

zenon EE 8.00
2018



COPADATA

A modern office interior featuring a lounge area with a long, white bar and blue-topped stools. The bar is set against a white wall with a grid of framed posters. To the right, a dark grey wall displays the 'COPADATA' logo and shelves with bottles and glasses. A coffee machine and a vase of orange flowers are on the bar counter. The floor is made of large, light grey tiles. In the background, there are glass doors and a reception desk.

Company

COPA-DATA at a glance

Corporate Figures

1987 
founded in Austria

30 years of 
industrial expertise

 **100%**
independent
family business

240 
employees
worldwide

 **€37m**
turnover 2017

Core Business

 We develop
and sell
software

 
2 powerful products

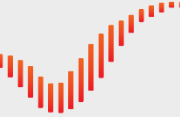
4 key industries
    

 **135,000**
installed zenon systems
worldwide

Sales Network

11 
subsidiaries

17 
distributors

more than
220 
partners

 **local**
sales & support in
46 countries



Application Profile

zenon EE Application Profile



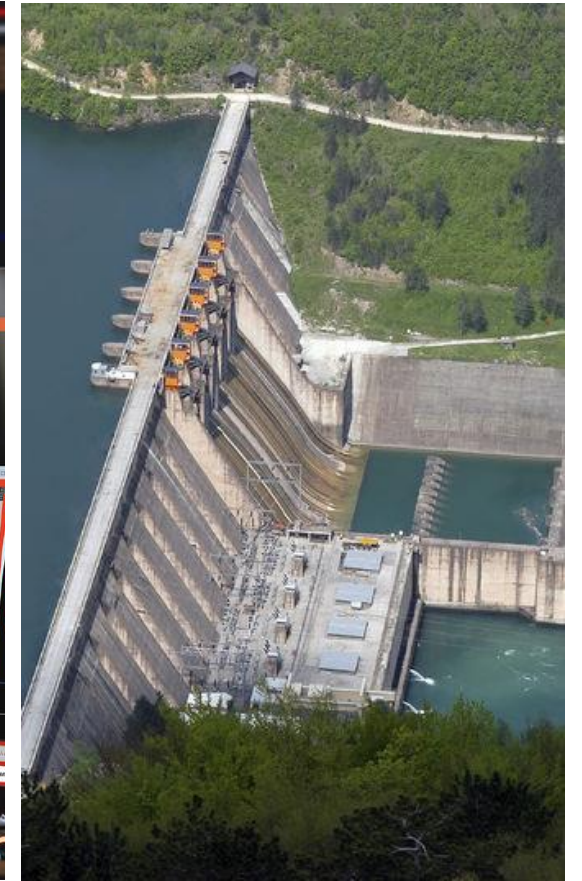
Renewables



Substation

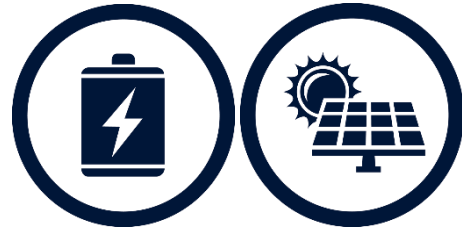


Distribution

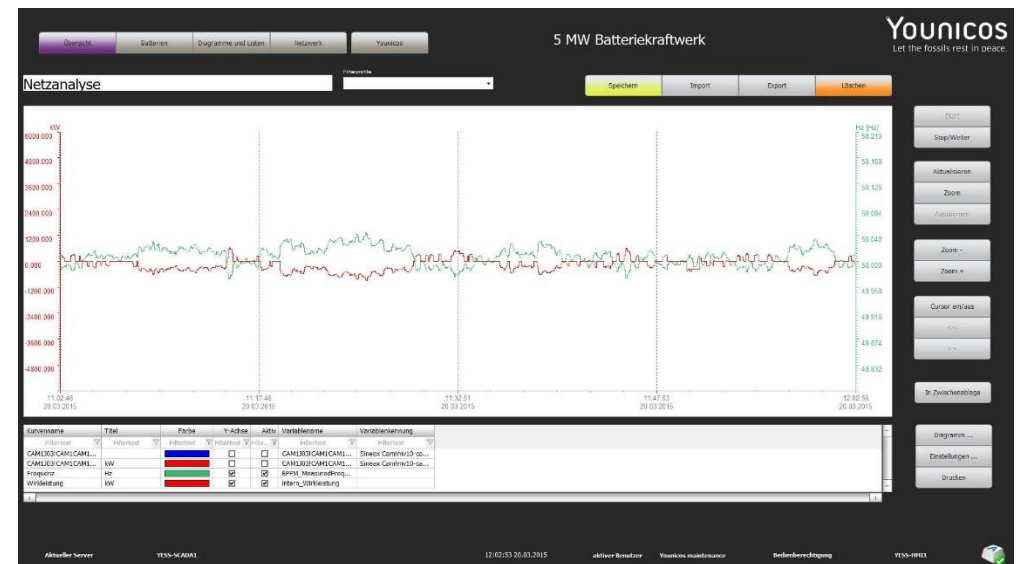
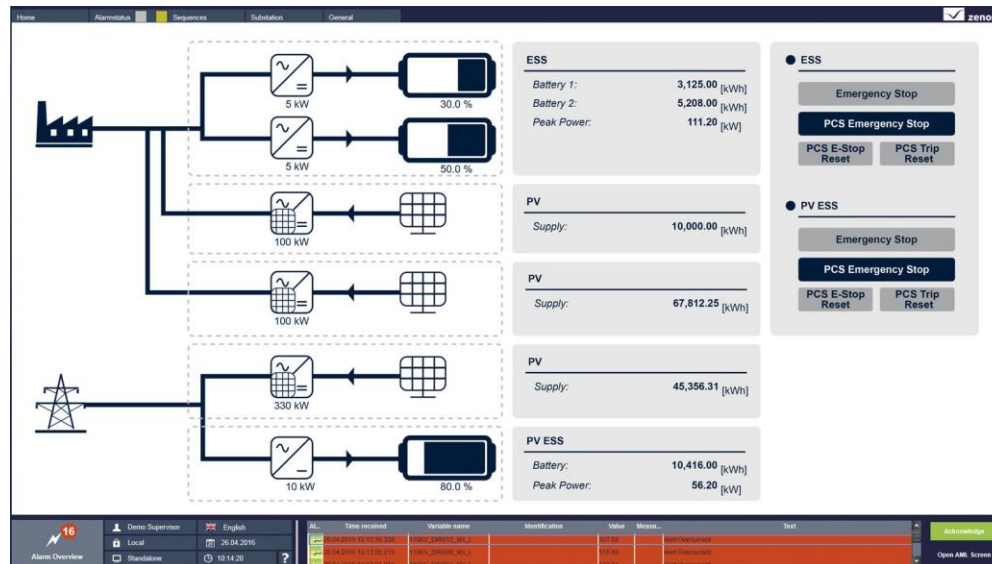


Hydro Power

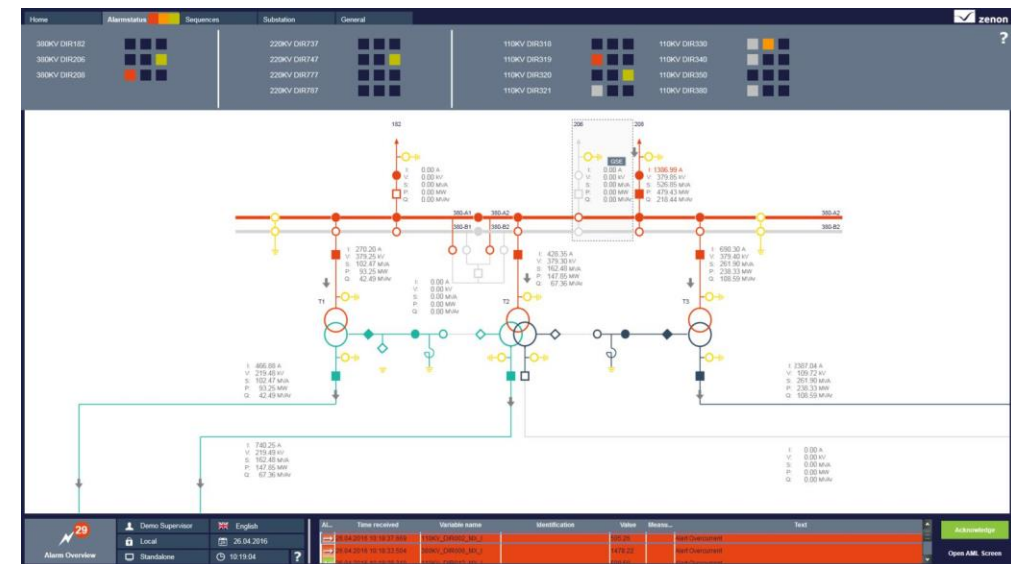
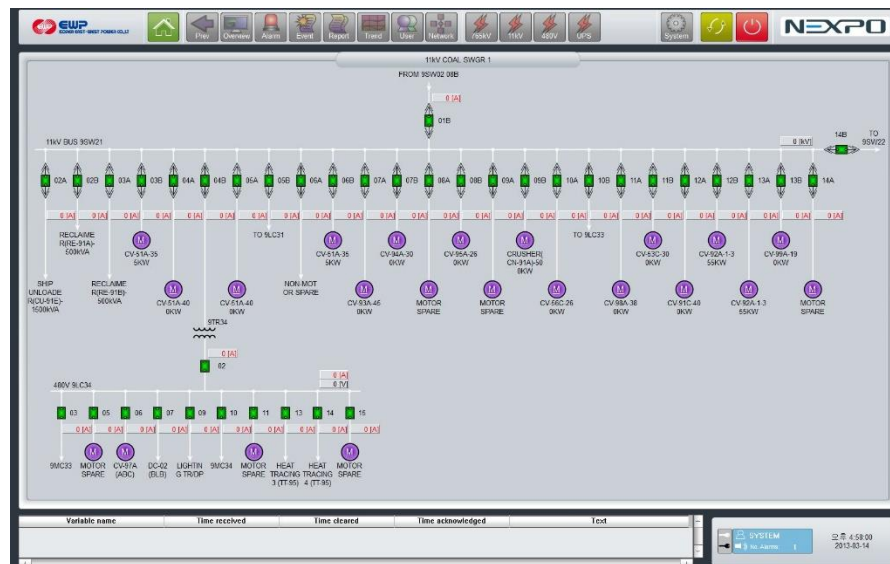
Renewables



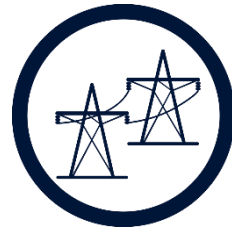
- ▶ Wind
- ▶ PV
- ▶ ESS



-

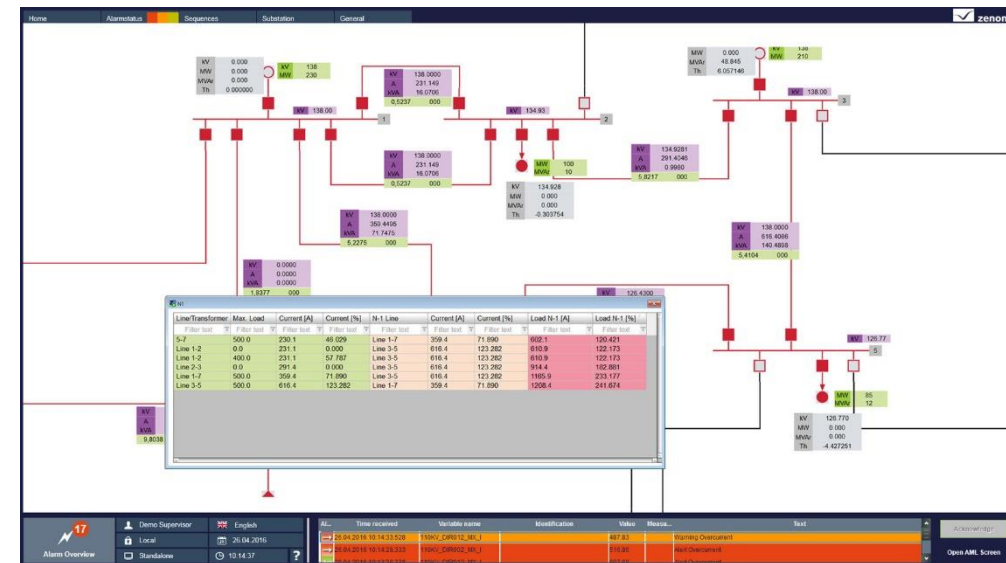
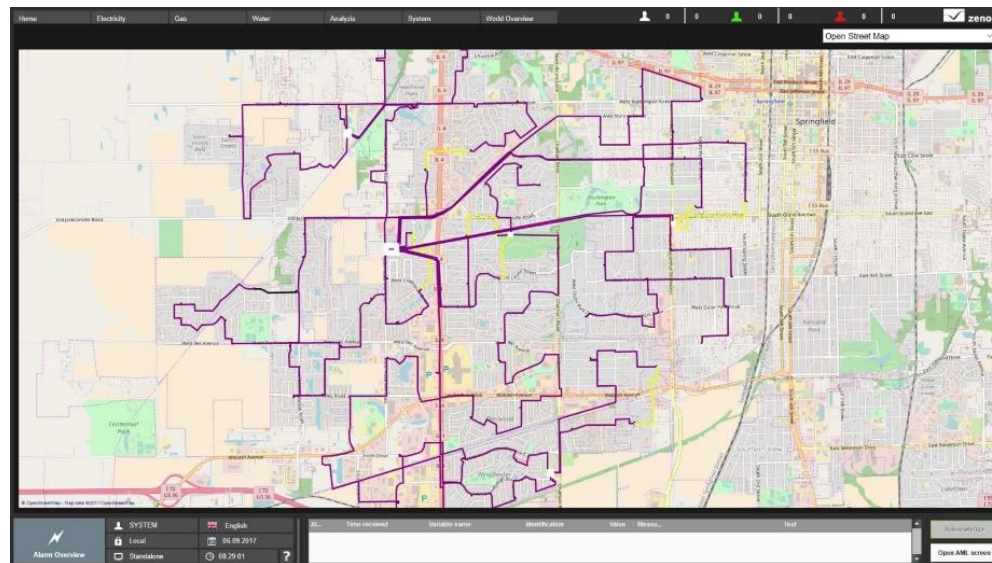
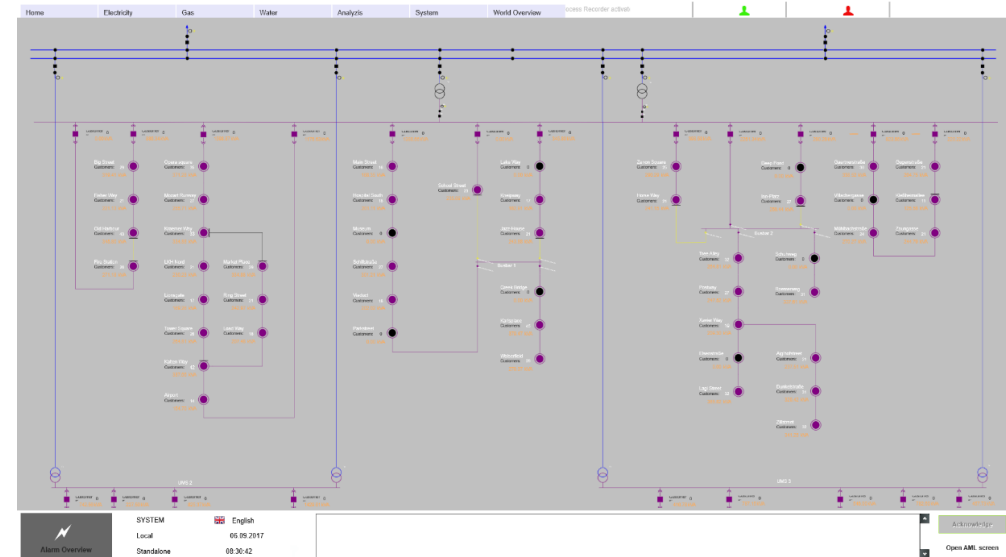


Distribution



► Multi-Domain

- Electricity (medium voltage)
- Gas
- Water
- Heat



Distribution – Focus Area



Any
substation

zenon



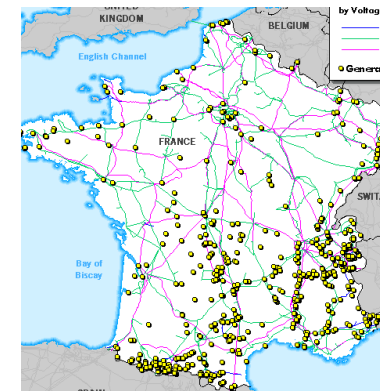
Small city
<100.000

zenon



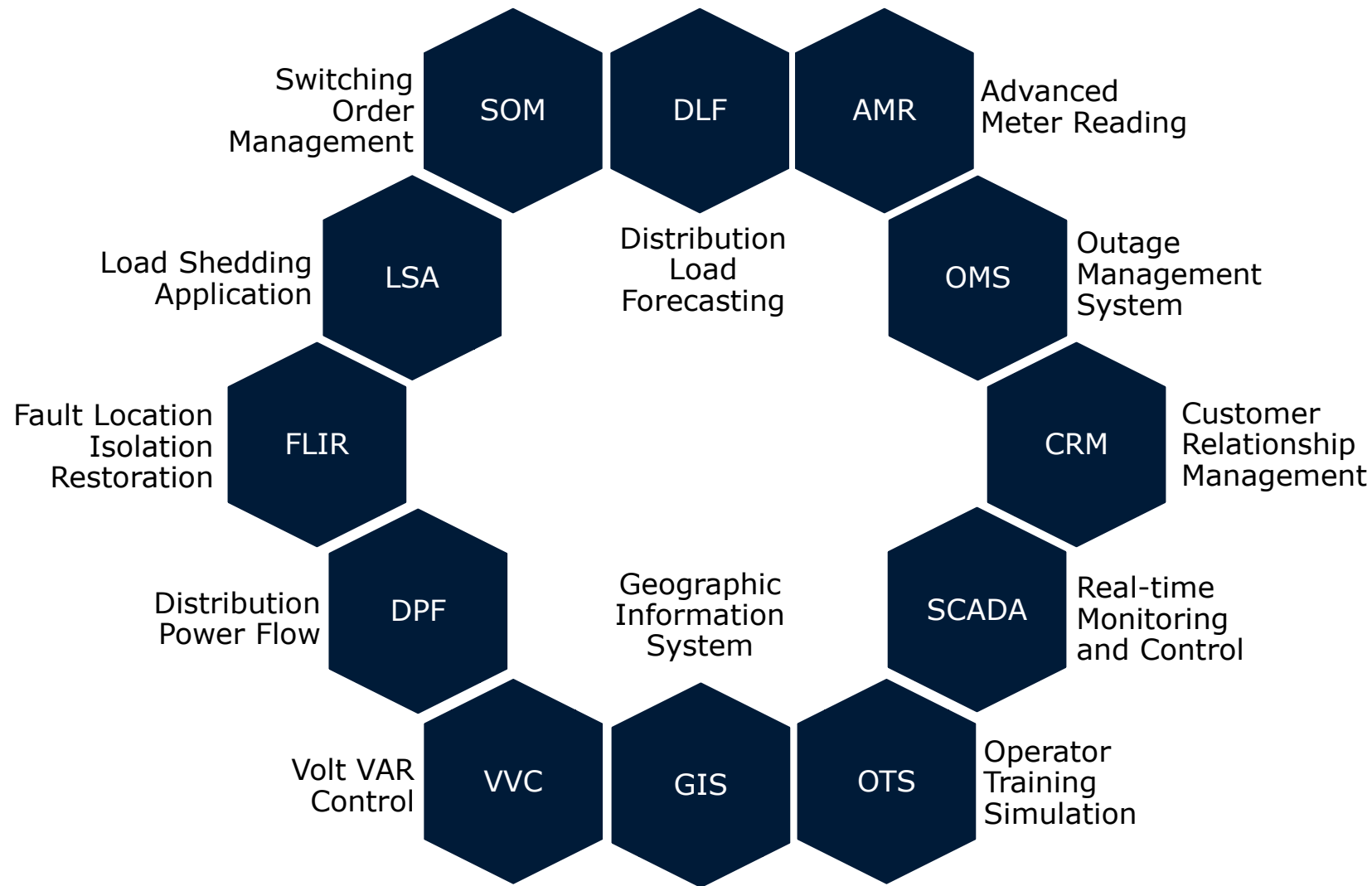
Big city
> 100.000

ABB
GE
PSI
Siemens



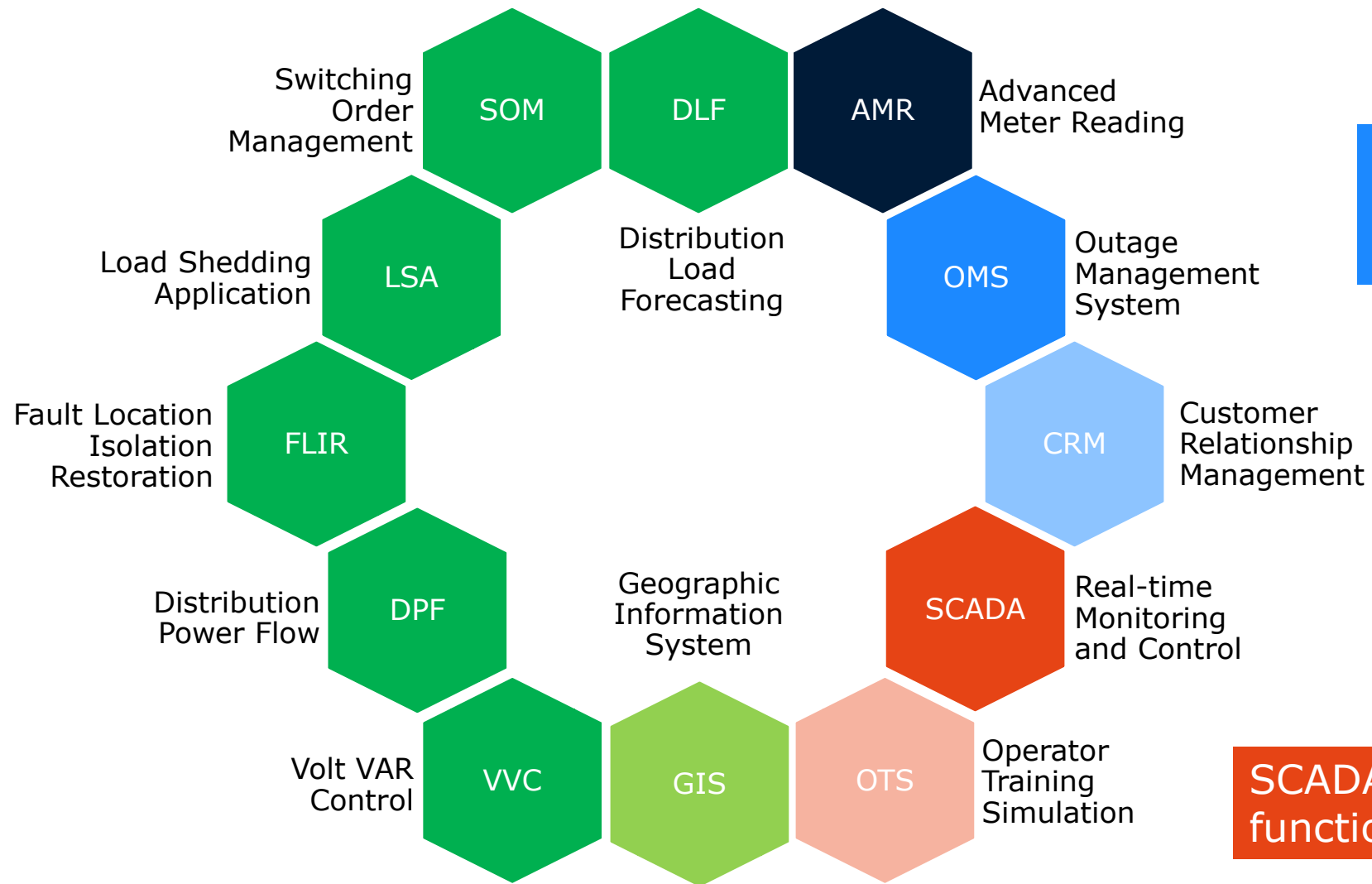
Entire country

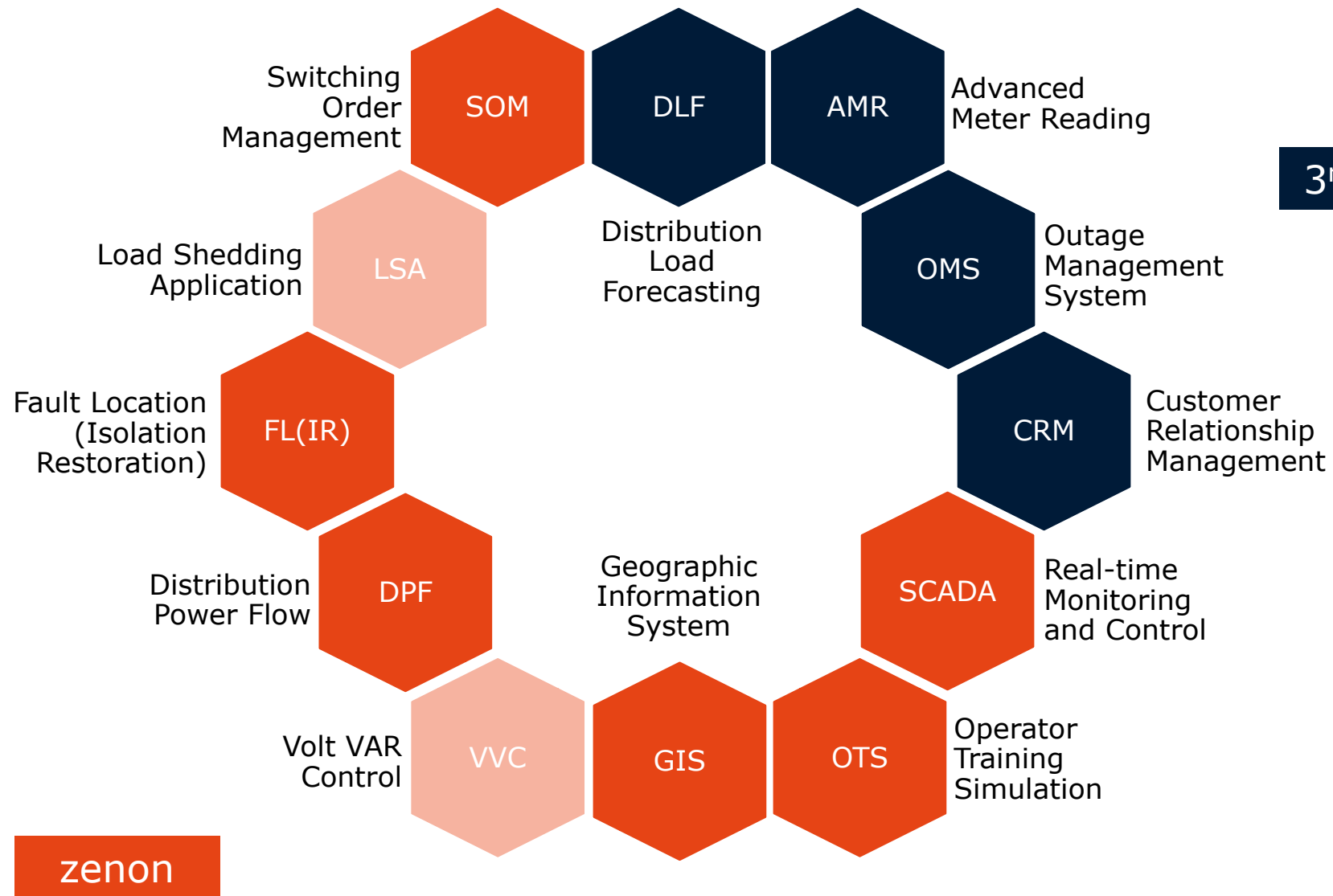
ABB
GE
PSI
Siemens



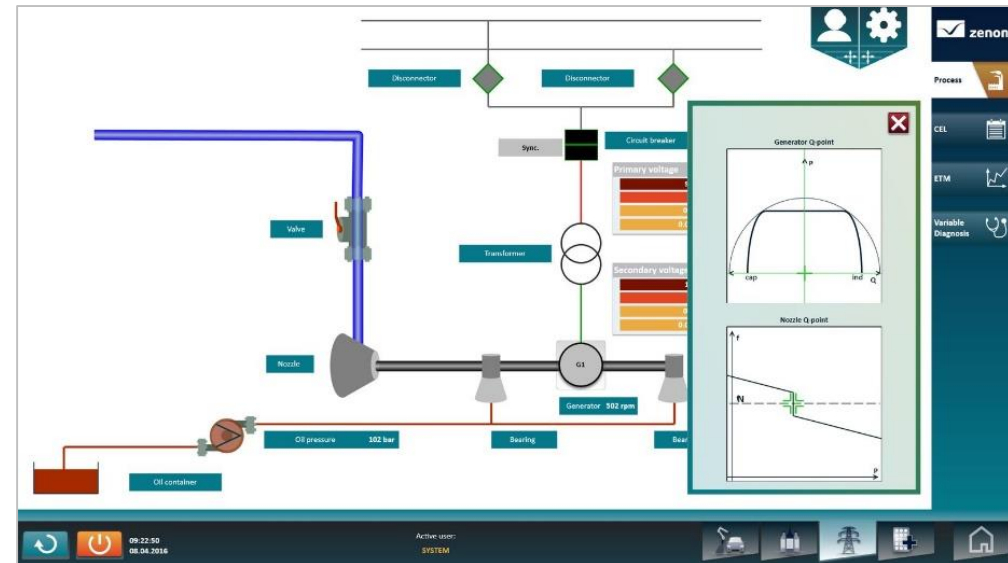
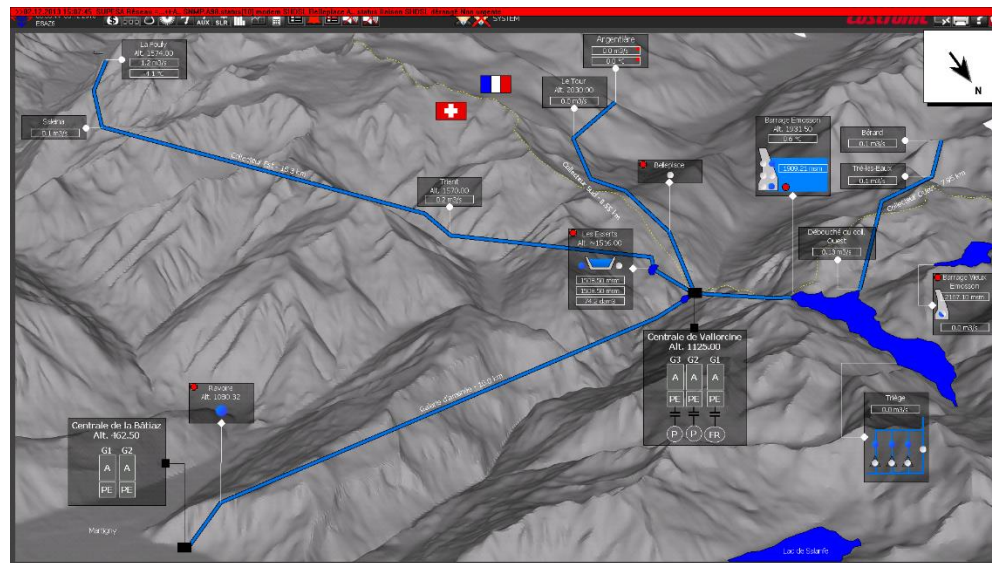
“A **Distribution Management System (DMS)** is a collection of applications designed to monitor & control the entire distribution network efficiently and reliably.” (Wikipedia)

Pure DMS
functions





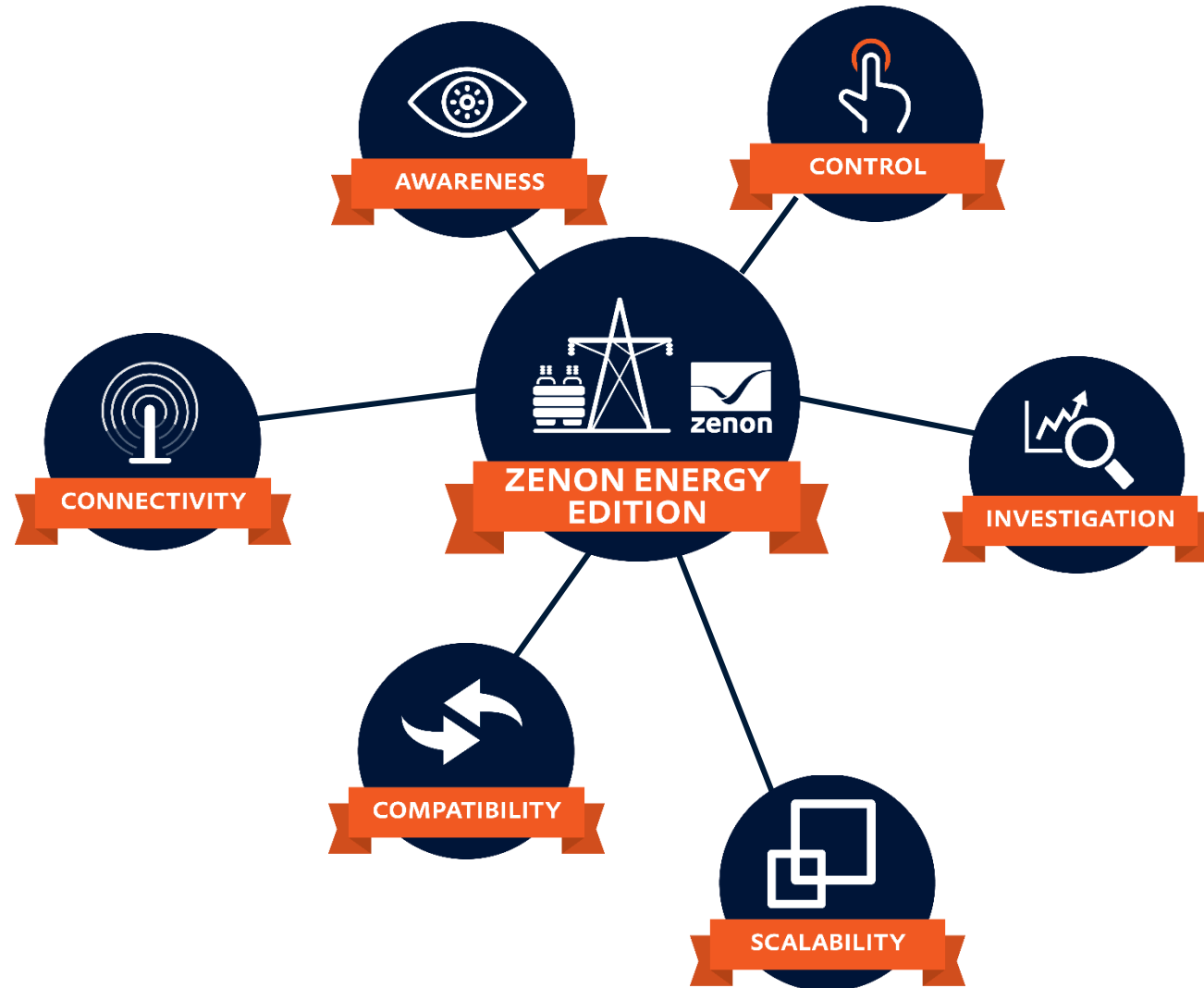
-



Product

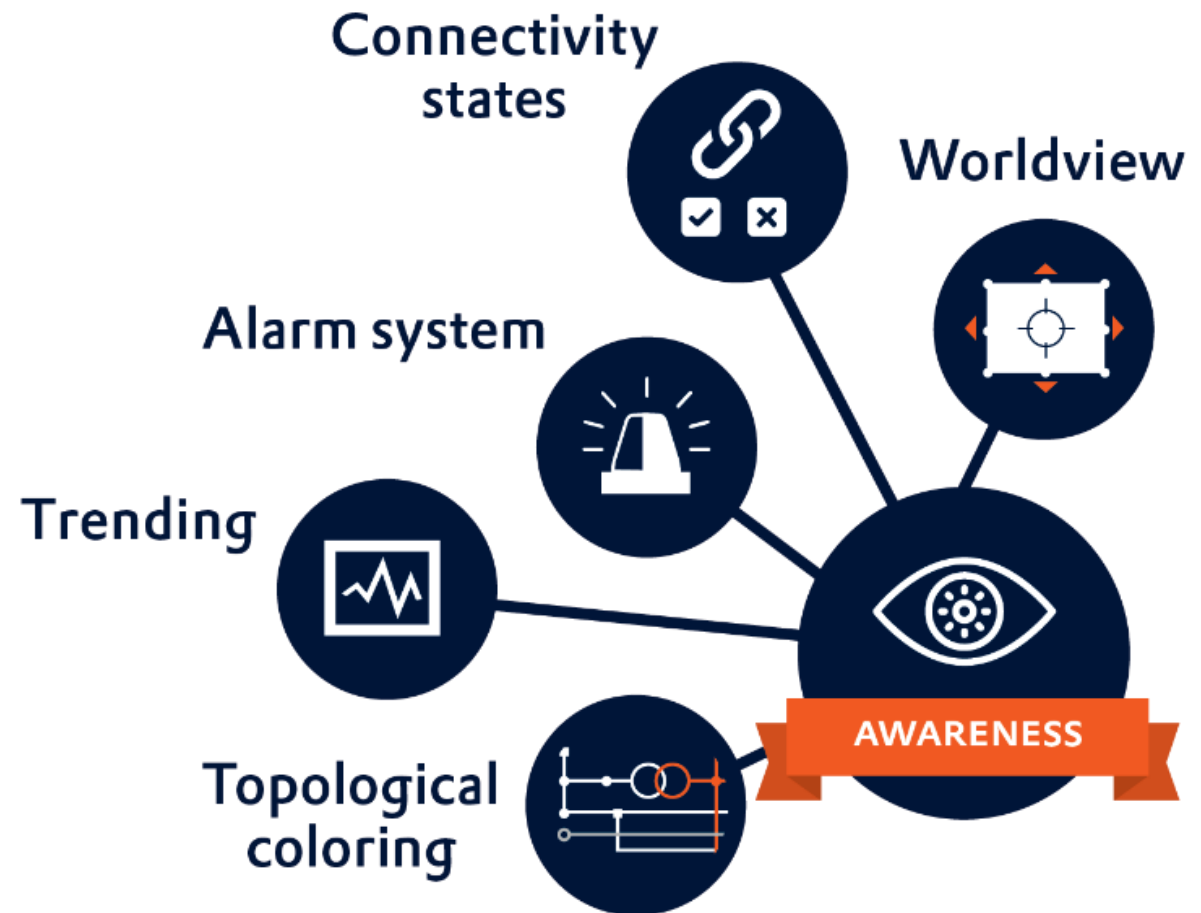


Why zenon Energy Edition?



