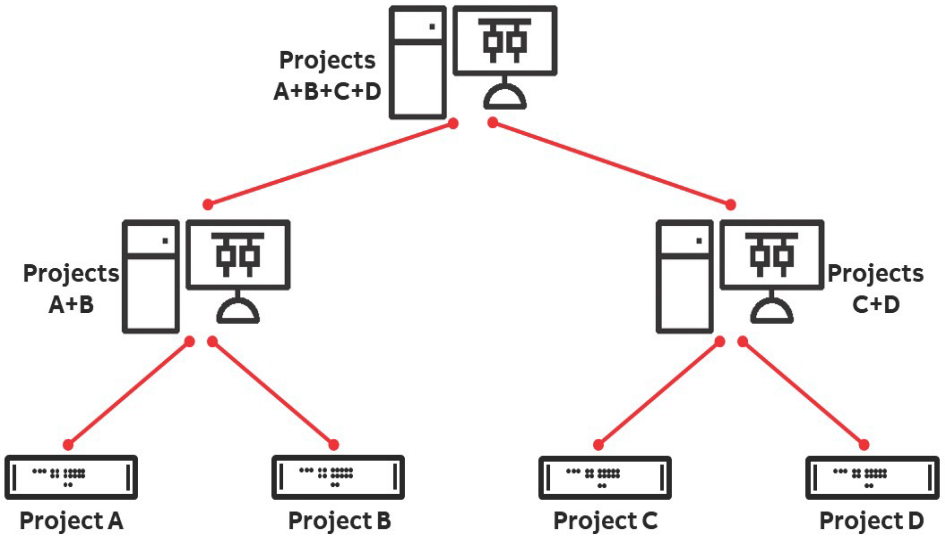


Figure 42. ZEE600 decentralized servers

11. Connectivity

Features

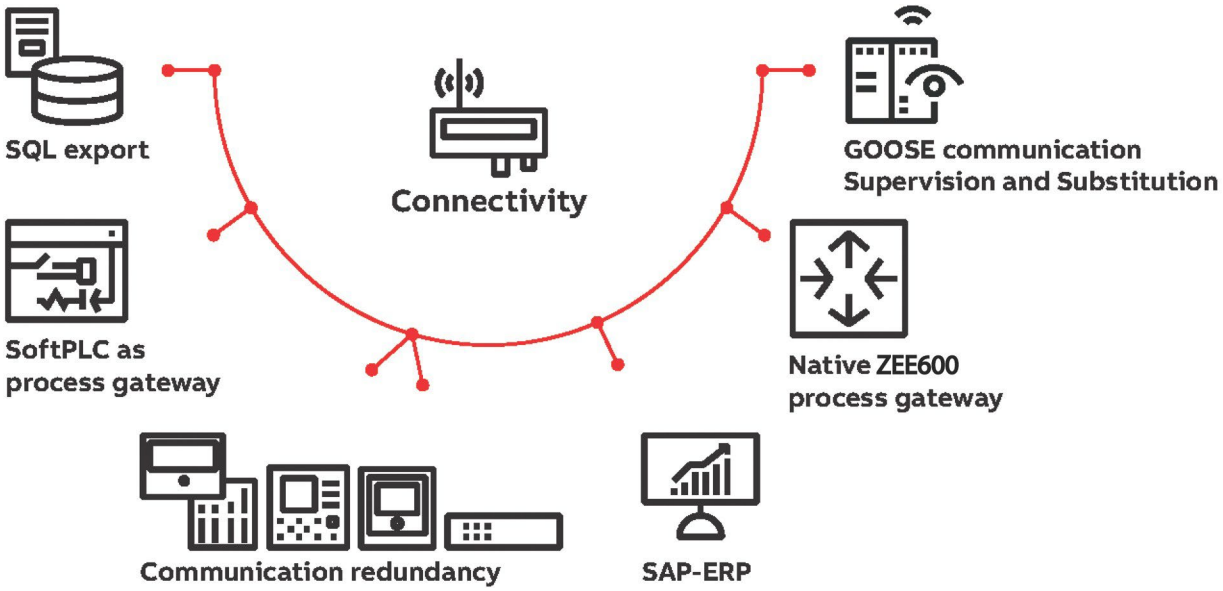


Figure 43. Connectivity with ZEE600

Process gateway (optional)
With native drivers that support all common communication protocols, the ZEE600 process gateway secures connectivity between field devices, such as protection relays, meters, PLCs and RTUs, and remote or higher-level systems.

The communication between ZEE600 and higher-level systems such as a control center or a DCS is bidirectional. This means that process data from Runtime can be forwarded to remote systems and they can write back values or commands to Runtime.

The process gateway is an add-on to Runtime and only works in combination with it. If Runtime has not been started, the process gateway does not start. Several instances can be started on a single computer. The process gateway can be started on both a standalone computer and in the network (server/standby/client). All process gateway instances started in the network provide the same process image.

For more details, see Selection and ordering data.

SoftPLC as process gateway
ZEE600 offers a number of protocol drivers.

- IEC 60870-5-101, IEC 60870-5-104 server
- IEC 60870-5-103 server
- IEC 61850 Edition 2 MMS client
- DNP3 serial, TCP server
- Modbus serial, TCP server

Additionally, the SoftPLC function can be used for direct communication with both downstream devices such as protection relays or meters and upper level systems. This aspect can be advantageously and flexibly used in combination with the pre-included drivers. For more details, see Selection and ordering data.

Communication redundancy
ZEE600 is designed for high-availability communication networks through support of PRP for redundant Ethernet networks. The PRP feature, as per IEC 62439-3, ensures seamless redundancy with zero switchover time for critical applications and operations, such as in electrification processes.

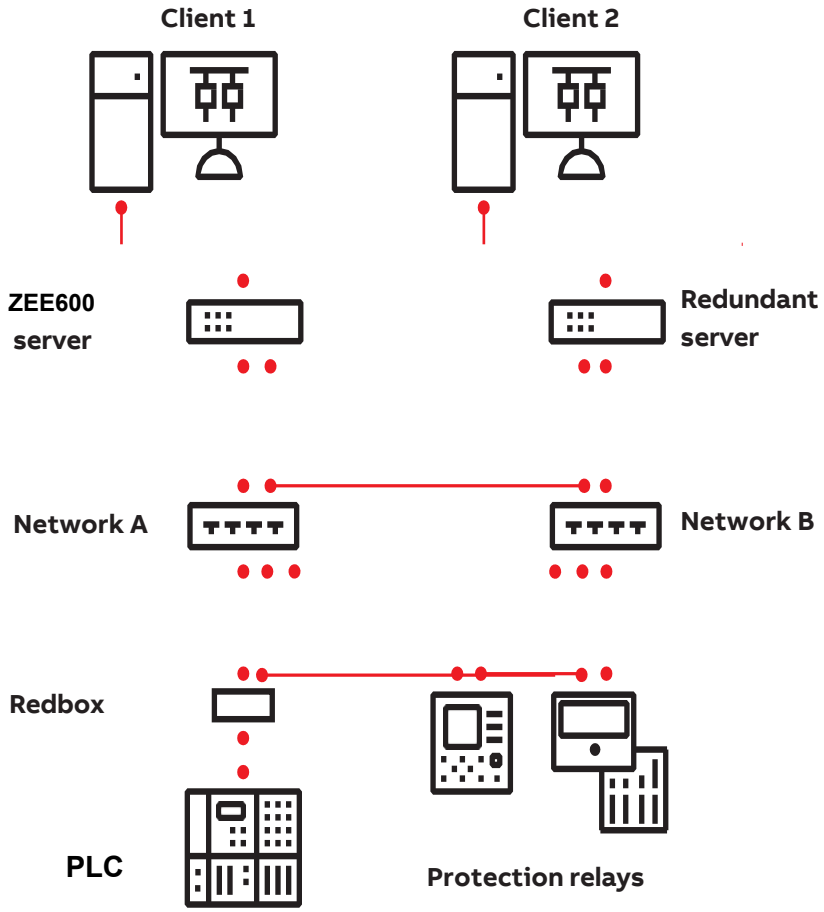


Figure 44. ZEE600 communication redundancy

PRP is based on duplicated networks where each message is sent via both networks. The first of the received messages is accepted whereas the duplicate is discarded. In ZEE600, message replication and discarding is done by the native PRP driver, which hides the two networks from upper- level applications.