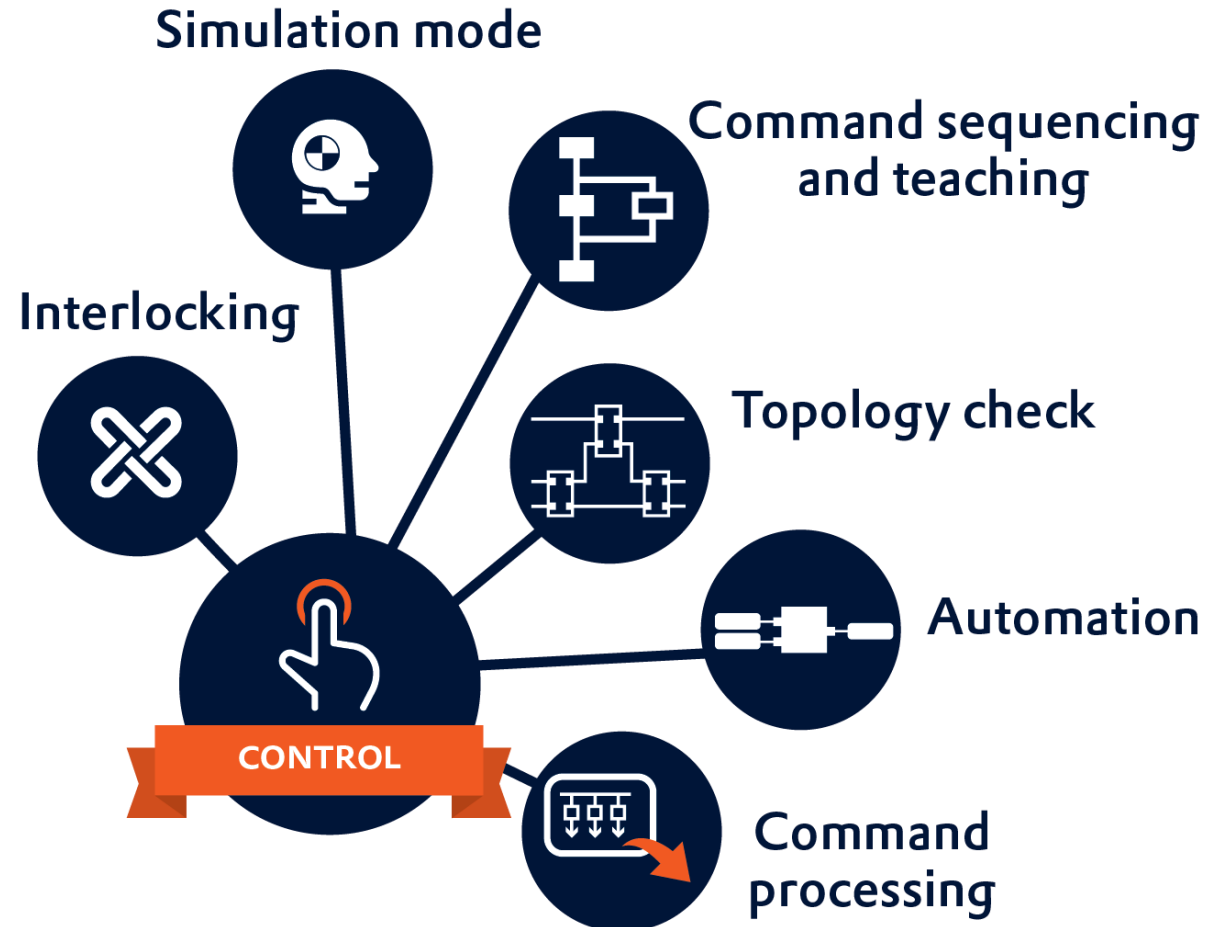
Awareness

- ▶ Worldview
- ▶ Alarm system
- ▶ Trending
- ▶ Topological coloring
- ▶ Connectivity states



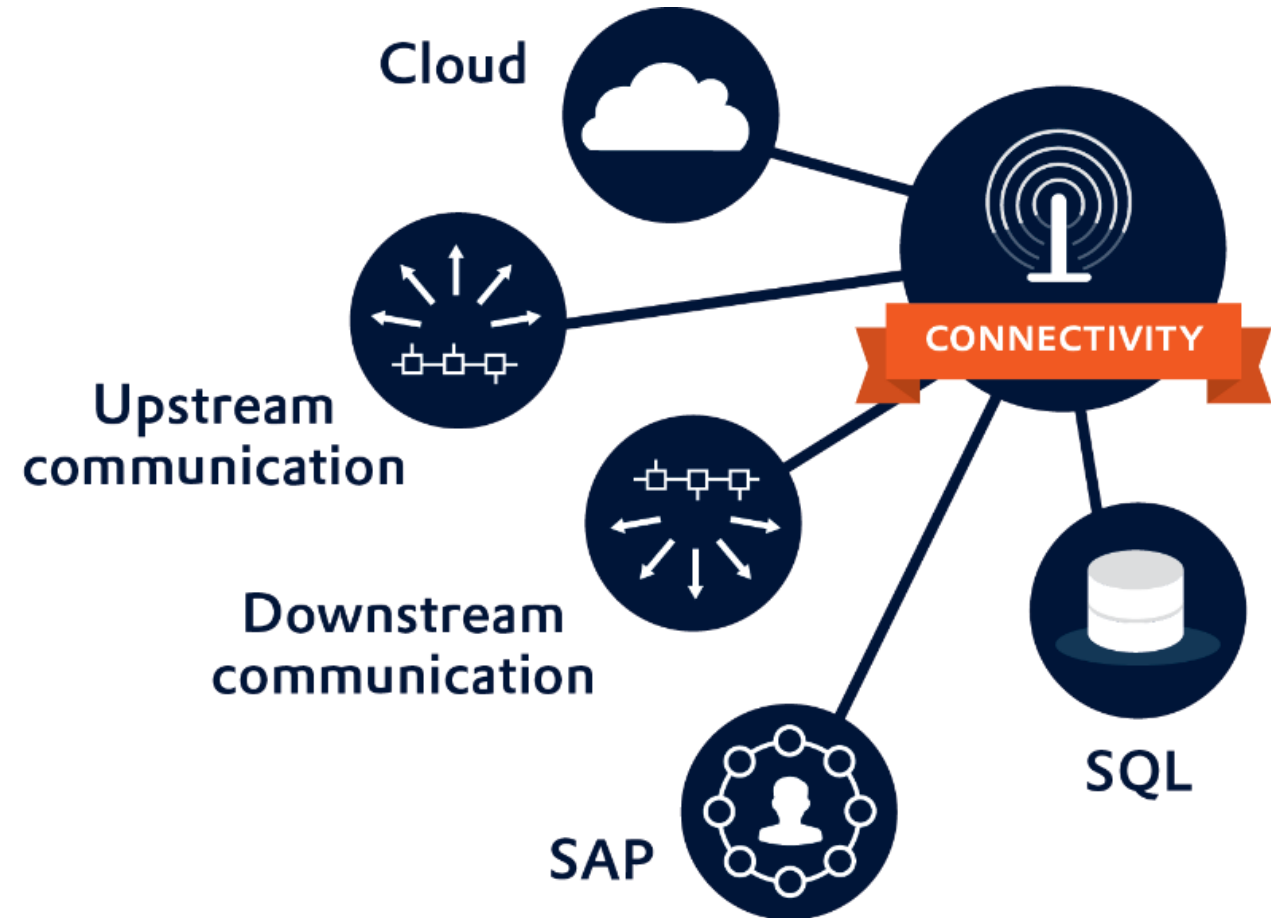
Control

- ▶ Command processing
- ▶ Automation
- ▶ Command sequencing and teaching
- ▶ Interlocking
- ▶ Topology check
- ▶ Simulation mode



Connectivity

- ▶ Downstream communication
 - 300 protocols
- ▶ Upstream communication
- ▶ SQL-DB
- ▶ SAP
- ▶ Cloud

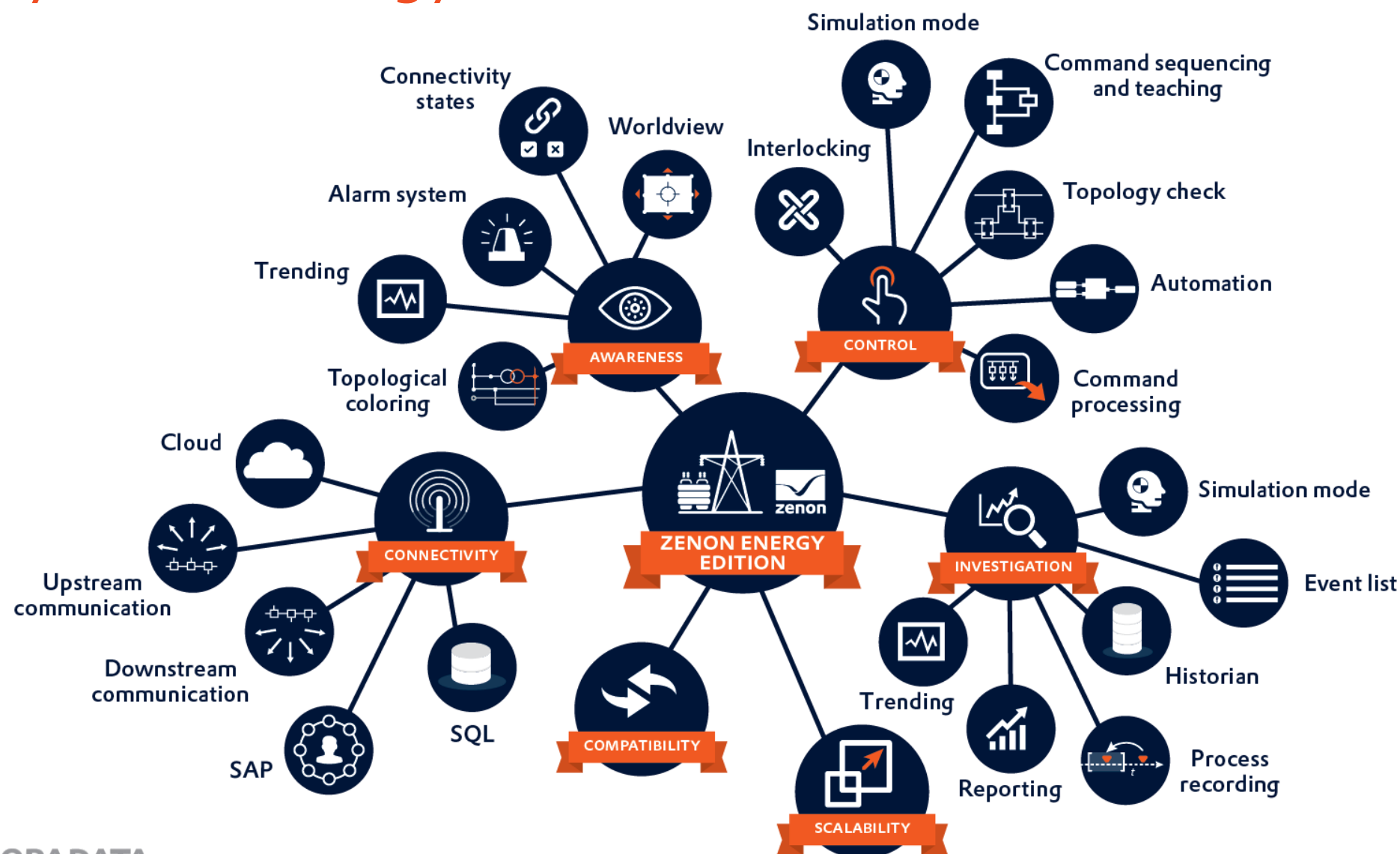


Investigation

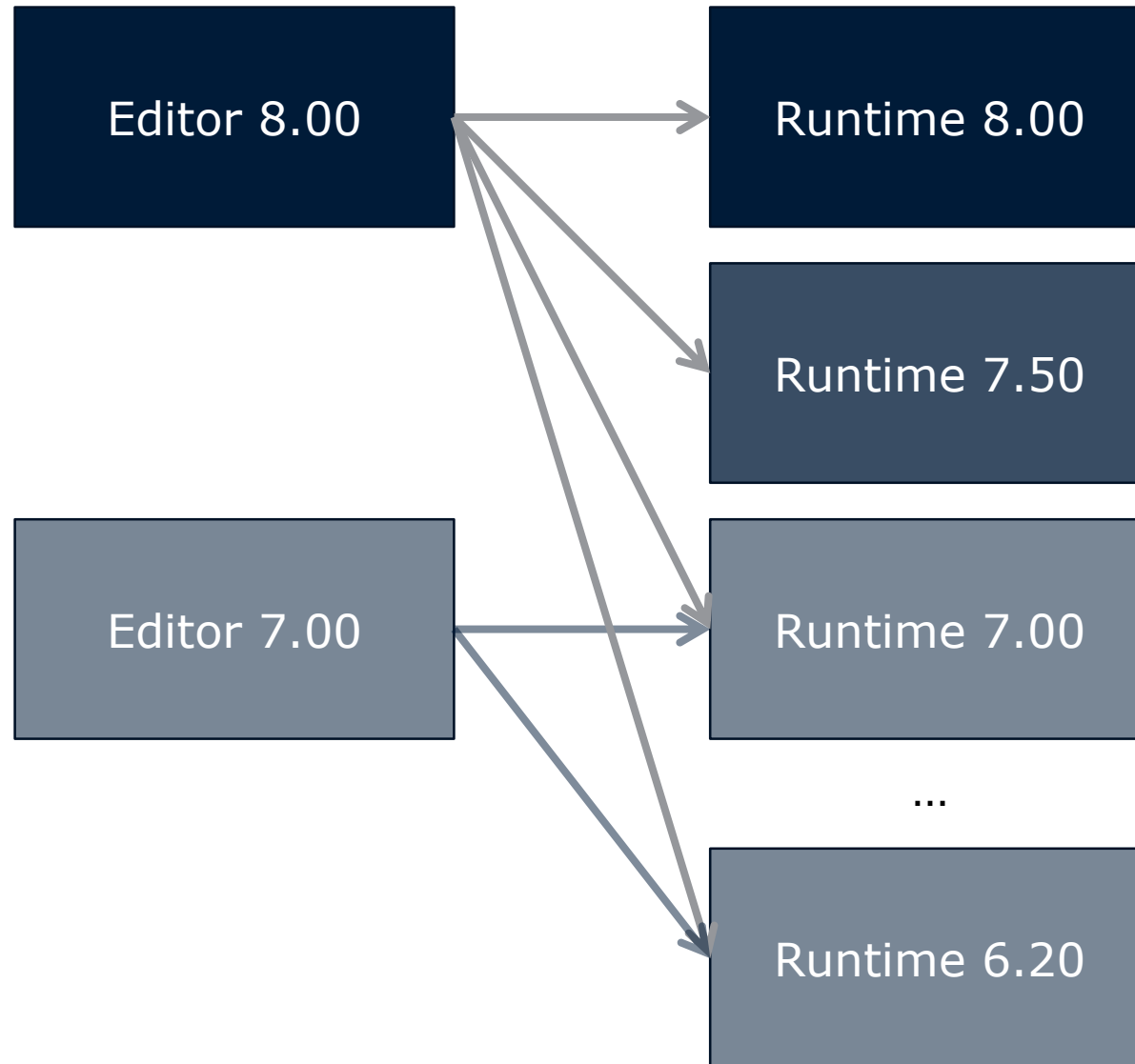
- ▶ Simulation mode
- ▶ Event list
- ▶ Historian
- ▶ Process recording
- ▶ Reporting
- ▶ Trending



Why zenon Energy Edition?

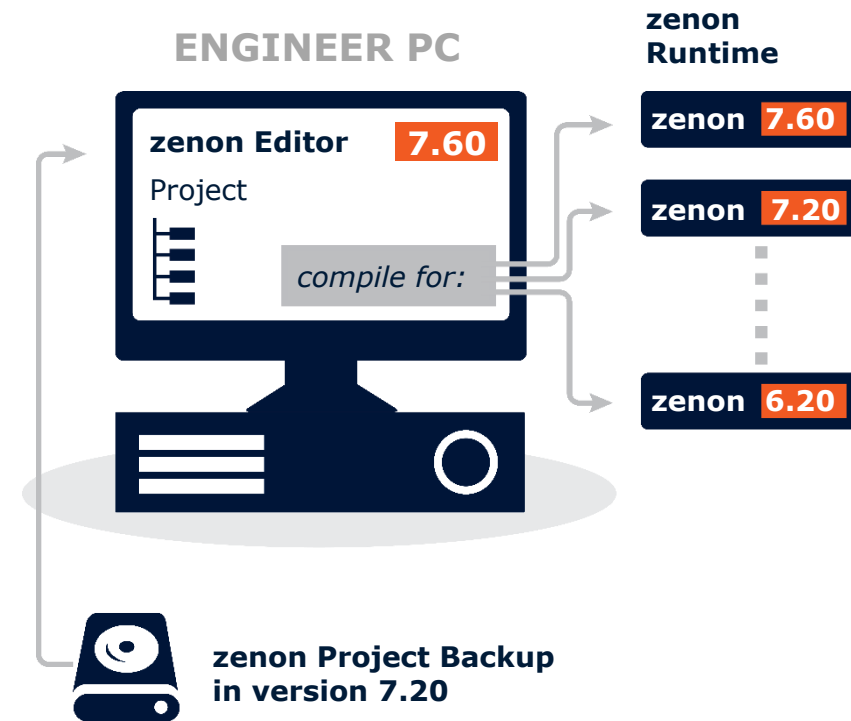


Compatibility Concept (Engineering)

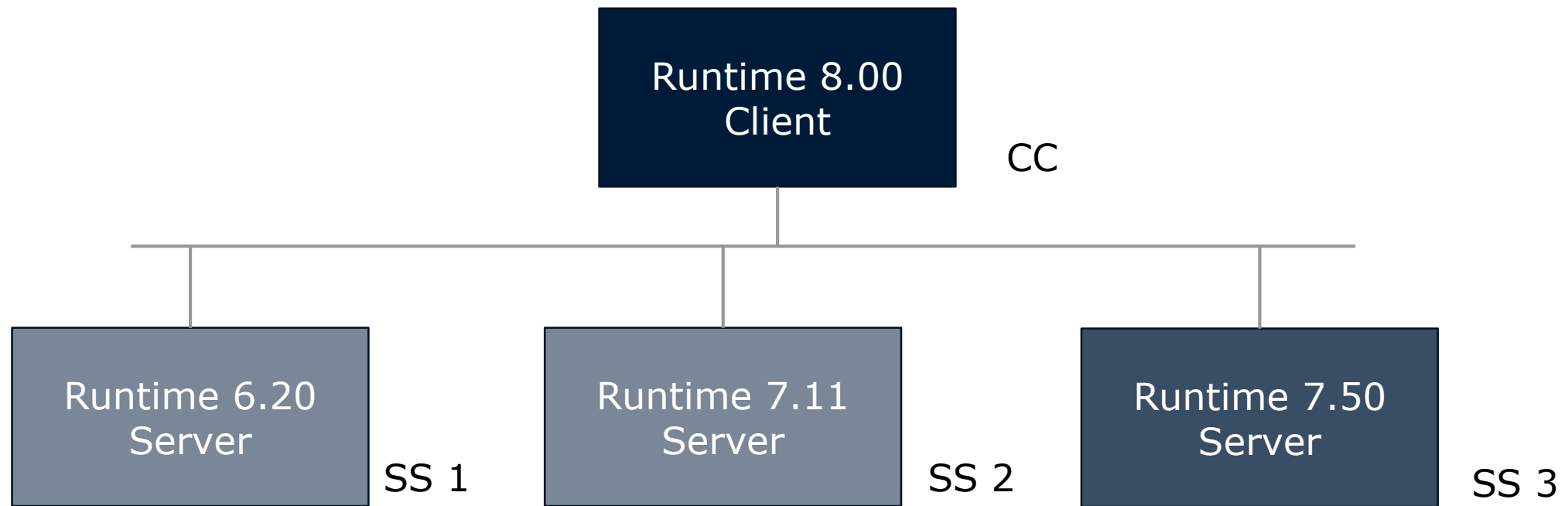


Compatibility for Future-Proof Projects

- ▶ Minimized risk for updates and upgrades
- ▶ Always up to date with technology
- ▶ No expensive machine downtime
- ▶ Simple servicing and maintenance
- ▶ Use of the latest operating systems and security standards

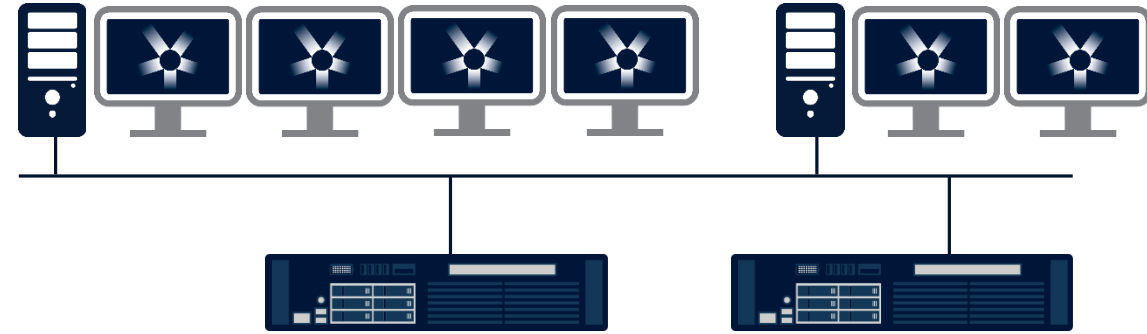


Compatibility Concept (Runtime)



Scalability

Full control center with redundant servers and client work stations



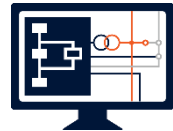
Redundant work stations



Double monitor



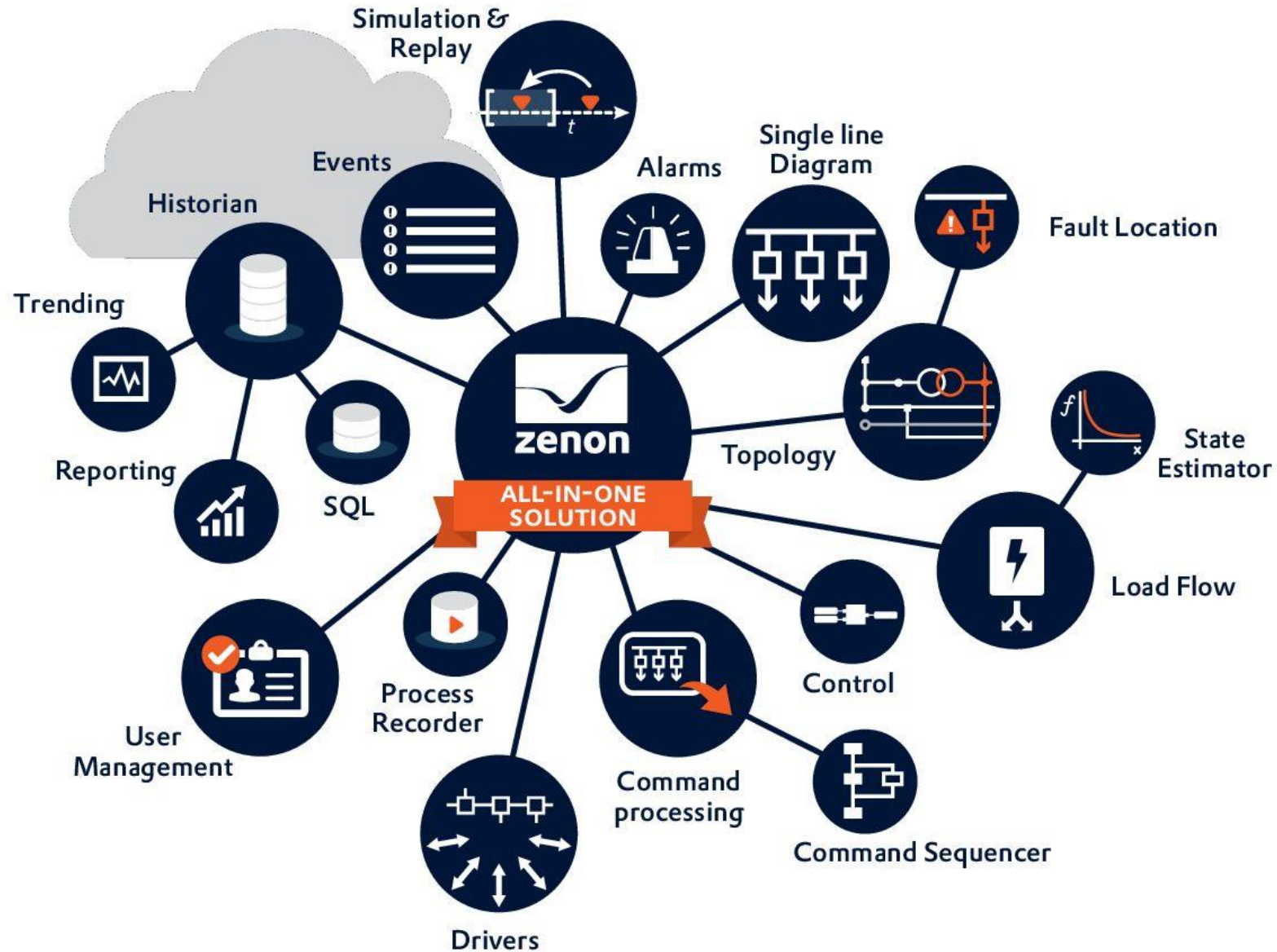
Single monitor



Small touch screen



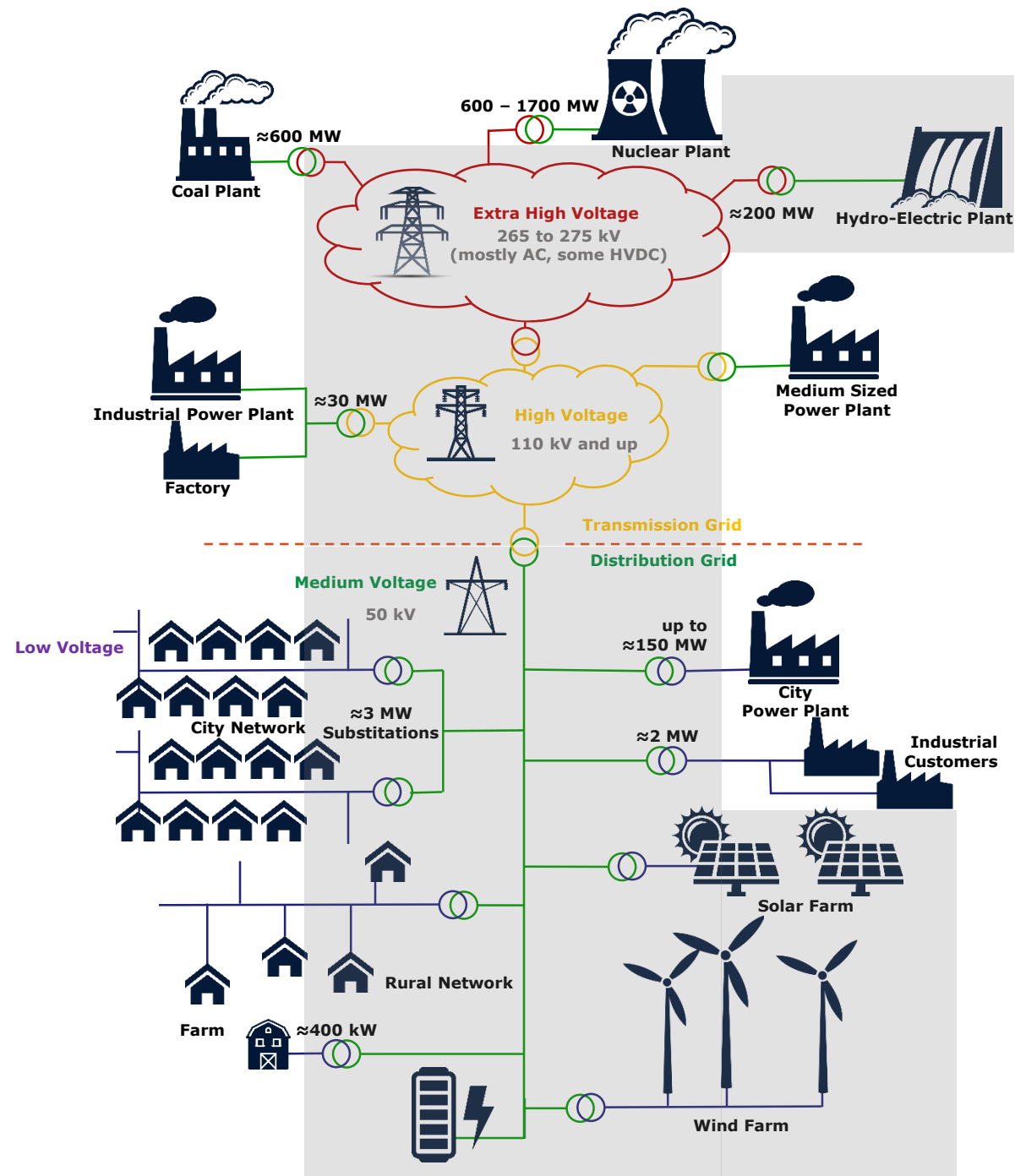
Scalability Top Level: SCADA with DMS



References



Reference Areas



References: Energy & Infrastructure





- ▶ 114 Substation
- ▶ 110-330 kV
- ▶ 13,000 km
- ▶ Virtualization
- ▶ IEC 61850
- ▶ DNP3
- ▶ Disaster Recovery



Three Major Integrators for FSK (Russia)

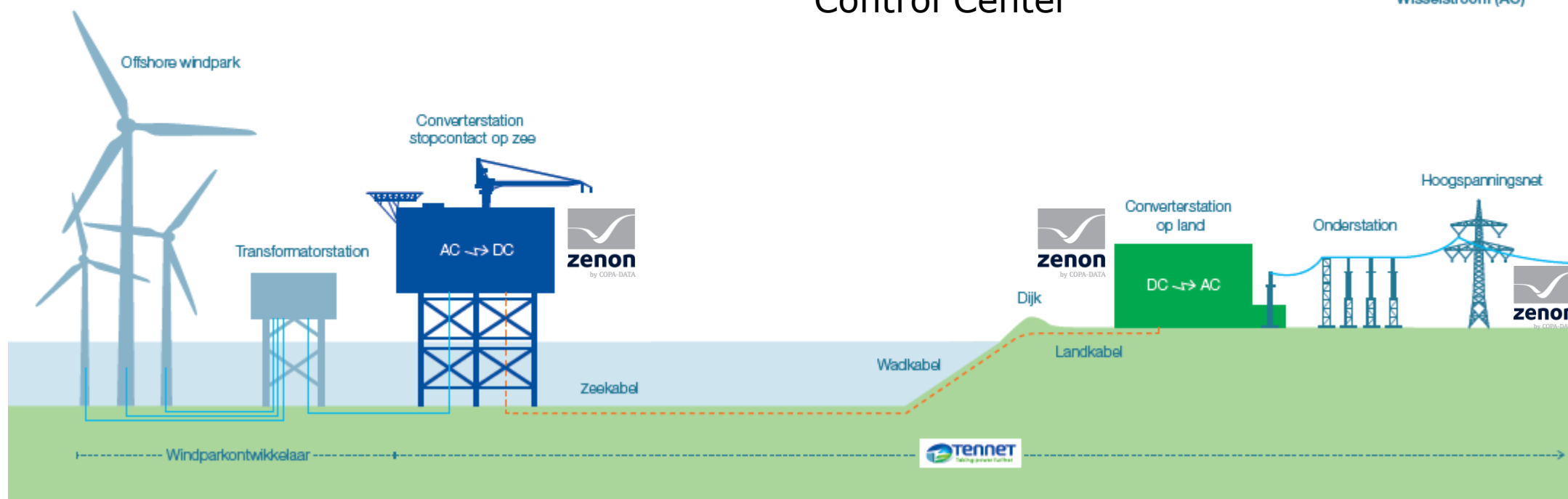
- ▶ Extreme requirements to SCADA system





DC offshore netaansluiting

(schematische weergave)

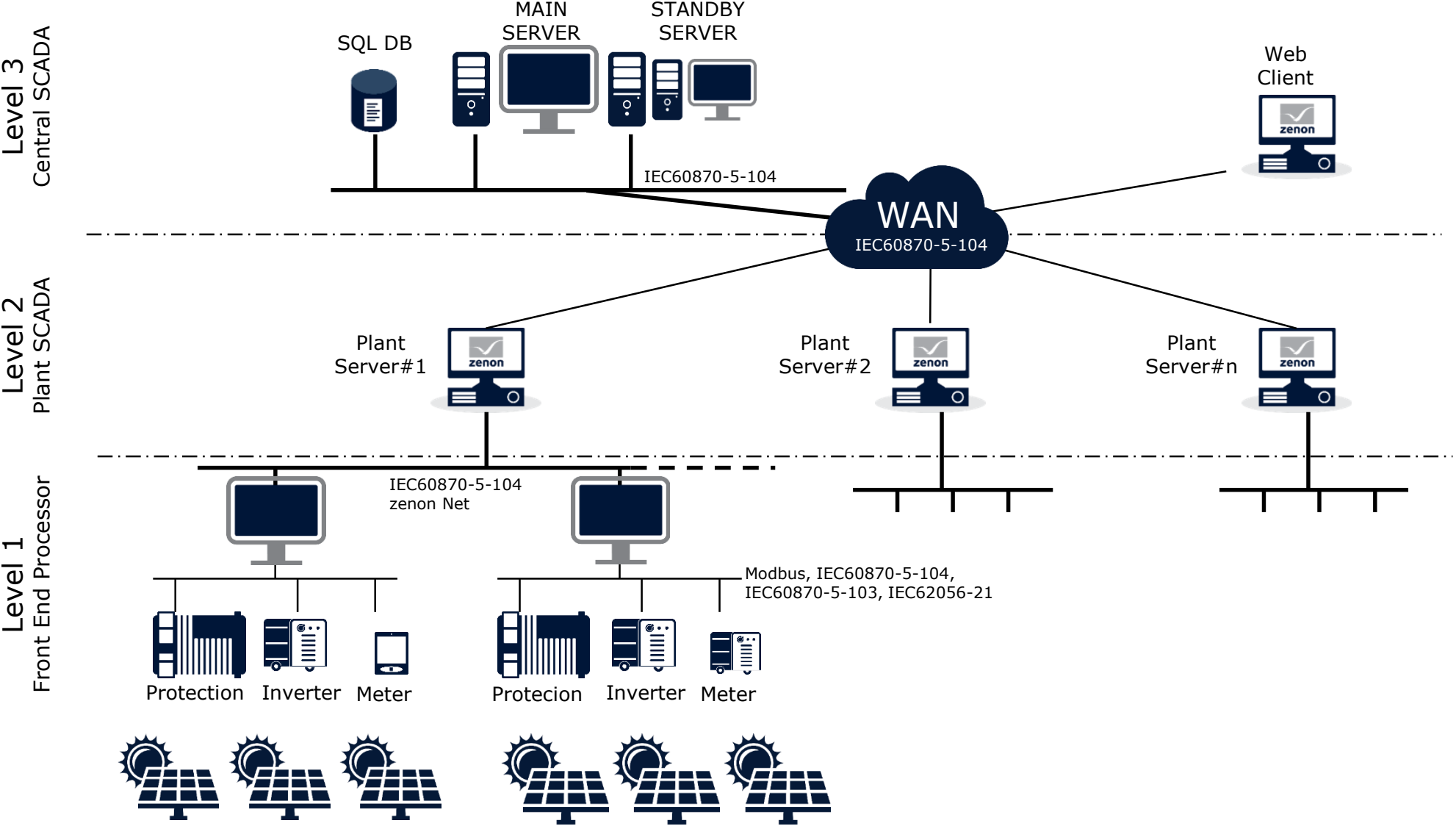


Control Center



COPA-DATA

PV Project Italy



Industrial IoT Reference



COPADATA



Remote Monitoring & Control solution for Gorenjske Elektrarne (GEK), a renewables energy producer from Slovenia



Challenge

- ▶ The customer wanted to achieve easy access for all employees out in the field in order to make their own services more efficient.
- ▶ Optimization of operational performance

Solution / Strategy

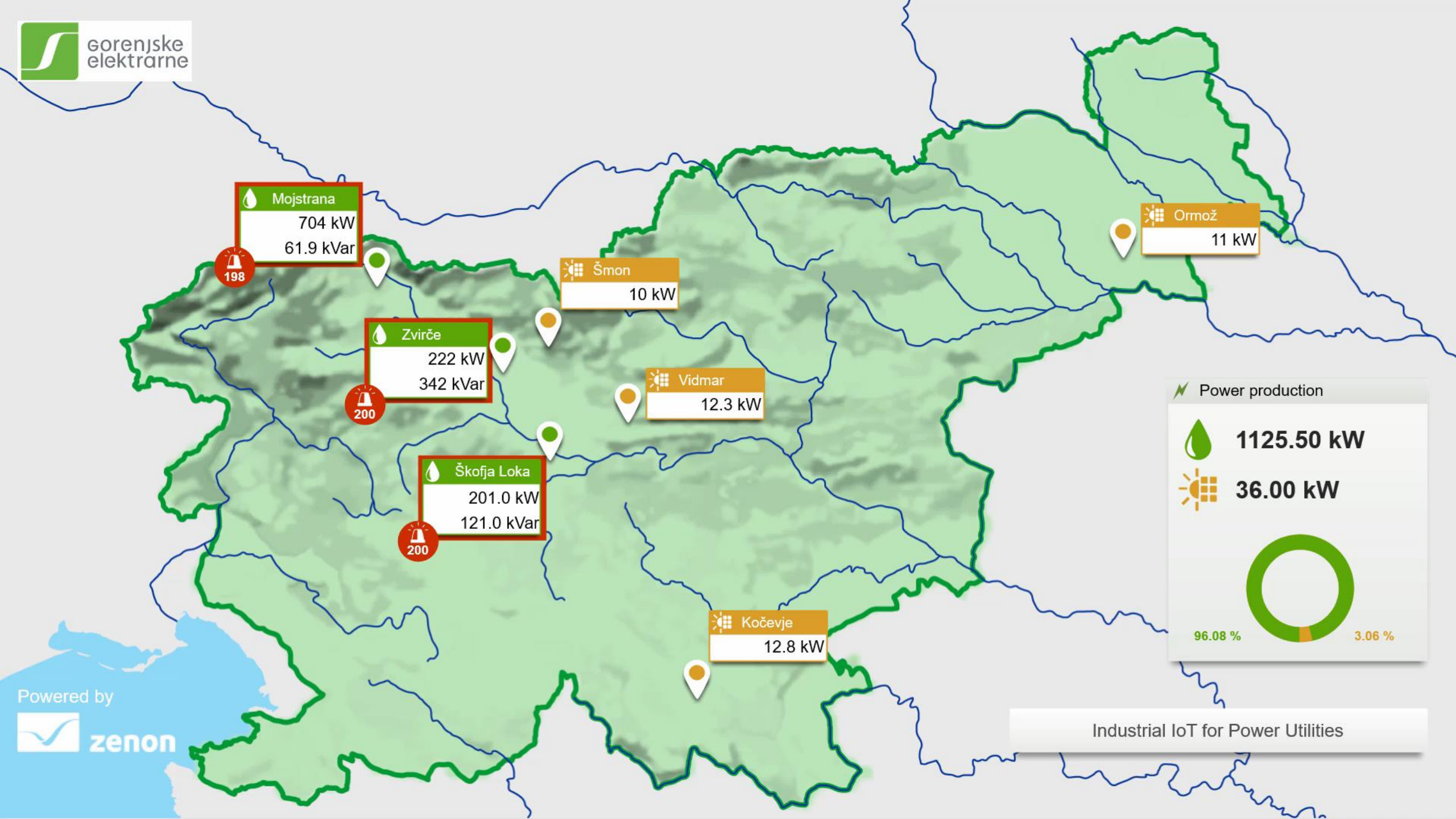
- ▶ Connecting and integrating 15 hydroelectric power plants and 23 photovoltaic power plants in one central solution
- ▶ Accessing information via mobile devices

Outcome

- ▶ **Operational cost reduction of 30%**
- ▶ **Production increase of 15%** through the elimination of downtime and sub-optimal operation

"The application is extremely fast and responsive. I am very happy with the outcome of our latest zenon project using Microsoft Azure as a platform. It is very useful for our company."

Jurij Cadež, Project Manager at Gorenjske Elektrarne



Industrial IoT Reference: Gorenjske Elektrarne (GEK)

[Case Study](#) + [Microsoft blog post](#) available about the Azure IoT project at Gorenjske Elektrarne (GEK).

Results of the combination zenon and Azure:

- ▶ **Operational cost reduction of 30%**
- ▶ **Production increase of 15%** through the elimination of downtime and sub-optimal operation

ENERGY | GORENJSKE ELEKTRARNE

Remote monitoring and control for distributed renewable energy generation

On the way to zero downtime with zenon and Microsoft Azure

Managing remote power generation sites has its own particular challenges, not least in terms of the efficient monitoring of operations. Slovenian renewables producer Gorenjske Elektrarne has resolved these challenges using a novel and technologically advanced IoT solution which combines COPA-DATA's software zenon with Microsoft's Azure cloud services.



Gorenjske Elektrarne is a subsidiary of Elektro Gorenjska, one of Slovenia's leading energy utility companies. It specializes in the development of power from renewable sources, including solar and hydroelectric power. Given the nature of its power sources, many of the company's power generation sites are located in remote and difficult terrain. This can present challenges in terms of the monitoring and control of remote locations.

Gorenjske Elektrarne's use of COPA-DATA's SCADA software began in 2006 when a refurbishment project at

Gorenjske Elektrarne's Sotška hydroelectric power station utilized zenon for the plant's local control and monitoring systems. The Gorenjske Elektrarne team were pleased with the improved system overview and reliability zenon delivered.

Jurij Čadež, Project Manager at Gorenjske Elektrarne, says: "zenon is a simple tool to deploy and extremely stable in operation. Trust and conviction in the solution are two of the many reasons we chose to standardize on zenon."

www.copadata.com

ENERGY | GORENJSKE ELEKTRARNE



This zenon network diagram of the sites controlled from the Voderjuz control room uses color coding to clearly communicate essential status information.



zenon integrates live camera feeds of key locations for easy observation and analysis. Here, an augmented overview of the Sotška hydroelectric power plant and four detail views of the same plant are shown.

IMPROVED VISIBILITY HAS HELPED TO OPTIMIZE OUTPUT

The decision to standardize on zenon led to a major project at the Sotška Hydroelectric Power Plant (HPP). zenon was implemented to control operations with built-in fail-safe redundancy, to record key plant parameters, enable the visualization of current statuses, alert engineers to alarm states and sub-optimal operation, and enable further operational analysis.

Aleš Ažman, the Director at Gorenjske Elektrarne responsible for the Sotška project, says: "We have had a very good experience with the COPA-DATA solution. For us, it was important to optimize production costs and gain an overview of all operational parameters at the Sotška power plant. zenon has helped us to achieve this and, in doing so, has helped us improve the power stations' output and reduce associated operational costs."

CENTRALIZED CONTROL DELIVERS COST SAVINGS

The Sotška project also included an initiative to improve the centralized monitoring of HPP operations. zenon was implemented to allow operational parameters, alarm management and live camera feeds to be displayed at the HPP control center in Kranj.

The insight that zenon delivers has enabled the team at headquarters in Kranj to fully understand a situation before dispatching a team of field engineers to the location – saving valuable time and money. In addition, zenon has also enabled the Gorenjske Elektrarne team to control operations remotely from the HPP control center.

Aleš Ažman outlines the benefits: "We have seen a huge improvement with our data following the zenon integration. We are now also very grateful to zenon because all our maintenance engineering has been streamlined."

Jurij Čadež confirms: "zenon's 100% reliability has been great for us. The optimization project led to a reduction in downtime. zenon has enabled us to regulate the turbine operations and when the temperature exceeds a given level we are alerted of this indicator immediately. Because of the risks associated with water accumulation it is important to be able to control operations remotely and zenon has proved very useful for this too."

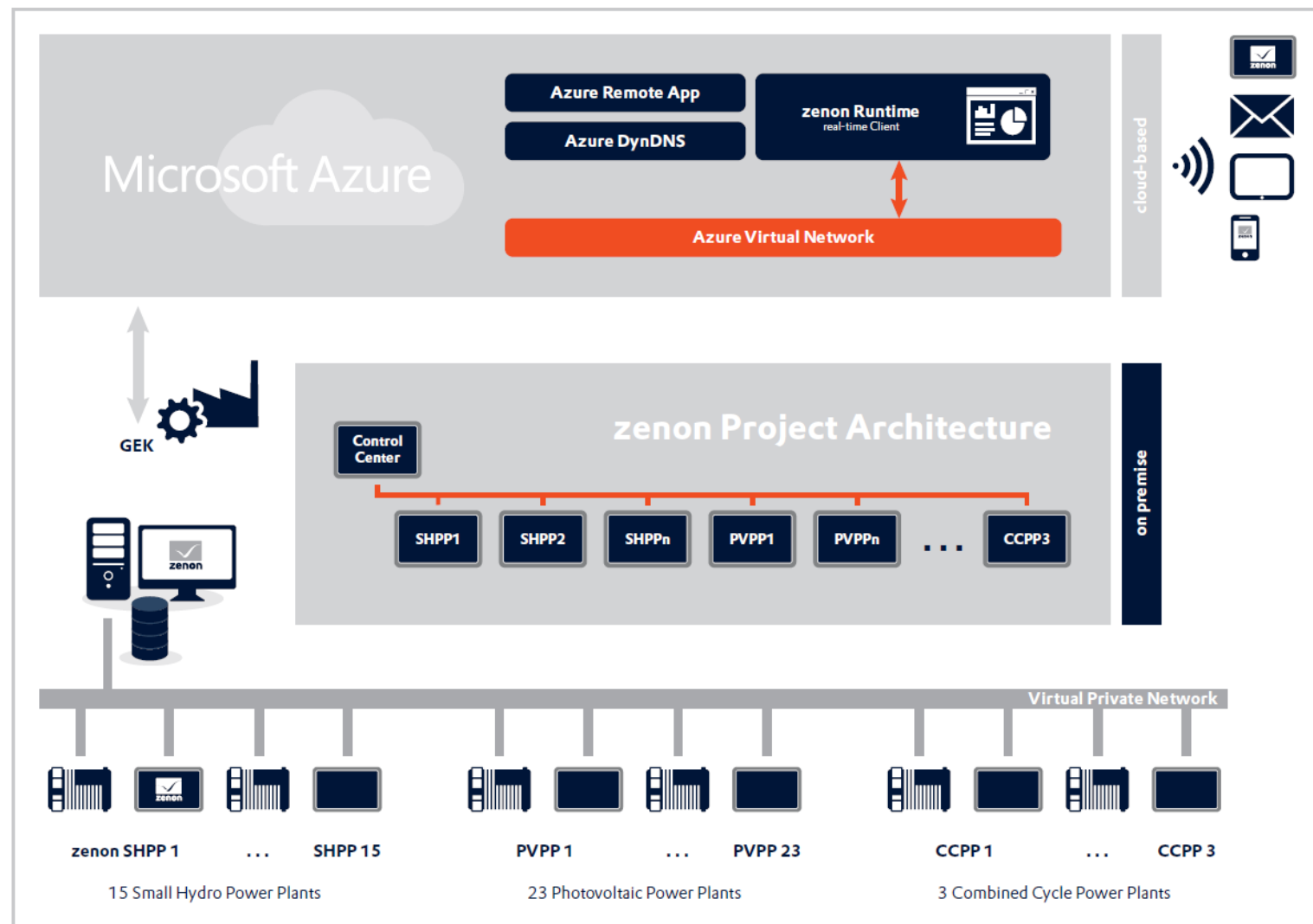
COMMUNICATION CHALLENGES REQUIRE CREATIVE SOLUTIONS

Over recent years, Gorenjske Elektrarne has successfully developed its power generation capabilities and it now owns and operates thirteen plants across Slovenia. zenon has been implemented across all utilities to read the process data and

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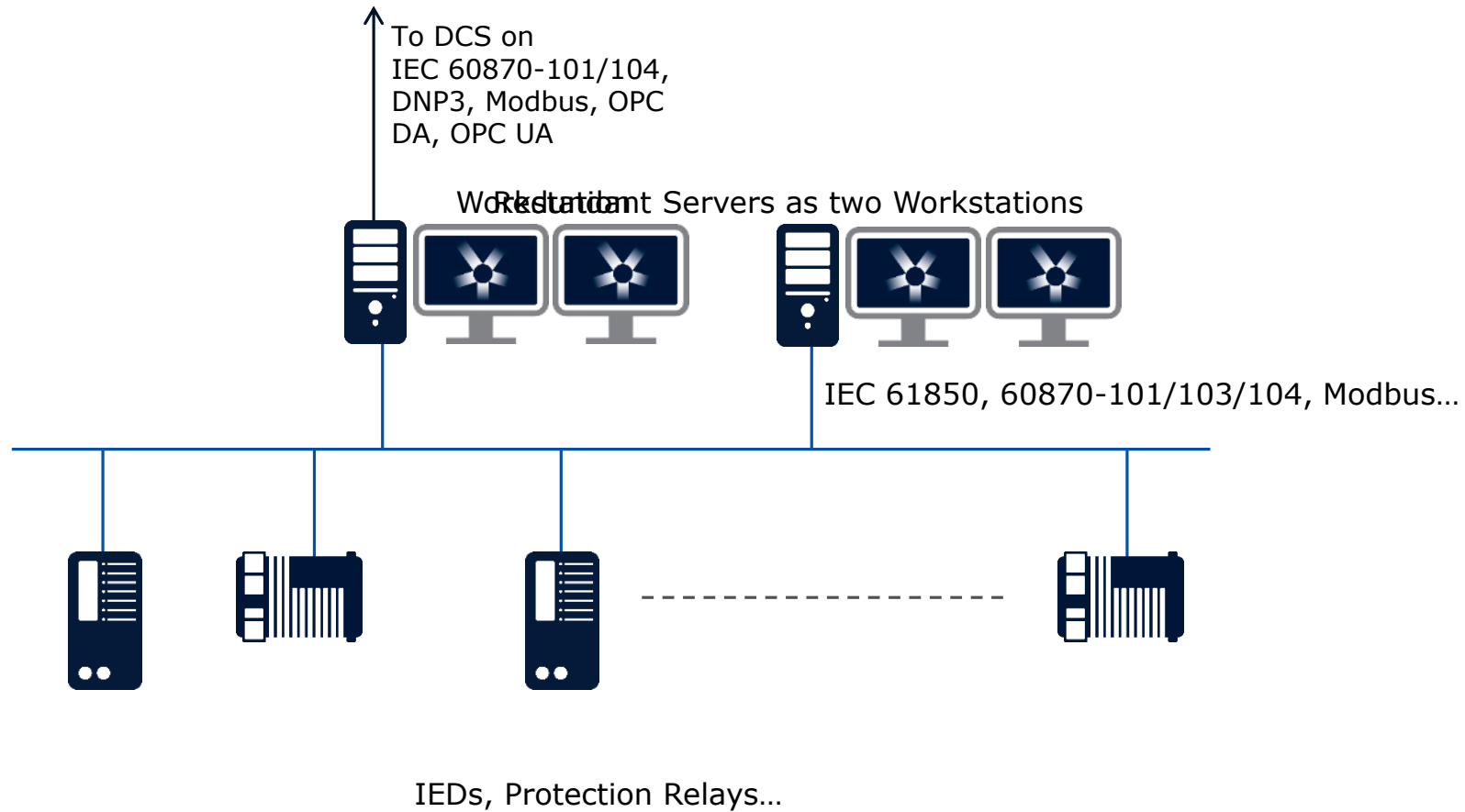
Industrial IoT Reference: Gorenjske Elektrarne (GEK)