Besides the protection relays and other substation devices supporting PRP, the ZEE600 server machine needs to be equipped with a LAN card with two Ethernet ports and internally bridged network adapters. For devices which do not support PRP, an external redundancy box adaptation unit is needed.

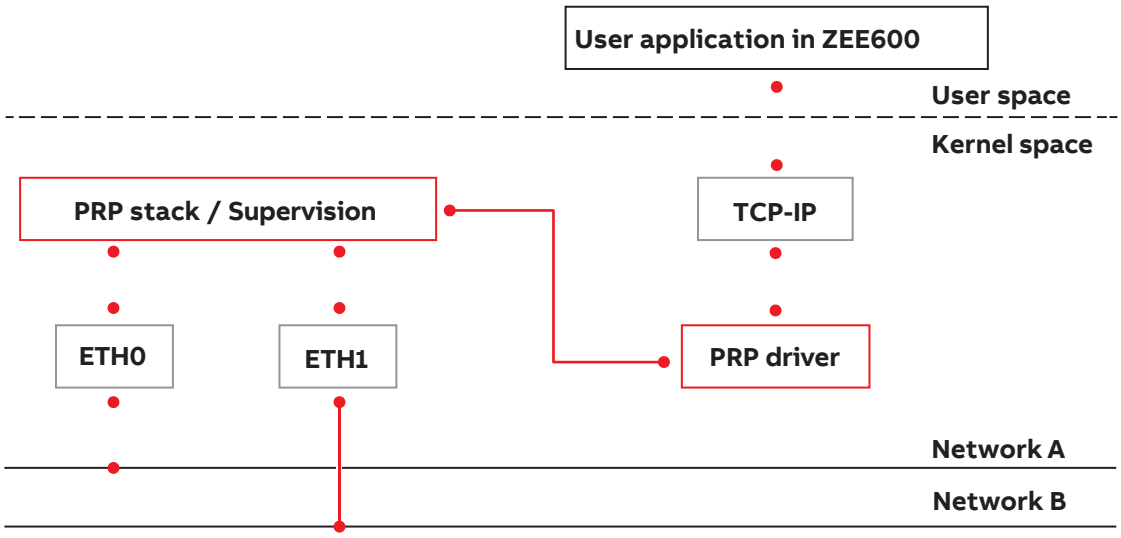


Figure 45. ZEE600 PRP

SQL Export (optional)

SQL Export is an optional module of Editor and Runtime which allows archive data, alarm data and event data to be exported to an SQL database. This is a unidirectional export, meaning that the exported data cannot be read back into ZEE600. In this aspect, the SQL server export differs from the Historian SQL server interface.

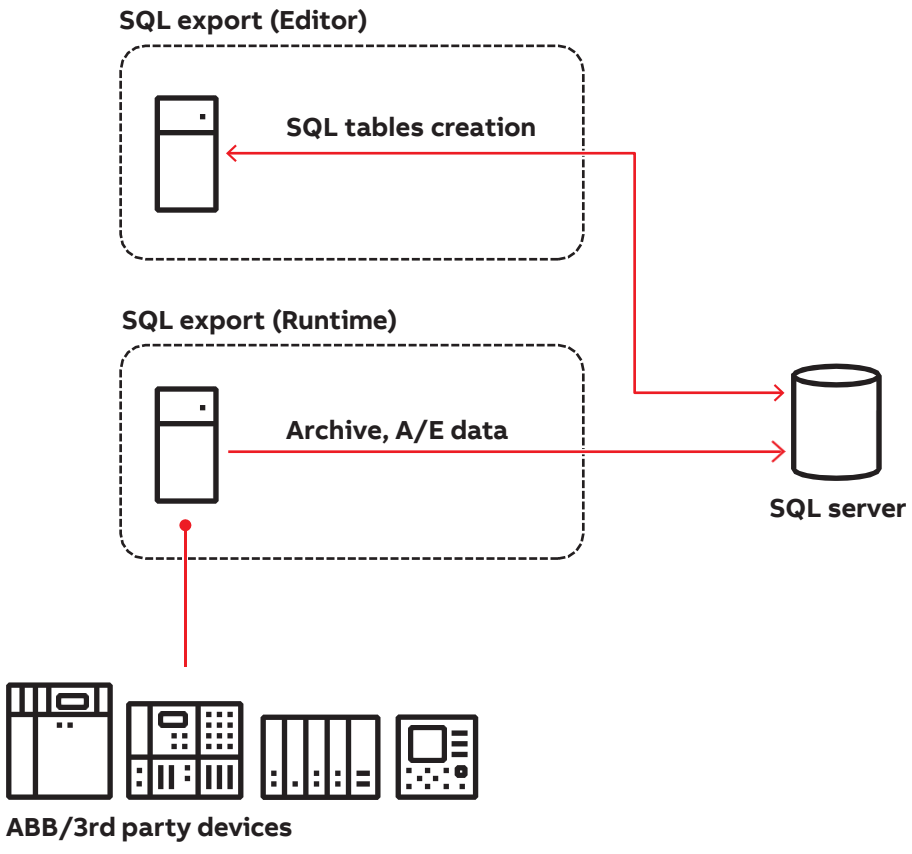


Figure 46. SQL Export

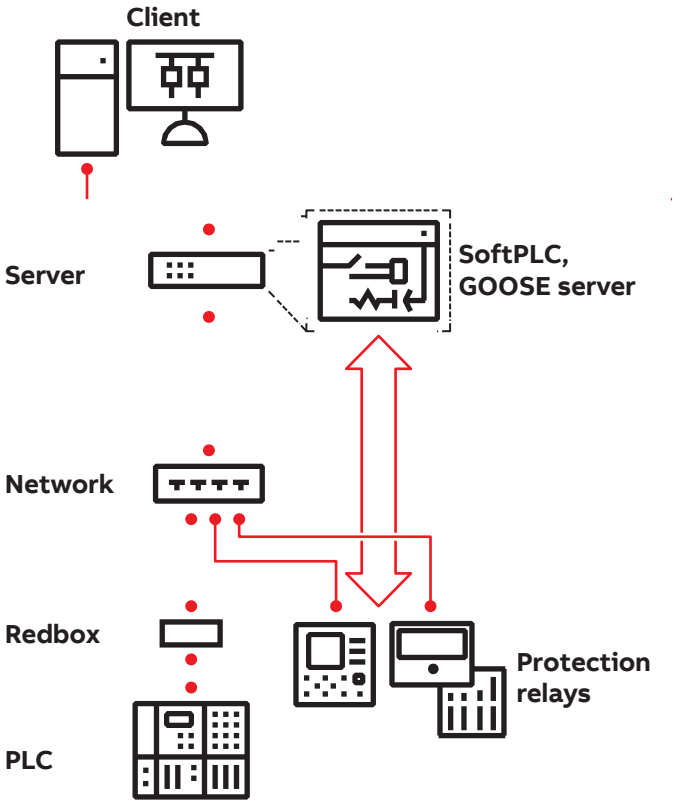


Figure 47. ZEE600 IEC 61850 GOOSE supervision

IEC 61850 GOOSE supervision and substitution (optional) The SoftPLC driver can be used to publish and subscribe IEC 61850 GOOSE messages and thereby exchange application information such as system-wide protection interlocking data with peer devices such as protection relays and other substation devices.