Gorenjske Elektrarne (GEK):

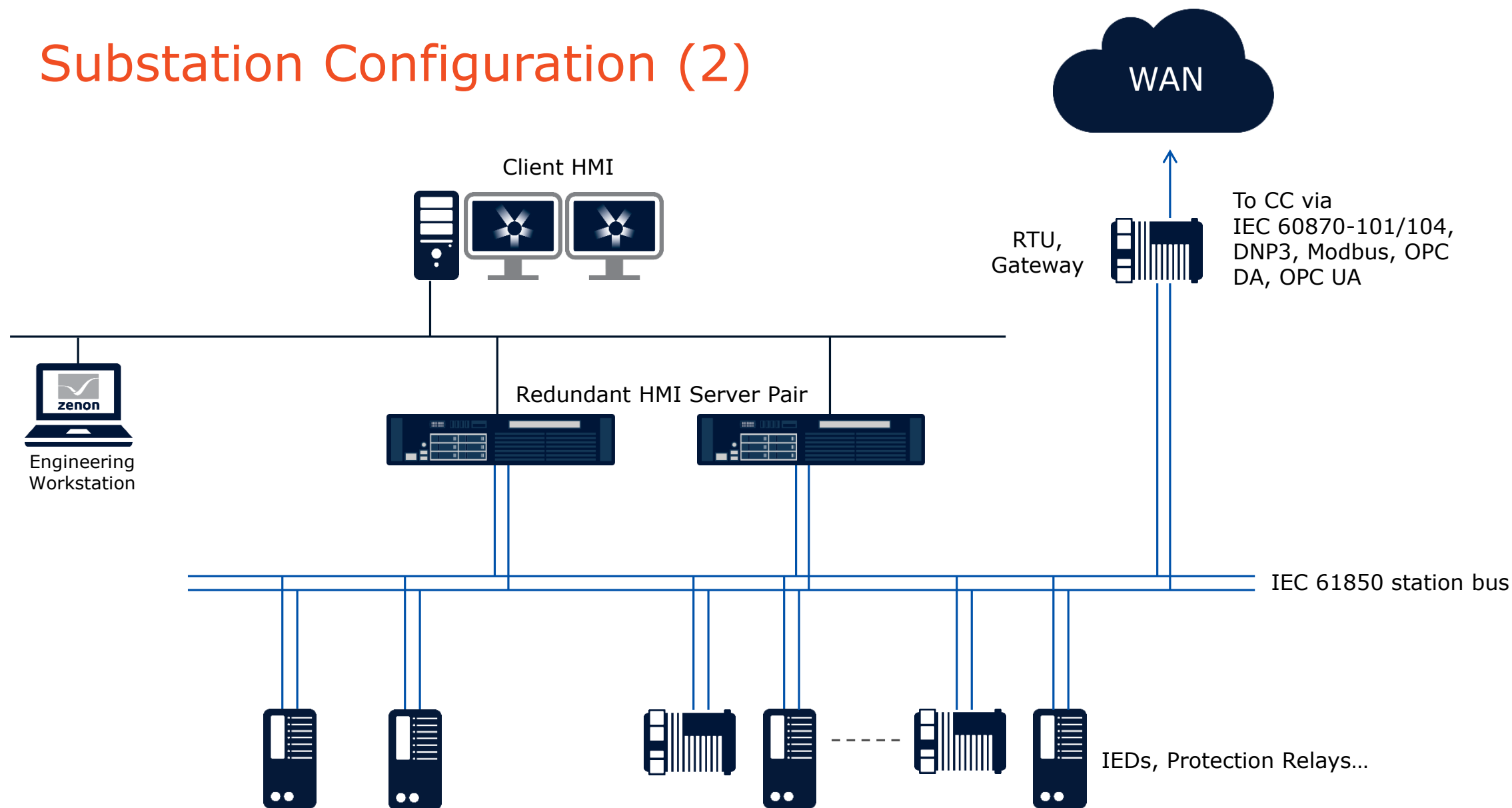


Configuration Examples

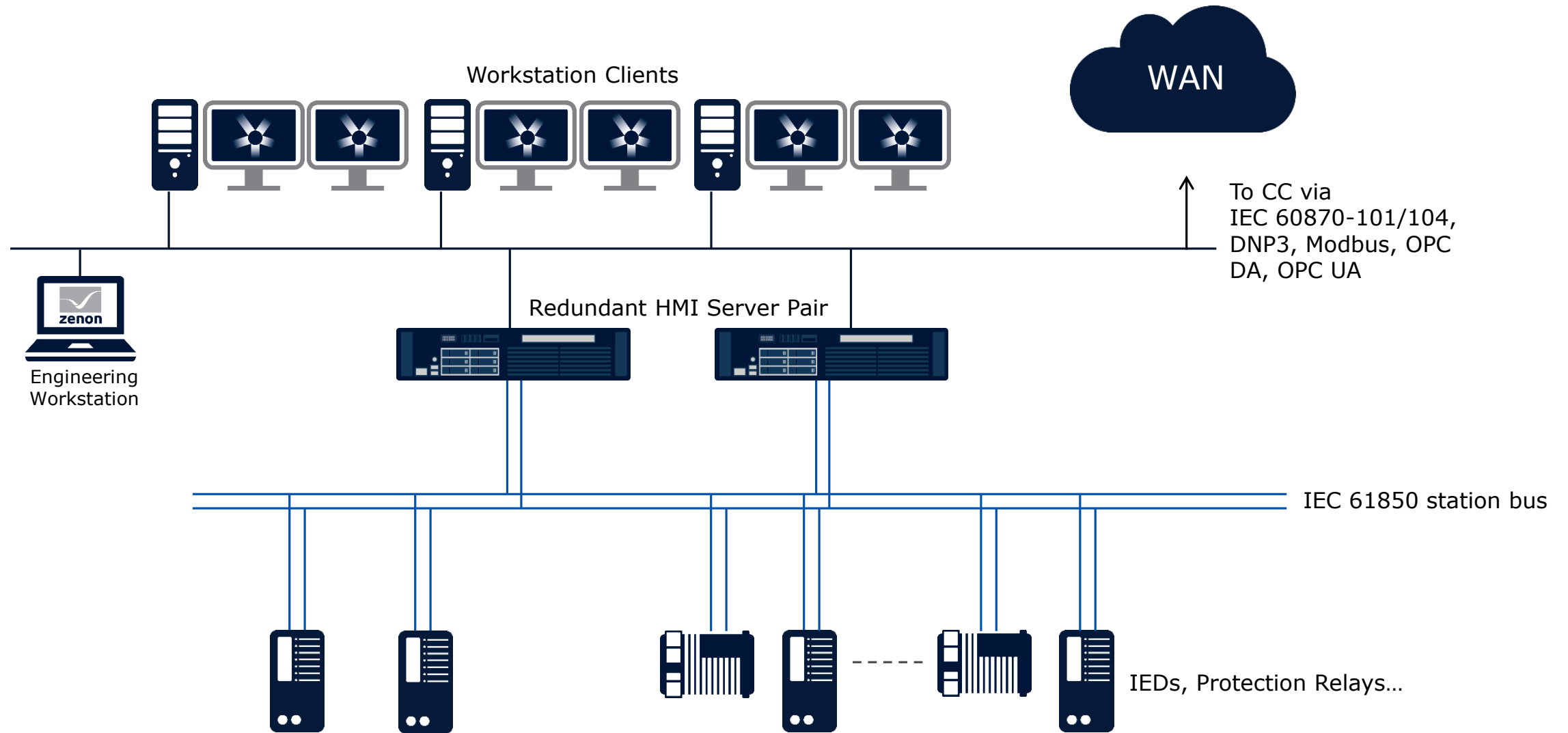
Substation Configuration



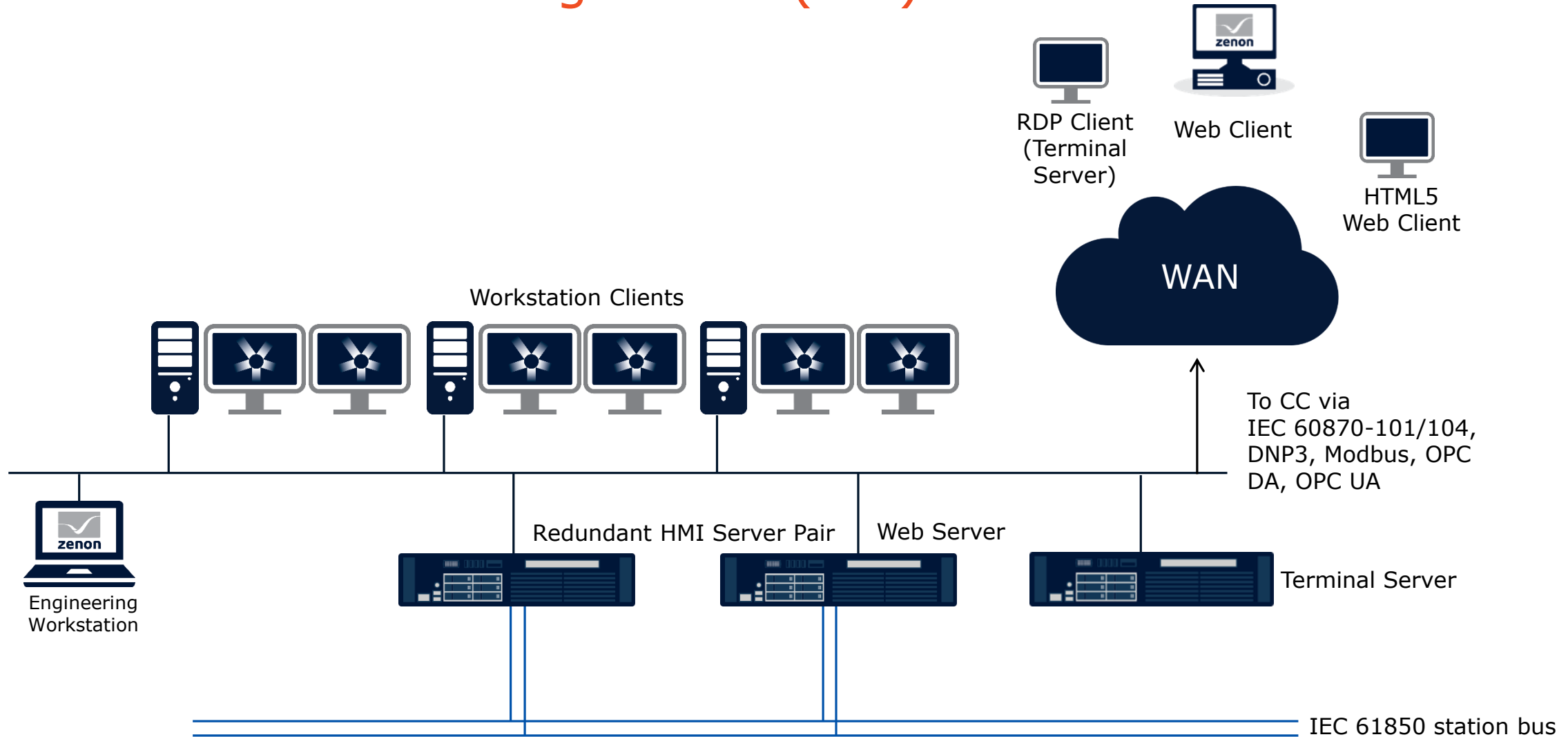
Substation Configuration (2)



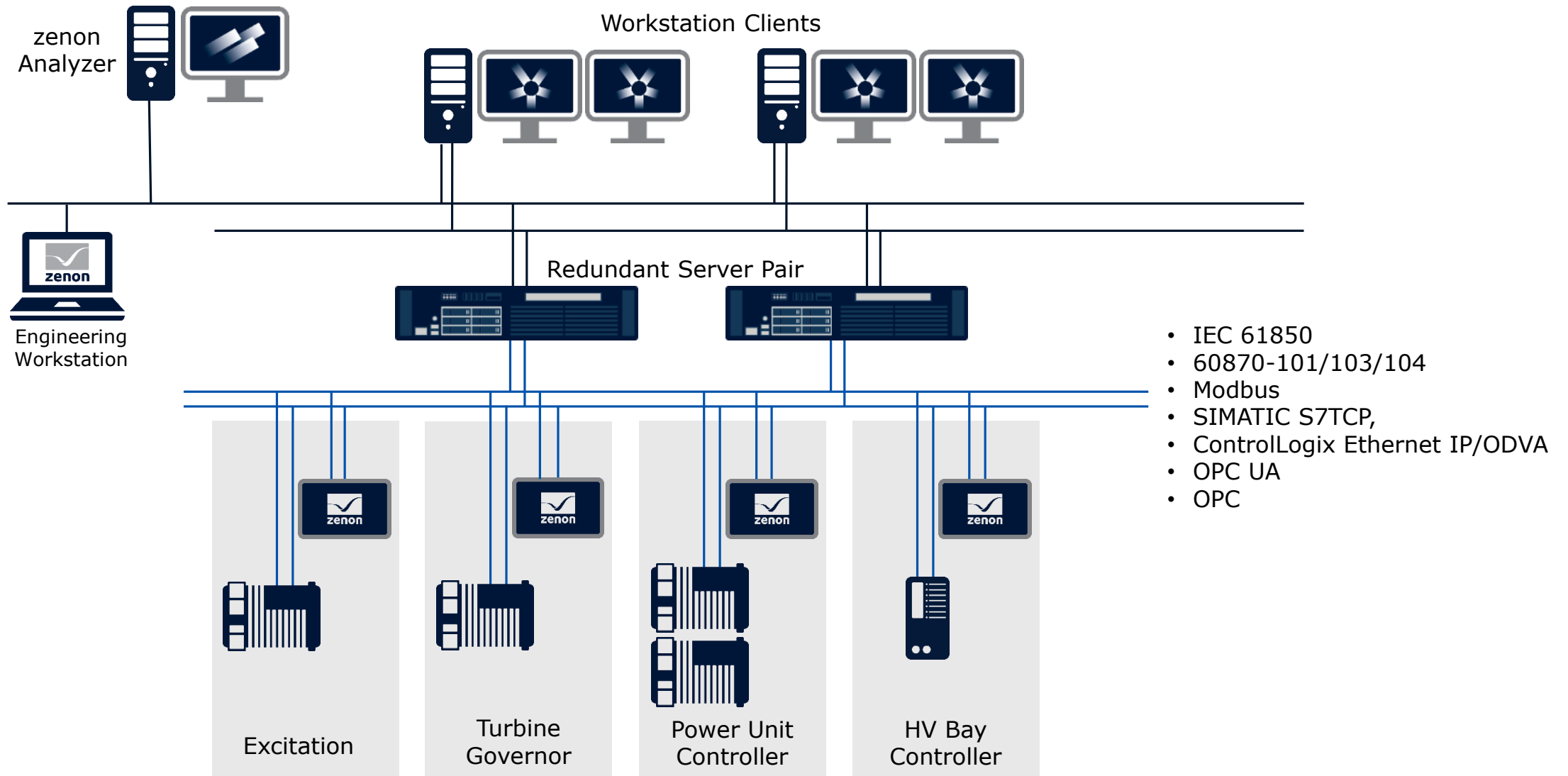
Substation Configuration (3)



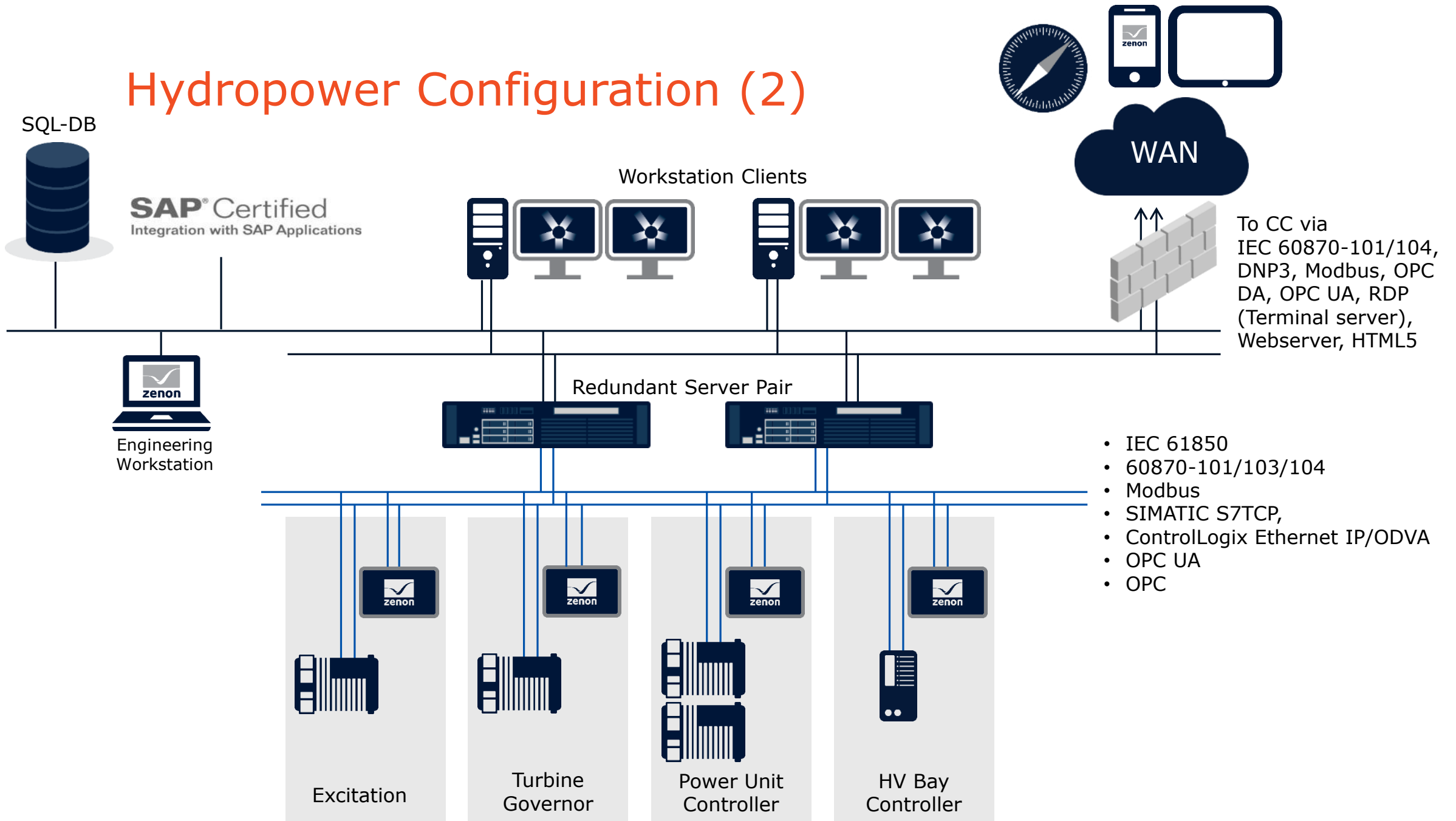
Substation Configuration (3.1)



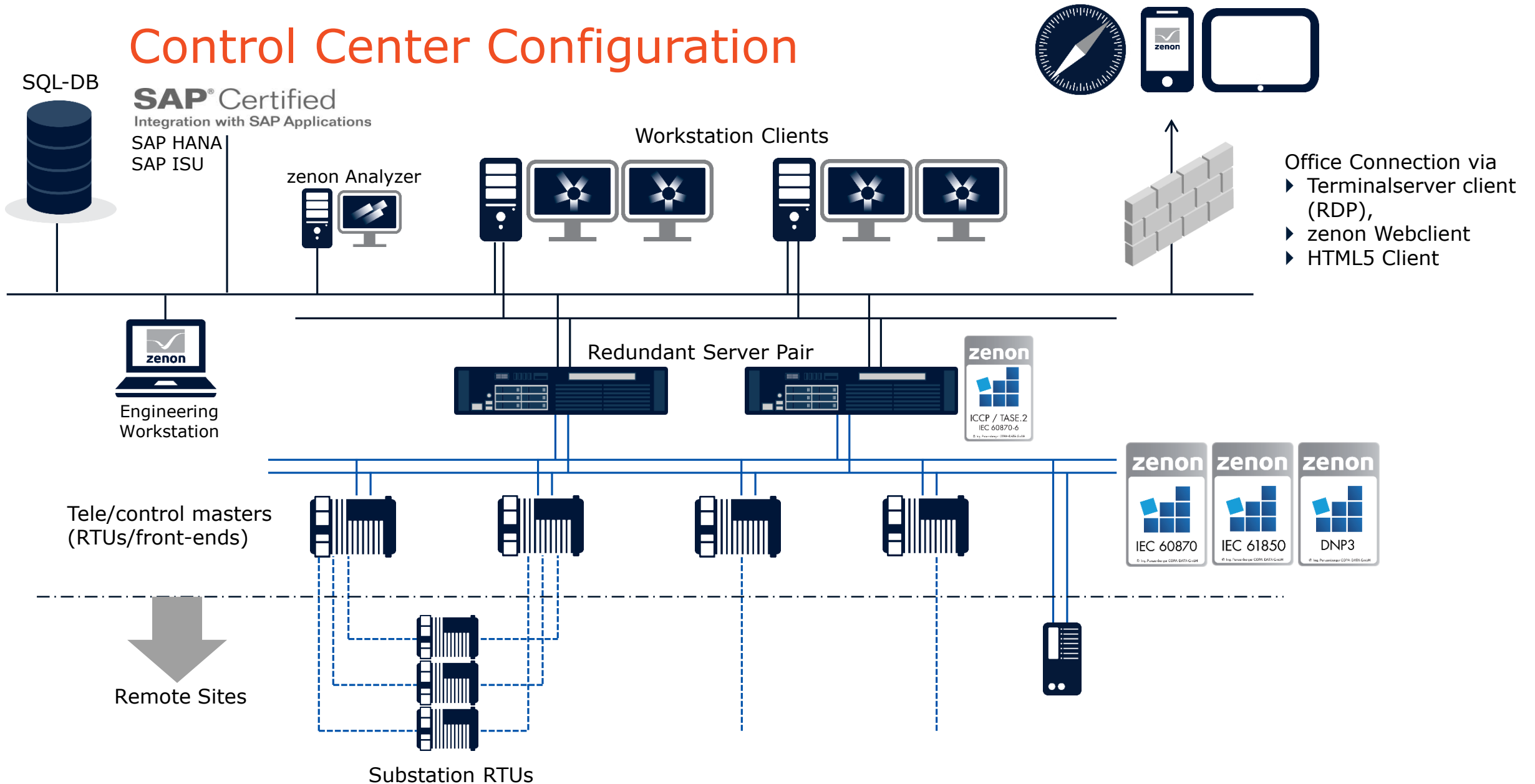
Hydropower Configuration



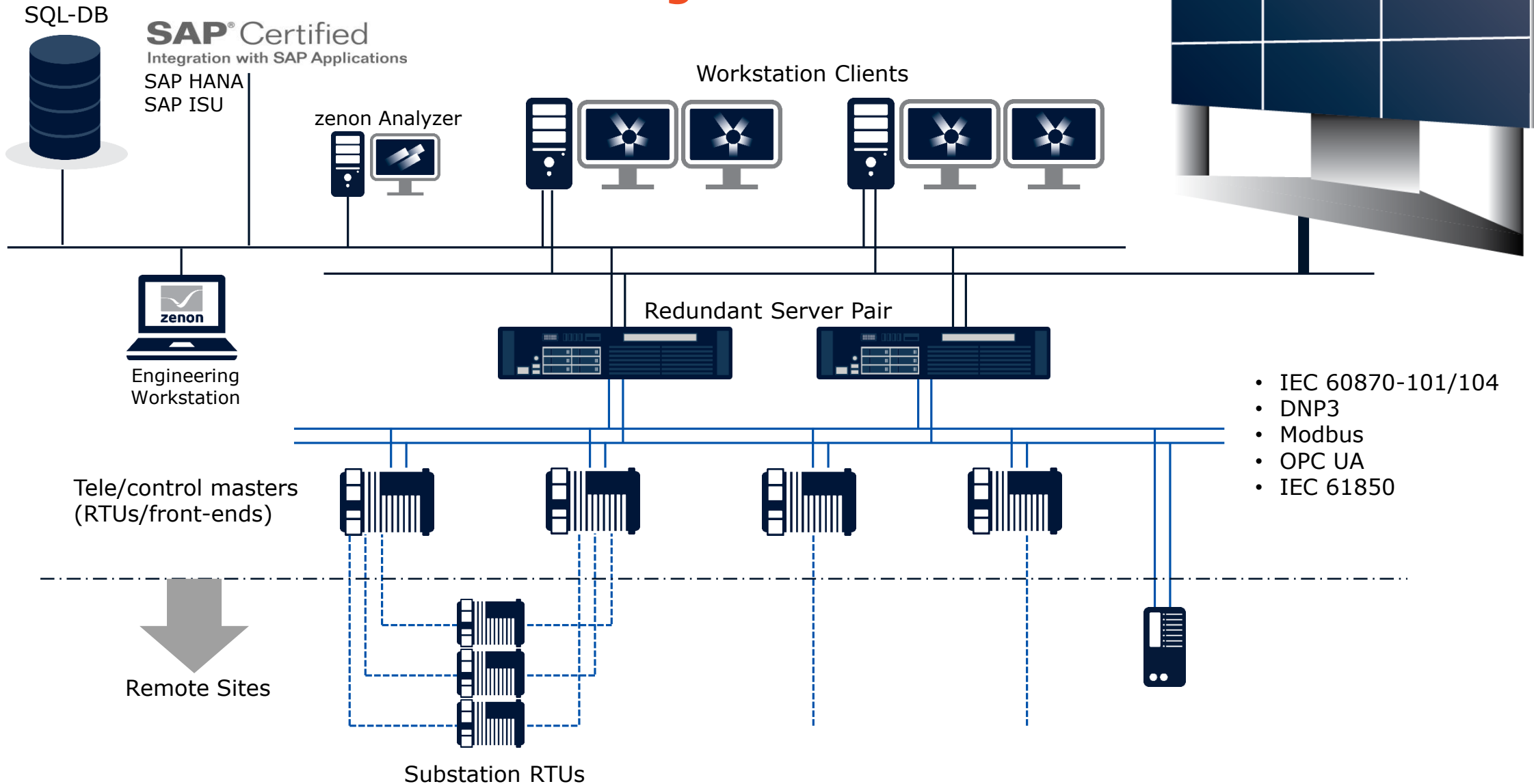
Hydropower Configuration (2)



Control Center Configuration



Control Center Configuration

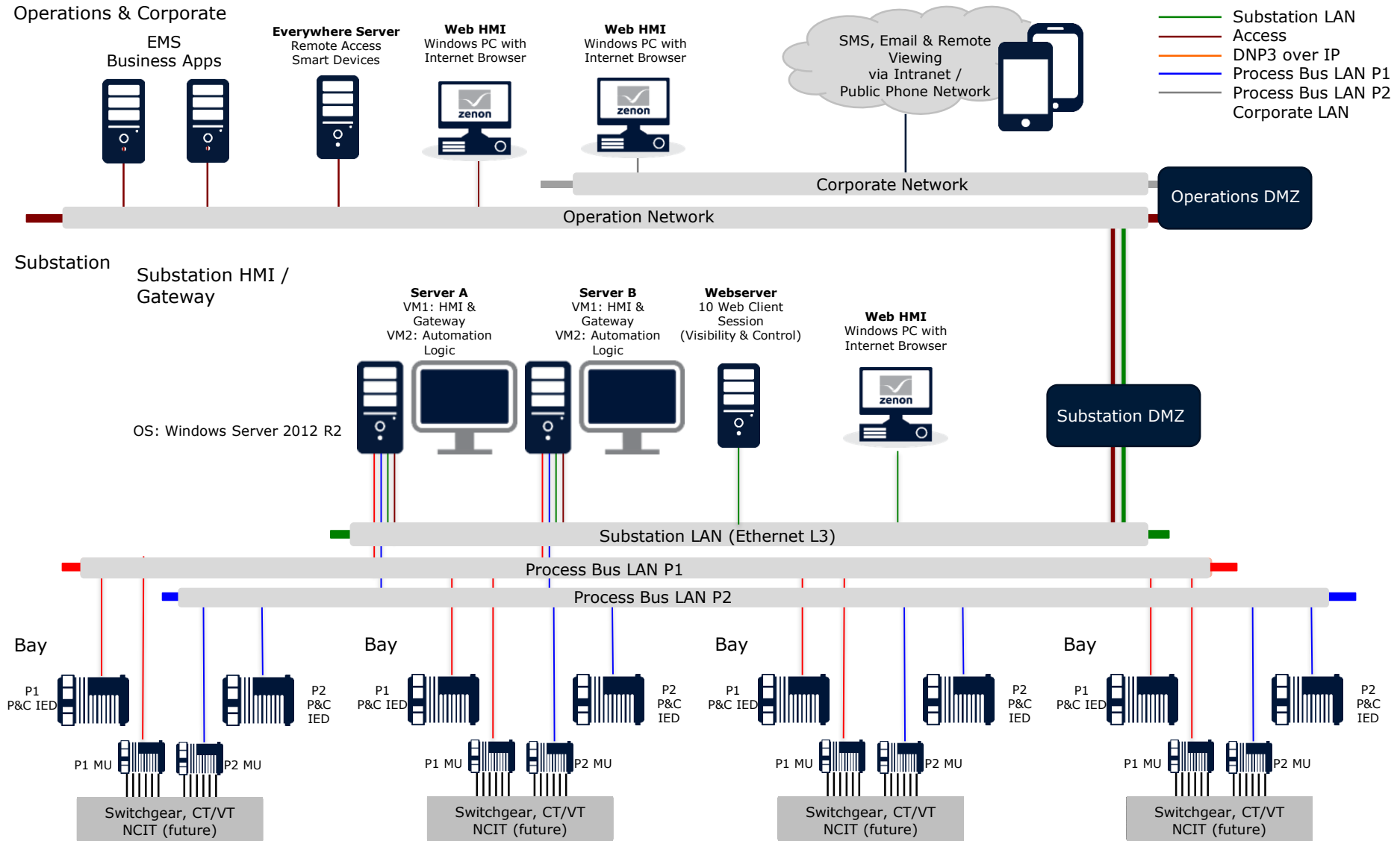


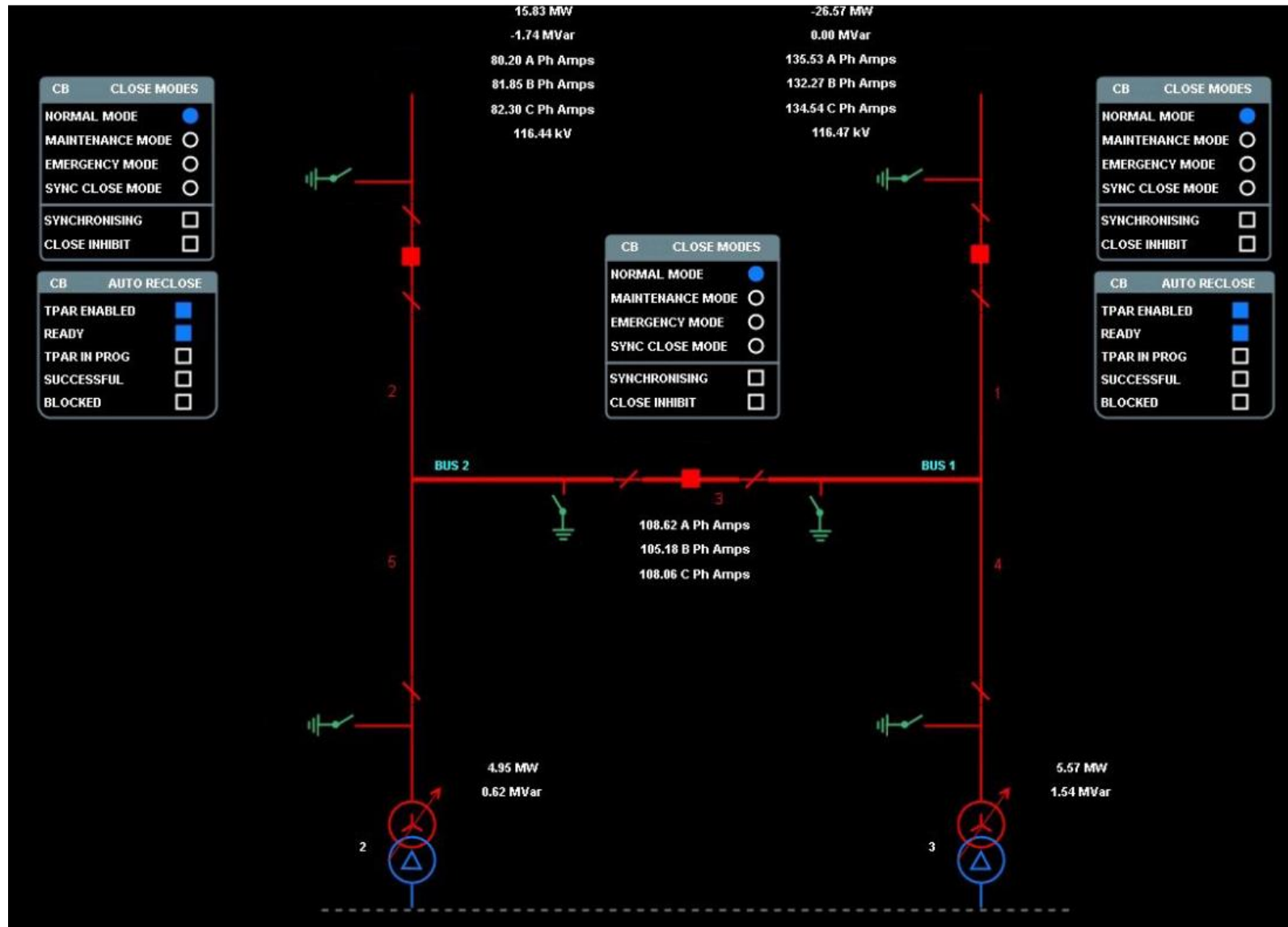
Solution Examples



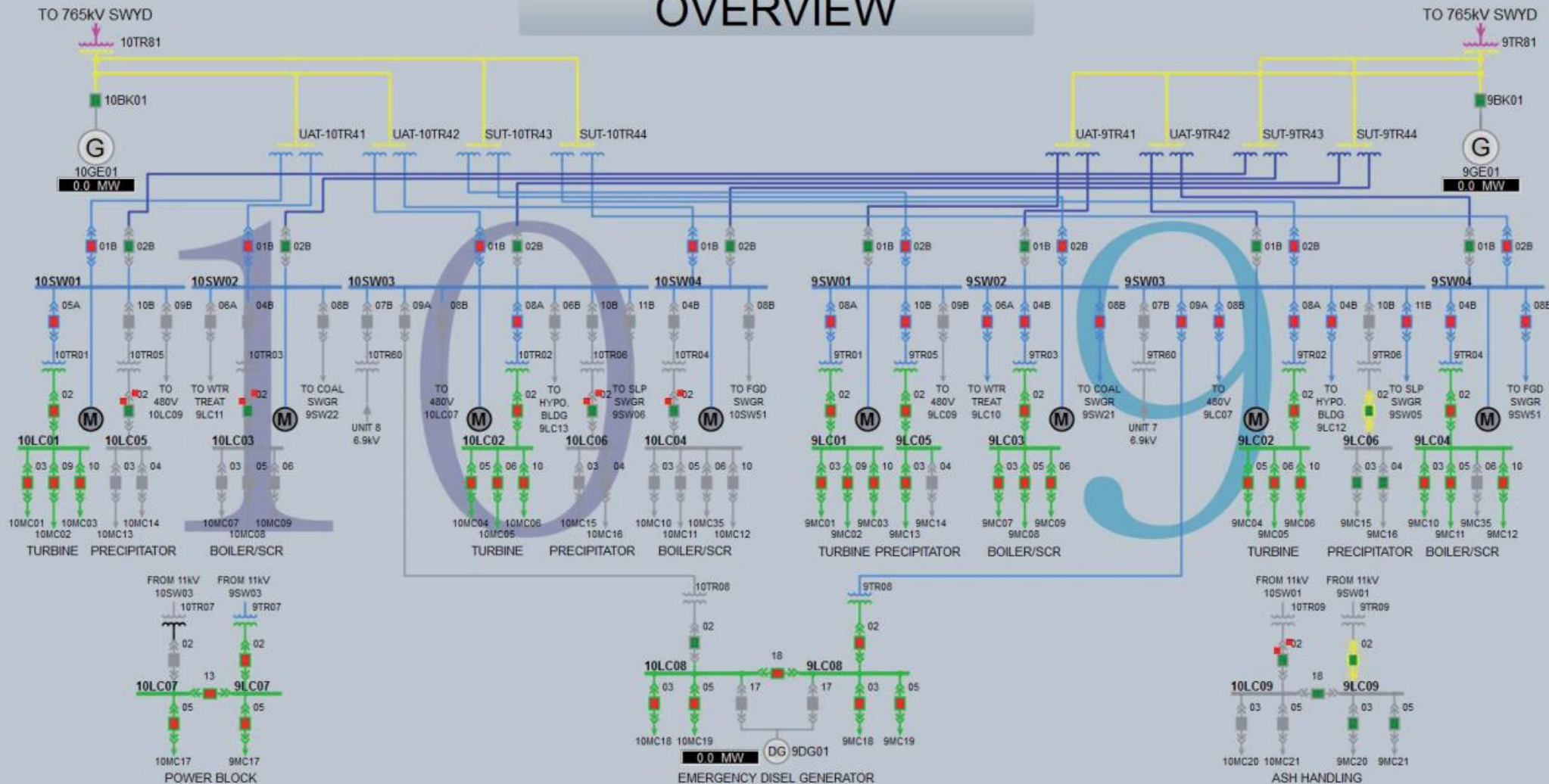
Solution Digital Substation

IEC 61850 Process Bus Proof-of-Concept System Architecture Proposal





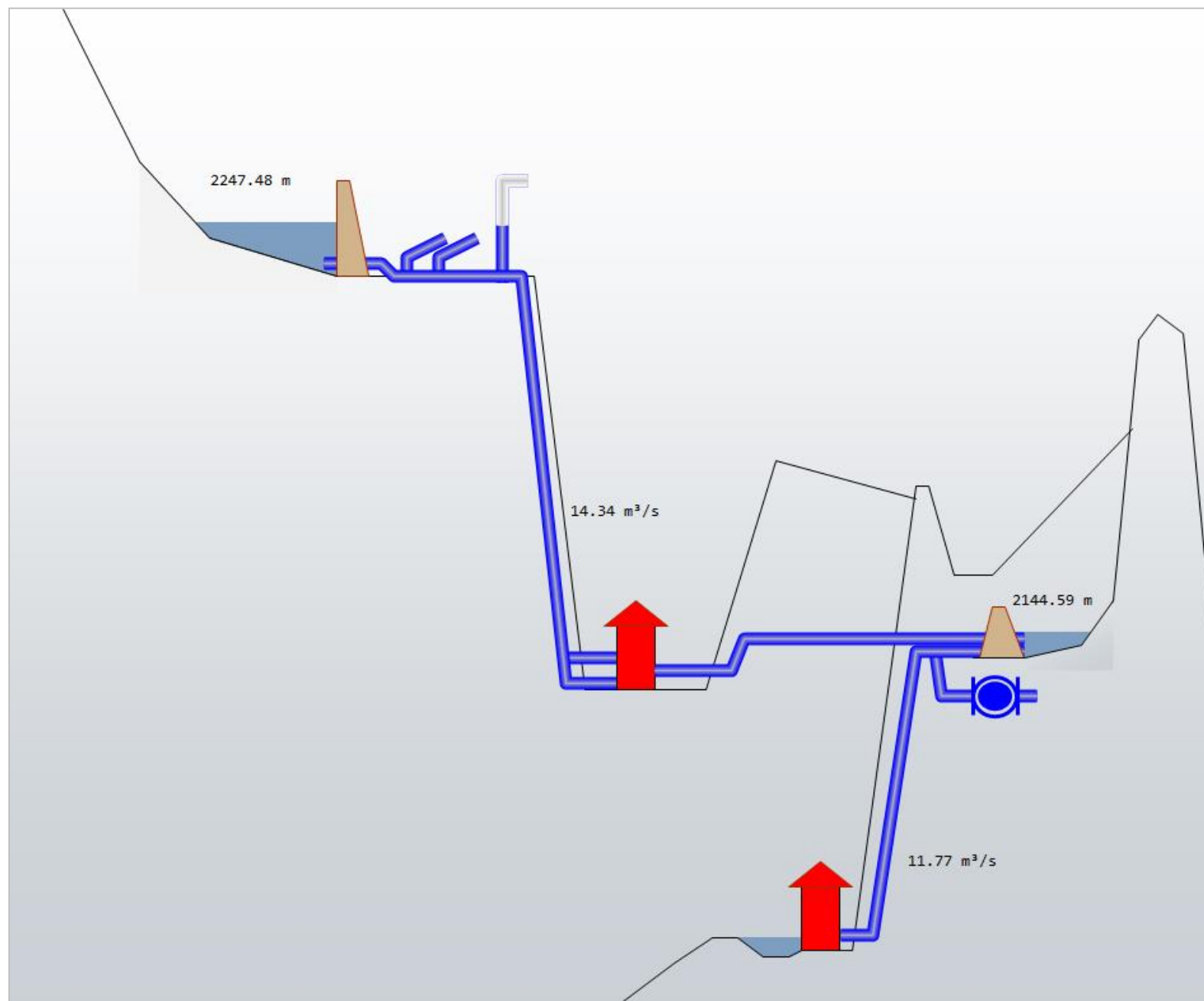
OVERVIEW

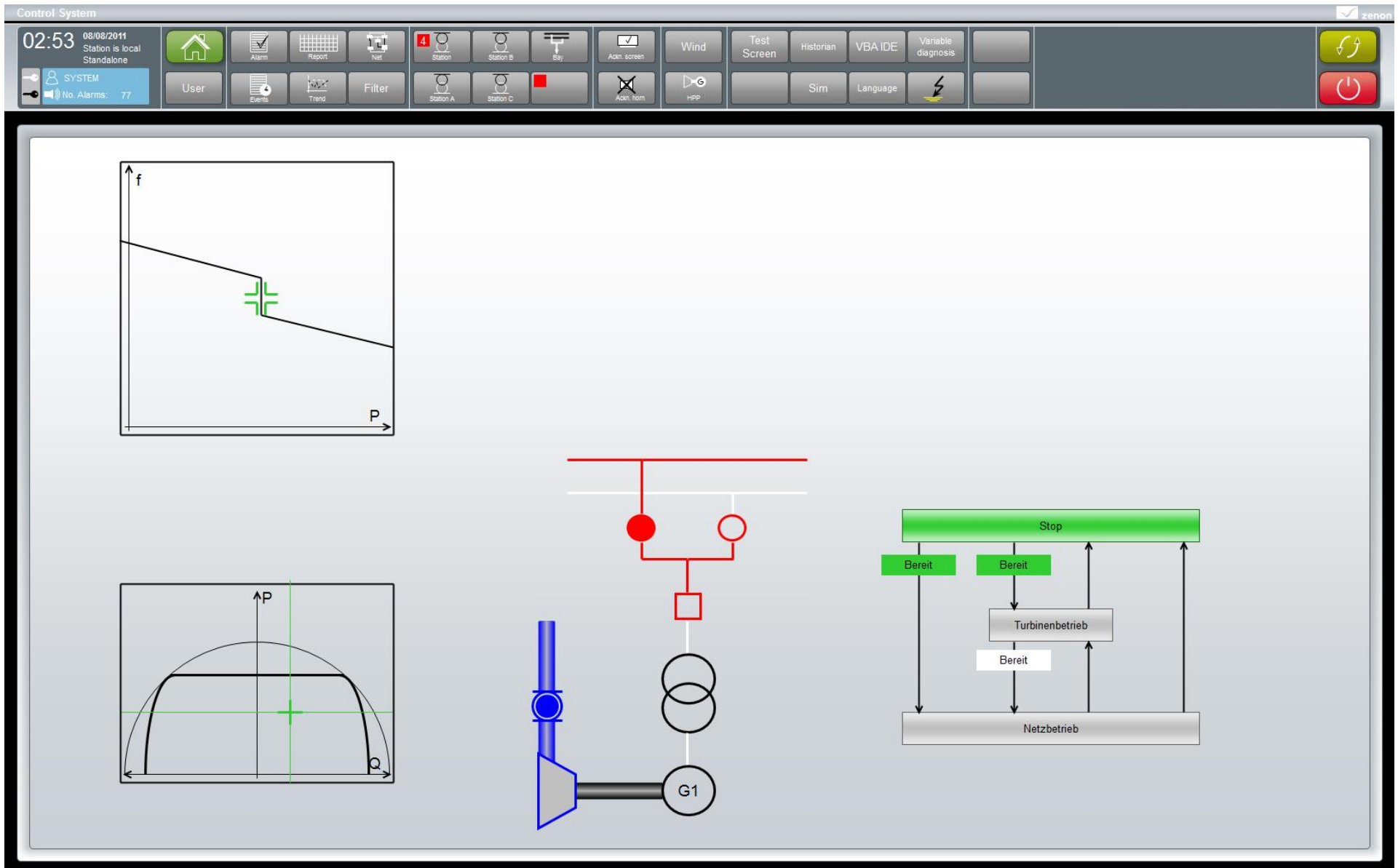


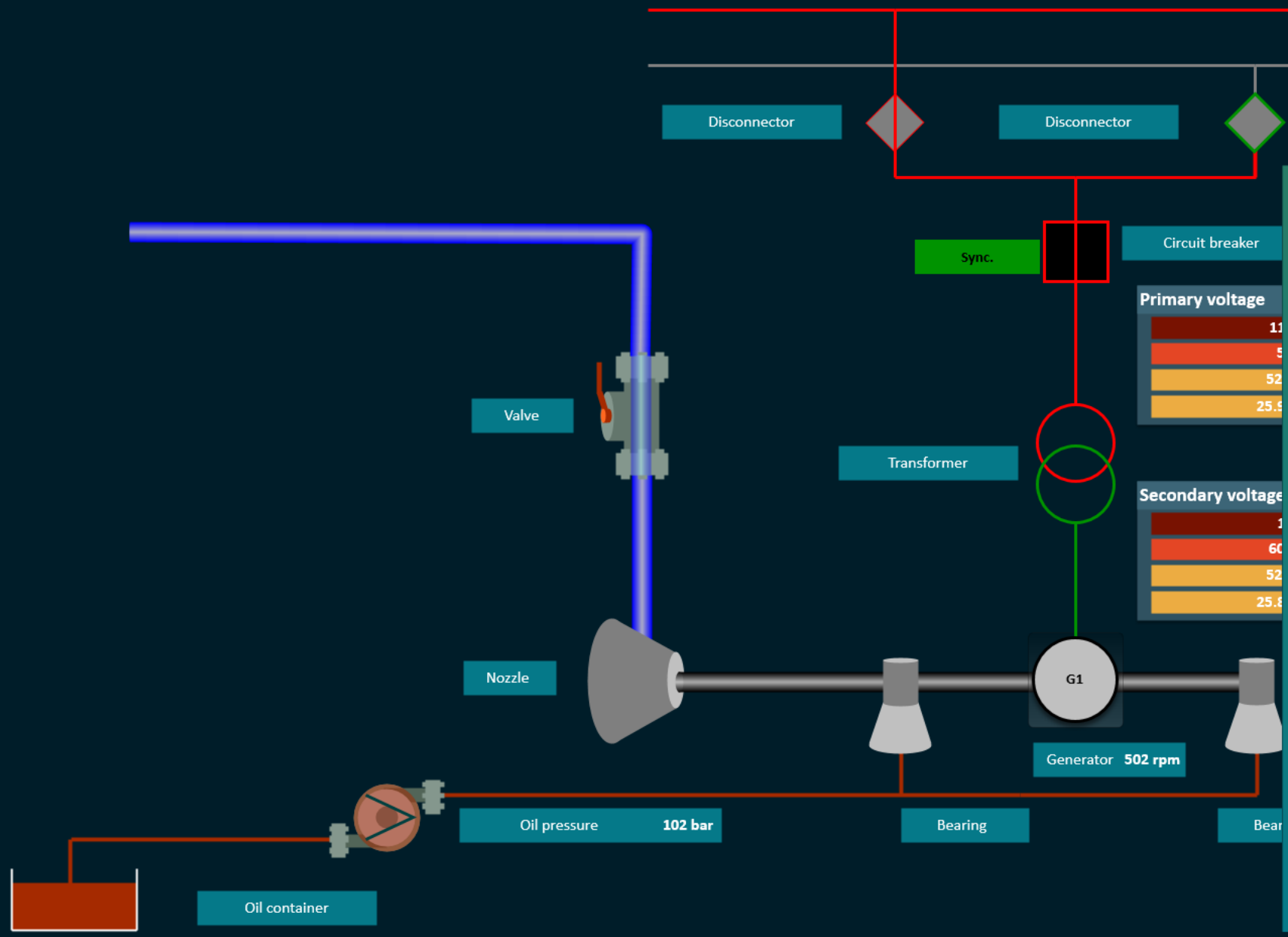
Solution Hydro Power



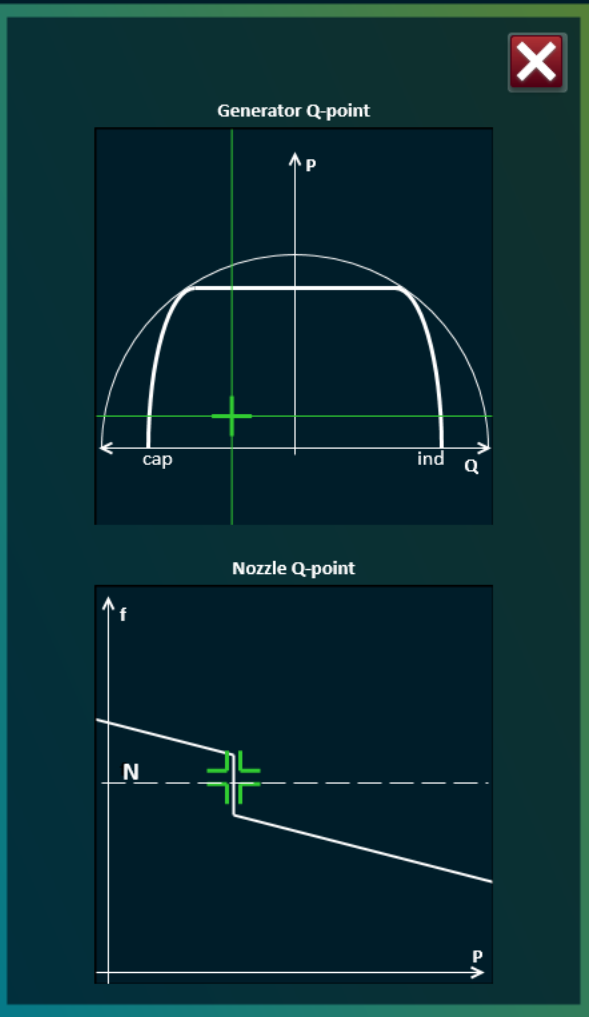
COPADATA

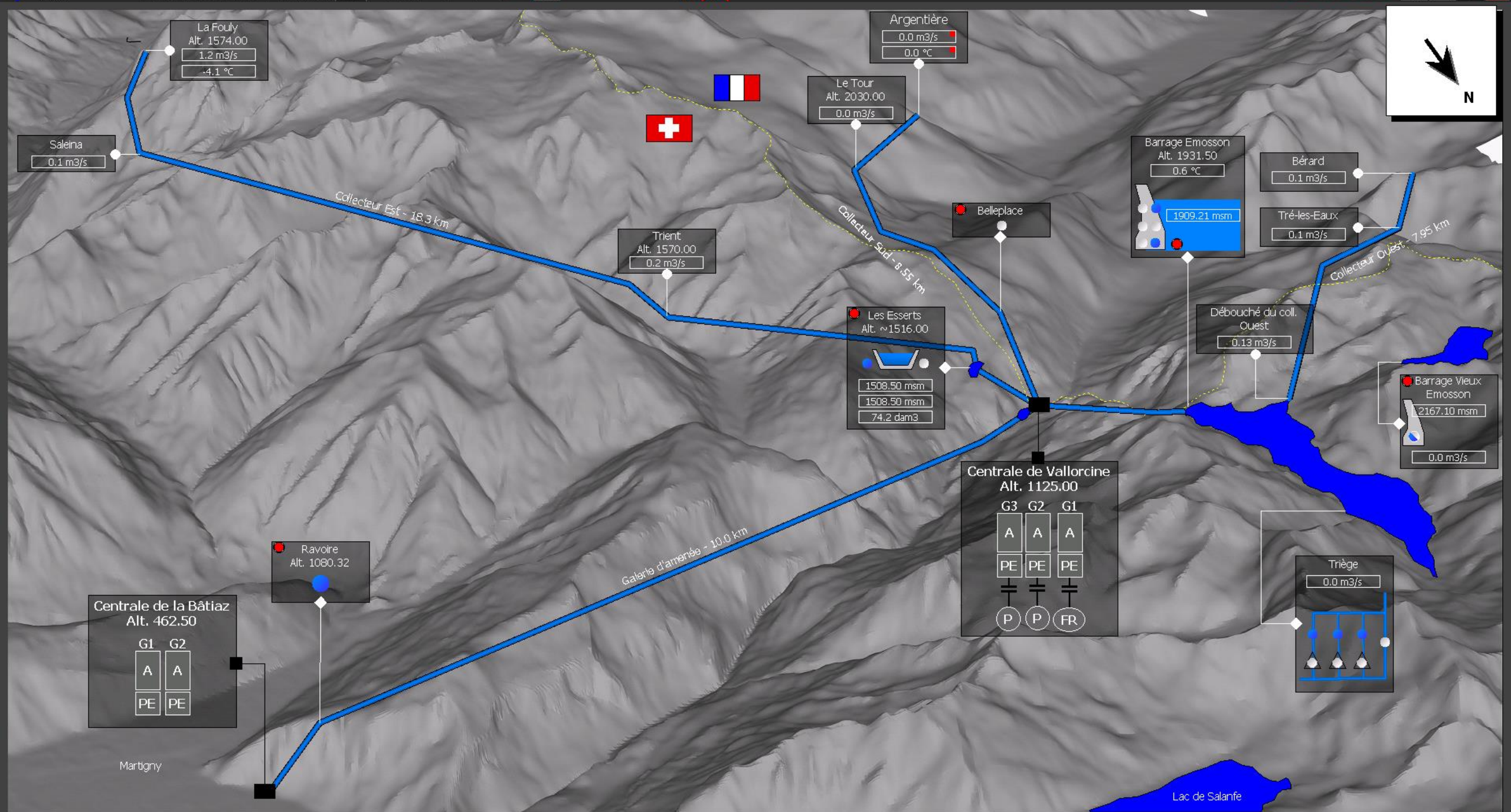






Primary voltage	
11	5
52	25.5
Secondary voltage	
1	60
52	25.5







Solution Wind Power

zenon Wind Package

- ▶ IEC 61400-25-4 Annex C driver
- ▶ Time saving symbol-based engineering
- ▶ Reports
- ▶ Online view (world view)
- ▶ Alarm List (with Alarm aggregation)
- ▶ Event List
- ▶ Allen Bradley ControlLogix/CompactLogix driver

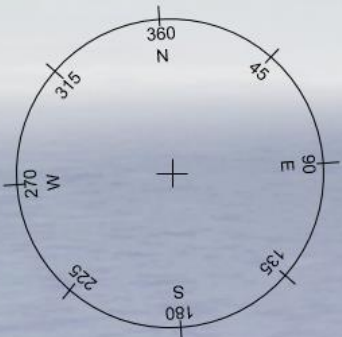
Matrix Symbol

Windfarm	Substation																		
Neusiedlersee	 25.05 kV	1029.2	1163.5	1297.8	1432.1	1566.4	1700.8	1835.1	1969.4	2103.7	2238.0	2372.3	2506.6	2640.9					
Toscana____	 17.68 kV	2640.9	2775.2	2909.5	3043.8	223.3	357.7	492.0	626.3	760.6	894.9	1029.2	1163.5	1297.8	1432.1	1566.4	1700.8	-1.0	1969.4
		2103.7	2238.0	2372.3	2506.6	2640.9	2775.2	2909.5	3043.8	-1.0	357.7	492.0	626.3	760.6	894.9	1029.2			
Balaton____	 11.37 kV	2103.7	2238.0	2372.3	2506.6	2640.9	2775.2	2909.5	3043.8	223.3	357.7	492.0	626.3	760.6	894.9	1029.2	1163.5	1297.8	1432.1
		1566.4	1700.8	1835.1	1969.4	2103.7	2238.0	2372.3	2506.6	2640.9	2775.2	2909.5	3043.8	223.3	357.7	492.0	626.3	760.6	894.9
		1029.2	1163.5	1297.8	1432.1	1566.4													
Bratislava____	 9.87 kV	760.6	894.9	1029.2	-1.0	1297.8	-1.0	1566.4	1700.8	1835.1	1969.4	2103.7	2238.0	2372.3	2506.6	2640.9	2775.2	2909.5	3043.8
		223.3	357.7	492.0	626.3	760.6	894.9	1029.2	1163.5	1297.8	1432.1	1566.4	1700.8	1835.1	1969.4	2103.7	2238.0	2372.3	2506.6
		2640.9	2775.2	2909.5	3043.8	223.3	357.7	492.0	626.3	760.6									
Bulgaria____	 10.90 kV	2372.3	2506.6	2640.9	2775.2	2909.5	3043.8	223.3	357.7	492.0	626.3	-1.0	894.9	1029.2	1163.5	1297.8	1432.1	1566.4	1700.8
		1835.1	-1.0	2103.7	2238.0	2372.3	2506.6	2640.9	2775.2	2909.5	3043.8	223.3	357.7	492.0	626.3	760.6	894.9	1029.2	1163.5
		1297.8	1432.1	1566.4	1700.8	1835.1	1969.4	2103.7	2238.0	2372.3	2506.6	2640.9							
Waldviertel__	 30.11 kV	492.0	626.3	760.6	894.9	1029.2	1163.5	1297.8	1432.1	1566.4	1700.8	1835.1	1969.4	2103.7	2238.0	2372.3	2506.6	2640.9	2775.2
		2909.5	3043.8	223.3	357.7	492.0	626.3	760.6	894.9	1029.2	1163.5	1297.8	1432.1	1566.4	1700.8	1835.1	1969.4	2103.7	2238.0
		2372.3	2506.6	2640.9	2775.2	2909.5	3043.8	223.3	357.7	492.0	626.3	760.6	894.9	1029.2	1163.5	1297.8	1432.1		



Turbine

Rotating Objects



4°

Energy

Gearbox 50.4 °C

Generator 50.7 °C

Brake 50.6 °C

World View - Decluttering



Report (1)

Expected Energy Production

Busbar Price / kWh

0.042

Name	Nominal Power [kWh]	Capacity Factor [%]	Availability [%]	Annual Expected Output [kWh]	Annual Cash Flow [\$]
Turbine 0	1600.00	27.43	100.00	3844042.18	163371.75
Turbine 1	1600.00	27.43	100.00	3844042.18	163371.75
Turbine 2	1600.00	27.43	100.00	3844042.18	163371.75
Turbine 3	1600.00	27.43	100.00	3844042.18	163371.75
Turbine 4	1800.00	32.98	100.00	5200854.05	221036.24
Turbine 5	2000.00	32.97	100.00	5776221.36	245489.35
Turbine 6	2000.00	32.97	100.00	5776221.36	245489.35
Turbine 7	1600.00	37.14	100.00	5205598.46	221237.88
Turbine 8	1600.00	37.14	100.00	5205598.46	221237.88
Turbine 9	1600.00	37.14	100.00	5205598.46	221237.88
Turbine 10	1600.00	37.14	98.82	5144019.77	218620.78
Turbine 11	1600.00	37.14	100.00	5205598.46	221237.88
Turbine 12	2200.00	37.16	100.00	7160627.23	304326.58
Turbine 13	2200.00	37.16	100.00	7160627.23	304326.58
Turbine 14	2200.00	37.16	100.00	7160627.23	304326.58
Turbine 15	2200.00	49.67	100.00	9572749.30	406841.74
Turbine 16	2200.00	49.67	100.00	9572749.30	406841.74
Turbine 17	2000.00	49.66	100.00	8700326.88	369763.80
Turbine 18	2000.00	49.66	100.00	8700326.88	369763.80
Turbine 19	2000.00	49.66	100.00	8700326.88	369763.80
Turbine 20	2000.00	49.66	100.00	8700326.88	369763.80
Turbine 21	2000.00	49.66	100.00	8700326.88	369763.80
Turbine 22	1800.00	49.64	100.00	7827582.10	332672.16
Turbine 23	1800.00	62.89	100.00	9917031.31	421473.72
Turbine 24	1800.00	62.89	100.00	9917031.31	421473.72
Turbine 25	1800.00	62.89	100.00	9917031.31	421473.72
Turbine 26	1800.00	62.89	100.00	9917031.31	421473.72
Turbine 34	1400.00	75.45	100.00	9253580.45	393277.07

SUMMARY	SUM [kWh]	AVG [%]	AVG [%]	SUM [kWh]	SUM [\$]
	51600.00	43.93	99.96	198974181.58	8456400.58



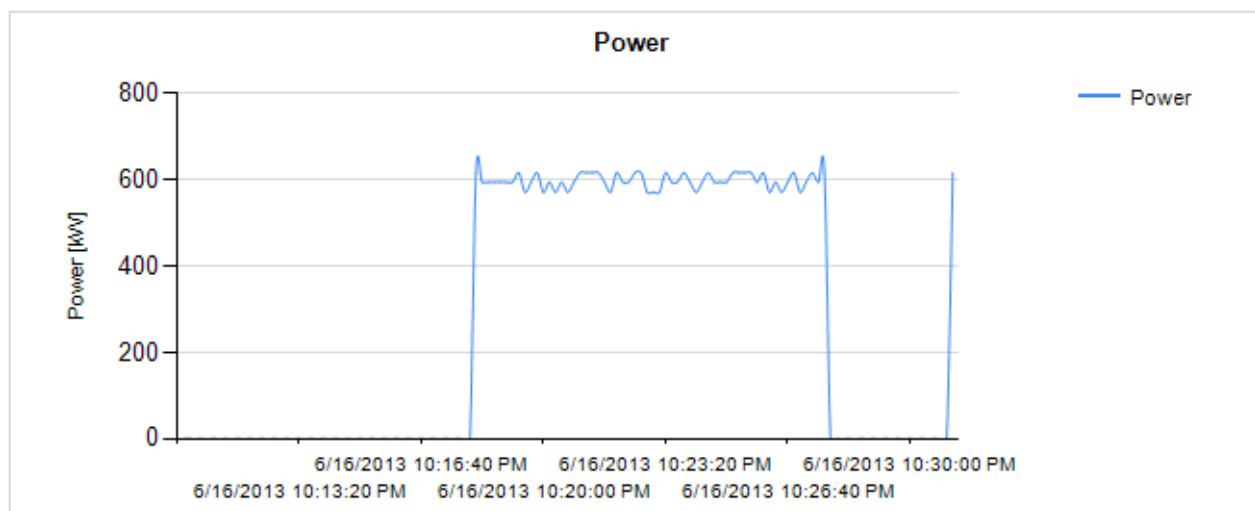
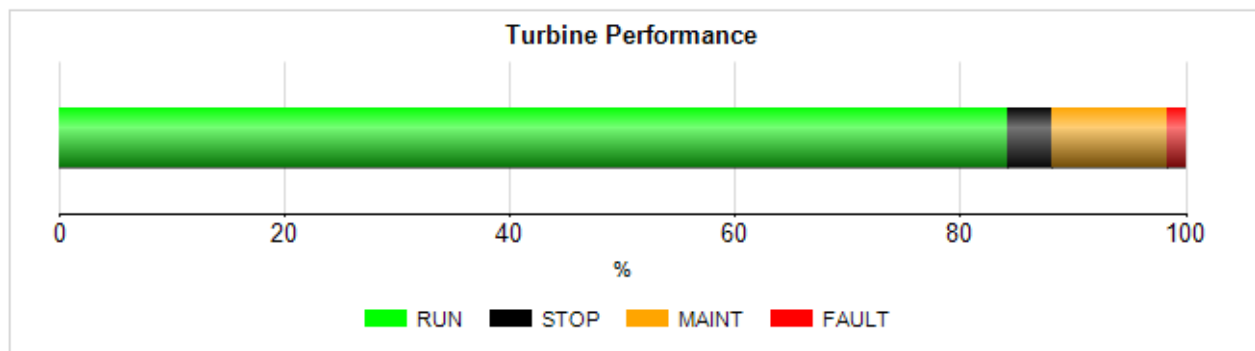
COPADATA

Report (2)

Wind Turbine Performance Report



Turbine Number:	Turbine 10	Period Start:	6/16/2013 10:10:10 PM
Nominal Power [kW]:	1600	Period End:	6/16/2013 10:31:10 PM
Energy [kWh]:	98.092		



References

Overview

Wind Power Plant

Substation

Wind Turbine 1

Wind Turbine 2

Wind Turbine 3

Wind Turbine 4

Wind Turbine 5

Wind Turbine 6

Wind Turbine 7

Event List

Alarm List

Login

Logout

Logged in:

Administrator

Reload

Exit

14:45:25
06.07.2011

Wind power plant general information

	Wind speed	Turbine status	Rotor speed	Active power	Reactive power
Wind Turbine 1	6.40 m/s	Run	13.18 rpm	264 kW	108 kVAr
Wind Turbine 2	7.00 m/s	Run	15.66 rpm	463 kW	104 kVAr
Wind Turbine 3	9.00 m/s	Run	15.87 rpm	543 kW	134 kVAr
Wind Turbine 4	8.20 m/s	Stop	0.00 rpm	0 kW	0 kVAr
Wind Turbine 5	5.90 m/s	Run	14.79 rpm	371 kW	137 kVAr
Wind Turbine 6	9.20 m/s	Run	16.50 rpm	727 kW	130 kVAr
Wind Turbine 7	9.40 m/s	Stop	0.50 rpm	-7 kW	130 kVAr



Substation



WT1



WT2



WT3



WT4



WT5



WT6



WT7



COPADATA

References

Overview	Wind turbine operation command	WTUR: Wind turbine general information	WCNV1: Wind turbine converter 1 information
Wind Power Plant		Total (net) active energy production 477843 kWh	Operation mode of converter Rdy
Substation	Start Turbine	Total (net) reactive energy production -94894 kVArh	Status of converter cooling system Inact
Wind Turbine 1	Stop Turbine	Active (real) energy demand 3451 kWh	Torque value 0 kNm
Wind Turbine 2		Reactive energy demand 158248 kVArh	Converter - Generator side temperature 31.3 °C
Wind Turbine 3		Active (real) energy supply 481294 kWh	Converter - Grid side temperature 29.9 °C
Wind Turbine 4	Active power generation setpoint	Reactive energy supply 63354 kVArh	
Wind Turbine 5	1500 kW	Turbine status Stop	WCNV2: Wind turbine converter 2 information
Wind Turbine 6		Active power generation 0 kW	Operation mode of converter Rdy
Wind Turbine 7		Reactive power generation 0 kVAr	Status of converter cooling system Inact
Event List	Reactive power generation setpoint (offset)	WROT: Wind turbine rotor information	Torque value 0 kNm
Alarm List	100 kVAr	Angular rotor position 358 °	Converter - Generator side temperature 31.0 °C
		Temperature in the rotor hub 27 °C	Converter - Grid side temperature 31.0 °C
		Pitch angle setpoints for blade 1 85.00 °	
		Pitch angle setpoints for blade 2 85.00 °	WNAC: Wind turbine nacelle information
		Pitch angle setpoints for blade 3 85.00 °	Nacelle orientation 246 °
		Pitch angle for blade 1 84.95 °	Wind speed outside nacelle 4.40 m/s
		Pitch angle for blade 2 84.95 °	Wind direction outside nacelle 279 °
		Pitch angle for blade 3 84.95 °	Temperature outside nacelle 27.1 °C
Login	Remote Desktop Connection		Temperature inside nacelle 33.0 °C
Logout	Remote Desktop	WGEN: Wind turbine generator information	
Logged in:		Status of generator cooling system Inact	WYAW: Wind turbine yawing information
Administrator		Generator speed 0.00 rpm	Mode of yaw system Auto
		Temperature measurements for stator 29 °C	Mode of the yaw brake On
Reload		Temperature measurements for rotor 28 °C	Yaw bearing angle (relative to true North) 360 °
Exit			Cable windup -0.32



References

AN 18-10-H380D



Application-note

SORGENIA Wind Farm San Gregorio Magno (SA) 150 kV Substation, HV cable and GIS for Terna grid



150kV GIS in Terna CP Substation

Sorgenia built up a new wind farm in four selected areas of the site of San Gregorio Magno (SA) Italy; the comprehensive wind farm consists of No. 17 Wind Turbine Generators, each rated 2,5 MW. The cumulative generated power of the wind farm is collected via a 30 kV switchgear, in a dedicated pre-fabricated building at the site ("Cabina di Smistamento"). The generated power is then addressed (via two cable feeders of about 15 km length) to the 150 / 30 kV Substation close to the 150 kV ENEL Distribuzione Substation in Buccino. The plant, rated 42,5 MWe, produces electrical power for the High Voltage Italian national grid (RTN: Rete di Trasmissione Nazionale).



150KV Wind Farm Substation



2,5 MW WTG

SAET scope of supply was a Turn Key with:

- 30 kV cabin with 15 km cable .
- Electrical 150/30 kV 42,5 MW SS
- ENEL Busbar extension
- The 150 kV underground cable
- The new 150kV GIS bay in Enel CP

The supply was complete with Auxiliaries, IEC 61850 Protection system, Metering, Substation SCADA and Disturbance Recorder. The SCADA (Zenon Energy Edition) integration to National Grid has been completed with Communication devices to allow Data transmission between "Wind farm" and S/S to TERNA remote supervision via IEC 608705104 protocol and for disturbance records analysis COMTRADE protocol. The complete package has been successfully commissioned into operation by Saet



Protection Control Panel



30 kV Switchgears in Subst.



SCADA Terminals



San Gregorio Magno wind farm



SAET S.p.A. - Via A. Moravia, 8
35030 SELVAZZANO D. (PD)
Telefono +39 049 8989711 - Telefax +39 049 8975299
E-mail: info@saetpd.it - Internet: www.saetpd.it



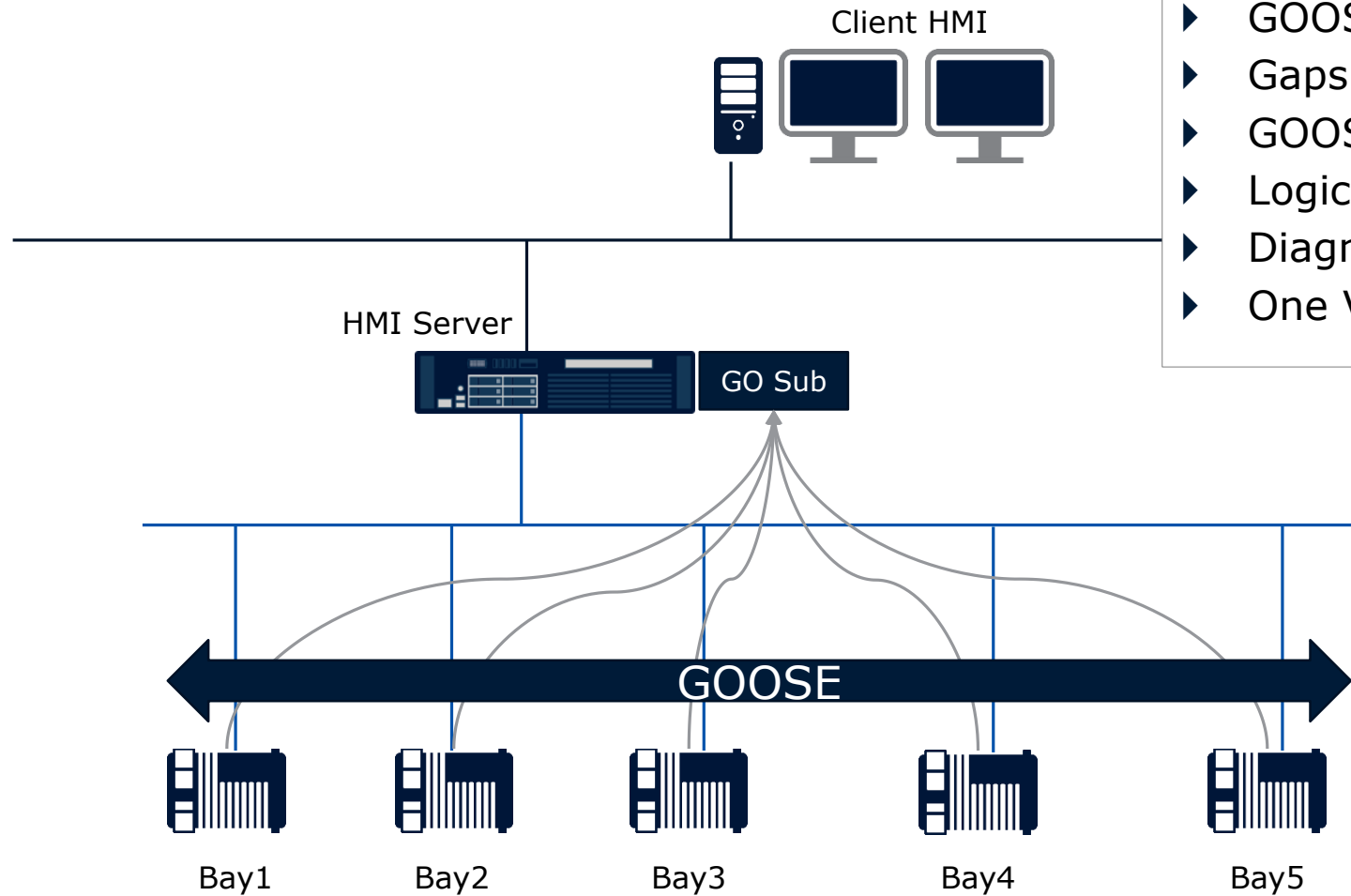
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Solution GOOSE Supervision

GOOSE Supervision

- ▶ Get an Alarm when GOOSE problems occur
- ▶ GOOSE Subscriber
- ▶ Gaps in Sequence number?
- ▶ GOOSE delayed?
- ▶ Logic driver makes diagnosis
- ▶ Diagnosis Variables
- ▶ One Variable per GOOSE CB

GOOSE Supervision



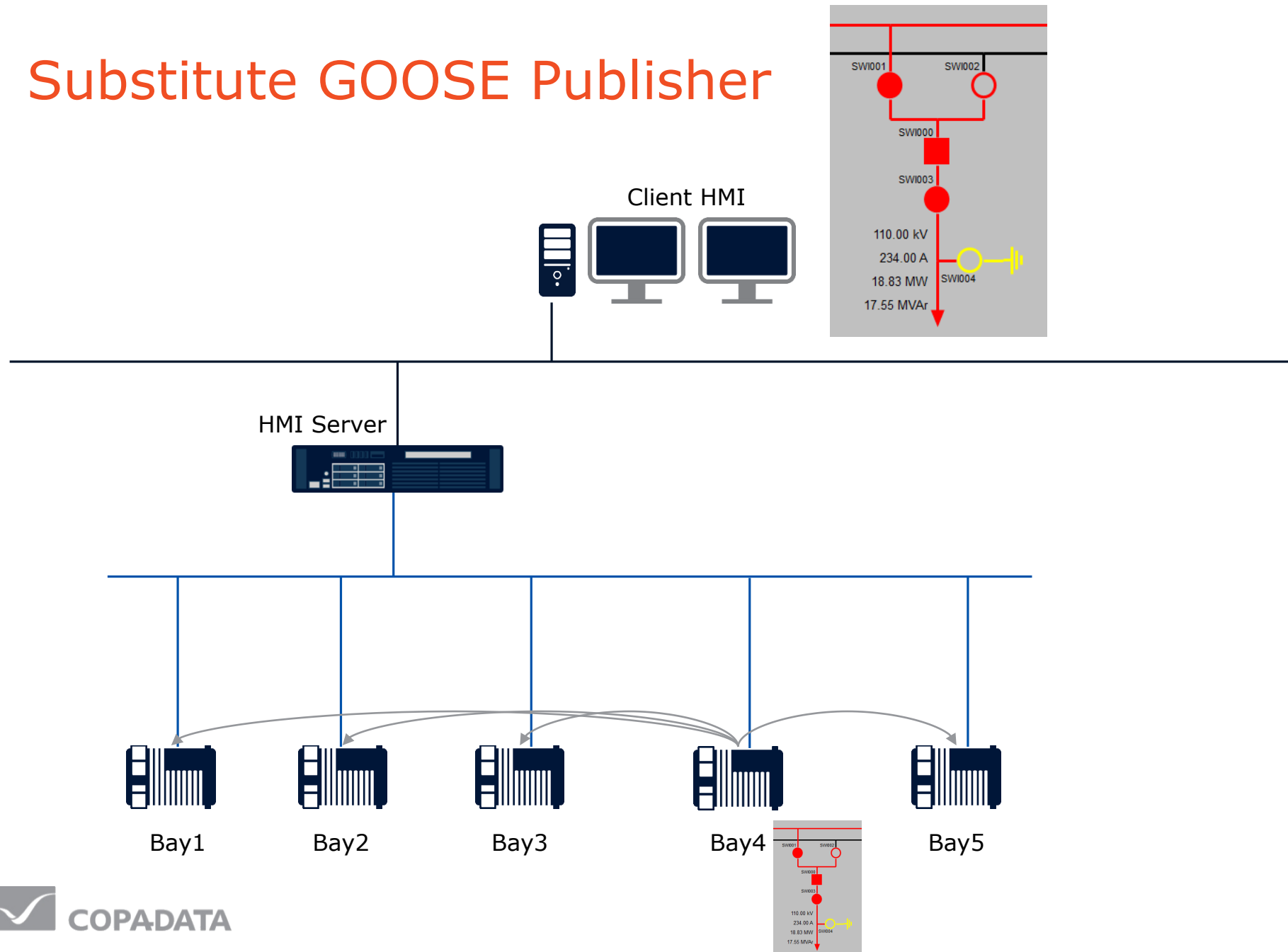
- ▶ Get an Alarm when GOOSE problems occur
- ▶ GOOSE Subscriber
- ▶ Gaps in Sequence number?
- ▶ GOOSE delayed?
- ▶ Logic driver makes diagnosis
- ▶ Diagnosis Variables
- ▶ One Variable per GOOSE CB

Solution GOOSE Substitution

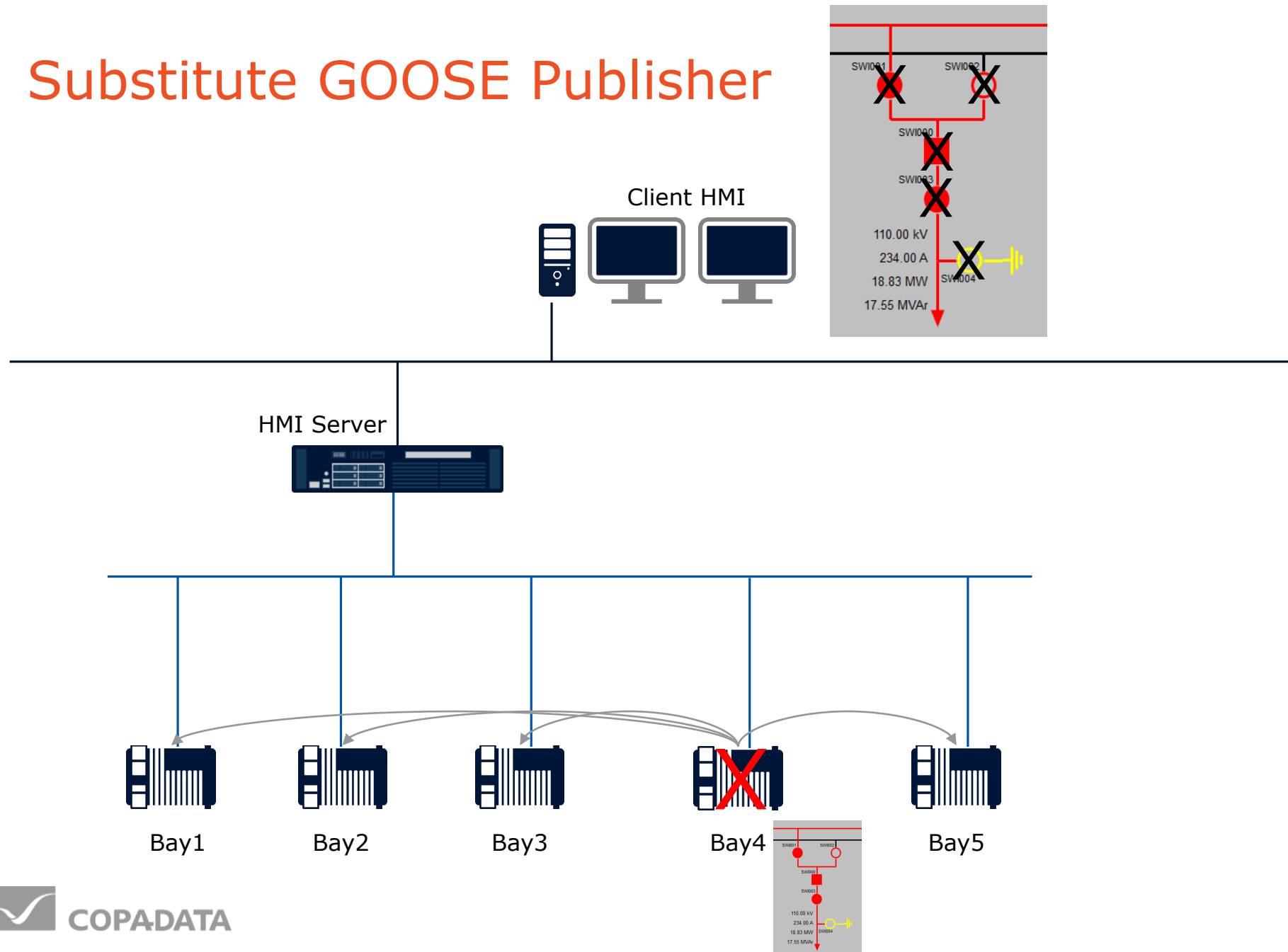
GOOSE Substitution

- ▶ BCUs need status from neighbor BCUs (via GOOSE) for interlocking
- ▶ If one BCU fails, the neighbor BCUs can't calculate interlocking
- ▶ User substitutes invalid switches in the HMI
- ▶ By this the GOOSE publisher in the HMI Server can publish this information via GOOSE
- ▶ Now the neighbor BCUs receive the correct switch statuses and can calculate their interlocking

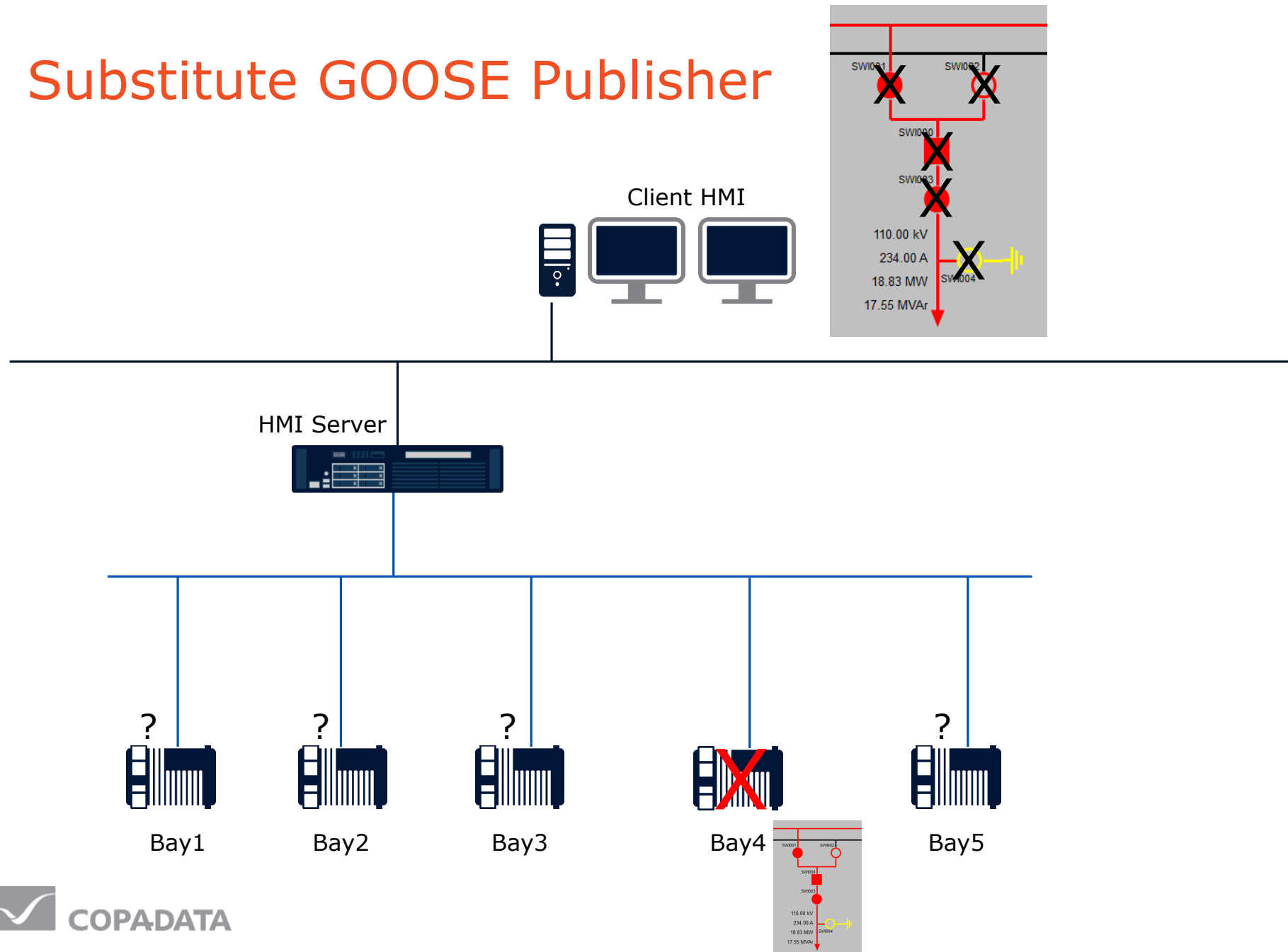
Substitute GOOSE Publisher



Substitute GOOSE Publisher

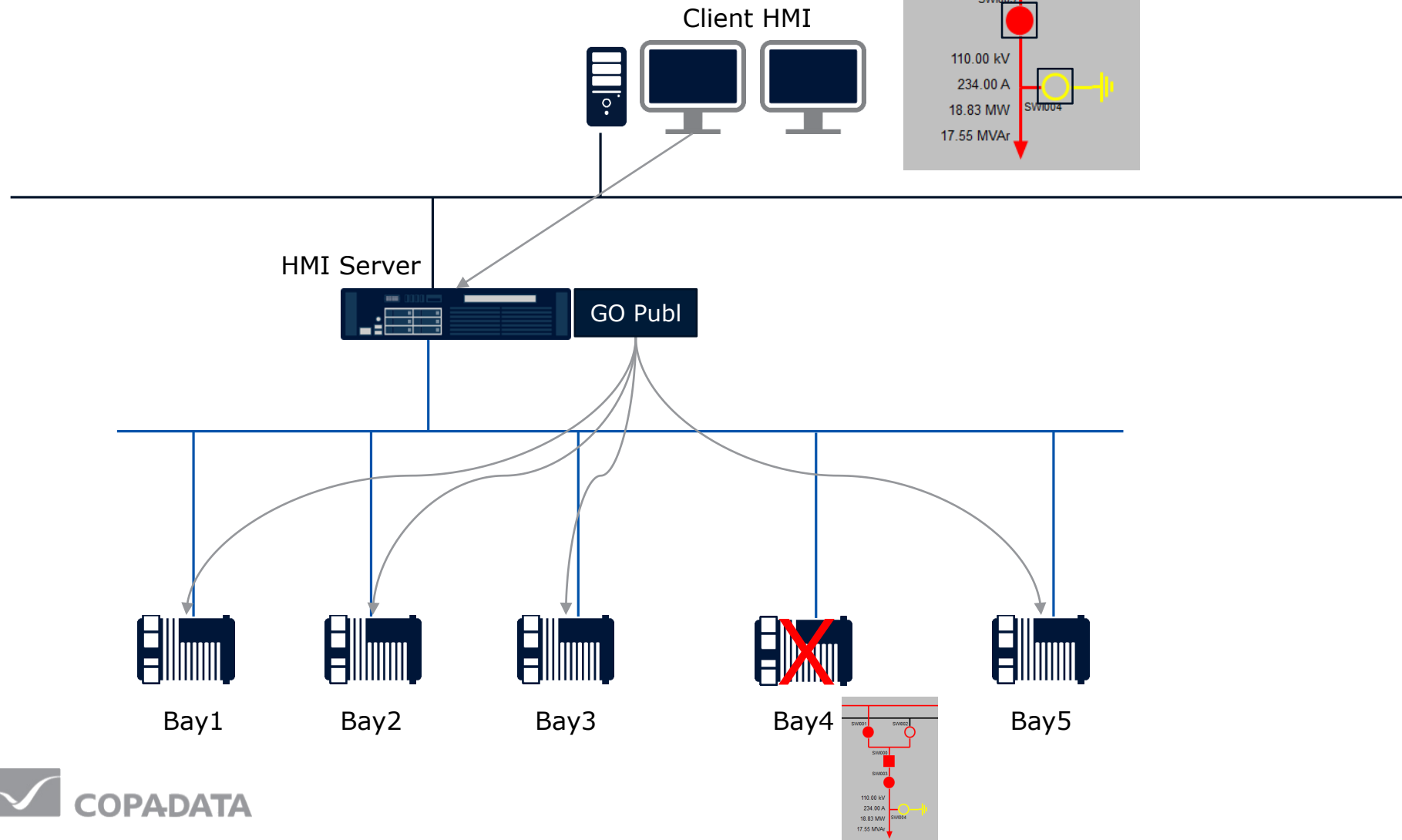


Substitute GOOSE Publisher



Substitute GOOSE Publisher

Substitute
(replace)