The GOOSE server driver supervises the GOOSE communication and performs certain diagnoses.

- Alarm generation on occurrence of GOOSE communication problems
- Detection of connection loss
- GOOSE subscriber detection

12. Scalability

ZEE600 supports scalability by offering upgrading of server tags, client tags and Web server concurrent connections.

It is also possible to add functionality according to the project requirements.

i. Communication protocols
ii. Process awareness
iii. Process control
iv. Special modules

For more information, see Selection and ordering data.

13. Engineering

Object-oriented engineering
ZEE600 has an object-orientated structure. Objects are created and maintained at a single point but they can be used in multiple places and across projects. A library of common symbols can be created and reused across projects. It is also easy to integrate components, processes and functions and include them in customized libraries.

The reusability of graphical objects, screens or entire projects enables rapid reuse of existing project configuration without re-engineering. Screens can be saved as templates in Editor (engineering environment). Wizards perform multiple project engineering steps to help automate the project creation process and minimize the engineering time.

Distributed or collaborative engineering
To accelerate project development, ZEE600 allows multiple engineers to check out portions of a project and simultaneously work on specific areas where only they can make changes. These changes are then synchronized across all engineering machines. Also logging of changes in a project is enabled along with simplified version control.
This approach significantly reduces engineering time and increases efficiency in large projects. Amongst working teams, tasks can be split up according to the members' expertise. Teams can be added at any time and reorganized.
The projects are managed on a central SQL server which ensures that objects can only be modified by one user. The object under work is checked out and locked for everyone else which helps to eliminate overlapping or double configuration.

Once the object has been checked back in, all other users have immediate access to the latest version of the project. Standalone projects can also be converted into multi-user projects at any time and vice versa.

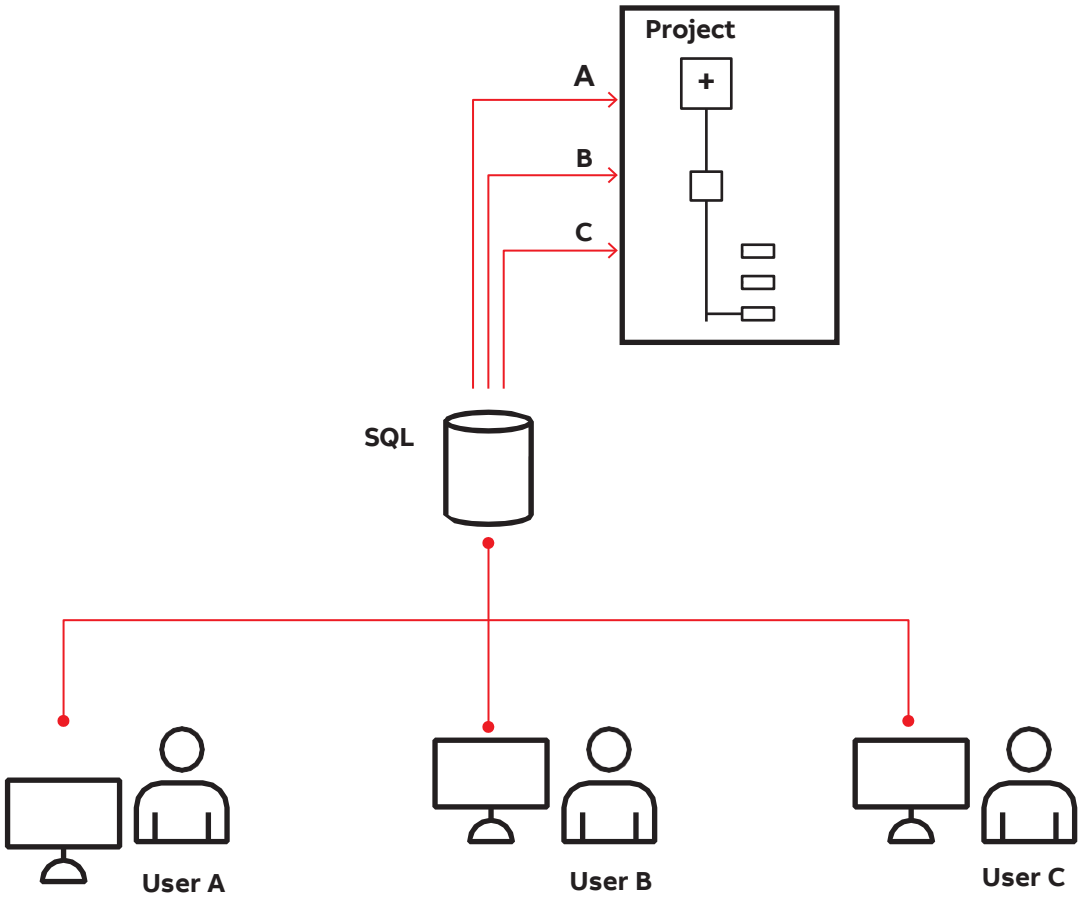


Figure 48. ZEE600 distributed engineering

Multi-project administration and management (for large projects)

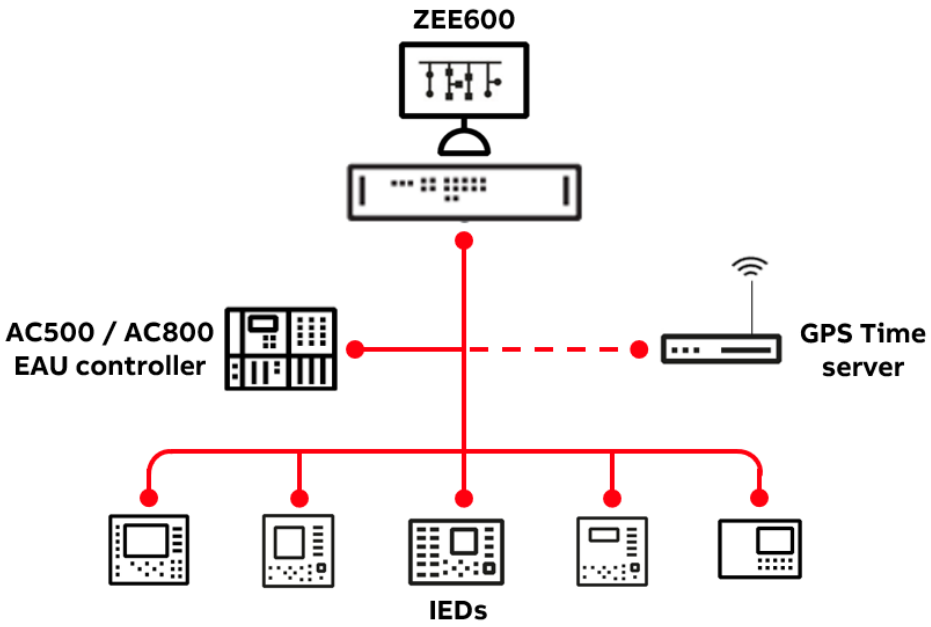
The ZEE600 multi-project administration follows the principle of decentralization where a user can split large projects into several smaller or logical projects under a single package and deploy them as required. The projects can be spread across several different computers which improves performance and increases flexibility. Combined with the object-oriented approach, this facilitates easy enhancements and project maintenance.