Features Explained



Process Recorder

Alarm/Event Analysis – Typical Workflow

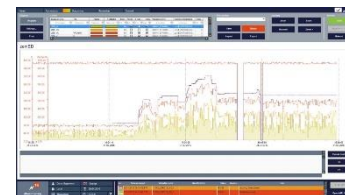
Alarm

- Check alarm list
- Find causes



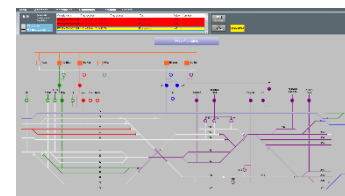
Trend

- Analyze Trends
- Find causes
- Compare with older events

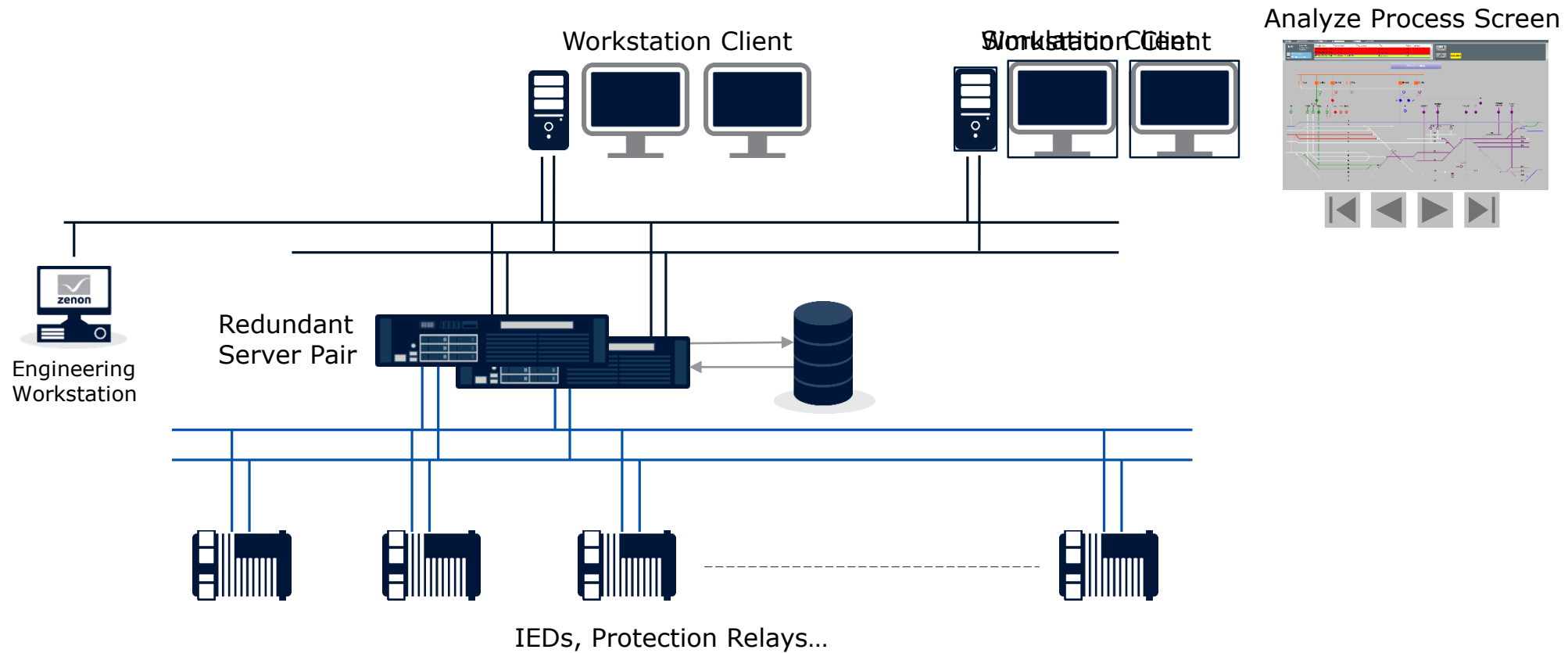


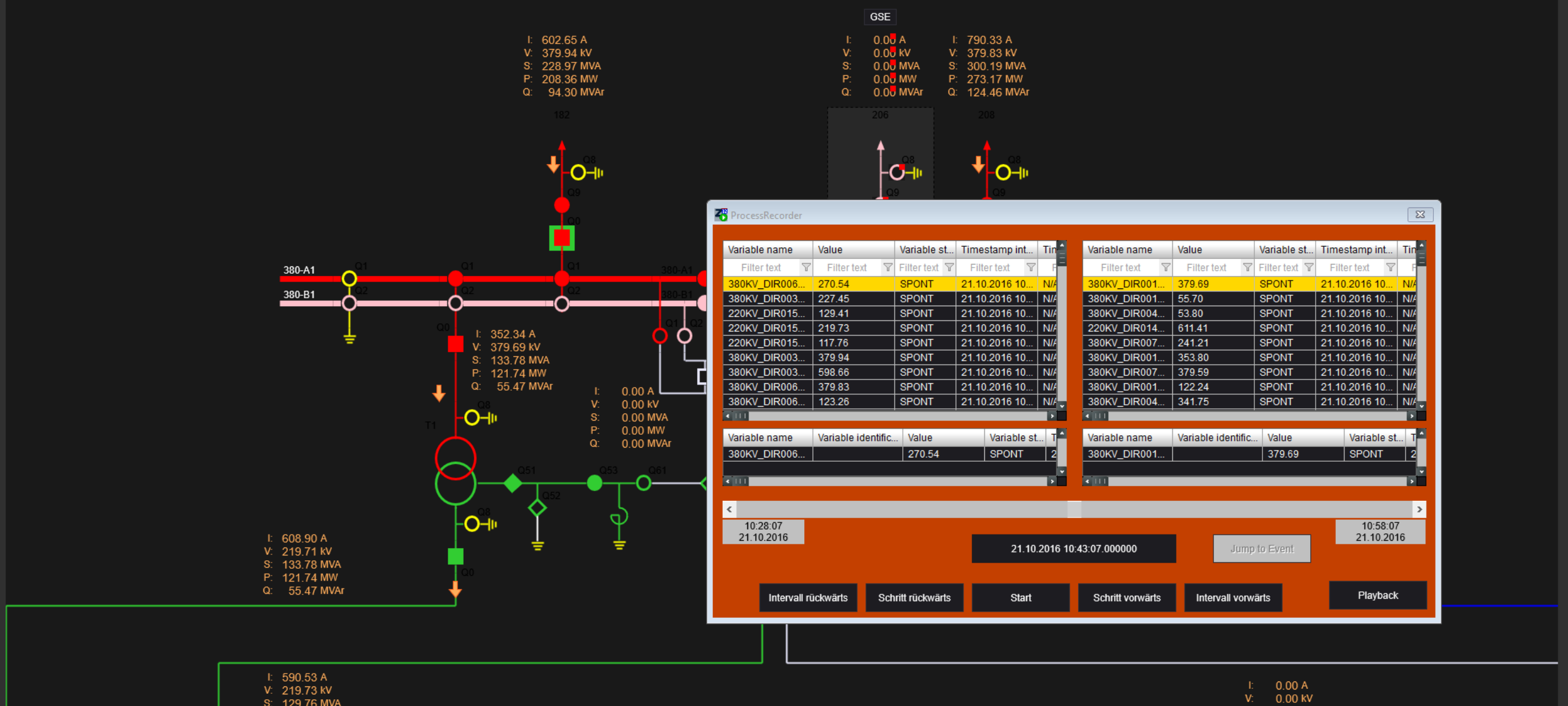
Replay in Screens

- See recorded process
- Compare with healthy states

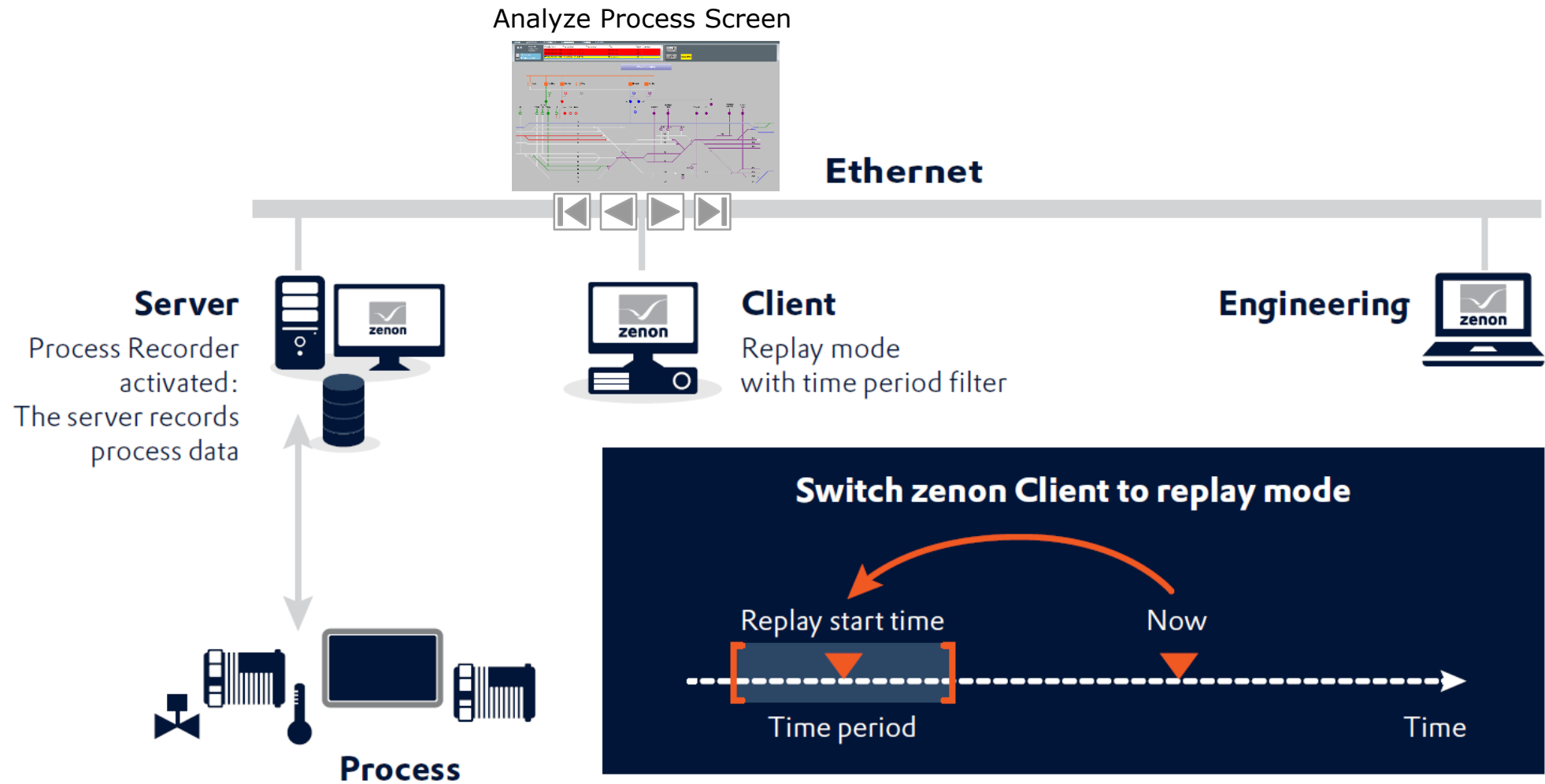


Process Recorder

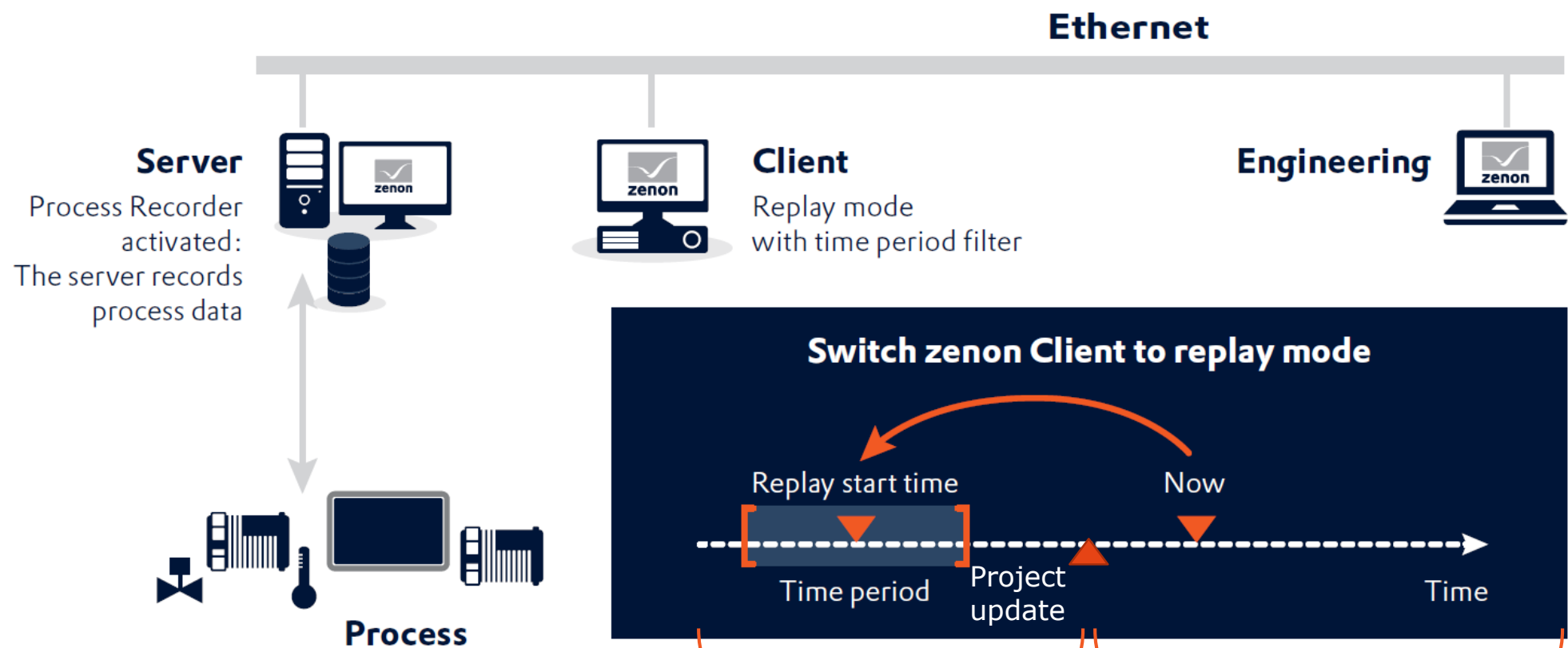




Process Recorder: Principle



Process Recorder: Version-Safe



Project V 2.6



Project V 2.7



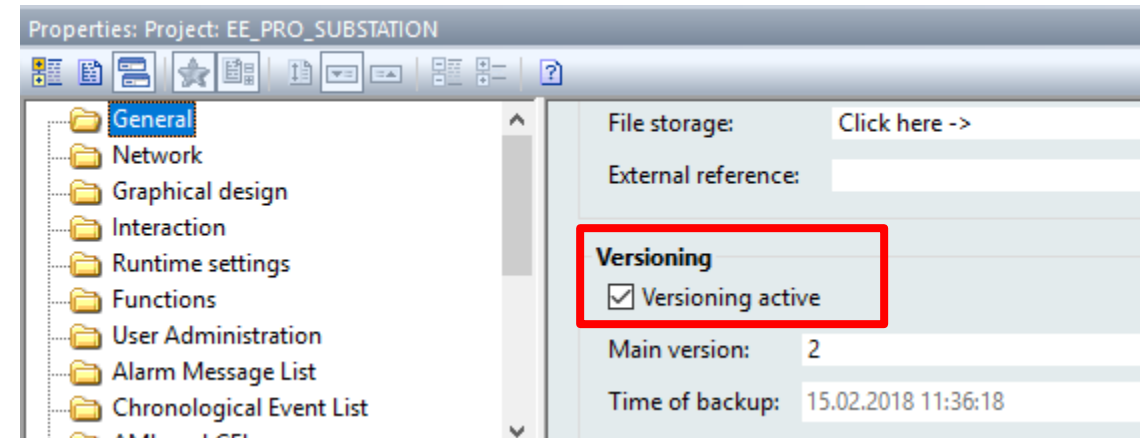
Process Recorder: Version-Safe (how-to)

ED:

- ▶ Project versioning active!
- ▶ Make project backup or raise version-number

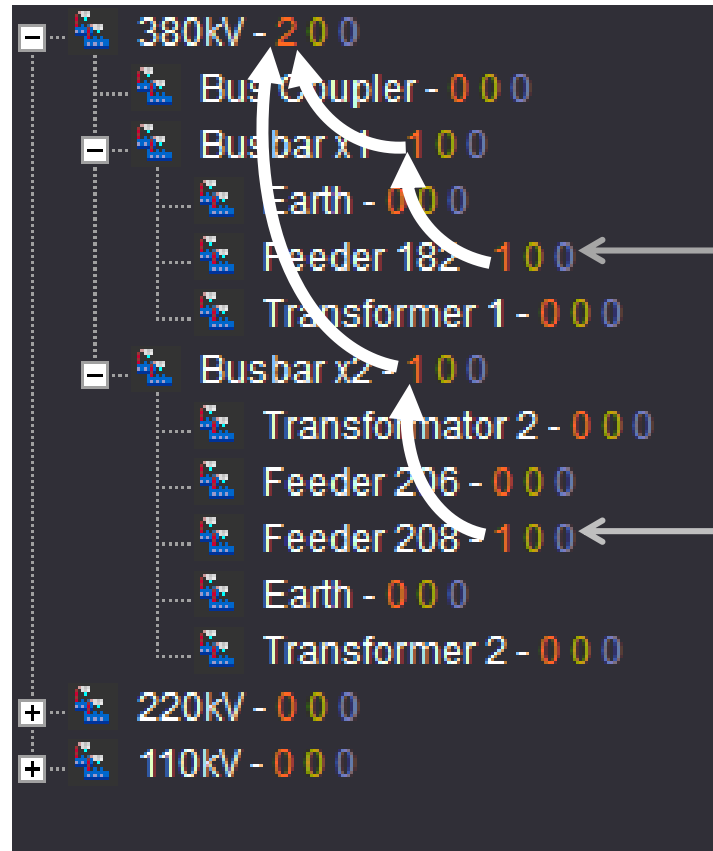
RT:

- ▶ Reload Runtime
- ▶ → Process Recorder creates bookmark



Aggregated Alarms via Equipment Model

Aggregated Alarms



Variable B

Alarm!

Warn

Info

Variable C

Alarm!

Warn

Info

Why use Equipment Model?

- ▶ Energy Application are always well structured
- ▶ Use the structure in zenon
- ▶ Engineering so easy – no alarm areas needed
- ▶ Stay on alarm areas if you don't have a clear hierarchy in your application

Two Time Stamps

Alarm List

Home Alarmstatus Sequences Substation General

Filter Filter profiles Alarm Management Alarm function

Filter Filter profiles Save Delete Print Import Export Acknowledge Delete Acknowledge page Delete page Acknowledge all Delete all Execute function Open help...

Set filter
[*]-[*]-[T,Rel:0d,1h,0m,0s]

Alarm List

Al...	Time received	Zeit kommt intern	Zeit kommt extern	Time cleared	Time acknowledged	Varia
→	29.01.2018 13:56:10.807000	29.01.2018 13:56:10.807000	29.01.2018 13:56:10.807000			380KV_DIR005_LOCAL
→	29.01.2018 13:55:25.801000	29.01.2018 13:55:26.007702	29.01.2018 13:55:25.801000			380KV_DIR005_XCBR_
→	29.01.2018 13:54:06.633949	29.01.2018 13:54:06.633949				_380KV_DIR005_LOCAL
→	29.01.2018 13:54:06.633949	29.01.2018 13:54:06.633949				220KV_DIR005_LOCAL
→	29.01.2018 13:54:06.633949	29.01.2018 13:54:06.633949				110KV_DIR003_LOCAL

$\Delta=0.206702$ sec

Two Time Stamps

- ▶ Internal Time
- ▶ External Time
- ▶ Resolution: μs (00h:00m:00s.000000)

- ▶ New additional time columns in AML and CEL:
 - Time received internal
 - Time received external

 - If remotely stamped event is received: both columns are set (e.g. IEC 61850)
 - If event without time stamp is received: only column "Time received internal" is filled and "Time received external" remains empty

- ▶ Old time column "Time received"
 - Shows external time stamp if existing, otherwise internal time

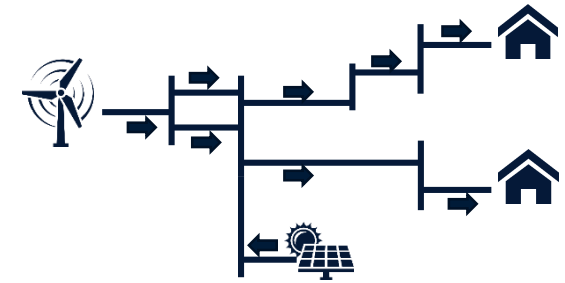
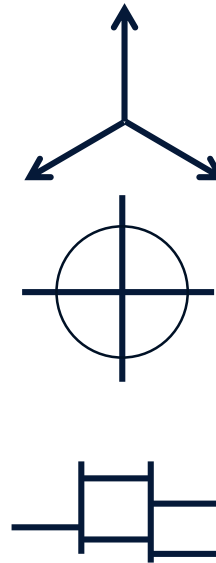
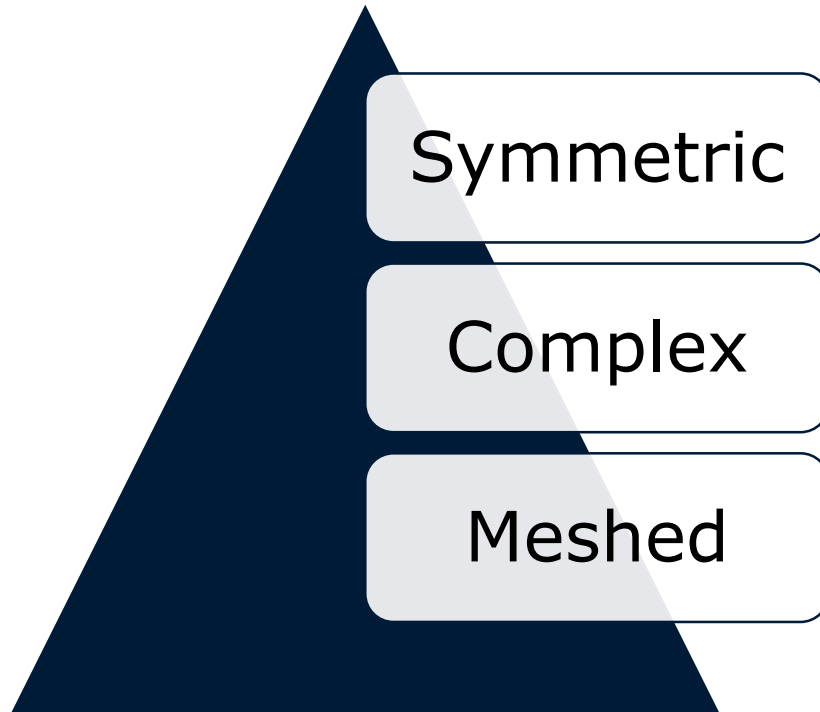
Why Internal and External?

- ▶ See if data traveled for quite a while
- ▶ Delta high: Check why
- ▶ Delta high: Importance of data minimized

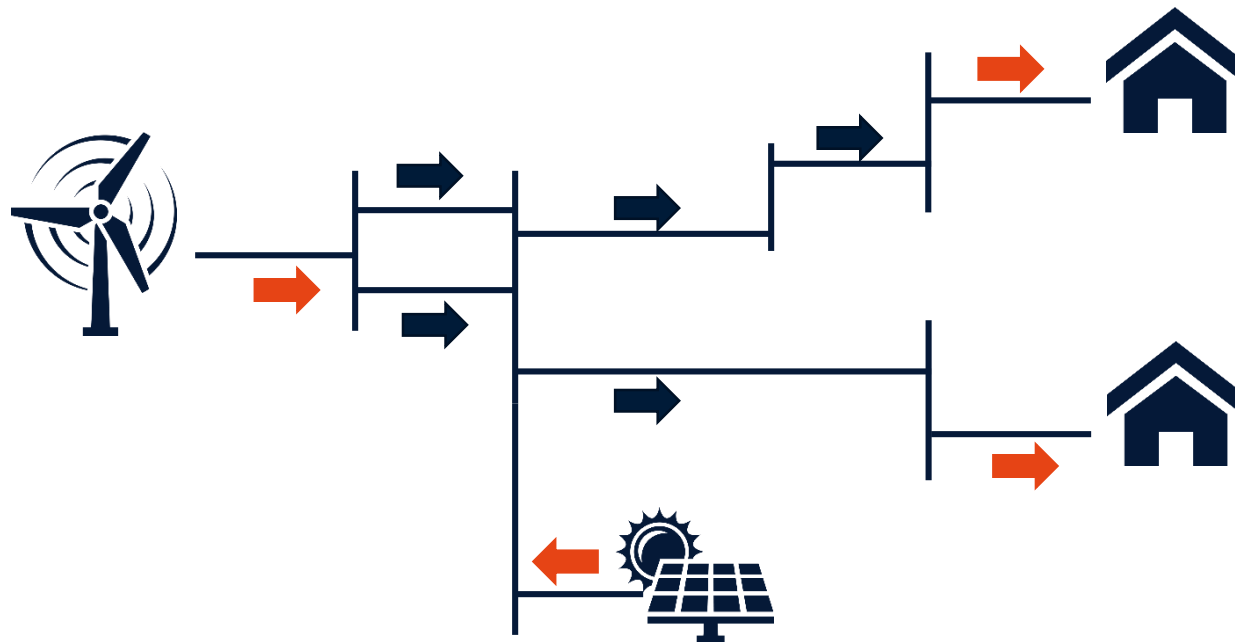


Load Flow Calculation

LFC – Load Flow Calculation



What can you do with LFC?



By measuring
orange arrow you can
calculate black arrow

Additional features:

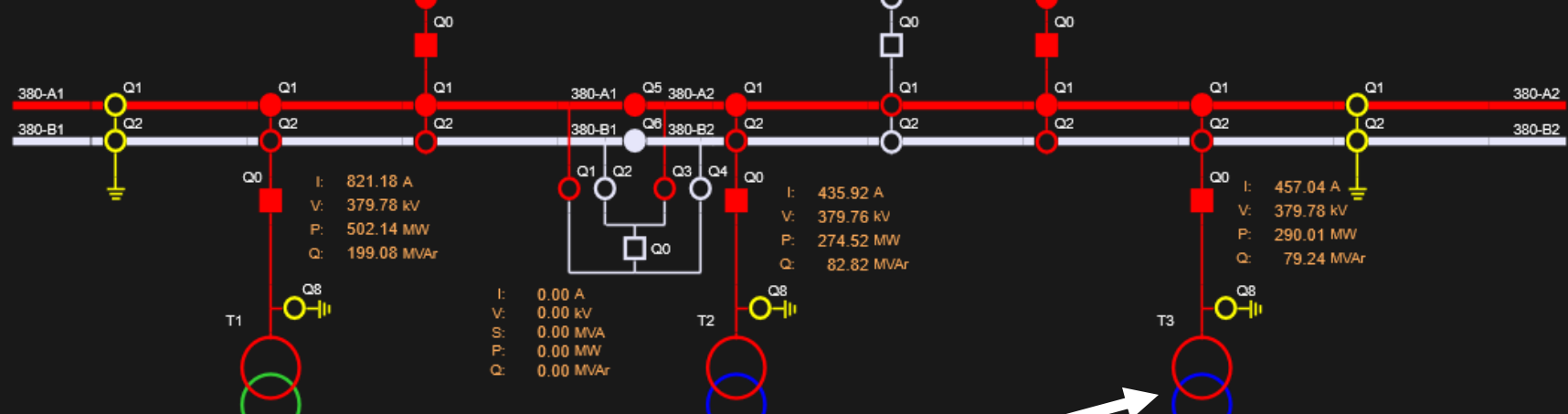
Pre-switching calculation

N-1 calculation

Pre Switching Calculation

Would I cause any damage to my grid if I execute this control command?





Switchgear

Action type

User input

Variable

110KV_DIR017_XCBR_RV

Interlocking

Active	Text	Type	Unlock...	Unlock...
Filter text	Filter text	Filter text	Filter...	Filter...
Yes	The transformer 'Transformer 3' will be overloaded by 34.90% more than allowed	Topological interlocking	Yes	No
No	Voltage towards ground	Topological interlocking	No	No
No	Switching operation in area with undefined status	Topological interlocking	No	No
No	Area with undefined status would increase	Topological interlocking	No	No
No	Disconnecter under load	Topological interlocking	No	No
No	Device would not be supplied	Topological interlocking	No	No
No	Interconnect grids	Topological interlocking	No	No
No	Interconnect various voltage levels	Topological interlocking	No	No
No	Status already exists	Target/actual comparison	Yes	No

Select / operate

OPEN

CLOSE

Unlock all

Cancel

V: 0.00 kV
S: 0.00 MVA
P: 0.00 MW
Q: 0.00 MVar

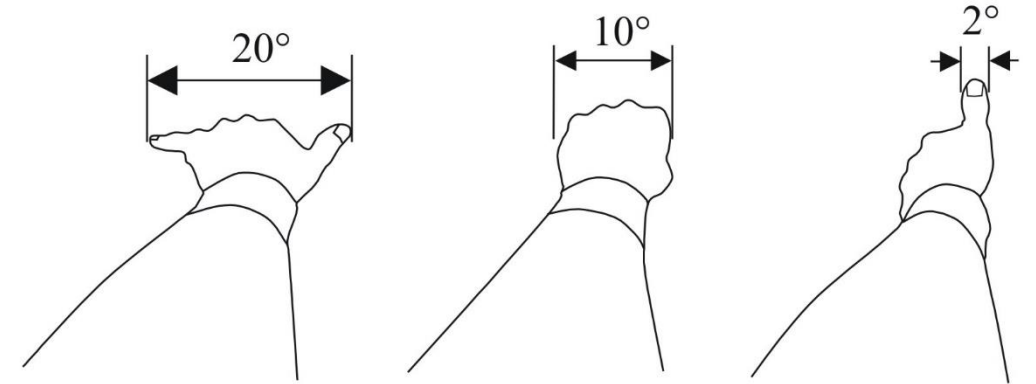
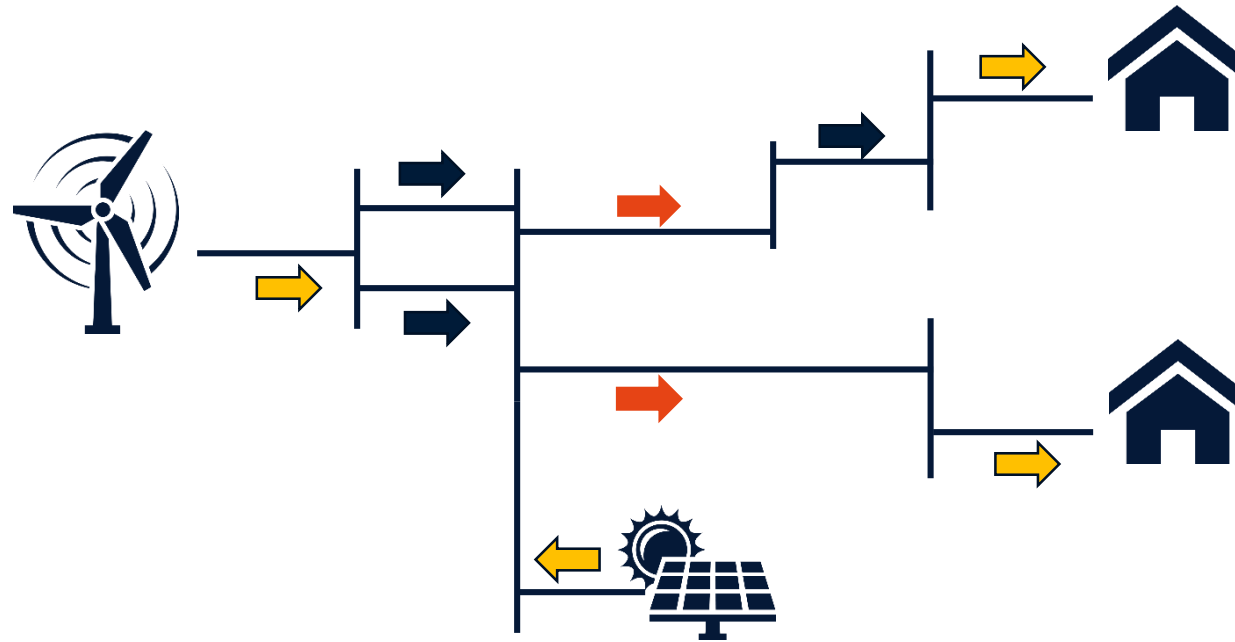
747

777

787

State Estimator

State Estimator

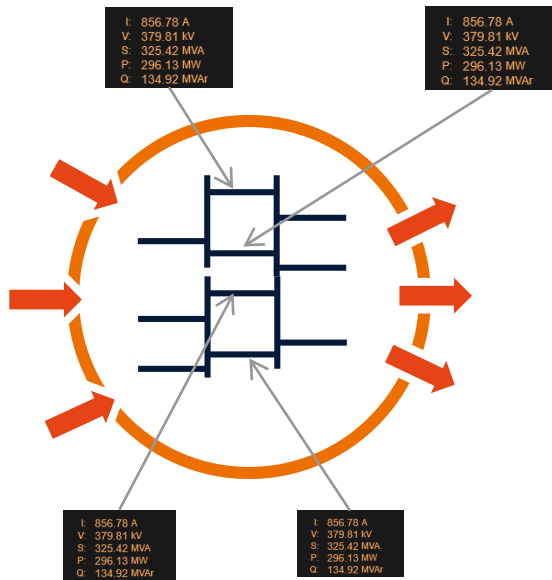


By knowing
 you can
calculate 
in order to be
used for the
LFC

When do you use LFC and when SE?

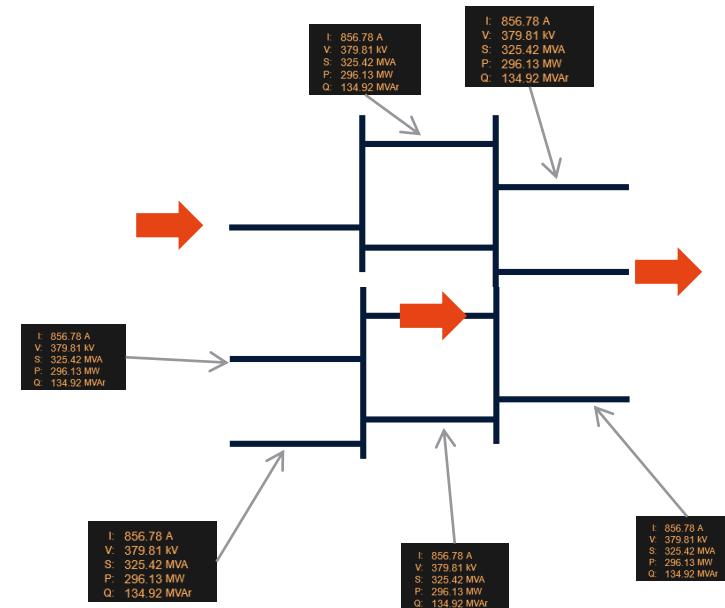
LFC

- ▶ Small Grid/Substation
- ▶ All Inputs and loads measured (and valid)



SE

- ▶ Large grid
- ▶ No complete measurement

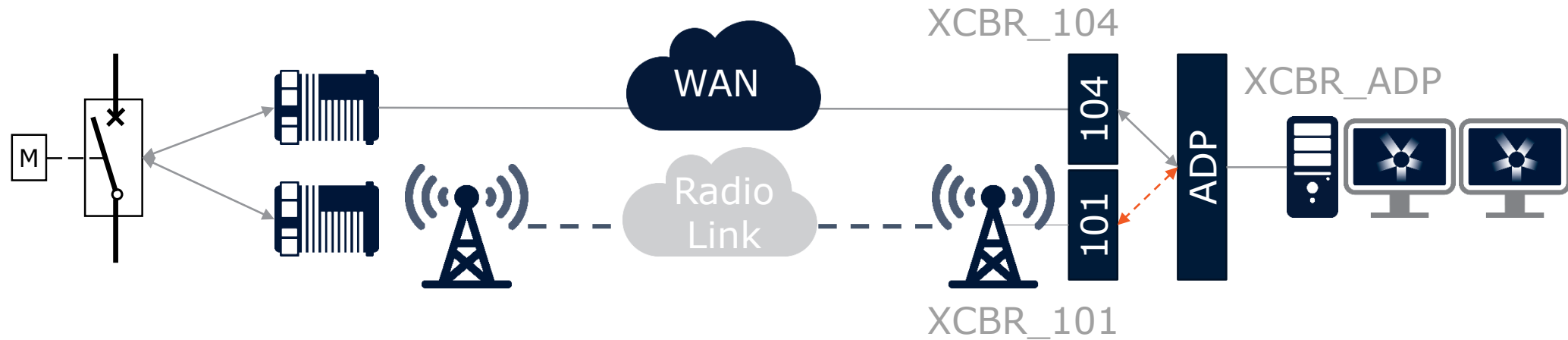


Alternative Data Source

Alternative Variable Source

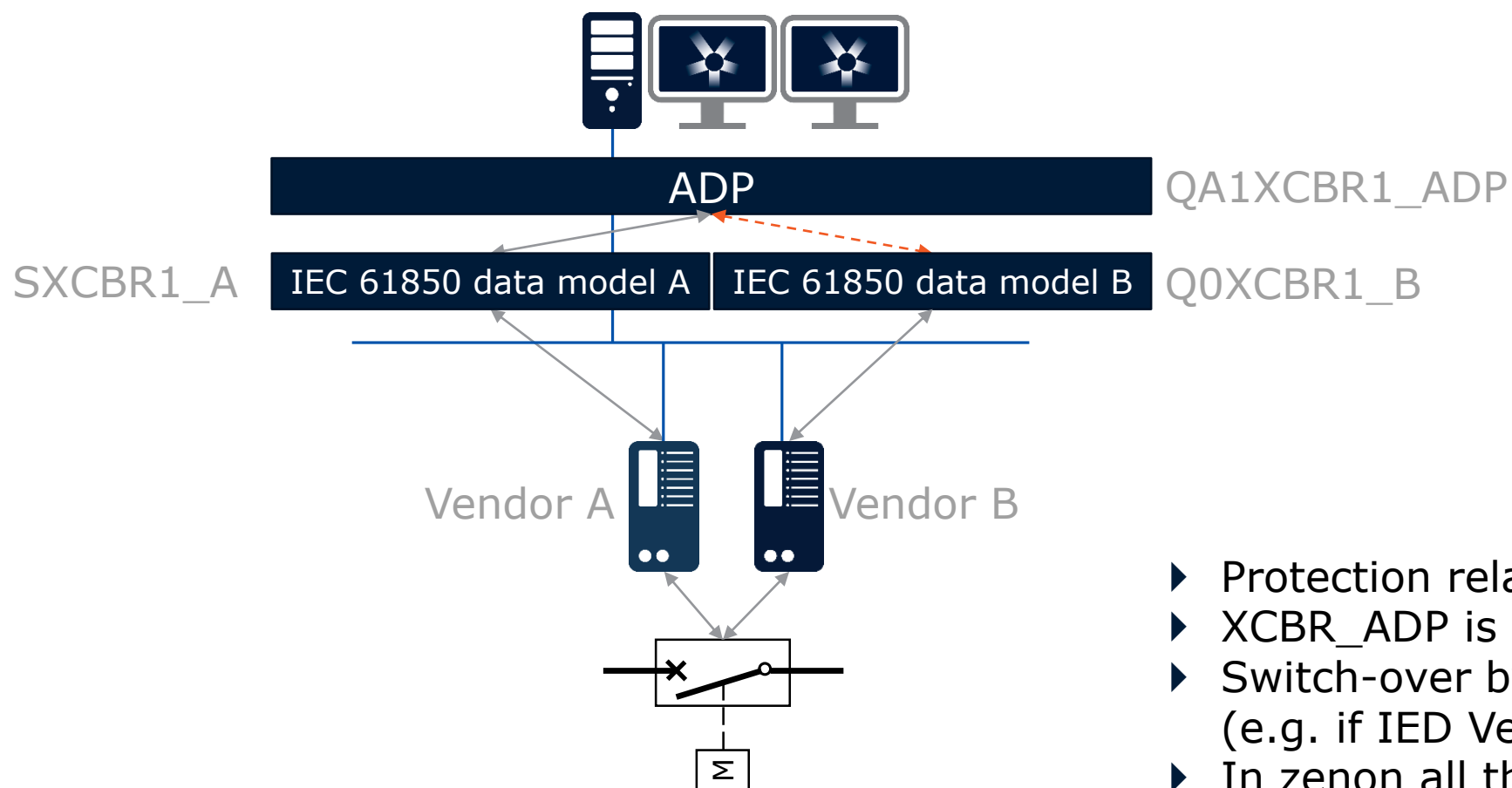
- ▶ Wrap a single point of information over several information sources meaning the same
- ▶ Monitoring and control direction possible
- ▶ Switch over by manual or automatic trigger (e.g. quality flag)
- ▶ ADP Variable doesn't extend TAG count

Alternative Variable Source – Use Case #1



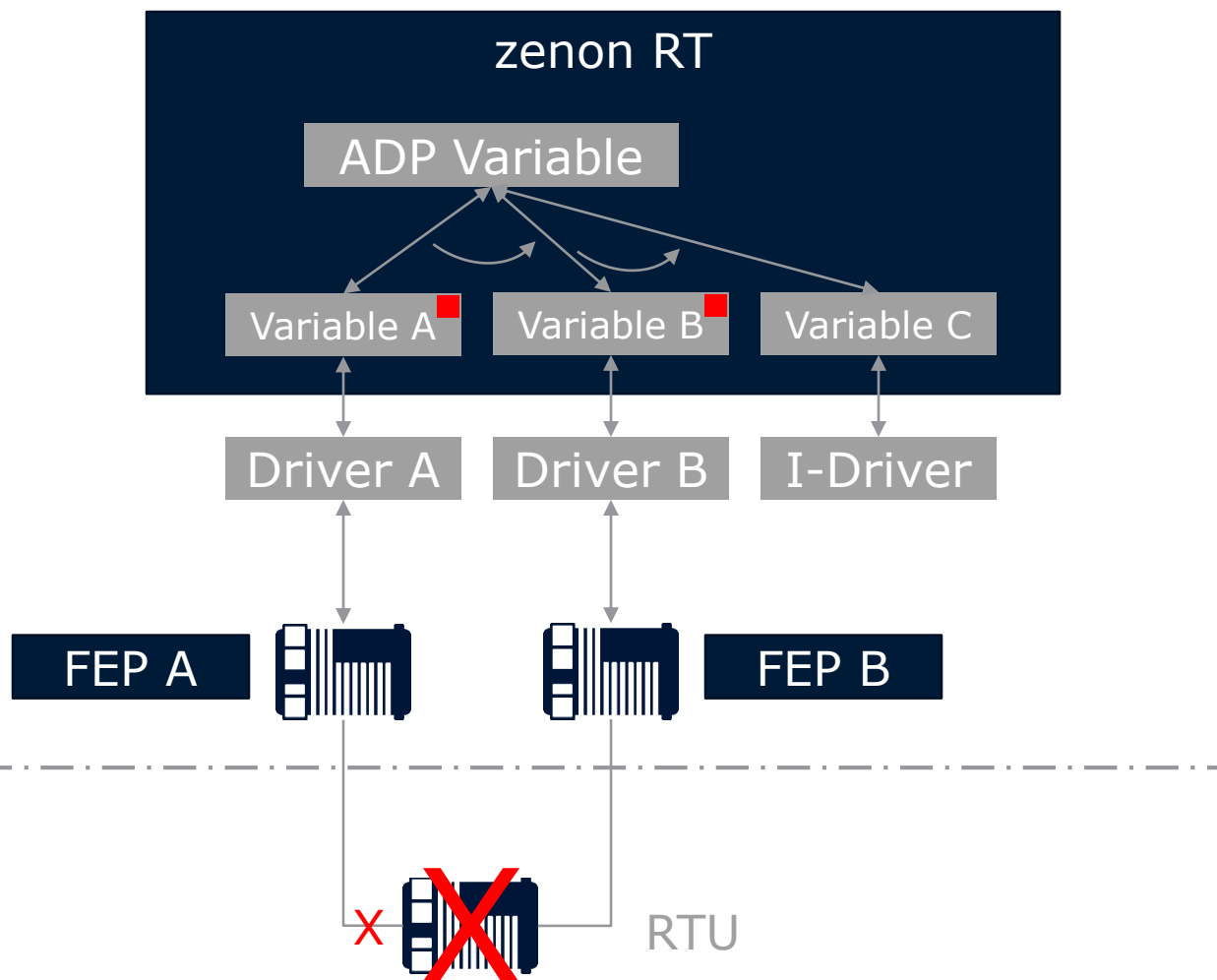
- ▶ XCBR_ADP is connected to preferred source
- ▶ Switch-over by connection state variable
- ▶ In zenon all three variables exist
- ▶ No TAG count for XCBR_ADP