The ZEE600 multi-project administration follows the principle of decentralization where a user can split large projects into several smaller or logical projects under a single package and deploy them as required. The projects can be spread across several different computers which improves performance and increases flexibility. Combined with the object-oriented approach, this facilitates easy enhancements and project maintenance.

In ZEE600, the server and client are not defined in relation to a computer but in relation to a project. This way multiple project administration can be started for several visualization projects at the same time on one PC. A PC can be the server for one project and, at the same time, the client for another project. A PC can even be a multi-server (server for several projects) and a multi-client (client for several projects) simultaneously.

14. ZEE600 visualization libraries complimenting PLC automation applications

ZEE600 provide the user with a seamless integration of AC500/AC800M EAU (Electrification Automation Unit) functions, completing the solution with an enhanced status and alarms data visualization.



Load Shedding based on AC500

The combination of ZEE600 and EAU* load-shed library, provides comprehensive load-shedding solution for the power network in an industrial plant. The AC500/AC800M are power PLCs, featuring a wide range of performance, communications and I/O capabilities for industrial applications. They provide a reliable and powerful platform to design and create scalable, cost-effective and flexible automation solutions.

The following load-shedding modes are supported:

- Fast load-shedding based on network contingencies.
- Slow load-shedding based on transformer overloading or the maximum demand violation on the grid tie feeder.
- Manual load-shedding based on operator-defined priorities or amount of loads to be shed in kW.

***Note :** The EAU libraries are designed to be deployed across AC500 and AC800M PLCs that realizes power management applications for ABB's digital solutions for distribution networks, comprehensively taking advantage offered attributes by the platform.

The LS library handle load-shedding functionality for plant electrical network comprising of:

- 6 generators
- 2 external network connectivity (tie line or grid transformers) and 6 busbars
- 15 network breakers
- 60 load-shedding groups (10 loads/ load groups per busbar)

Libraries provide the user with several standardized visualization screens:

- **Busbar Data**
  contains all the load's related information and Subnetwork info for busbar. User can monitor Information (like Load value, CB Status, Trip command Status, Shedding priority) related to load's of each busbar.
- **Network Configuration**
  The single line diagram for the project, focusing on bays involved into load shed function.
- **Subnetwork Details**
  Information related to the active subnetwork, like subnetwork critical data, total load, load shed data, subnetwork status and Accumulated load Table can be monitored for each individual active subnetwork.

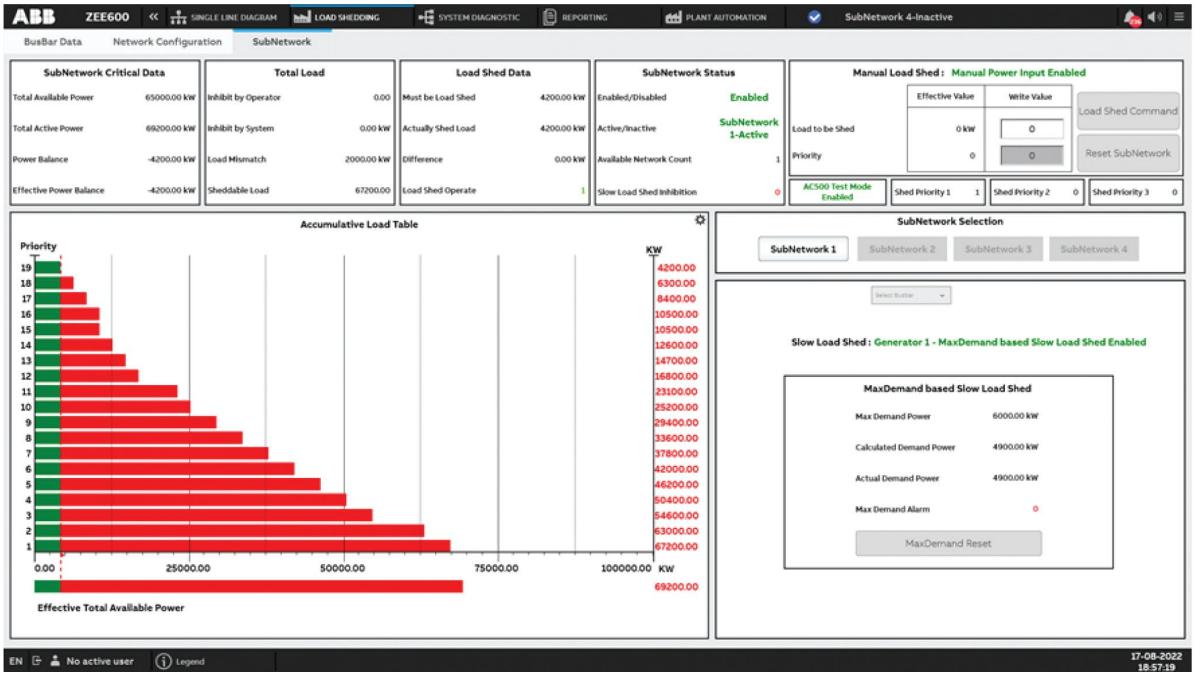


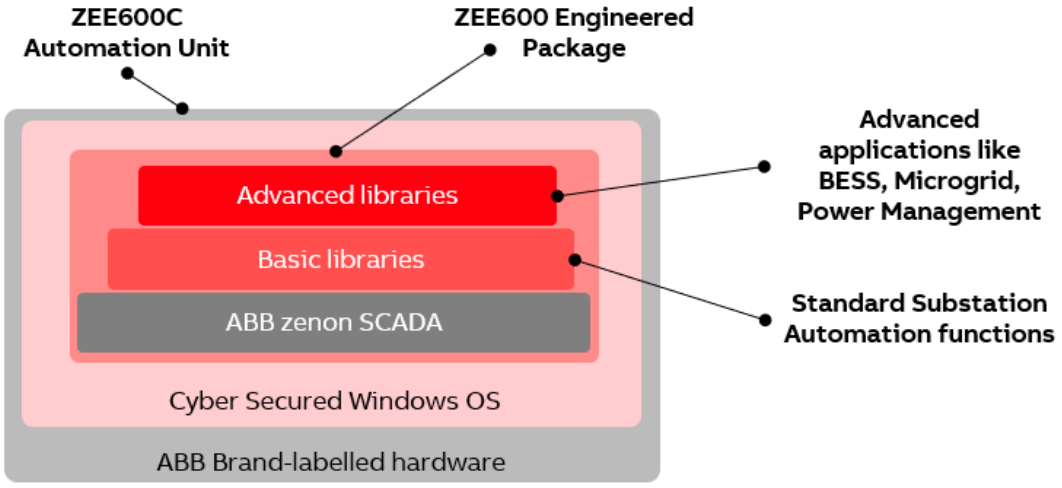
Figure 49. Load Shedding: subnetwork details page

For more info refer:

Document ID	Document Name
2NGA000631	Power Management AC500, ZEE600 Compact Load-Shedding Solution IEC 61850 Point List And Communication Protocol Manual
2NGA000632	Power Management AC500 V3 and ZEE600 Compact Load-Shedding Solution, Technical Manual
2NGA000633	Power Management AC500 V3 and ZEE600 Compact Load-Shedding Solution, Application and Engineering Manual
2NGA000634	Power Management AC500 V3 and ZEE600 Compact Load-Shedding Solution, Operational Manual

15. ZEE600C Substation Automation Unit

The ZEE600C combines the advantages of ZEE600 into a customized, substation grade computer. Special software licensing packages address wide range of applications, from a Substation Gateway to an HMI, to a single Substation Automation unit and redundant substation automation units.



The ZEE600C fulfills the expectations for small to mid-sized electrification automation installations that need a predefined set of SCADA functionality, communication, and automation capabilities.

In addition to providing connectivity to substation and switchgear devices based on IEC 61850, IEC 60870-5, DNP3, Ethernet IP and Modbus-TCP, the ZEE600C also supports a dedicated interface towards ABB AC500 PLC family and optional communication redundancy based on HSR/PRP.

The ZEE600C also supports a wide range of connectivity options towards upper-level systems including IEC 60870-5, DNP3, Modbus TCP and OPC UA.

The robust, compact, rack mountable, fanless hardware is based on a substation grade (IEC 61850-3 and IEEE 1613 certified), with a possibility of a redundant power supply.

Scope:

- Process awareness
- Process control
- Process monitoring
- Secure access
- Network handling
- Cybersecurity

Benefits:

- Compact feature set with scalability as needed for small to medium scale installations
- Decreased project time, increased engineering process efficiency through a scalable, preinstalled electrification and automation SCADA server product
- Simplified deployment and operation of automation systems
- High availability through redundancy options
- Adherence to the ABB lifecycle policy that guarantees product lifetime reliability
- Certified IEC 62443-4-1 Cyber secured development process
- Extended warranty, up to five years

More info at: **ZEE600C-DOCUMENTATION**

16. Hardware requirements

ZEE600 can be hosted on any COTS business or industrial computer adhering to the minimal recommended hardware requirements.
Typical examples of computer hardware that can host Editor and Runtime on a single machine are given below:

The described industrial PC specification is suitable for a harsh substation environment and therefore, it can be used directly in substation switchgear (LV compartment).

i. Intel® Core™ i7 processor
ii. 16 GB RAM
iii. 8 × Ethernet LAN 10/100/1000
iv. Win10 IoT Ent (or higher)
v. Redundant SSD (optional)
vi. 2-port Gigabit Ethernet card with PRP/HSR (optional)
vii. Additional extra power supply (optional)
viii. IEC 61850-3 compliant

If a server-grade substation computer is not required and if ZEE600 is used for compact HMI and communication gateway requirements.

i. Intel® Core i5 processor
ii. 16 GB RAM
iii. 2 × Ethernet LAN 10/100/1000
iv. Win10 IoT Ent (or higher)
v. Redundant SSD (optional)
vi. LV power supply 24 V

17. Minimum Hardware Requirements

Table 3. Editor

Description	Minimum requirement	Recommendation
CPU	Single core with SSE2 support	Quad core
RAM memory	From 4 GB Note: The more projects you have simultaneously available in memory, the more memory you need.	8 GB
Hard disk	At least 13 GB free space for a complete installation plus additional space	
Monitor resolution	Extended VGA with 1024 x 768 pixels[1)]	Double monitor setup 2 x 1920 x 1080
Graphics adapter	64 MB dedicated memory. Cards with shared memory can lead to performance loss. Note the system requirements when using DirectX chapter.	
Input devices	Standard keyboard or mouse	
USB interface or DVD drive	For the installation, regardless of installation medium. The installation is also possible via network. Installation files can also be downloaded from the download area from our ABB Homepage.	
Network connection (optional)	Recommended 10 Mbit/s with TCP/IP protocol for Remote Transport, project backups on central file server, multi-user capable Editor, etc.	

1) Required for ZEE600 standard templates

Table 4. Runtime

Description	Minimum requirement	Suggested
CPUs	Single core with SSE2 support	Quad core
RAM	From 512 MB Note: Projects with big amounts of data, Network projects, multiple projects used simultaneously and projects in redundancy mode need more memory.	4096 MB
Hard disk	2 GB free space for the Runtime-installation plus additional space for the projects. Attention: If you log historical data (e.g. Archive data or Alarm-/CEL-Data), you need sufficient SSD space or you have to make sure during engineering that the historical data is evacuated or deleted.	
Monitor resolution	1920 x 1080[1)]	
Graphics adapter	64 MB dedicated memory. Cards with shared memory can lead to performance loss. Note the System requirements when using DirectX chapter in relation to this.	
Input devices	Keyboard and/or mouse. Operation via touchscreen is also possible. Many individual, customizable soft keyboards for the touchscreen are available for you. In addition, there is the possibility of Multi-Touch operation.	
USB interface (optional)	For installation of ZEE600. Installation also possible via network or other storage media.	
Network connection (optional)	64 kbits/s for standard client/server projects, 100 Mbits/s full duplex for redundant communication	1000 kbits/s full duplex for standard client/ server projects
WAN connection (optional)	Any desired connection via router, e.g. per ISDN or DSL Data transfer is slower in a WAN than in a local network for technical reasons. Be sure to check the possible data transfer rates of your WAN technology already at the time when you create the project.	
Message Control (optional)	Please refer to chapter Message Control for the requirements.	
Interfaces (optional)	The necessary interfaces depend on the requirements of the PLC and/or the bus connection, for example serial RS232 or RS422/485 interfaces, ISA/PCI slots, etc.	

1) Required for ZEE600 standard templates

Table 5. Web Server

Description	Minimum requirement	Recommendation
CPU	Single core with SSE2 support	
RAM memory	From 1024 MB	
Hard disk	256 MB free space	1 GB free hard drive space
Network connection	10 Mbits/s full duplex	1000 Mbits/s full duplex
Remote connection	Dial-up modem with 9600 bit/s	1 Mbits/s full duplex

Table 6. Web Client

Description	Minimum requirement	Recommendation
CPU	Single core with SSE2 support	Quad core
RAM memory	From 1024 MB	
Hard disk	64 MB free space	80 GB free hard drive space
Network connection	10 Mbits/s full duplex	1000 Mbits/s full duplex
Remote connection	Dial-up modem with 9600 bit/s	1 Mbits/s full duplex
Graphic adapter	64 MB dedicated memory	

Table 7. Operating system

Description	Energy Edition	Everywhere	Logic Runtime
Windows 10 Pro	x	x (PC)	x
Windows 10 Enterprise	x	x (PC)	x
Windows 10 IoT Enterprise	x	x (PC)	x

18. Selection and ordering data

ZEE600 has a simple process of defining the architecture, function, interfaces, and ata for a system to satisfy specified requirements. With this, ZEE600 supports tying cost effective solutions according to your needs.