Alternative Variable Source – Use Case #2



- ▶ Protection relays from two different vendors
- ▶ XCBR_ADP is connected to preferred source
- ▶ Switch-over by connection state variable (e.g. if IED Vendor A is removed)
- ▶ In zenon all three variables exist
- ▶ No TAG count for XCBR_ADP

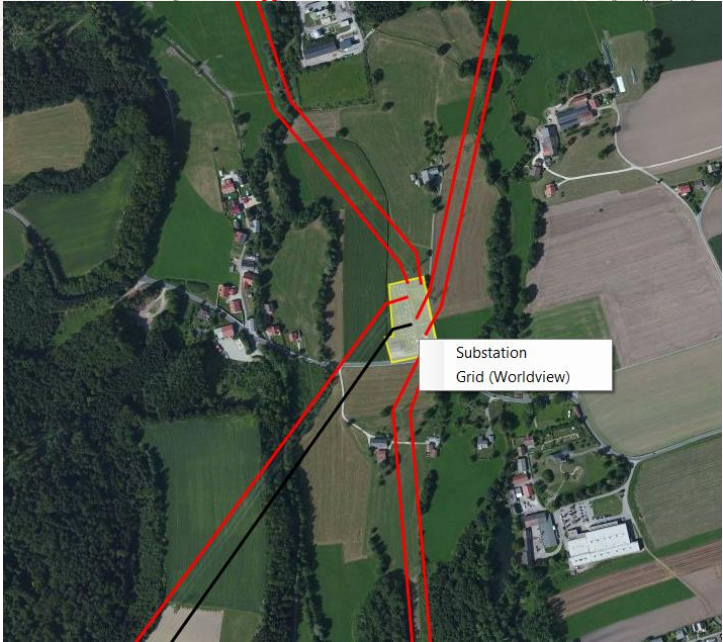
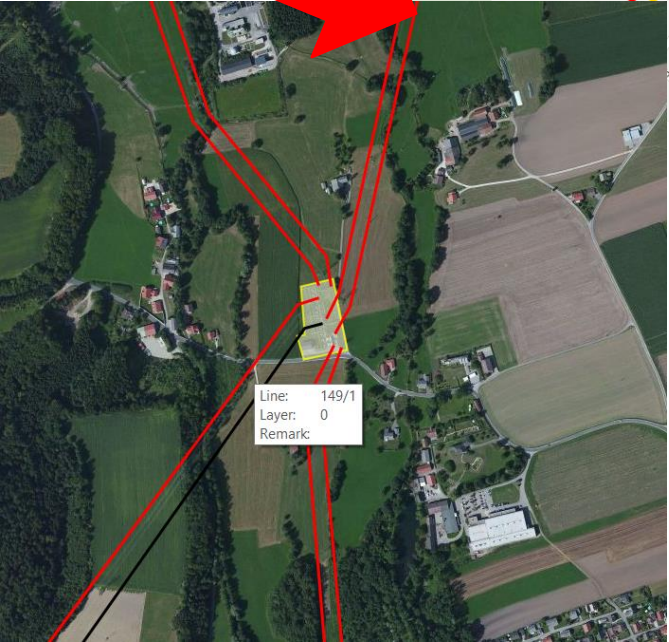
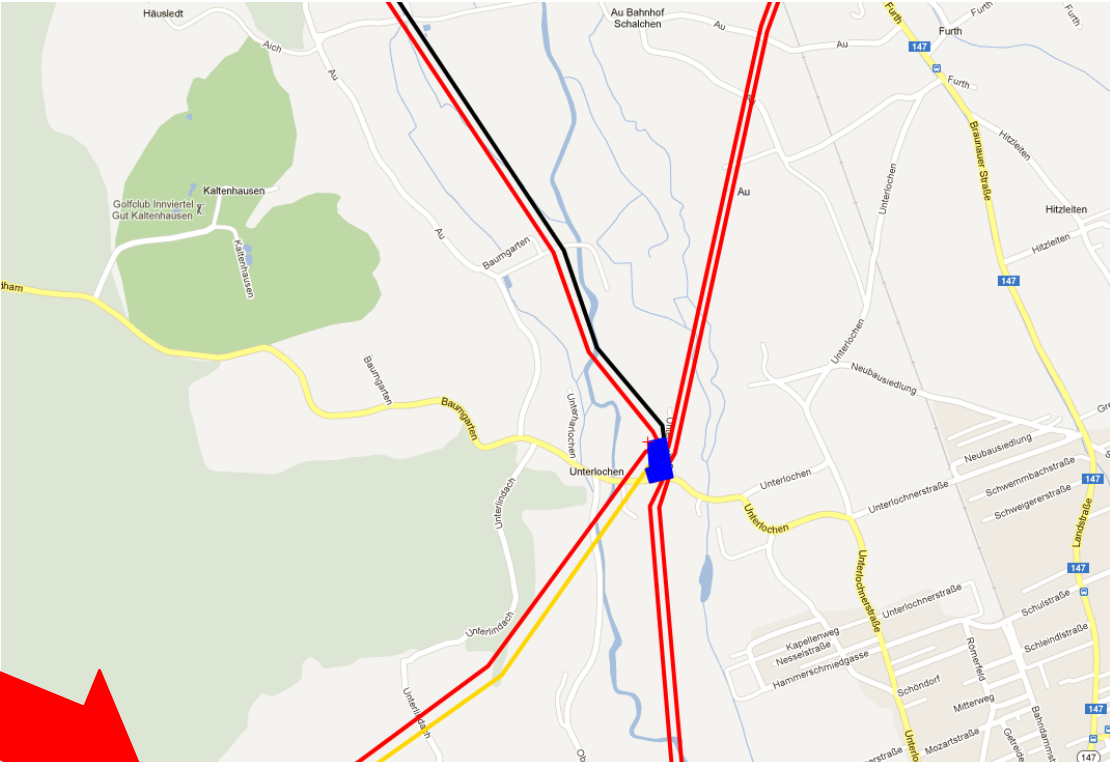
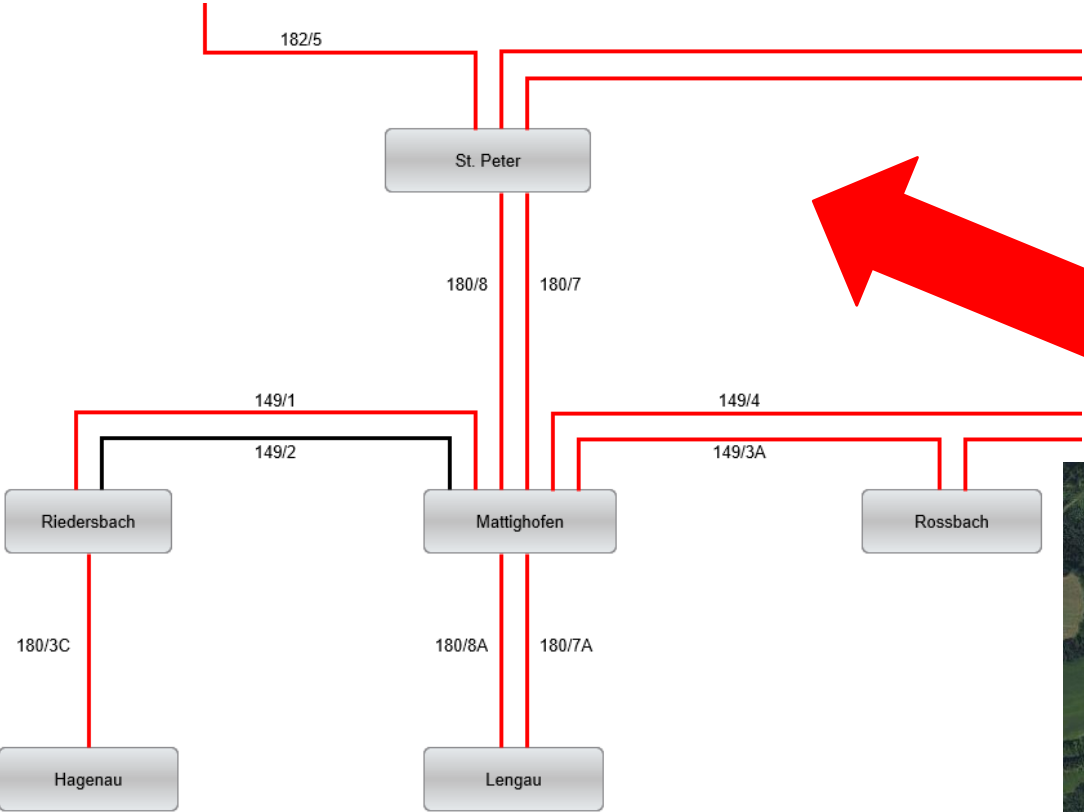
Alternative Variable Source – Use Case #3



- ▶ Redundant Front End processors provide same information
- ▶ LFC (in DMS application) requires valid data at any time
- ▶ If Variable A fails: use redundant Variable B
- ▶ If Variable A and B fail: use Variable C (static, e.g. standard load)

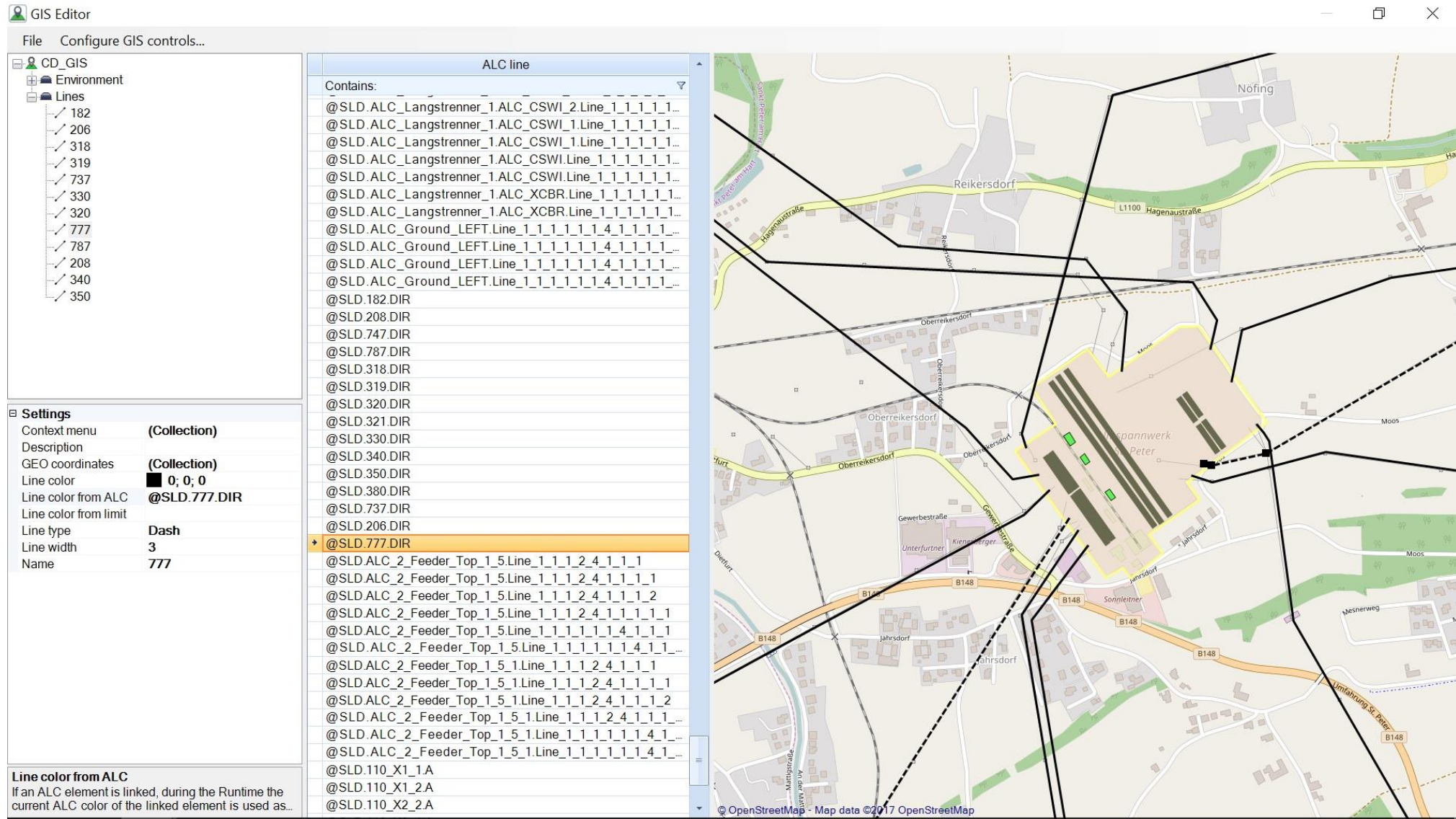
GIS Integration

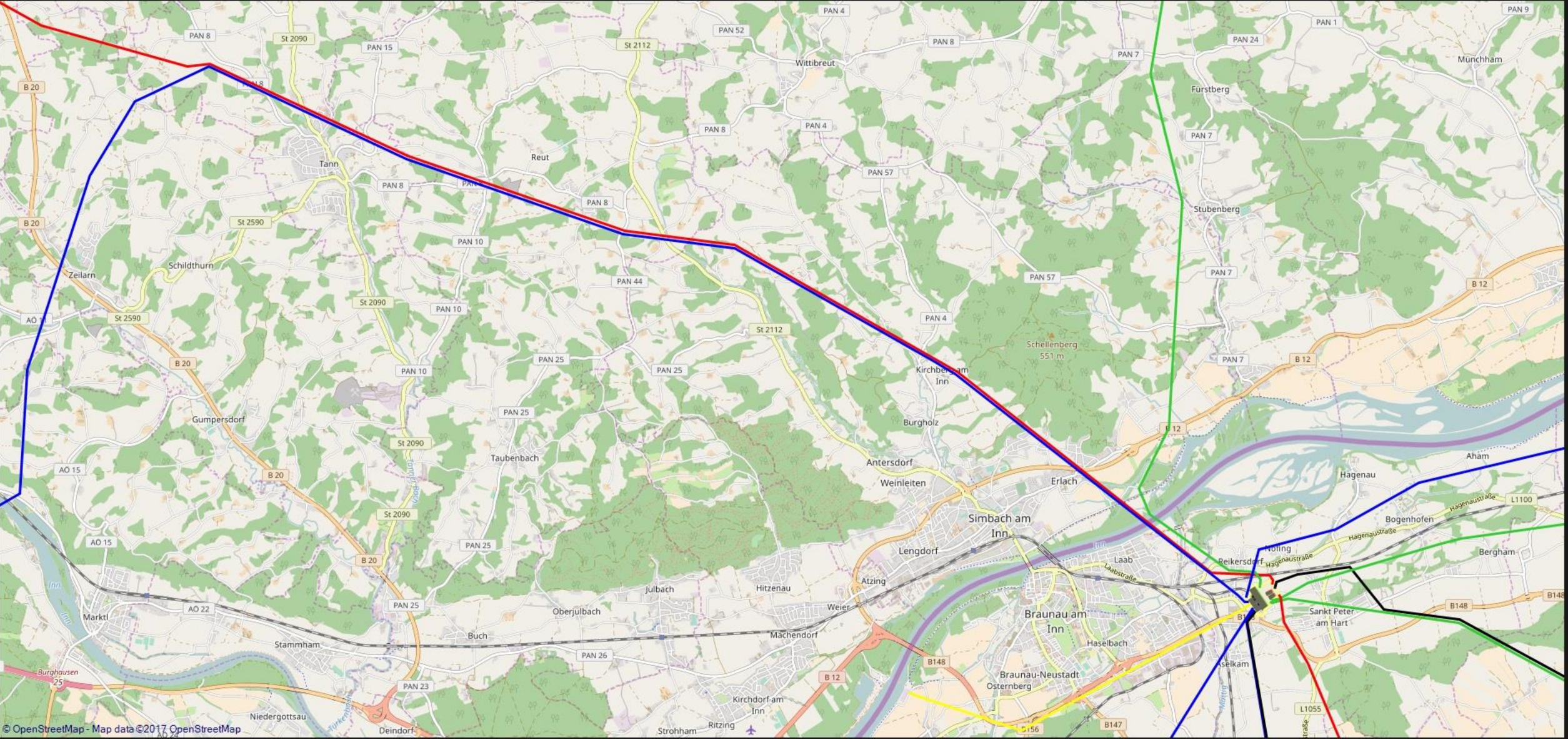
GIS



COPADATA

GIS Editor





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Alarm Overview

SYSTEM

Local

Standalone

English

09.02.2017

08:54:44

AI...

Time received

Variable name

Identification

Value

Measu...

Text

	09.02.2017 08:54:42.776	110KV_DIR012_MX_I		510.65		Alert Overcurrent
	09.02.2017 08:53:45.651	110KV_DIR004_MX_I		508.25		Alert Overcurrent
	09.02.2017 08:53:43.152	110KV_DIR000_MX_I		501.17		Alert Overcurrent

Acknowledge

Open AML Screen

GIS FAQ

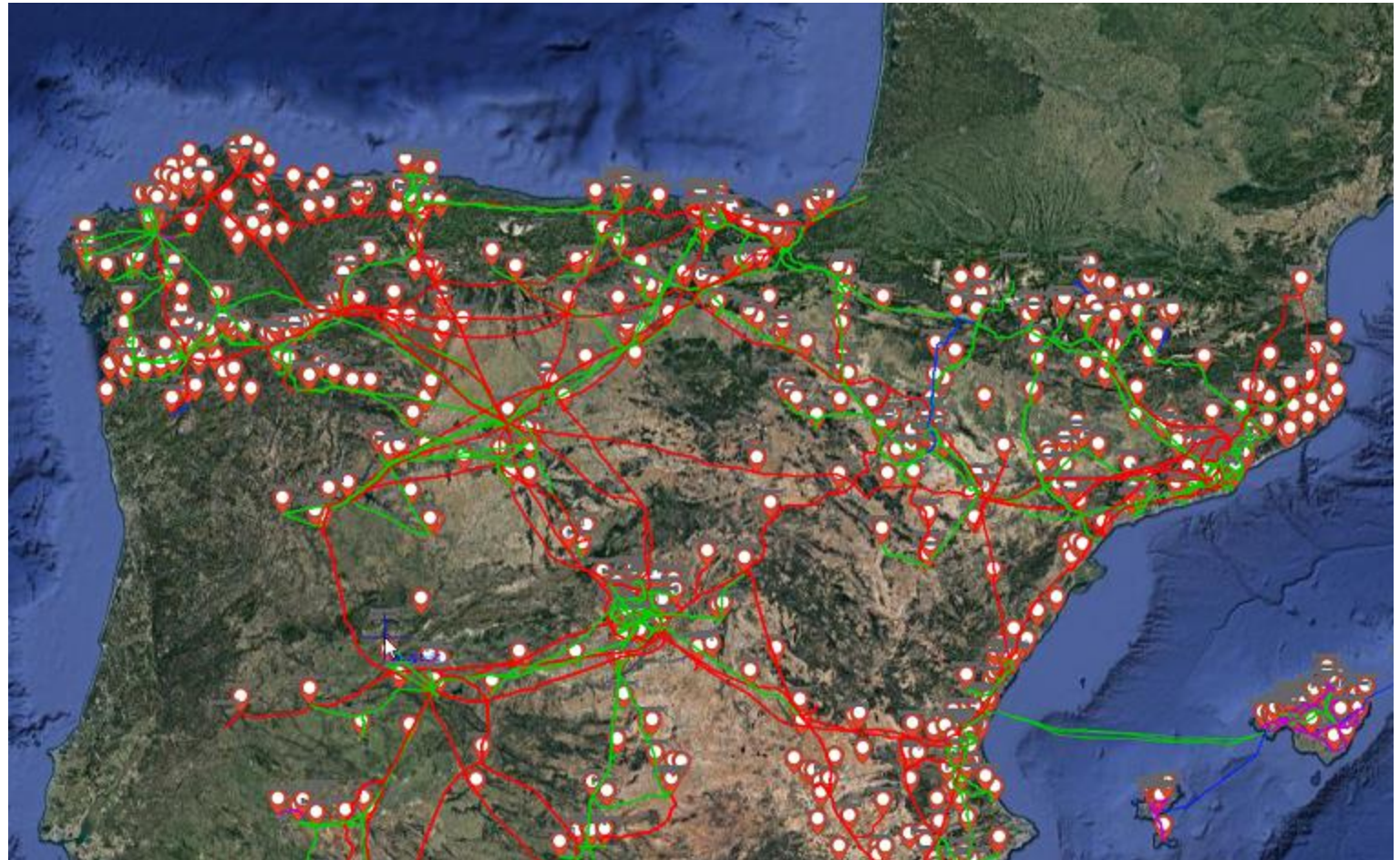
- ▶ Supports ArcGIS (ESRI) online maps
- ▶ No export or import or additional ArcGIS layers
- ▶ No use of native zenon elements or symbols
- ▶ Supports color palette switching
- ▶ Supports ALC
- ▶ Supports Limit Colors
- ▶ KMZ import possible

GIS



- ▶ Support of KMZ-files
- ▶ Fault location
- ▶ Decluttering

KMZ = zipped KML
KML = XML based description
of place marks, overlays and
paths for an earth browser



Upstream and Downstream

Looking for a multilingual SCADA?

- ▶ zenon Energy Edition speaks...
 - IEC 61850 MMS Client, MMS Server and GOOSE
 - IEC 60870-5-101, -103, -104 Master and Slave
 - DNP3 Master and Outstation
 - Modbus Master and Slave
 - And 300 other Languages (Protocols)

IEC 61850 Client

IEC 61850 Client Driver

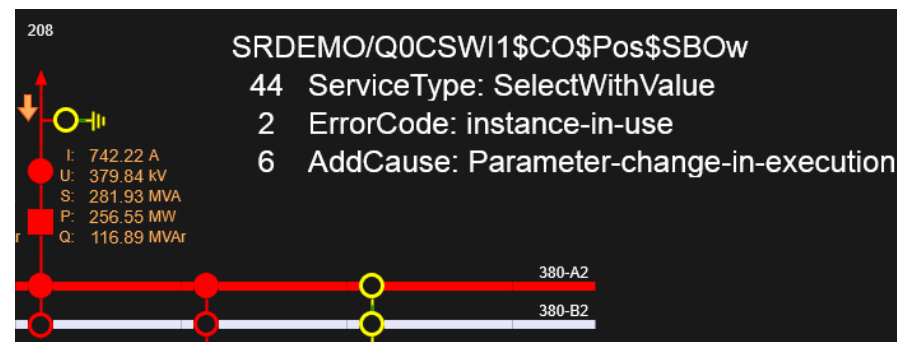
- ▶ Key words for Host-name (\$SCADA_SERVER1)
- ▶ Data set shown at RCB assignment
- ▶ 10 further improvements

Important if you change hardware

Better overview for engineer

Feature List – IEC 61850

- ▶ Ed.2 Service Tracking
- ▶ Driver acts as communication Client (KEMA certified)
- ▶ “Direct operate” and “select before operate” support
- ▶ Driver supports RTU time stamping and RTU quality
- ▶ Online browsing for process variables
- ▶ Offline browsing (SCL files)
- ▶ Definable Originator Category (orCat)
- ▶ File transfer
- ▶ Individual Trigger Options
- ▶ Dynamic Datasets
- ▶ ACSE Authentication (IEC 62351-4)
- ▶ Use your own variable names!



Sequence of events list

Time received	Text
17.02.2015 14:45:52	380KV_DIR208_XCBR_CO: SelectWithValue, error: instance-in-use, CO=Off by station-control: 'zenon: ATSZG-TBL022' --> negative - addCause: Parameter-change-in-execution



IEC 61850 Certificate Level A¹

Page 1/2

Issued to:
Ing. Punzenberger COPA-DATA GmbH
Karolingerstr. 7B
5020 Salzburg
Austria

No. 30107088-Consulting 11-0196

For the client system:
COPA-DATA IEC850 - Driver for
IEC61850 protocol; version 6.51.0.4101
Hardware: HP Compaq dc7800 with
Windows 7 Professional x64

Issued by: **KEMA**

The client system has not shown to be non-conforming to:
IEC 61850-6, 7-1, 7-2, 7-3, 7-4 and 8-1
Communication networks and systems in substations

The conformance test has been performed according to IEC 61850-10 with client system's protocol, model and technical issue implementation conformance statements: "zenon driver manual COPA-DATA IEC850 Driver for IEC61850 protocol v.6.51.0.4101", "TISSUES Implementation Conformance Statement for the IEC 61850 interface in COPA-DATA IEC850 - Driver for IEC61850 protocol with version "6.51.0.4101" and product's extra information for testing: "PIXIT for COPA-DATA IEC61850 Client v.4101".

The following IEC 61850 conformance blocks have been tested with a positive result (number of relevant and executed test cases / total number of test cases as defined in the UCA IUG Client Test procedures version 1.1):

1 Basic Exchange (18/22)	12a Direct Control (8/7)
2 Data Sets (4/3)	12b SBO Control (8/9)
2+ Data Set Definition (3/4)	12c Enhanced Direct Control (8/7)
5 Unbuffered Reporting (15/18)	12d Enhanced SBO Control (8/9)
6 Buffered Reporting (18/22)	14 File Transfer (8/8)

This Certificate includes a summary of the test results as carried out at KEMA in the Netherlands UniCA Multi IED simulator v1.21.0.5 and UniCA 61850 analyzer v4.21.03. The test is based on the UCA IUG "Conformance Test Procedures for Client System with IEC 61850-8-1 interface, version 1.1". This document has been issued for information purposes only, and the original paper copy of the KEMA report: No. 30107088-Consulting 11-0196 will prevail.

The test has been carried out on one single specimen of the client system as referred above and submitted to KEMA by COPA-DATA. The manufacturer's production process has not been assessed. This Certificate does not imply that KEMA has certified or approved any product other than the specimen tested.

Amhem, 14 Jun. 2015

M. Arjans
Regional Director Management & Operations Consulting

R. Schimmel
Certification Manager

1 Level A - Independent Test lab with certified ISO 9000 or ISO 17025 Quality System

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KEMA Nederland B.V.
Utrechtseweg 310, 6812 AR Amhem P.O.Box 9035, 6800 ET Amhem The Netherlands
T +31 26 356 61 42 F +31 26 351 54 66 sales@kema.com www.kema.com



IEC 61850 Certificate Level A¹



No. ZE 15 07 90699 002

Issued to:
Ing. Punzenberger COPA-DATA GmbH
Karolingerstr. 7B
5020, Salzburg
Austria

For the client product:
zenon Supervisor/Energy Edition
Version: 7.50
HP Z440 Workstation
with Windows 7 Professional

Issued by:
TÜV SÜD Product Service GmbH
Communication Protocols
Barthstrasse 16
D-80339 Munich
Germany



This certification mark can only be used for the product defined above.

The client product has not been shown to be non-conforming to:
IEC 61850 Edition 2 Parts 6, 7-1, 7-2, 7-3, 7-4 and 8-1
Communication networks and systems for power utility automation.

The conformance test has been performed according to IEC 61850-10 Edition 2, the UCA International Users Group Edition 2 Client Test Procedures version 1.0 with TPCL² version 1.0_rev2 with the product's protocol, model and technical issue implementation conformance statements: "IEC850.pdf (Chapter PICS)", "IEC850.pdf (Chapter MICS)", "IEC850.pdf (Chapter TICS)" and product's extra information for testing: "IEC850.pdf (Chapter PIXIT)".

The following IEC 61850 conformance blocks have been tested with a positive result (number of relevant and executed test cases / total number of test cases):

1 Basic Exchange (18/24)	9 GOOSE Control Block (2/2)
2 Data Sets (6/10)	12a Direct Control (7/9)
2+ Data Set Definition (5/8)	12b SBO Control (9/11)
3 Substitution (3/3)	12c Enhanced Direct Control (7/9)
4 Setting Group Selection (2/3)	12d Enhanced SBO Control (9/11)
4+ Setting Group Definition (5/5)	13 Time Synchronization (4/4)
5 Unbuffered Reporting (20/23)	14 File Transfer (6/8)
6 Buffered Reporting (25/28)	15 Service Tracking (6/17)

This certificate includes a summary of the test results as carried out at Munich in Germany with Anvil 3.6.0.0/3.7.0.0 and Wireshark 1.10.7. This document has been issued for information purposes only, and the original paper copy of the TÜV SÜD Product Service GmbH test report: No. 713060501-TR01, version 1.0 will prevail.

The test has been carried out on one single specimen of the product as referred above and submitted to TÜV SÜD Product Service GmbH by Ing. Punzenberger COPA-DATA GmbH. The manufacturer's production process has not been assessed. This certificate does not imply that TÜV SÜD Product Service GmbH has certified or approved any product other than the specimen tested.

Munich, 06.08.2015

Maurizio Scavazzon
Technical Certifier

Albi Kospiri
Test Engineer

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¹ Level A - Independent Test lab with certified ISO 17025 Quality System
² Test Procedure Change List

Page 1 / 2

According to the "TÜV SÜD Group Certification Rules" please see reverse side.

TÜV SÜD Product Service GmbH - Zertifizierstelle - Ridlerstraße 65 - 80339 München - Germany

TUV®

A 1 / 04.11

ZERTIFIKAT ♦ CERTIFICATE ♦ CERTIFICADO ♦ СЕРТИФИКАТ ♦ 證書

IEC 61850
client
configuration
tool

Tree of
imported
SCD file

Variable import
for selected
Report/Dataset

Driver,
Connection,
Report
configuration for
zenon project

IEC850 driver configuration

File selection
C:\Users\juergenr\Documents\FH Salzburg\Lehre\Labor SS2015\Labor 1\SEL487E.icd

Configuration

New Driver Import Quality Create Supervisor
New Connection Import Variables...

IEDs
> >>

Connections

1_10.0.0.70_E1Q03F1KF1
... E1Q03F1KF1CFG/LLN0/BRep01[BR]_DSet01
... E1Q03F1KF1CFG/LLN0/BRep02[BR]_DSet02
... E1Q03F1KF1CFG/LLN0/BRep03[BR]_DSet03
... E1Q03F1KF1CFG/LLN0/BRep04[BR]_DSet04
... E1Q03F1KF1CFG/LLN0/BRep05[BR]_DSet05
... E1Q03F1KF1CFG/LLN0/BRep06[BR]_DSet06
... E1Q03F1KF1CFG/LLN0/URep01[RP]_DSet07
... E1Q03F1KF1CFG/LLN0/URep02[RP]_DSet08
... E1Q03F1KF1CFG/LLN0/URep03[RP]_DSet09
... E1Q03F1KF1CFG/LLN0/URep04[RP]_DSet10
... E1Q03F1KF1CFG/LLN0/URep05[RP]_DSet11
... E1Q03F1KF1CFG/LLN0/URep06[RP]_DSet12

IEC 61850 Treiber
1_192.168.0.55_Server1
2_10.0.0.70_E1Q03F1KF1
Reports
Host0
E1Q03F1KF1CFG/LLN0/BRep03[BR]_DSet03
Host1

Variables in Dataset

Functional Constraints (FC)
☐ ST ☐ MX ☐ SR ☐ SV ☐ CF ☐ SP

Quality Variables
☐ QualityVariable

Create
Cancel

Variable Search:

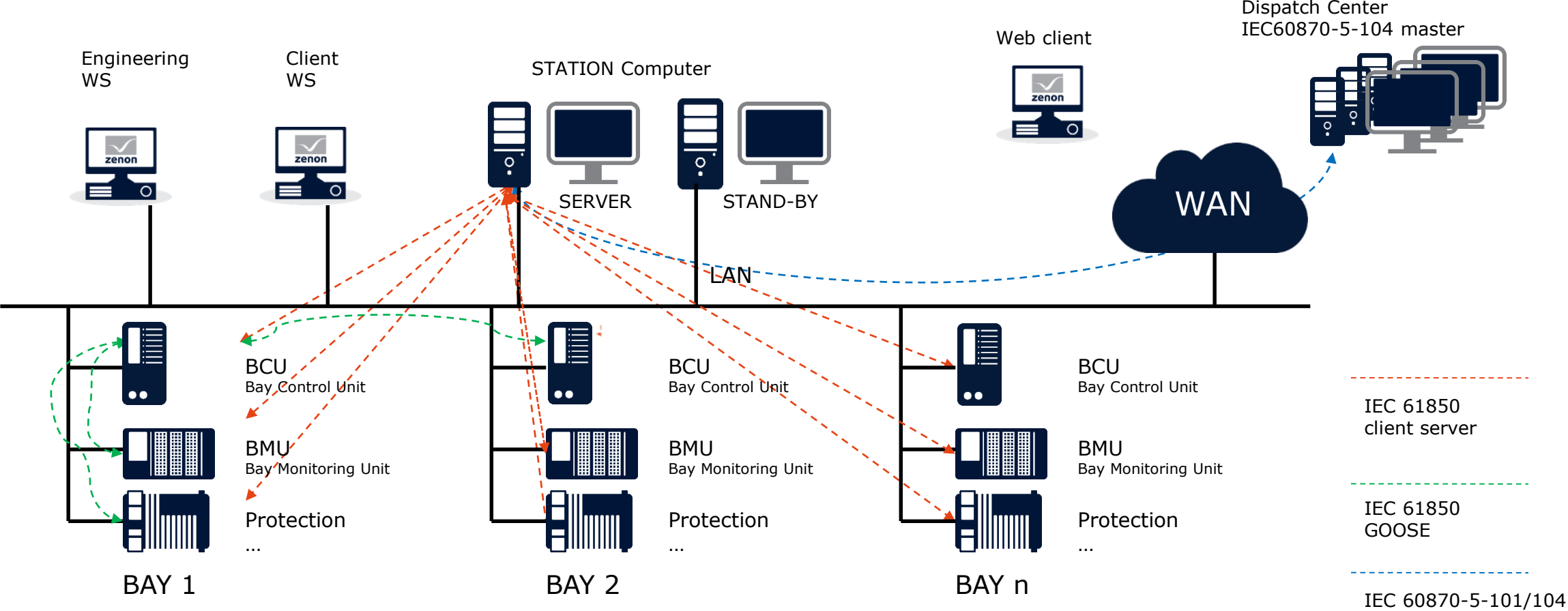
E1Q03F1KF1IE1Q03F1KF1CFG/S52AXCBR1/Pos/stVal[ST]
E1Q03F1KF1IE1Q03F1KF1CFG/S52AXCBR1/Pos/q[ST]
E1Q03F1KF1IE1Q03F1KF1CFG/T52AXCBR2/Pos/stVal[ST]
E1Q03F1KF1IE1Q03F1KF1CFG/T52AXCBR2/Pos/q[ST]
E1Q03F1KF1IE1Q03F1KF1CFG/U52AXCBR3/Pos/stVal[ST]
E1Q03F1KF1IE1Q03F1KF1CFG/U52AXCBR3/Pos/q[ST]
E1Q03F1KF1IE1Q03F1KF1CFG/W52AXCBR4/Pos/stVal[ST]
E1Q03F1KF1IE1Q03F1KF1CFG/W52AXCBR4/Pos/q[ST]
E1Q03F1KF1IE1Q03F1KF1CFG/X52AXCBR5/Pos/stVal[ST]
E1Q03F1KF1IE1Q03F1KF1CFG/X52AXCBR5/Pos/q[ST]

add add all remove remove all ☐ Quality-REMA

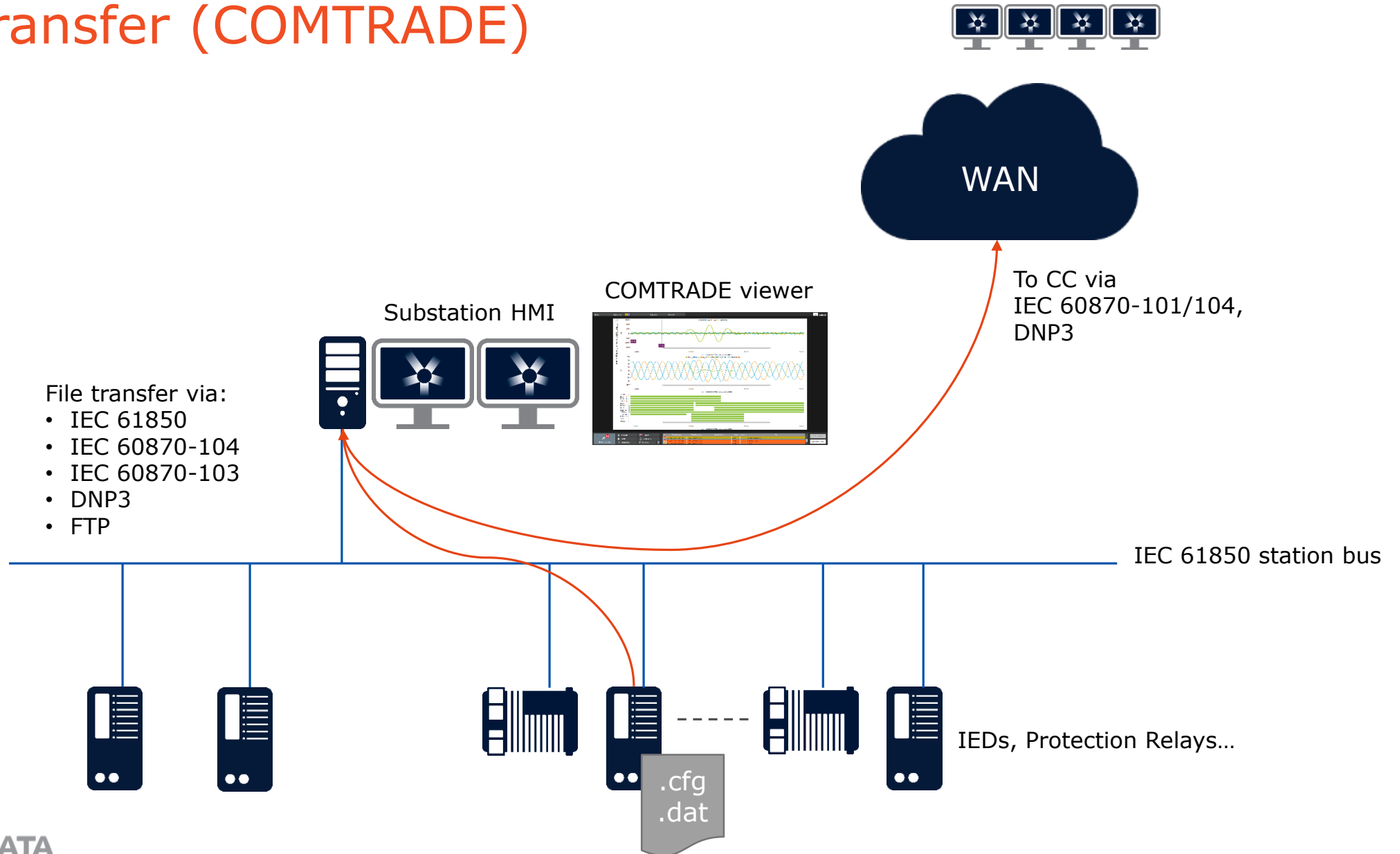
E1Q03F1KF1IE1Q03F1KF1CFG/X52AXCBR5/Pos/stVal[ST]
E1Q03F1KF1IE1Q03F1KF1CFG/U52AXCBR3/Pos/stVal[ST]

Using as Host0 =Host0
Using as Host1 =Host1
Found connection E1Q03F1KF1
Loaded File C:\Users\juergenr\Documents\FH Salzburg\Lehre\Labor SS2015\Labor 1\SEL487E.icd
Found 1Connections
Found 12 Reports
Found Driver IEC 61850 Treiber
Found Driver IEC 61850 driver
Found Driver Siemens_IEC61850
Found Driver NR_IEC61850
Found Driver Alstom_IEC61850

Communication protocols within a station



File Transfer (COMTRADE)



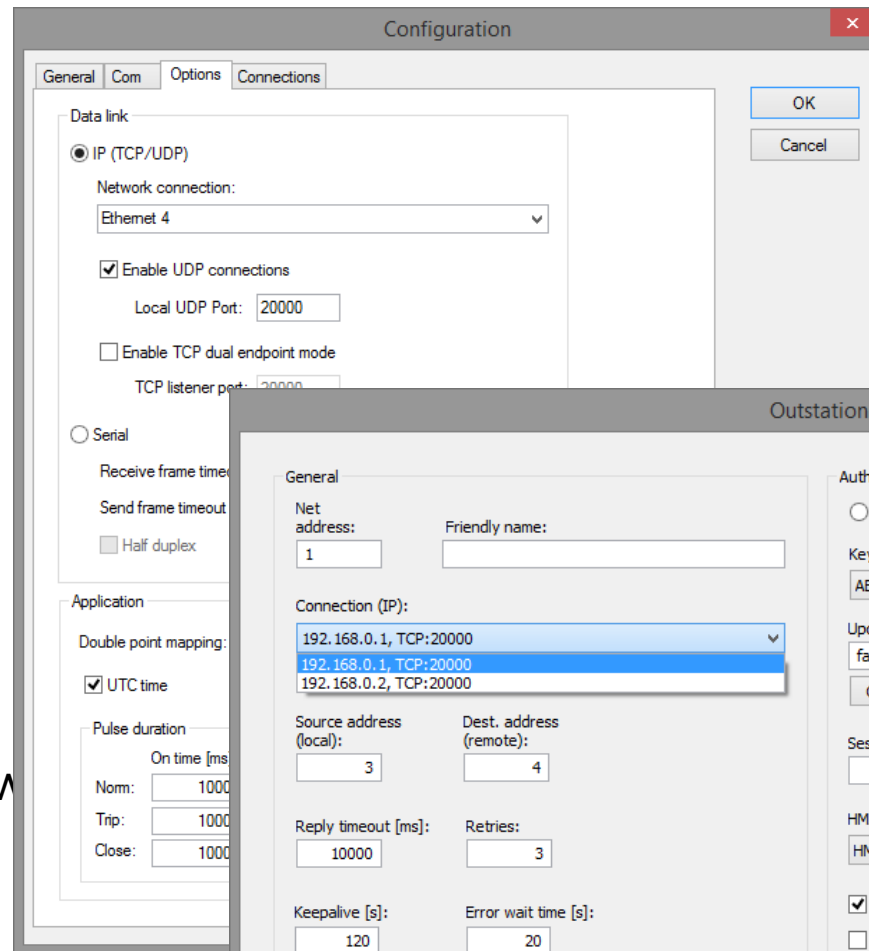


Feature List – IEC 60870

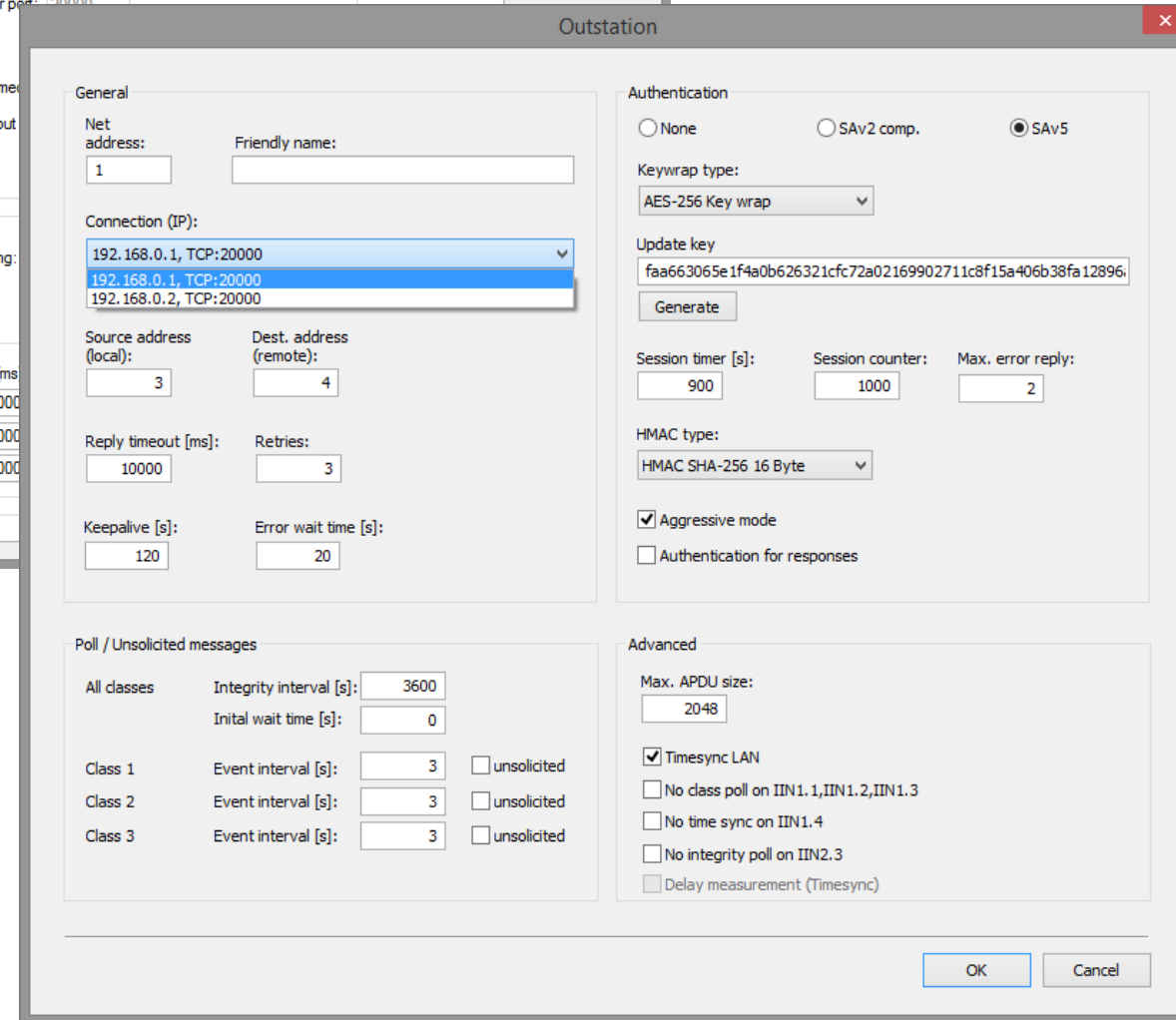
- ▶ 60870-5-101, 60870-5-103 and 60870-5-104
- ▶ Driver acts as communication Master
- ▶ NUC redundancy
- ▶ RTU time stamping is supported
- ▶ “Direct execute” and “select and execute”
- ▶ COT (Cause of transmission handling)
- ▶ Supports OSI communication logging
- ▶ Online browsing for process variables
- ▶ File transfer (monitoring and control direction)
- ▶ Slave through zenon Process Gateway

DNP3 – Key Features

- ▶ Master through driver
- ▶ Serial or TCP/IP communication
- ▶ Cyclical class poll
- ▶ Supports unsolicited mode
- ▶ Supports Real Time Stamping
- ▶ Slave through zenon Process Gateway
- ▶ Security Version 2



Configuration dialog box, General tab. The 'Data link' section has 'IP (TCP/UDP)' selected. 'Network connection' is set to 'Ethernet 4'. 'Enable UDP connections' is checked, with 'Local UDP Port' set to 20000. 'Enable TCP dual endpoint mode' is unchecked, with 'TCP listener port' set to 20000. The 'Serial' section is collapsed. The 'Application' section has 'Double point mapping' unchecked and 'UTC time' checked. 'Pulse duration' is set to 1000 ms for 'On time', 'Norm.', 'Trip', and 'Close'.