ABB Ability ZEE600 handles process visualization, control and substation data management in electrification solutions for several customer segments. All of ZEE600 add on functions are covered by an additional specific license module, the ZEE600-LIB that works together with ZEEn-SRV server license to offer the full functionality of ZEE600.

System and license layout

Before selection and ordering preparation, one needs to have a good level of system understanding. This is to ensure that the most appropriate licenses are chosen that would rightly fit into the eventual system building, engineering and operational requirements.

Figure 50. System and license layout

Once the system design is finalized, followed by the functional allocation to the system components, one can proceed with the required licenses' selection and eventually proceed with ordering from local ABB contact or global channel partners at https://new.abb.com/channel-partners/search#..

Sales support is available at ZEE600.sales@abb.com.

System Design

System design, results in an overview of the functions and the external interfaces the system shall maintain. A system may have external connections to material, energy and data flows.

For the selection of the right ZEE600 licenses, it is enough to focus on data flows in the electrification system. System Design may end up in system design drawings, showing nodes, protocols and security infrastructure (network zones, firewalls, routers) and a Bill of Material to host the system function. On customer request, an Engineering Environment (Editor, ZEEn-ED-SA) can be added. For companies frequently integrating ZEE600 with ABB and 3rd party products, we recommend joining our Developer Network.

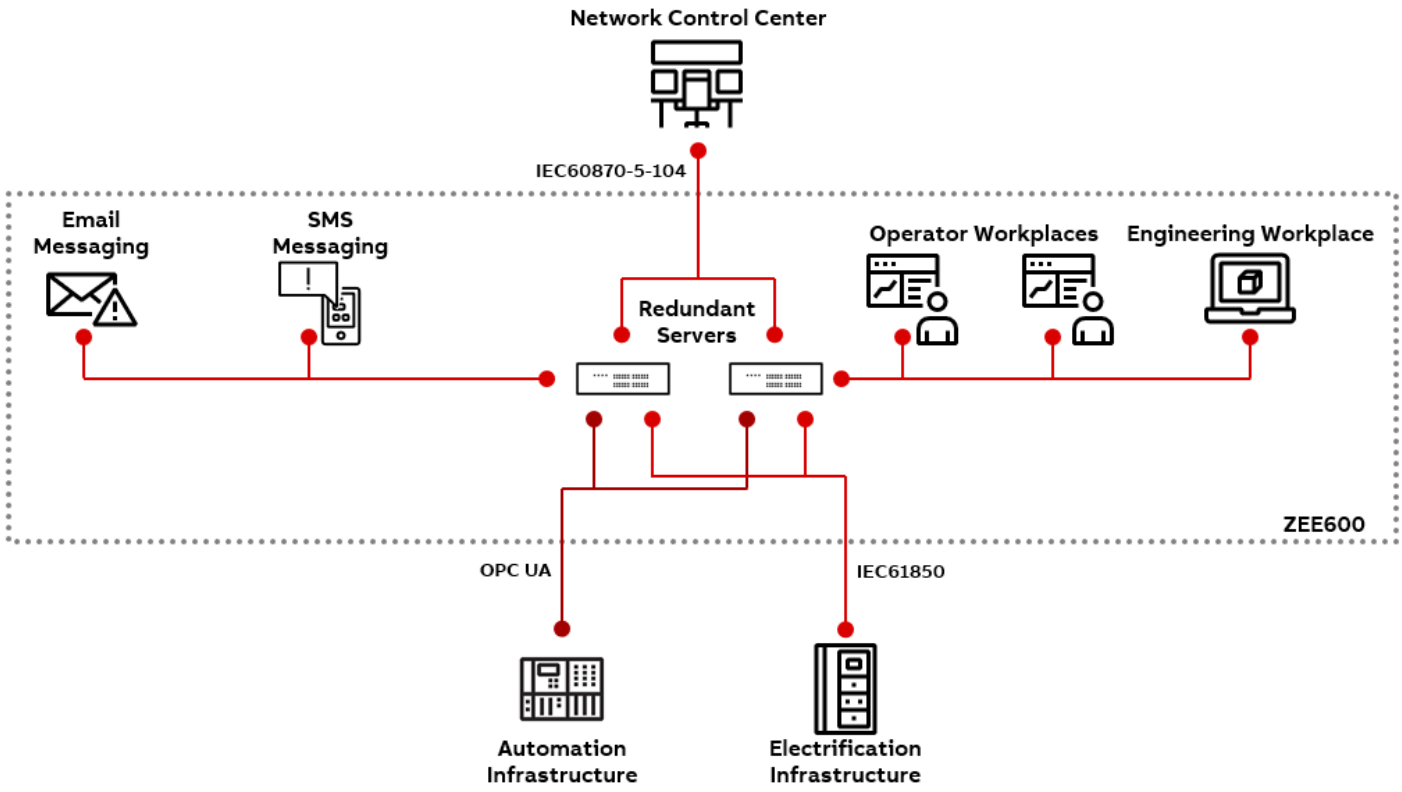


Figure 51. Example System Drawing

Functional allocation, system boundaries and interfaces
ZEE600 is a software that resides on servers that are interfacing with protection relays, PLCs, meters and other systems through serial and/ or Ethernet interfaces. A server has a client included as local operator workplace. Additional clients run on a separate computer and are licensed separately. Clients communicate with ZEE600 servers only. Additionally, state of the art technology like Terminal Server, Webserver or HTML5 based Web Engine architecture can be set up. Determine the numbers and types of nodes that run an ZEE600 Server or Client. For each server, consider one ZEEn-SRV. For each Client, consider one ZEEn-CLT license with the required number of tags. All licenses (server & client) shall be linked to ZEE600-LIB license for the ZEE600 Electrification Library.

Signals and Protocols

ZEE600 connects to devices through its more than 300 drivers and gateways. Data is exchanged through signals.
Binary, Analog Values, Alarms and Events are considered being separate signals, if they are transferred across the ZEE600 system boundaries.

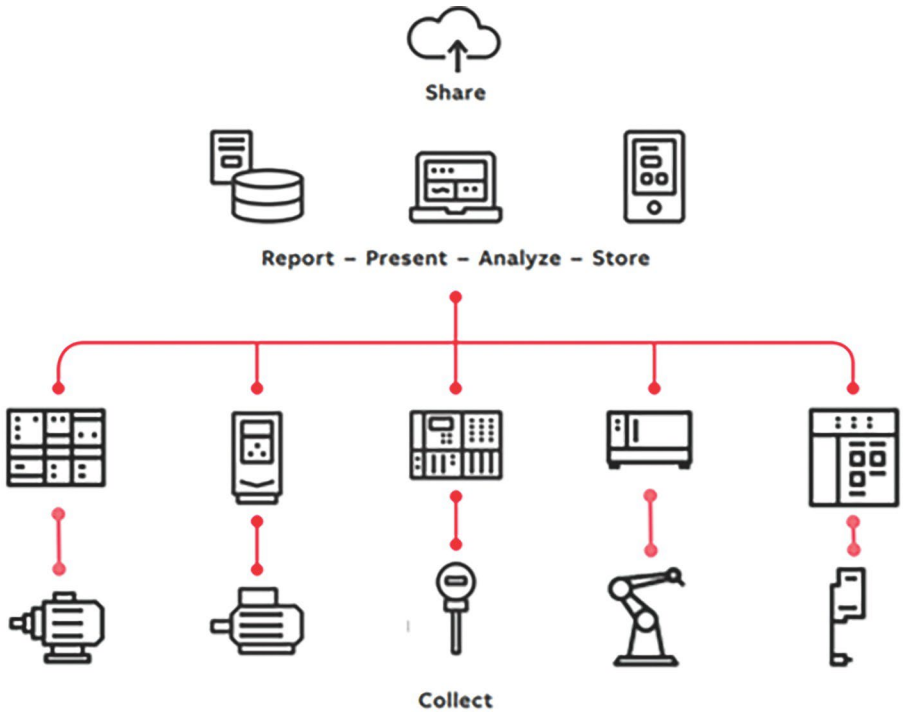


Figure 52. Determine Protocols and number of Signals

On each node, determine the numbers and types of external connections. Determine the protocols and number of signals communicated through the protocols. For each relay, about 100 tags are considered for communication with a ZEE600 server.

Additional Functions

The below table lists included and optional functions for the ZEE600 server and client. A full list of features and drivers can be found in the ABB Ability™ zenon Order Information that is available on www.abb.com/zenon. More information on ZEE600 is available at https://new.abb.com/medium-voltage/digital-substations/digital-systems/substation-or-plant-wide-solutions/zee600

Table 8. ZEE600 Features and Options

Feature	licensed on (3)	ABB ID	SRV	CL
Basic				
Operation			●	●
Networking			●	●
Can act as Server			●	
Can act as Client				●
Distributed engineering			●	●
Redundancy			●	●
Redundancy (circular)			●	●
Multiprojecthierarchy			●	●
Features and Modules				
3D Integration	D	ZM-3D	○	○
Alarm areas			●	●
Alarm handling			●	●
Automatic Line Coloring	D, S, C	ZM-ALC	●	●
Historian with SQL Export	D, S	ZM-ARCHEXP	●	
Command processing			●	●
Command sequencer	D, S	ZM-CS	○	
COMTRADE file analysis and management	D, S	ZEE600-LIB	○	○
Condition Monitoring for Switchgear	D, S	ZEE600-LIB	○	○
Development Option on Server	S	ZEEn-ED	○	○
Development Option Standalone	S	ZEEn-ED-SA	○	○
Electrical Devices Integrated	D, S	ZEE600-LIB	○	○
Engineering Reporting for Substation Automation	D	ZEE600-LIB	○	○
Event handling			●	●
Extended Trend Monitoring	D, S, C	ZM-ETM	●	●
Extended Trend and Historian Starter Edition	D, S, C	ZM-ARVETM-SE	●	●
GIS Editor and Control	D, S	ZM-GIS	○	
Historian SQL Server Interface	D, S	ZSQLSRV	○	
HTML window / embedded browser			●	●
Interlocking			●	●
Language switch			●	●
Load Management	D, S	ZM-EMS	○	
Message Control	D, S	ZM-MC	○	
Multi touch support			●	●
Online reload			●	●
PLC diagnosis for S7 Simatic Graph	D, S, C	ZM-PLC-DIAG	○	○

Table 8. ZEE600 Features and Options, continued

Feature	licensed on (3)	ABB ID	SRV	CL
Process Recorder	D, S	ZM-PR	○	
Programming Interface (C#)			●	●
Recipes (std)			●	●
Recipe group manager	D, S, C	ZM-RGM	●	●
Report Generator	D, S, C	ZM-REPORT	○	○
Report Viewer			●	●
SAP Interface	D, S	ZM-SAP	○	
Scheduler			●	●
Shift Management			●	●
User Experience harmonized	D, S, C	ZEE600-LIB	○	○
Worldview (mouse or touch)			●	●
WPF support			●	●
Energy Drivers				
DNP3 - DNP3 3rd generation driver	D, S	ZT-DNP3_TG	●	
IEC - IEC 60870-5-103 driver	D, S	ZT-IEC870-103	●	
IEC - IEC 61499 driver	D, S	ZT-IEC61499	○	
IEC 61400-25-4 Annex C drv.	D, S	ZT-IEC61400-25-4-C	●	
IEC 61850 client driver	D, S	ZT-IEC61850	●	
IEC60870-5-101_104 driver	D, S	ZT-IEC870	●	
IEC-62056-21 Driver	D, S	ZT-IEC62056	●	
Modbus Energy driver	D, S	ZT-MODBUS_E	●	
Process Gateways				
OPC UA Server	D, S, C	ZGW-OPCUA	○	○
MODBUS Slave	D, S, C	ZGW-MODBUS	○	○
SNMP SERVER/AGENT	D, S, C	ZGW-SNMP	○	○
DNP3 SLAVE/OUTSTATION	D, S, C	ZGW-DNP3	○	○
SQL ONLINE	D, S, C	ZGW-SQL	○	○
ICCP/TASE.2/IEC 60870-6	D, S, C	ZGW-ICCP	○	○
IEC60870 Slave	D, S, C	ZGW-IEC60870SL	○	○
MS Azure	D, S, C	ZGW-AZU	○	○
Web Functionality				
Webserver	D, S	ZWERBSRV8-P		
Runtime connection			○	○
Logic				

Table 8. ZEE600 Features and Options, continued

Feature	licensed on (3)	ABB ID	SRV	CL
Logic Runtime with *n* TAGs	D, S	ZLO-RT-*n*	●	○
Logic workbench	D, S			
Logic Monitoring Builder	D, S			
Logic Monitoring Viewer	D, S		●	○
Logic Drivers				
Logic Profibus Master driver	D, S	ST-ProfDP	●	●
Logic Profinet IO RT Controller driver	D, S	ST-PROFINETIORT	●	●
Logic Profinet IO RT Device driver	D, S	ST-K5BusPNIODev	●	●
Logic Ethernet/IP Scanner driver	D, S	ST-K5BusEIPC	●	●
Logic Ethernet/IP Point IO driver	D, S	ST-K5BusEIPFIO	●	●
Logic Ethernet/IP Adapter driver	D, S	ST-K5BusEIPS	●	●
Logic Ethernet/IP Tag Client driver	D, S	ST-K5BusEIPTag	●	●
Logic Modbus Master driver	D, S	ST-MBMASTER	●	●
Logic Modbus Slave driver	D, S	ST-MBSLAVE	●	●
Logic EtherCAT Master driver	D, S	ST-Ethercat	●	●
Logic Open Powerlink Master driver	D, S	ST-K5BusOpenEPL	●	●
Logic Energy Drivers				
Logic IEC61850 Client driver	D, S	ST-850CL	●	○
Logic IEC61850 Server + GOOSE driver	D, S	ST-850SeGo	●	○
Logic IEC60870 Master driver	D, S	ST-870M101104	●	○
Logic IEC60870 Slave driver	D, S	ST-870S101104	●	○
Logic DNP3 Master driver	D, S	ST-K5BusDNP3MCD	●	○
Logic DNP3 Slave/Outstation driver	D, S	ST-K5BusDNP3SCD	●	○
Analyzer				
Runtime connection			●	●
Analyzer Server		ZAN3-SRV	○	○
Analyzer Client		ZAN3-CL-X	○	○

● Included | ○ optional | (1) 1 included | (2) max. 1 | (3) S – Server; C – Client; D - Developer

Both hardware dongle and software-based licensing methods are supported. Two server licenses are required for redundant operation. The Editor license for engineering can be ordered either with runtime or as standalone.