Outstation dialog box, General and Authentication tabs. The 'General' tab shows 'Net address' as 1 and 'Friendly name' as empty. 'Connection (IP)' is set to '192.168.0.1, TCP:20000'. 'Source address (local)' is 3 and 'Dest. address (remote)' is 4. 'Reply timeout [ms]' is 10000 and 'Retries' is 3. 'Keepalive [s]' is 120 and 'Error wait time [s]' is 20. The 'Authentication' tab shows 'None', 'SAv2 comp.', and 'SAv5' radio buttons, with 'SAv5' selected. 'Keywrap type' is 'AES-256 Key wrap'. 'Update key' is set to 'faa663065e1f4a0b626321cfc72a02169902711c8f15a406b38fa12896'. 'Generate' button is visible. 'Session timer [s]' is 900, 'Session counter' is 1000, and 'Max. error reply' is 2. 'HMAC type' is 'HMAC SHA-256 16 Byte'. 'Aggressive mode' is checked, and 'Authentication for responses' is unchecked. The 'Poll / Unsolicited messages' section shows 'All classes' with 'Integrity interval [s]' as 3600 and 'Initial wait time [s]' as 0. 'Class 1', 'Class 2', and 'Class 3' all have 'Event interval [s]' as 3 and 'unsolicited' mode unchecked. The 'Advanced' section shows 'Max. APDU size' as 2048, 'Timesync LAN' checked, and 'No class poll on IIN1.1, IIN1.2, IIN1.3', 'No time sync on IIN1.4', 'No integrity poll on IIN2.3', and 'Delay measurement (Timesync)' all unchecked.

IEC 60870-5-101/104
Slave
(Process Gateway)

IEC 60870-101/104 Slave Process Gateway

- ▶ Balanced Mode
- ▶ Import/Export CSV
- ▶ Remote restart
- ▶ Robust against invalid requests

Settings

Settings

Configuration file
IEC870SLAVE.XML Import... Export...

☒ 870-104 ☐ 870-101 unbalanced ☐ 870-101 balanced

IP Port
2404

Link Address Size (870-101)
1

COM Port
COM 1

Baud Rate
9600

☐ Deactivate standard DPI/DCS mapping and use internal mapping (not recommended).

Device	Name
12.12.12.12	TEest

Add Delete

Device Sector SOE 104 settings

IP-Address of Master (807-104)
12 . 12 . 12 . 12

Link Address of Slave (870-101)
202116108

Name / Description
TEest

Short Pulse Long Pulse
1000 ms 2000 ms

Max. APDU size
253

☒ Commands allowed

Directory for File Transfer

Directory for File Transfer in Control Direction

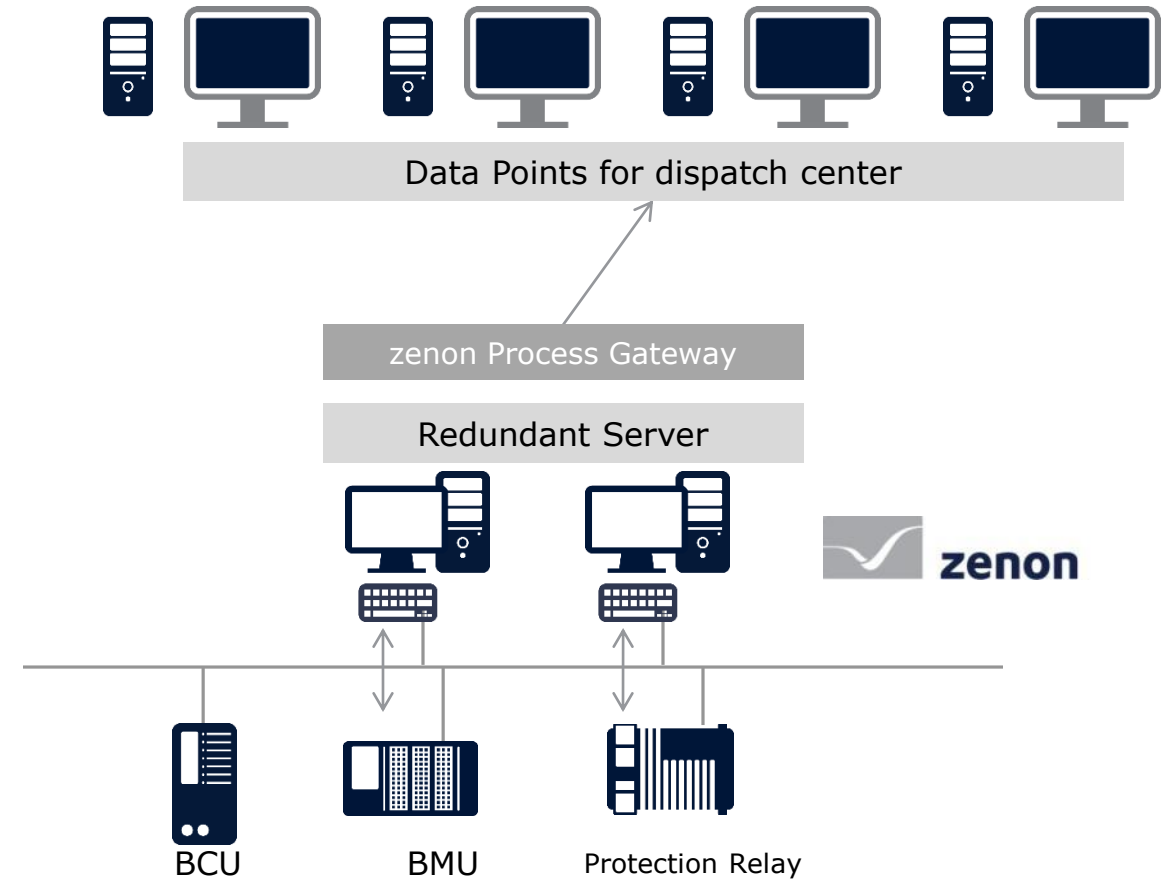
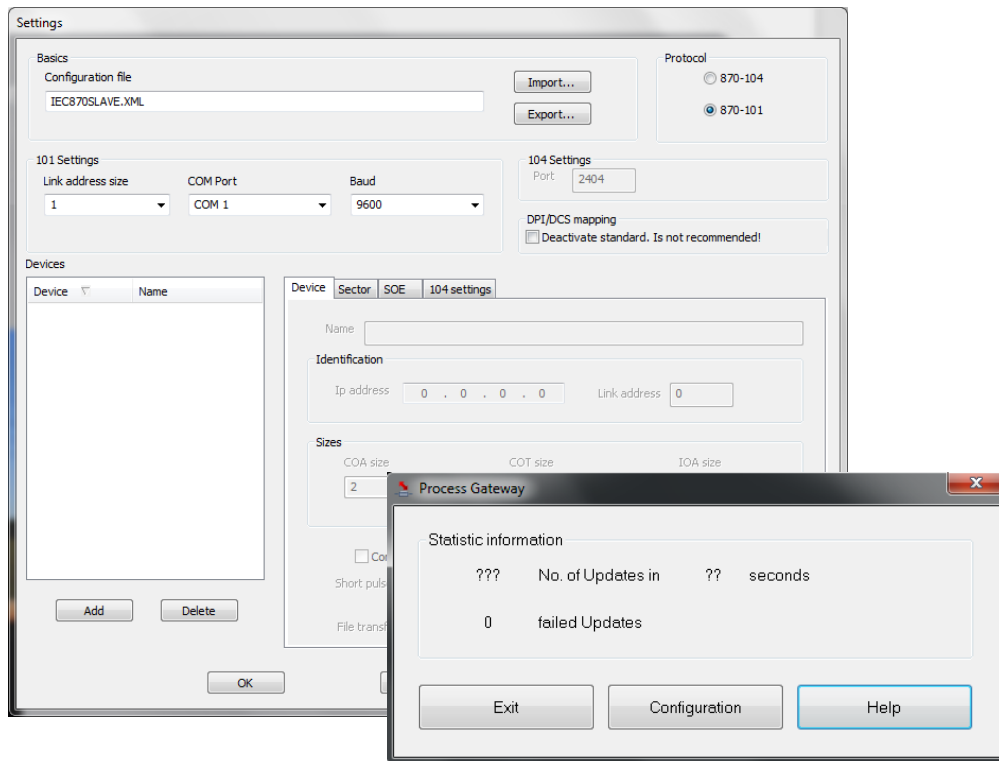
870-101 specific

COA Size COT Size IOA Size Test Timeout
2 2 3 20 s

OK Cancel Help

zenon Process Gateway

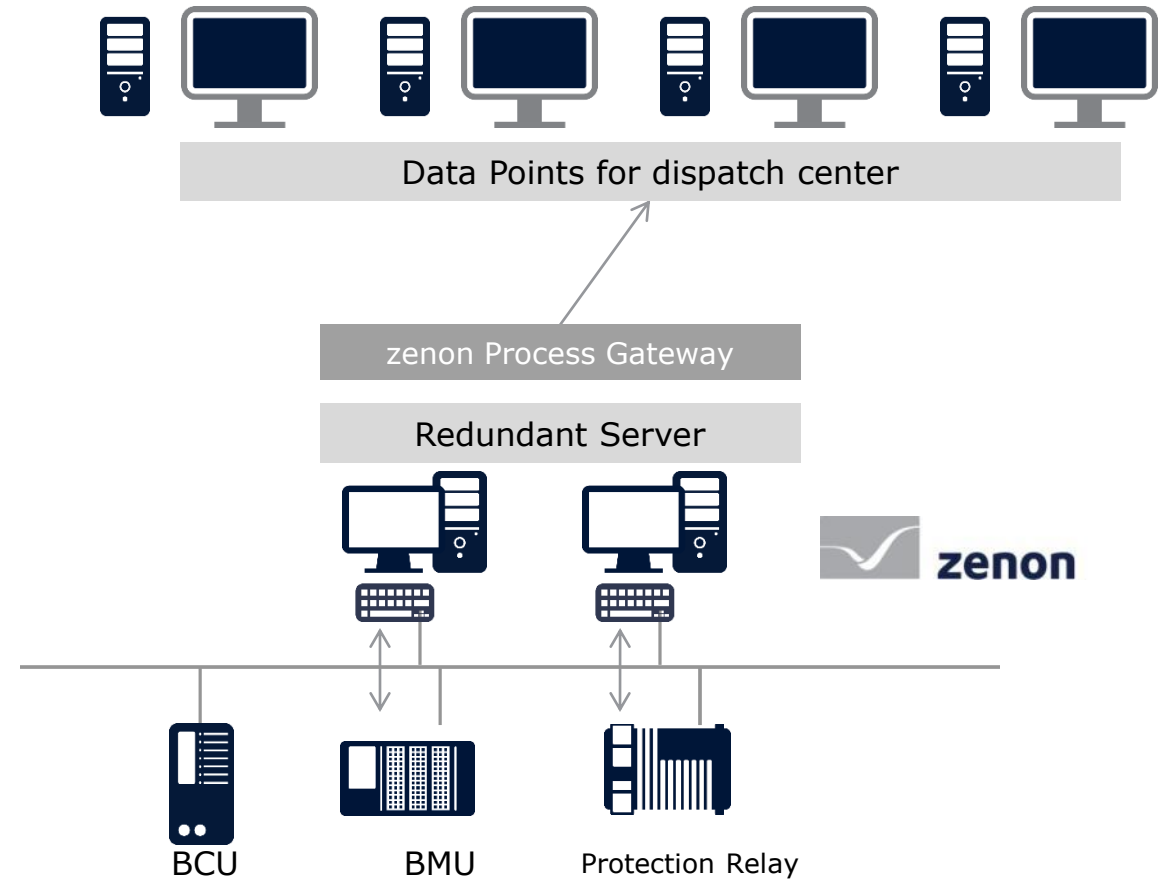
The slave/server side of zenon



zenon Process Gateway

The slave/server side of zenon

- ▶ IEC 60870-5-101 /-104 Slave/Server
- ▶ DNP3 Slave/Server
- ▶ Modbus Slave/Server
- ▶ OPC UA Server
- ▶ OPC DA Server
- ▶ SNMP Agent
- ▶ SQL Server



IEC 61850 Wizards

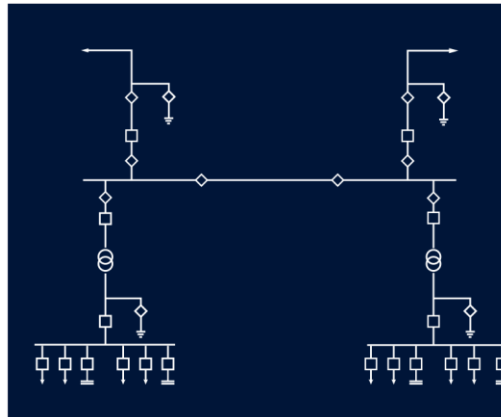
Automated Screen Design

SCL Tool (e.g. Helinks)

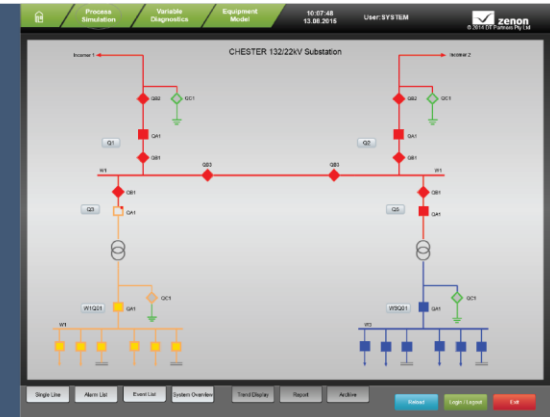
IEC 61850 SCL (*.SCD, *.SSD)

HMI Editor (e.g. zenon)

Single Line Diagram



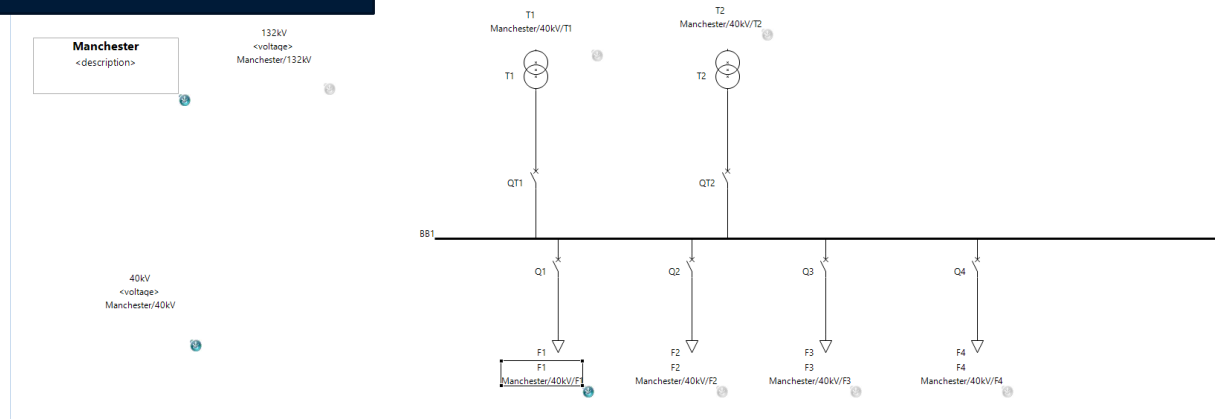
```
1 <!-- SCL -->
2 <!-- IEC 61850 SCL -->
3 <!-- SCL File -->
4 <!-- SCL File -->
5 <!-- SCL File -->
6 <!-- SCL File -->
7 <!-- SCL File -->
8 <!-- SCL File -->
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99 <!-- SCL File -->
100 <!-- SCL File -->
```



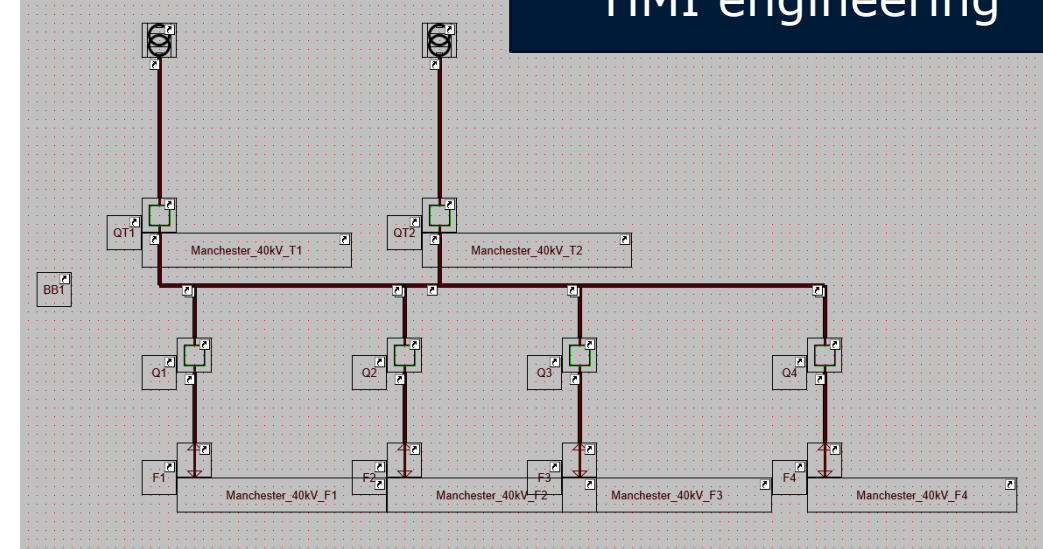
First Steps

Substation HMI just by the use of SSD file

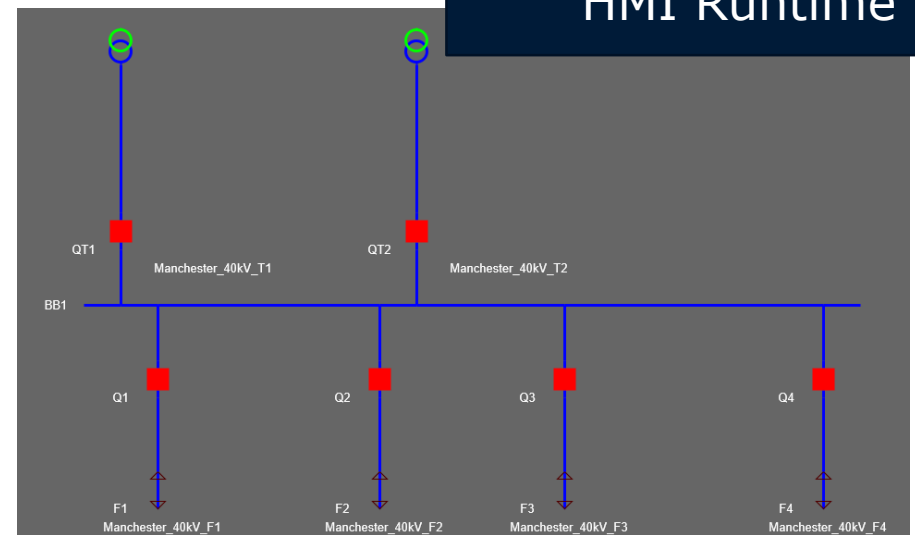
IEC 61850 SCT



HMI engineering



HMI Runtime



SSD... System Specification Description (IEC 61850 SCL)

Result – SCT

Default Application
9999

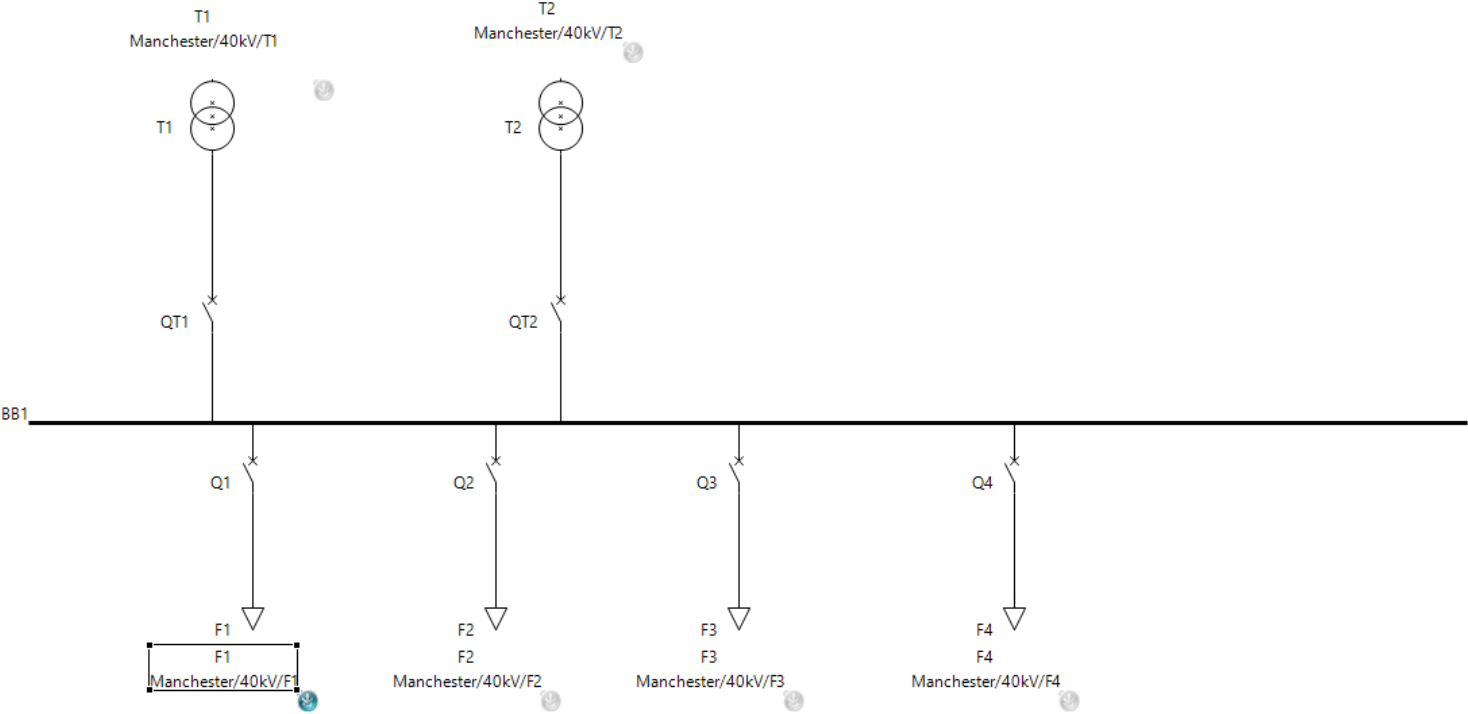
Reports
-001

Control
-002

Manchester
<description>

132kV
<voltage>
Manchester/132kV

40kV
<voltage>
Manchester/40kV



COPADATA

Result – HMI Wizard

IEC 61850 SSD Import

Configuration

Import

File: HelinksNEPA7.ssd ...

Symbols needed in active project symbol library

✓ CBR
✓ CTR
✓ DESC
✓ DIS
✓ DIS_grounded
✓ REA

Symbols
local

Import Symbols

Scale and layout

Global scaling factor
40

CBR x y
1 1

CTR x y
1 1

DIS x y
1 1

DISG x y
1 1

REA x y
1 1

IFL x y
1 1

PTR x y
1 1

VTR x y
1 1

CAP x y
1 1

Import to screen

Drag a column here to group by this column.

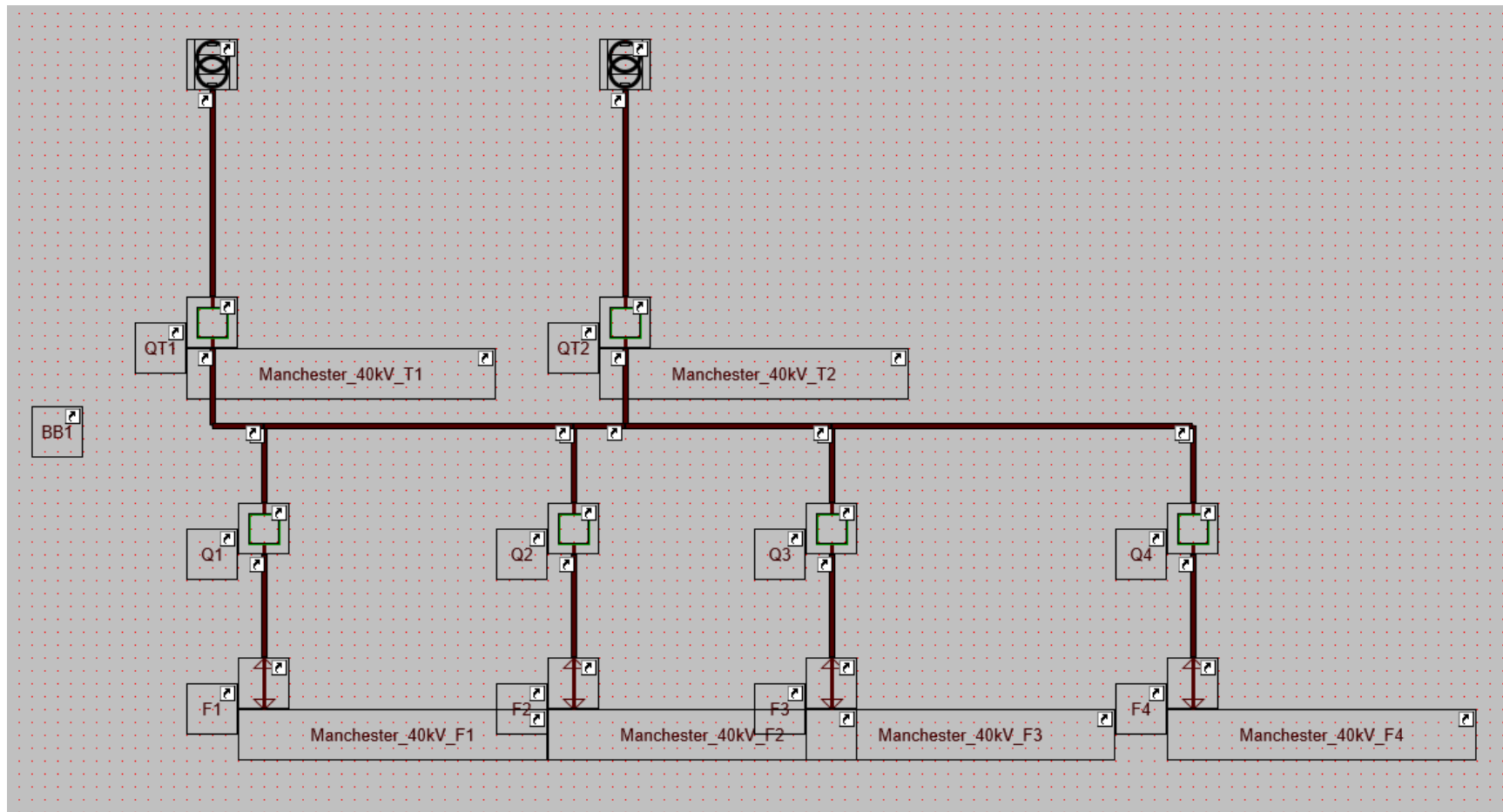
	Name	Type	Frame	Size
	Contains: ▾	Contains: ▾	Contains: ▾	Contains: ▾
	Bild 0	tpEnergy	Frame 0	1920 x 1080
▶	Screen 0	tpStandard	Frame 0	1920 x 1080

Layout

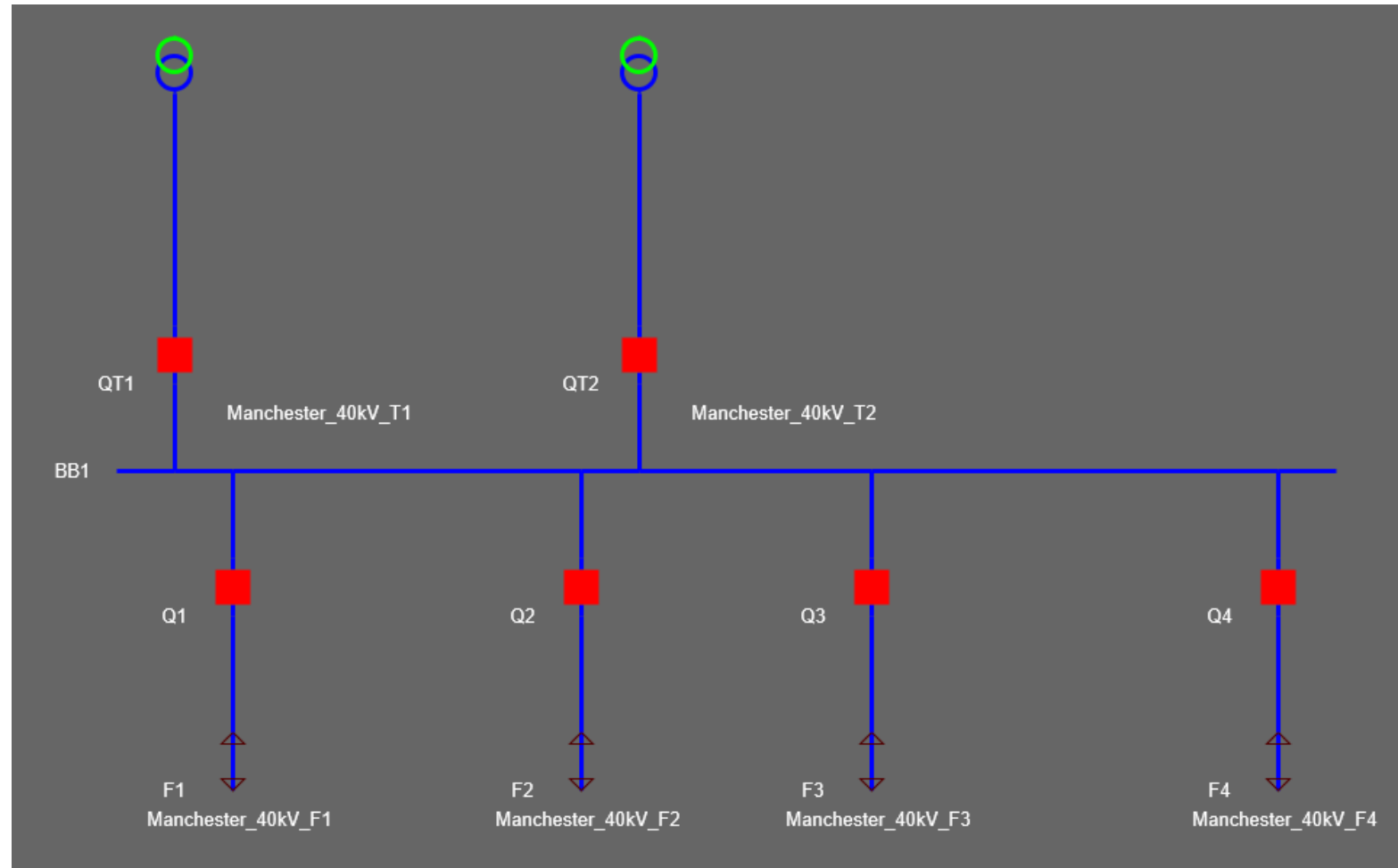
Bay name position ☒ Top ☐ Bottom

Cancel Import

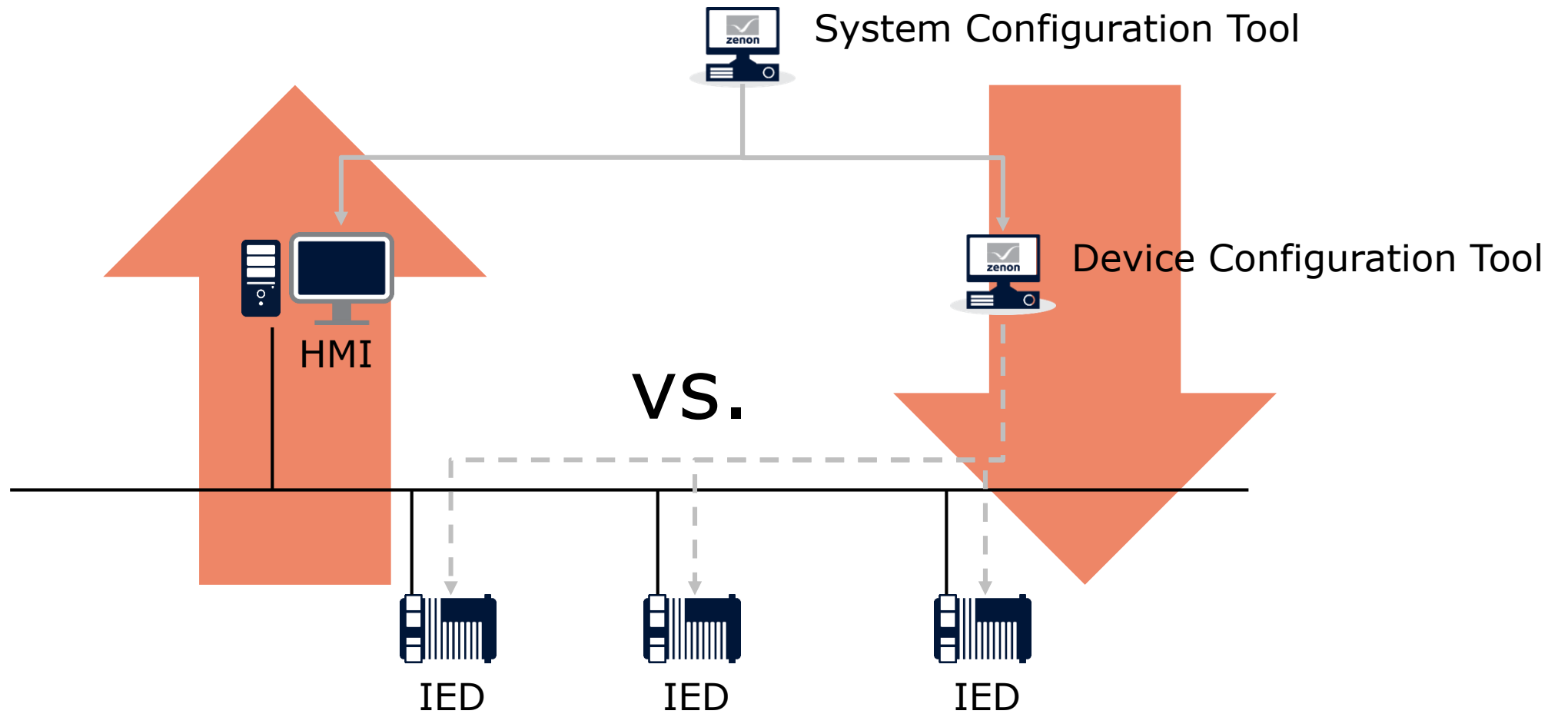
Result – HMI Editor Screen



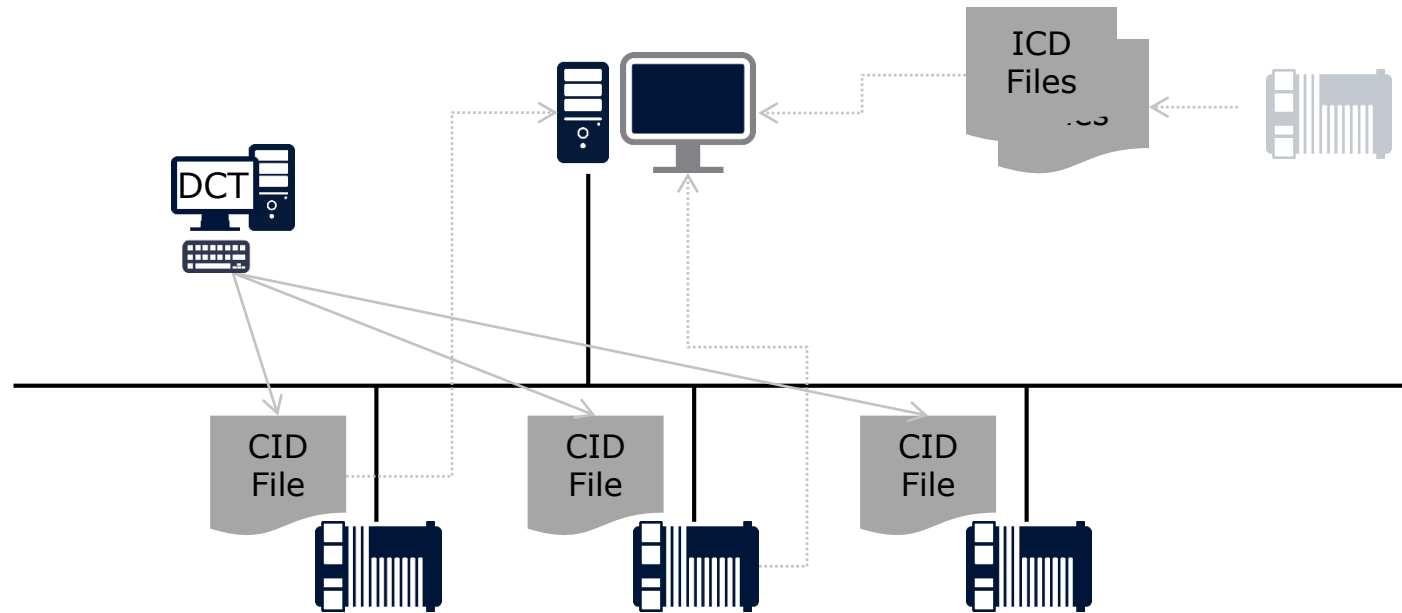
Result – HMI Runtime Screen

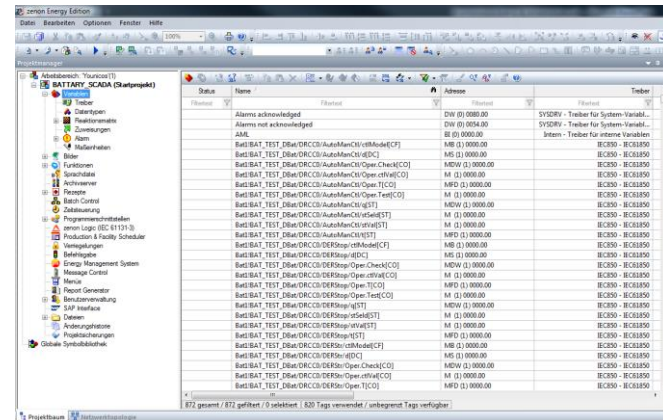
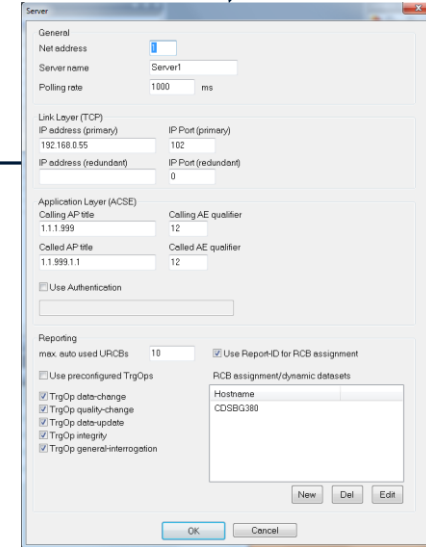
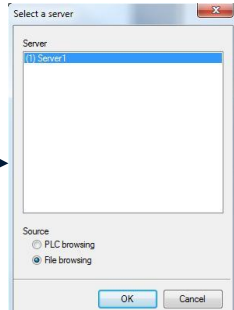
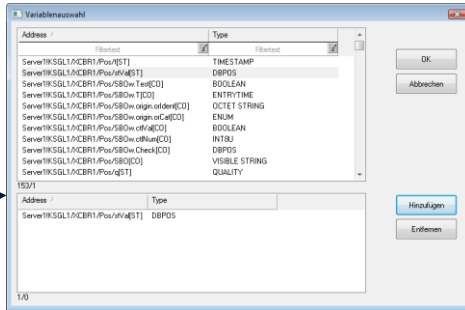
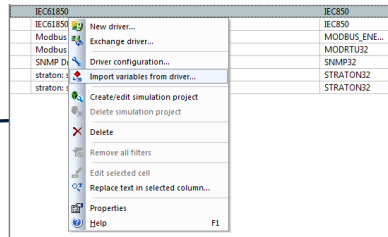
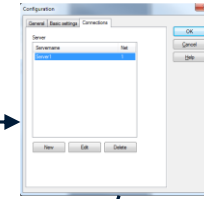
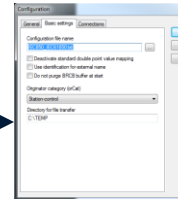
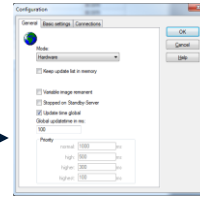
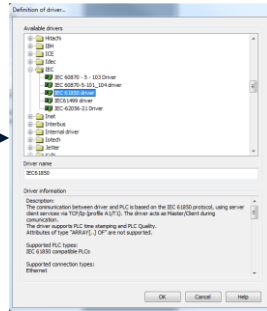
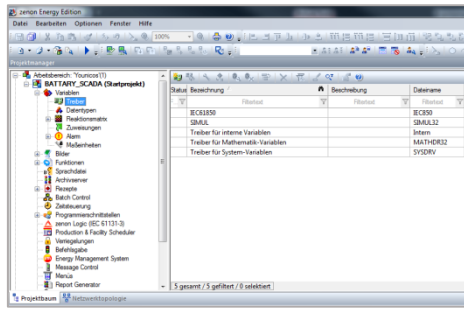


Top-down versus Bottom-up



System Configuration Bottom-Up



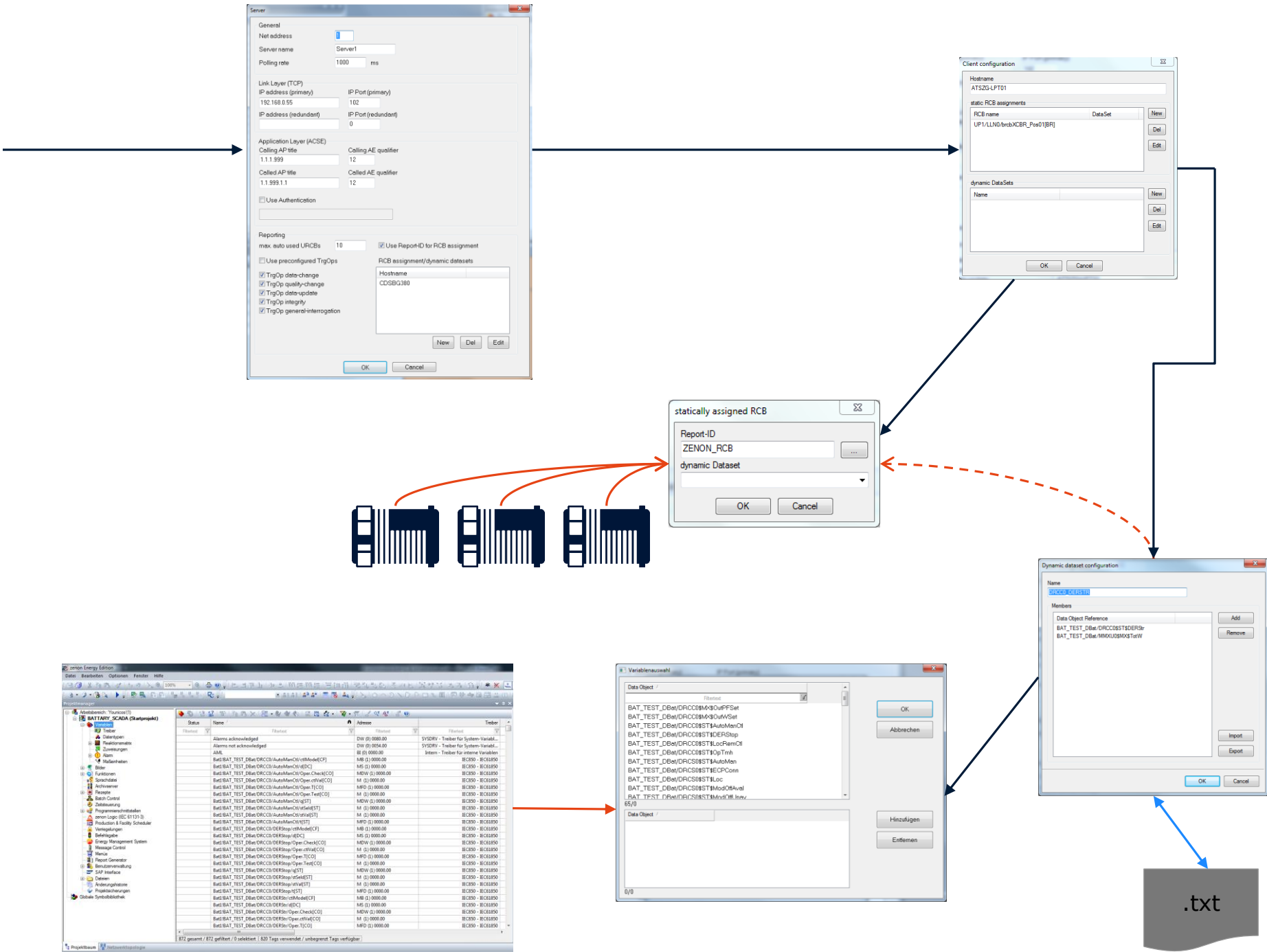


CID

ICD

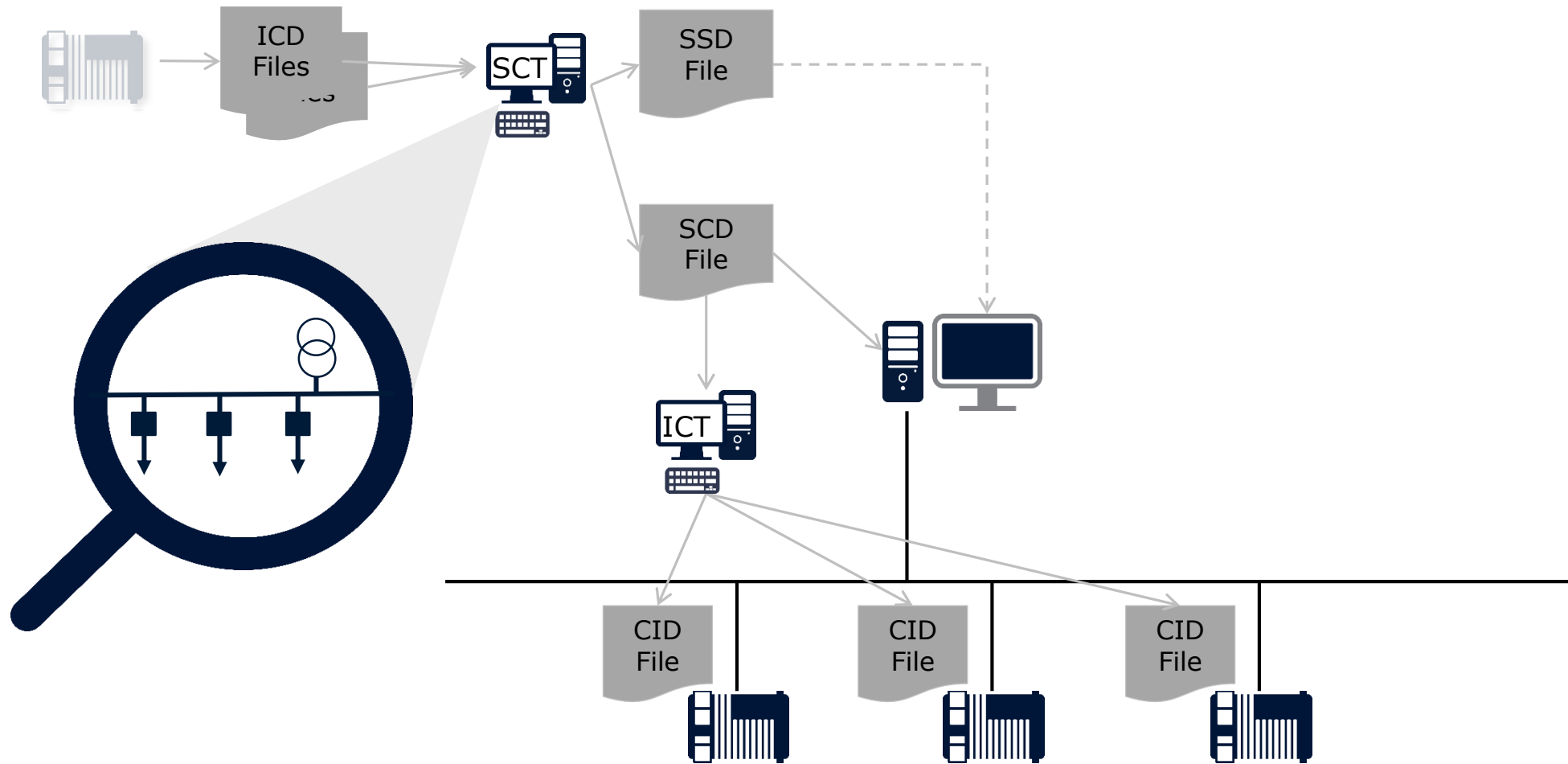
SCD





.txt

System Configuration Top-Down



IEC850 client
configuration
Wizard

Tree of
imported
SCD file

Variable import
for selected
Reports/Dataset

Driver(s),
Connection(s),
Report(s)
configuration for
zenon project

IEC850 driver configuration

File selection

C:\Users\juergenr\Documents\FH Salzburg\Lehre\Labor SS2015\Labor 1\SEL487E.icd

...