Bill of Material

After having collected all necessary information, create the Bill of Material for ordering.

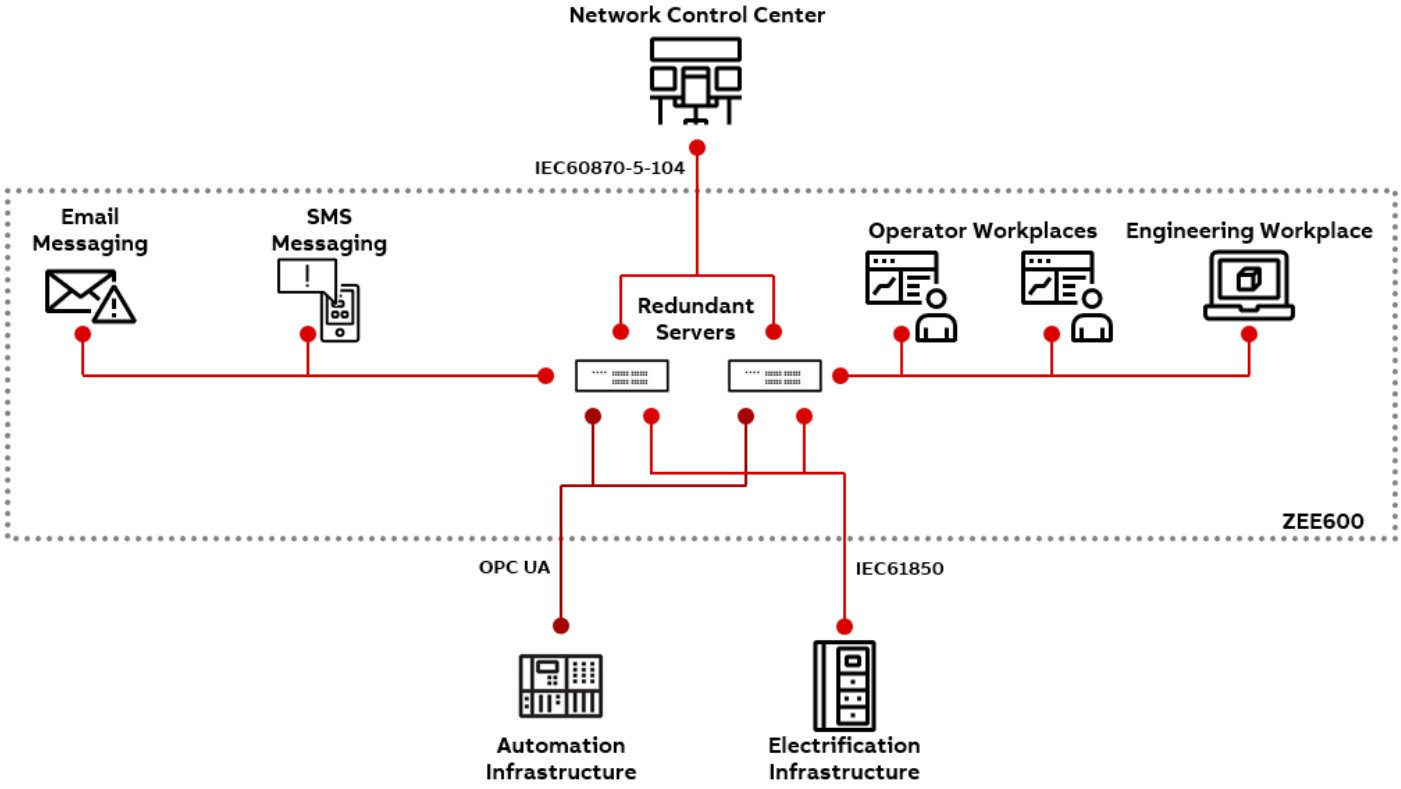


Figure 53. System drawing

The example system has redundant servers, two clients and one engineering workplace. The ZEE600 servers communicate through the IEC 61850 and OPC UA protocols with the electrification and automation infrastructure. The system is connected to a network control center through a IEC60870-5-104 gateway. According to the customer specification, the system communicates with 50 relays (40 plus 10 spare) and one PLC, exchanging 500 tags. The customer wants to have an SMS and Email messaging function to inform maintenance personnel and management in case of issues.

This information is good to start defining the system licenses:

- The system has 5500 tags, 50 relays with 100 tags each for IEC 61850 plus 500 tags for OPC UA
- These 5500 tags are managed by redundant servers that as well take the SMS and email messaging function and the IEC-104 gateway
- The system has two clients connected to the redundant servers for a productive operation of the facilities
- The customer asked for an engineering workplace.

All sums up to this Bill of Material:

Table 9. Bill of Material: Example System

ABB Order ID*	ABB ID	Description	Quantity
1SAS050074R-n	ZEEn-CLI-7000	Client 7000 Tags	2
1SAS050119R-n	ZEE600-LIB	ZEE600 Library	2
1SAS050069R-n	ZEEn-SRV-7000	Server 7000 TAGs	2
1SAS050119R-n	ZEE600-LIB	ZEE600 Library	2
1SAS053091R-n	ZGW-IEC60870SL	Process Gateway - 870 Slave	2
1SAS056041R-n	ZT-OPCUA	OPC UA Client driver	2

1SAS053028R-n	ZM-MC	Message Control	2
1SAS050078R-n	ZEEn-ED-SA	Energy Editor Standalone version	1

(*) Order code changes depending on ABB zenon platform version (n)

For ordering this Bill of Material, please contact your local ABB representative or ZEE600.sales@abb.com.

License variants

ZEE600 (both wizards & runtime) will refer to a specific custom module to be executed.
The customer needs to purchase/activate ZEE600 custom module (combined with main zenon license) in order to configure and/or start the project.

Different license types are available:

License Type	Template (Wizard & Runtime)	Object Import (Wizard & Runtime)	Disturbance Records (Wizard & Runtime)	Historian Energy Consumption Configurator (Wizard & Runtime)	Load Shedding (Wizard & Runtime)
Standard	X	X	X	X	
PMS	X	X	X	X	X

19. Documentation

Title	Document ID
ZEE600 manual	
ZEE600 Operation Manual	2NGA001331
ZEE600 Configuration Manual	2NGA001330
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20. Further information

Project support
You can receive support for all real projects you may have from our Support team. Contact via email at ZEE600.support@abb.com.

Trainings are available on https://mylearning.abb.com , custom trainings can be requested through ZEE600.training@abb.com.

General help
If you cannot find any information you require in this help chapter or can think of anything that you would like added, contact via email at ZEE600.support@abb.com.

21. Document revision history

Document revision/date	Product version	History
A/2019-10-28	1.0	First release
B/2019-12-17	1.0	Content updated
C/2021-06-08	2.0	Content updated
D/2023-05-15	2.1	Content updated
E/2023-09-14	2.2	Content updated

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