Apply

Configuration

New Driver

Import Quality

Create Supervision

New Connection

Import Variables...

IEDs

>

>>

Connections

1_10.0.0.70_E1Q03F1KF1

E1Q03F1KF1CFG/LLN0/BRep01[BR]_DSet01

E1Q03F1KF1CFG/LLN0/BRep02[BR]_DSet02

E1Q03F1KF1CFG/LLN0/BRep03[BR]_DSet03

E1Q03F1KF1CFG/LLN0/BRep04[BR]_DSet04

E1Q03F1KF1CFG/LLN0/BRep05[BR]_DSet05

E1Q03F1KF1CFG/LLN0/BRep06[BR]_DSet06

E1Q03F1KF1CFG/LLN0/URep01[RP]_DSet07

E1Q03F1KF1CFG/LLN0/URep02[RP]_DSet08

E1Q03F1KF1CFG/LLN0/URep03[RP]_DSet09

E1Q03F1KF1CFG/LLN0/URep04[RP]_DSet10

E1Q03F1KF1CFG/LLN0/URep05[RP]_DSet11

E1Q03F1KF1CFG/LLN0/URep06[RP]_DSet12

IEC 61850 Treiber

1_192.168.0.55_Server1

2_10.0.0.70_E1Q03F1KF1

Reports

Host0

E1Q03F1KF1CFG/LLN0/BRep03[BR]_DSet03

Host1

Variables in Dataset

Functional Constraints (FC)

☐ ST

☐ MX

☐ SR

☐ SV

☐ CF

☐ SP

Quality Variables

☐ QualityVariable

Create

Cancel

Variable Search:

E1Q03F1KF1IE1Q03F1KF1CFG/S52AXCBR1/Pos/stVal[ST]

E1Q03F1KF1IE1Q03F1KF1CFG/S52AXCBR1/Pos/q[ST]

E1Q03F1KF1IE1Q03F1KF1CFG/T52AXCBR2/Pos/stVal[ST]

E1Q03F1KF1IE1Q03F1KF1CFG/T52AXCBR2/Pos/q[ST]

E1Q03F1KF1IE1Q03F1KF1CFG/U52AXCBR3/Pos/stVal[ST]

E1Q03F1KF1IE1Q03F1KF1CFG/U52AXCBR3/Pos/q[ST]

E1Q03F1KF1IE1Q03F1KF1CFG/W52AXCBR4/Pos/stVal[ST]

E1Q03F1KF1IE1Q03F1KF1CFG/W52AXCBR4/Pos/q[ST]

E1Q03F1KF1IE1Q03F1KF1CFG/X52AXCBR5/Pos/stVal[ST]

E1Q03F1KF1IE1Q03F1KF1CFG/X52AXCBR5/Pos/q[ST]

add

add all

remove

remove all

☐ Quality-REMA

E1Q03F1KF1IE1Q03F1KF1CFG/X52AXCBR5/Pos/stVal[ST]

E1Q03F1KF1IE1Q03F1KF1CFG/U52AXCBR3/Pos/stVal[ST]

Using as Host0 =Host0

Using as Host1 =Host1

Found connection E1Q03F1KF1

Loaded File C:\Users\juergenr\Documents\FH Salzburg\Lehre\Labor SS2015\Labor 1\SEL487E.icd

Found 1Connections

Found 12 Reports

Found Driver IEC 61850 Treiber

Found Driver IEC 61850 driver

Found Driver Siemens_IEC61850

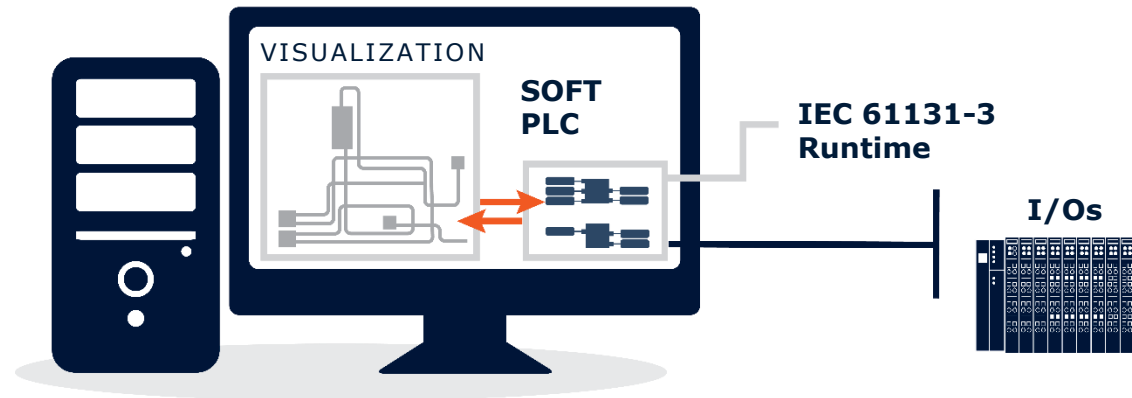
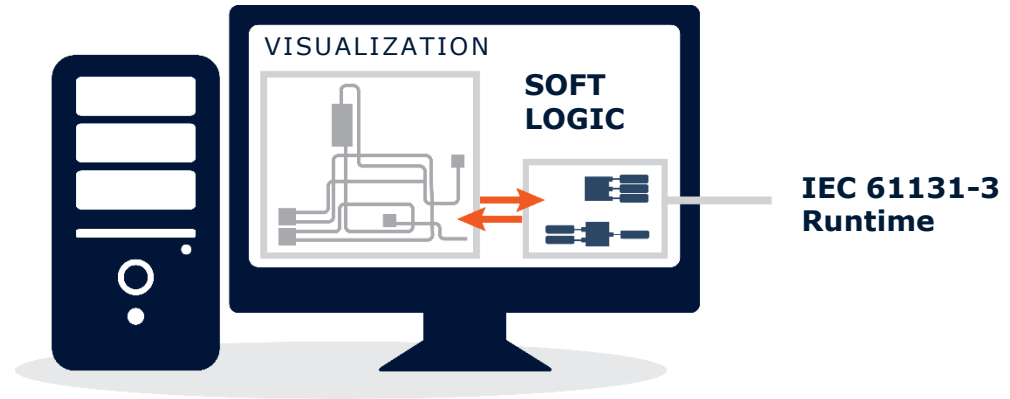
Found Driver NR_IEC61850

Found Driver Alstom_IEC61850

zenon Logic

Built-in Soft Logic

- ▶ Central database thanks to universal integration
- ▶ No more repeat data maintenance
- ▶ Offline simulation



Variable Object

Tag-based Information: Status Flags



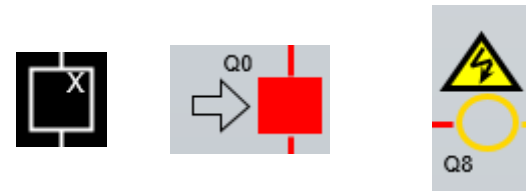
► Represent – by Combi Element

► React – by Reaction Matrix

► Set – by Command Input

► Examples:

- Off normal (N_NORM)
- Selected (NET_SEL, SE_870)
- Revision (REVISION)
- Blocked (OFF)
- Locked (M1)

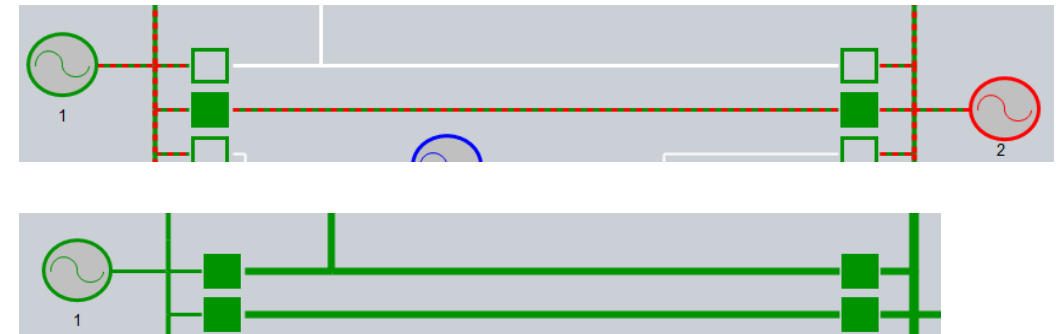
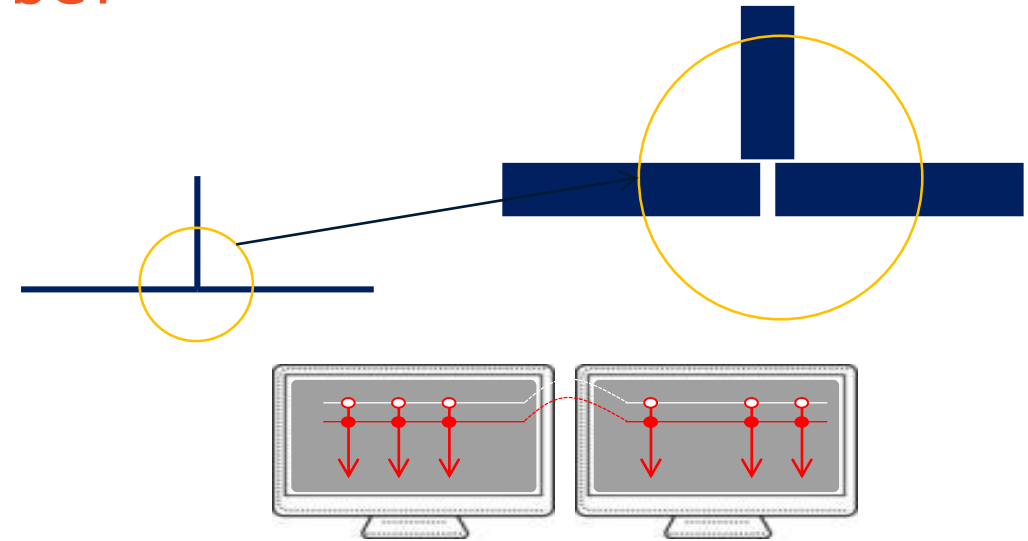


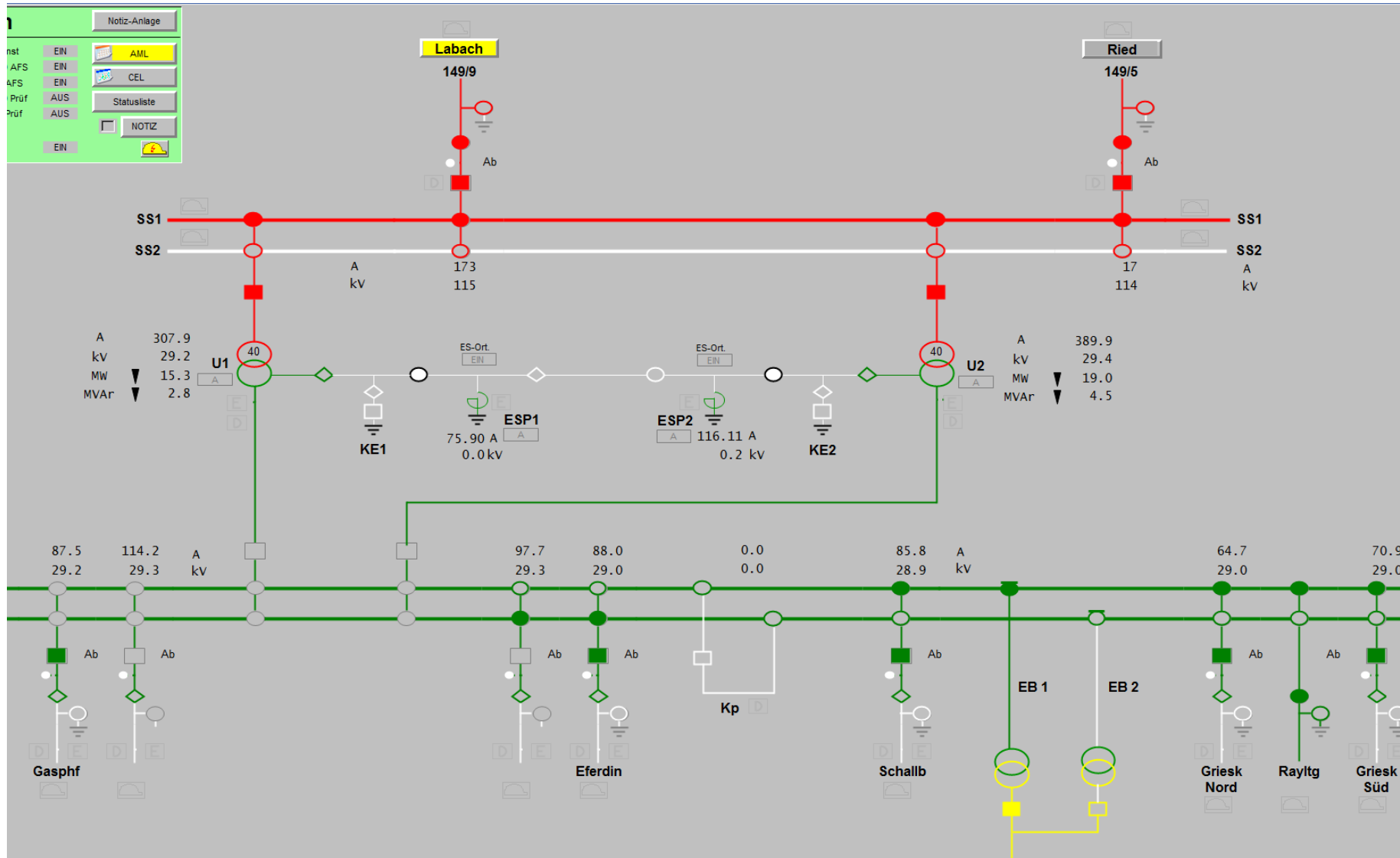
SM_DIR000_SWI000_Q	REVISION,SPONT,T_STD	0.00
SM_DIR000_SWI000_S	REVISION,T_STD	0.00

Automatic Line Coloring

Topological Coloring – how easy can it be?

- ▶ Totally graphic engineering
- ▶ Screen-/Monitor-spanning
- ▶ Secure feed and Multiple feed representation
- ▶ Topology Check based on this model
- ▶ Accessible via zenon API
- ▶ Reference (Alias)





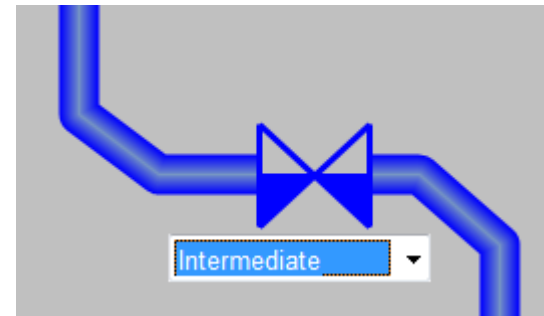
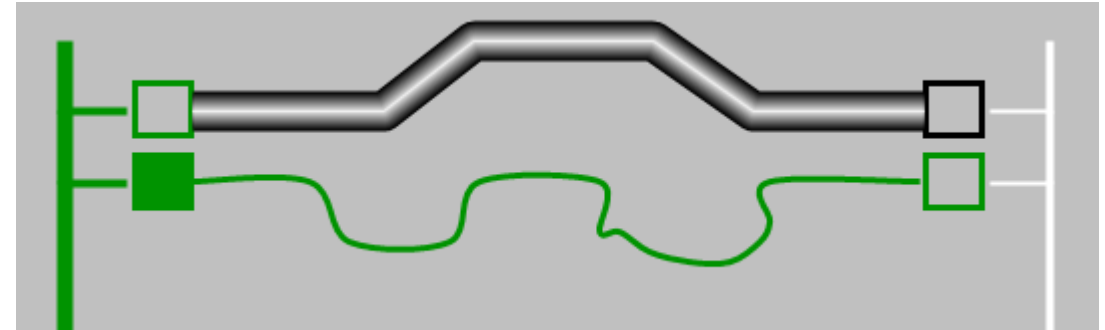
Topological Function Types

- ▶ Line (poly line, tube)
- ▶ Switch
- ▶ Valve
- ▶ Source
- ▶ Link
- ▶ Terminator
- ▶ Transformer

Standard EE

- ▶ Disconnecter
- ▶ Generator
- ▶ Drain

Topology Package



Screen Alarming

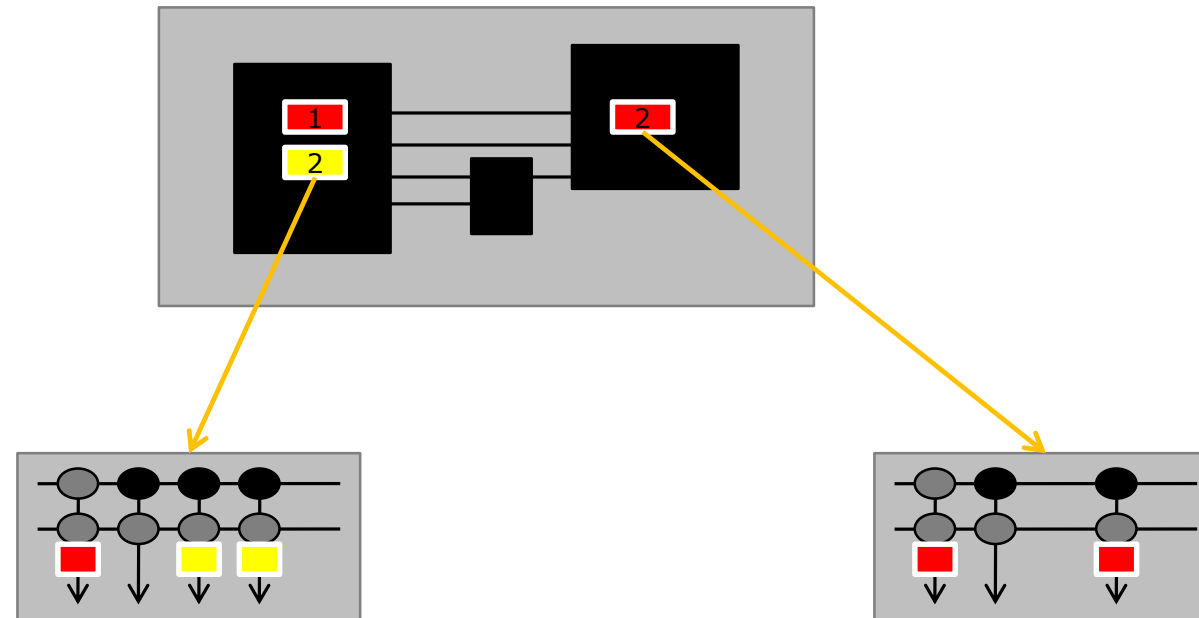
Guide the Operator

Aggregated alarms

- ▶ Localized categorization of alarms
- ▶ Analyzing status information for alarms
- ▶ Based on alarm classes
- ▶ Utilization on all dynamic elements
- ▶ Status for active and unacknowledged alarms



Optical guidance – Screen Alarming



Reporting

Reports

Document, analyze and present process values

- ▶ Use all data available
 - Online
 - Historian
- ▶ Do calculations
- ▶ Filter data
- ▶ Print out

Report

Testdata GE1

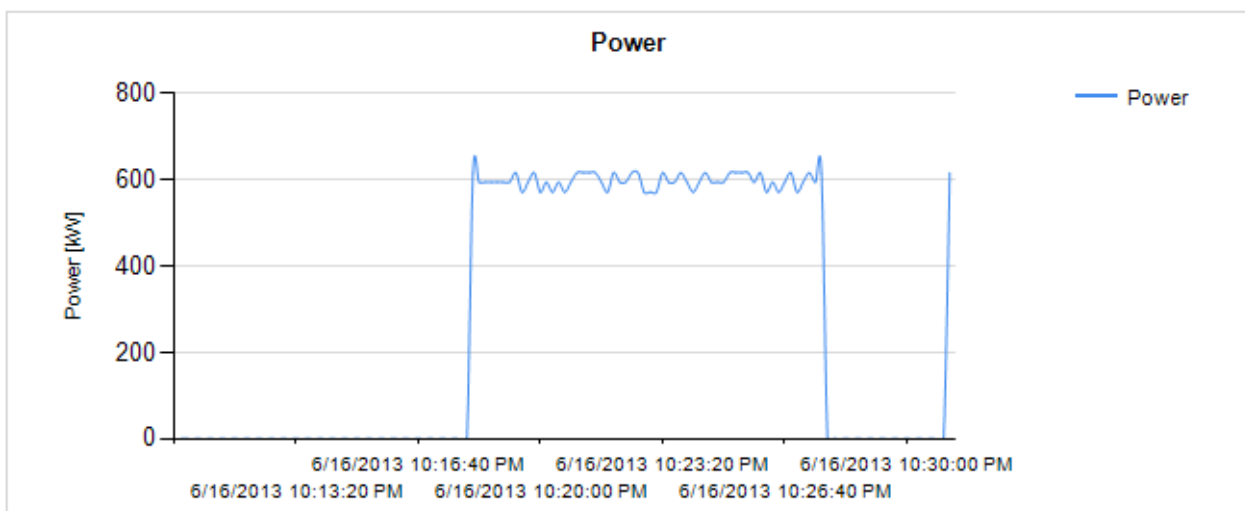
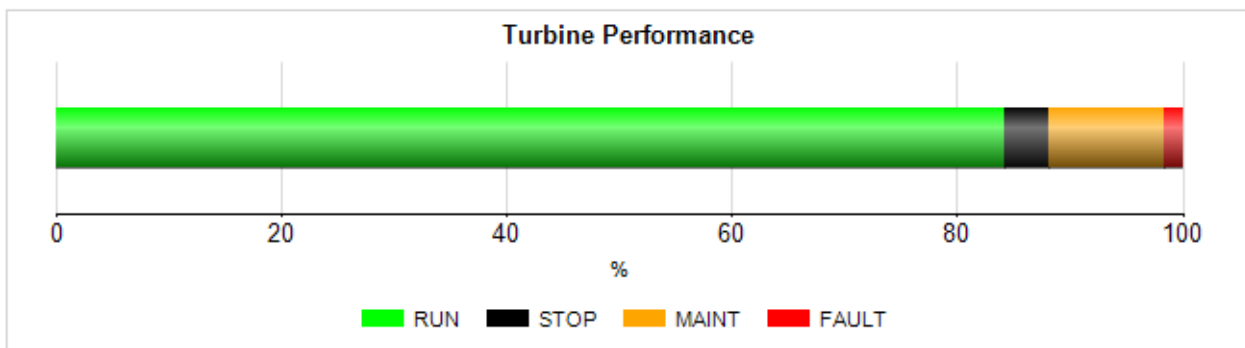
Time	kV	Status (kV)	MW	Status (MW)	[A]	Status [A]
24.10.2008 11:25:03		0-BIT		0-BIT		0-BIT
24.10.2008 11:26:27	110.041796875	SPONT	52.787488000000003	SPONT	545.1181640825	SPONT
24.10.2008 11:26:30	109.83499999999999	SPONT	52.523099999999999	SPONT	543.40911865234375	SPONT
24.10.2008 11:26:33	110.25079687500001	SPONT	53.014760000000003	SPONT	545.42730712890625	SPONT
24.10.2008 11:26:36	109.67	SPONT	51.973143999999998	SPONT	544.71820098359375	SPONT
24.10.2008 11:26:39	109.915396875	SPONT	53.743479999999998	SPONT	543.28179931640625	SPONT
24.10.2008 11:26:42	109.915296875	SPONT	51.509568000000002	SPONT	544.918212890625	SPONT
24.10.2008 11:26:45	110.338796875	SPONT	52.797552000000003	SPONT	543.7545160615625	SPONT
24.10.2008 11:26:48	110.33220312500001	SPONT	53.041544000000002	SPONT	545.29986779296875	SPONT
24.10.2008 11:26:51	110.23209375	SPONT	52.288347999999999	SPONT	545.227294921875	SPONT
24.10.2008 11:26:54	109.80859375	SPONT	53.783852000000003	SPONT	544.21820098359375	SPONT
24.10.2008 11:26:57	109.568796875	SPONT	52.456293999999997	SPONT	544.036371993125	SPONT
24.10.2008 11:27:00	109.5759	SPONT	51.476928000000001	SPONT	545.76361083984375	SPONT
24.10.2008 11:27:03	109.48640625	SPONT	53.523511999999997	SPONT	543.1181640825	SPONT
24.10.2008 11:27:06	109.617203125	SPONT	52.619764000000004	SPONT	545.49090576171875	SPONT
24.10.2008 11:27:09	110.46529687500001	SPONT	52.301983999999997	SPONT	544.21820098359375	SPONT
24.10.2008 11:27:12	109.89220312499999	SPONT	53.747472000000002	SPONT	543.43634033203125	SPONT
24.10.2008 11:27:15	109.98240625	SPONT	53.848284	SPONT	544.00909423828125	SPONT
24.10.2008 11:27:18	110.228796875	SPONT	54.027543999999998	SPONT	544.60043662109375	SPONT
24.10.2008 11:27:21	109.81959375	SPONT	52.771391999999999	SPONT	545.0545054296875	SPONT
24.10.2008 11:27:24	110.2145	SPONT	54.041271999999999	SPONT	544.80908203125	SPONT
24.10.2008 11:27:27	110.448796875	SPONT	54.375748000000002	SPONT	547.0181884765625	SPONT
24.10.2008 11:27:30	109.63590625000001	SPONT	53.777307999999998	SPONT	545.00908423828125	SPONT
24.10.2008 11:27:33	110.470796875	SPONT	52.204984000000003	SPONT	543.18182373046875	SPONT
24.10.2008 11:27:36	109.62529687499999	SPONT	53.943952000000002	SPONT	546.727294921875	SPONT
24.10.2008 11:27:39	110.31440625	SPONT	51.716360000000002	SPONT	545.136353536625	SPONT
24.10.2008 11:27:42	109.77559375	SPONT	53.340735999999997	SPONT	545.963622046875	SPONT
24.10.2008 11:27:45	110.53780625000001	SPONT	53.185532000000002	SPONT	545.76361083984375	SPONT
24.10.2008 11:27:48	110.17159375	SPONT	53.636200000000001	SPONT	547.0181884765625	SPONT
24.10.2008 11:27:51	109.824	SPONT	53.945943999999997	SPONT	545.78179931640625	SPONT
24.10.2008 11:27:54	110.10340625000001	SPONT	52.931547999999999	SPONT	545.29986779296875	SPONT
24.10.2008 11:27:57	110.384203125	SPONT	51.779595999999999	SPONT	545.60043662109375	SPONT
24.10.2008 11:28:00	110.26509375000001	SPONT	51.883595999999999	SPONT	545.81817020983125	SPONT
24.10.2008 11:28:03	109.9175	SPONT	52.771827999999999	SPONT	545.67209287109375	SPONT
24.10.2008 11:28:06	109.989	SPONT	51.990352000000001	SPONT	543.31817020983125	SPONT
24.10.2008 11:28:09	110.421296875	SPONT	52.876004	SPONT	544.10003662109375	SPONT

Reports (2)

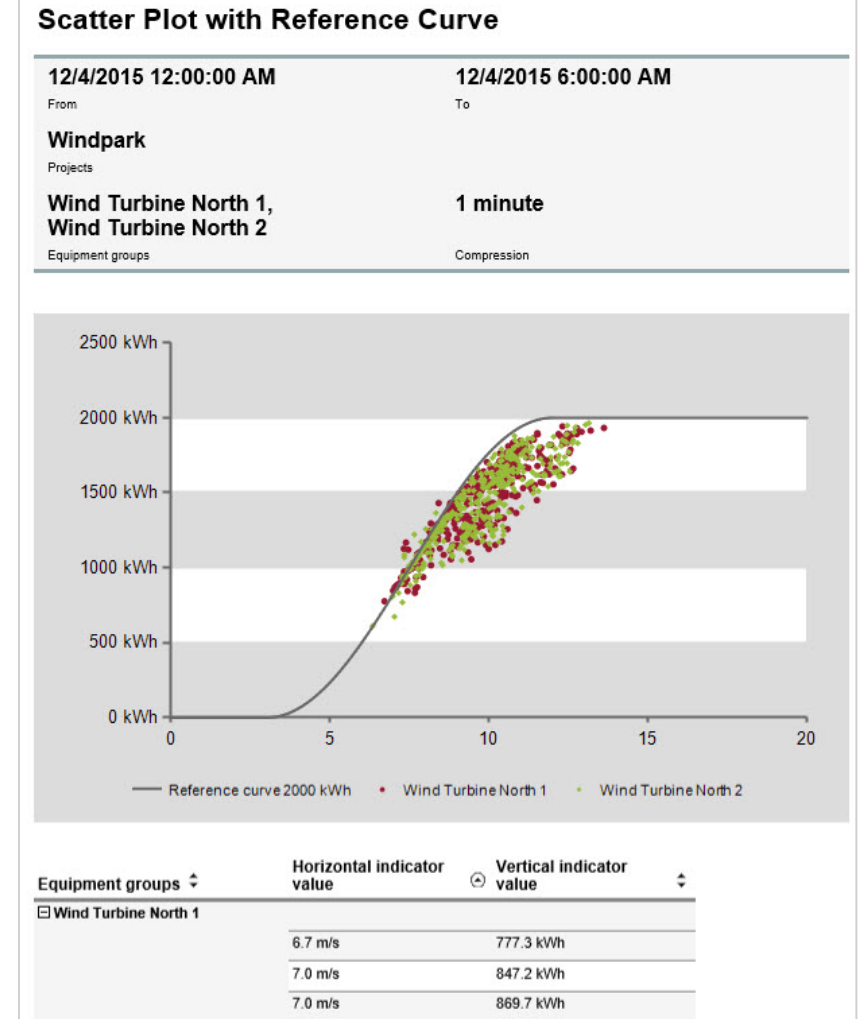
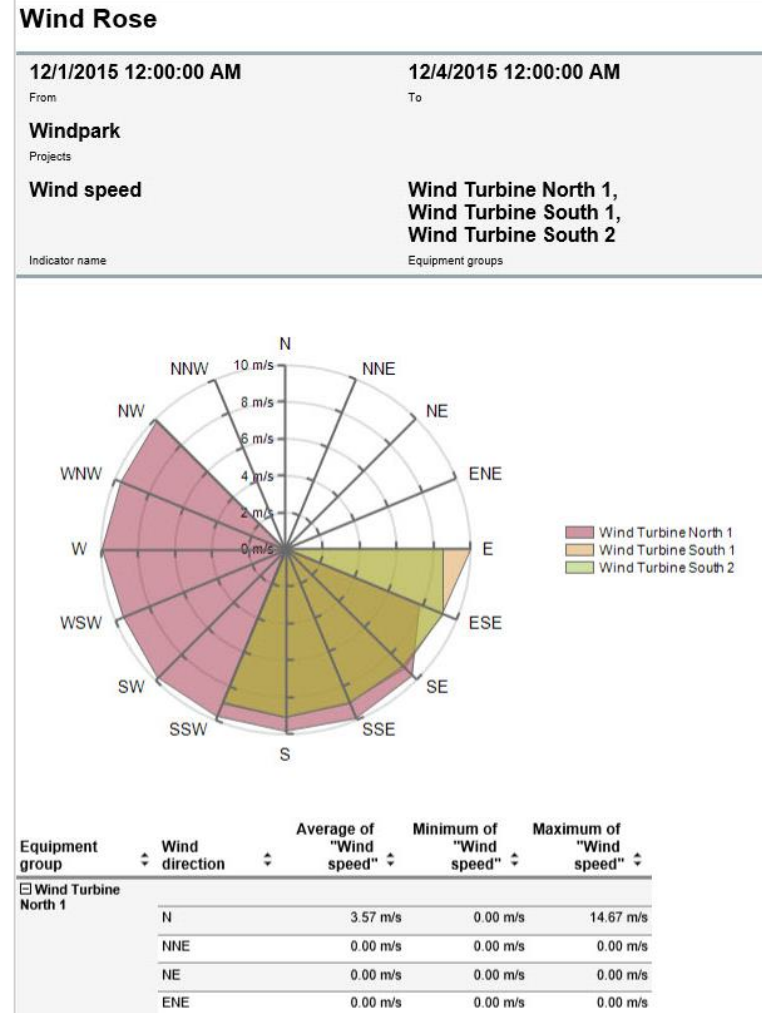
Wind Turbine Performance Report



Turbine Number:	Turbine 10	Period Start:	6/16/2013 10:10:10 PM
Nominal Power [kW]:	1600	Period End:	6/16/2013 10:31:10 PM
Energy [kWh]:	98.092		



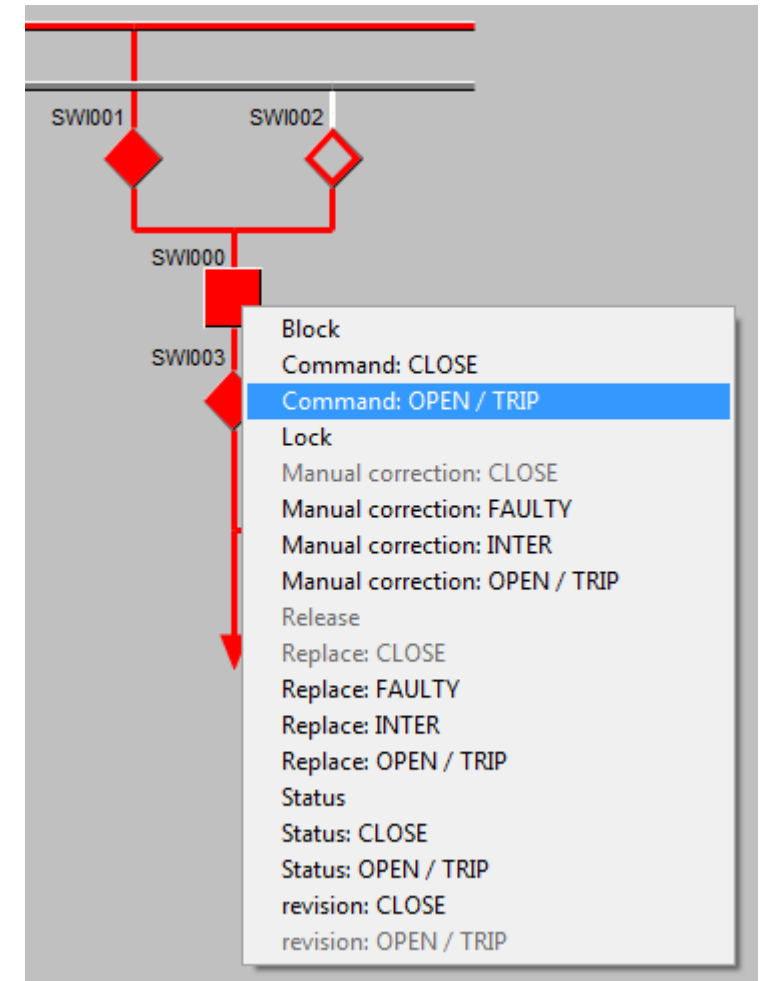
... just a few Examples

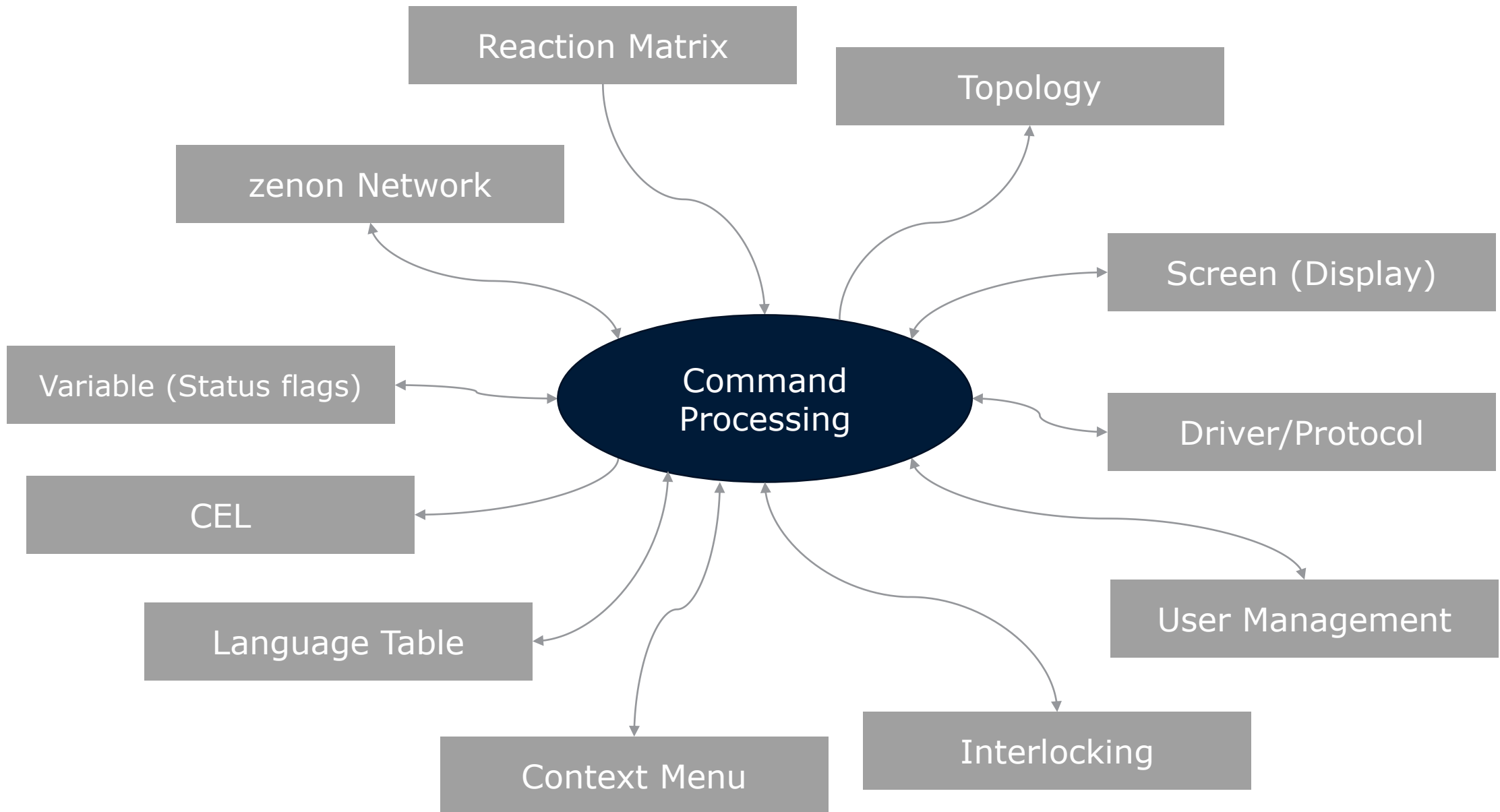


Command Processing

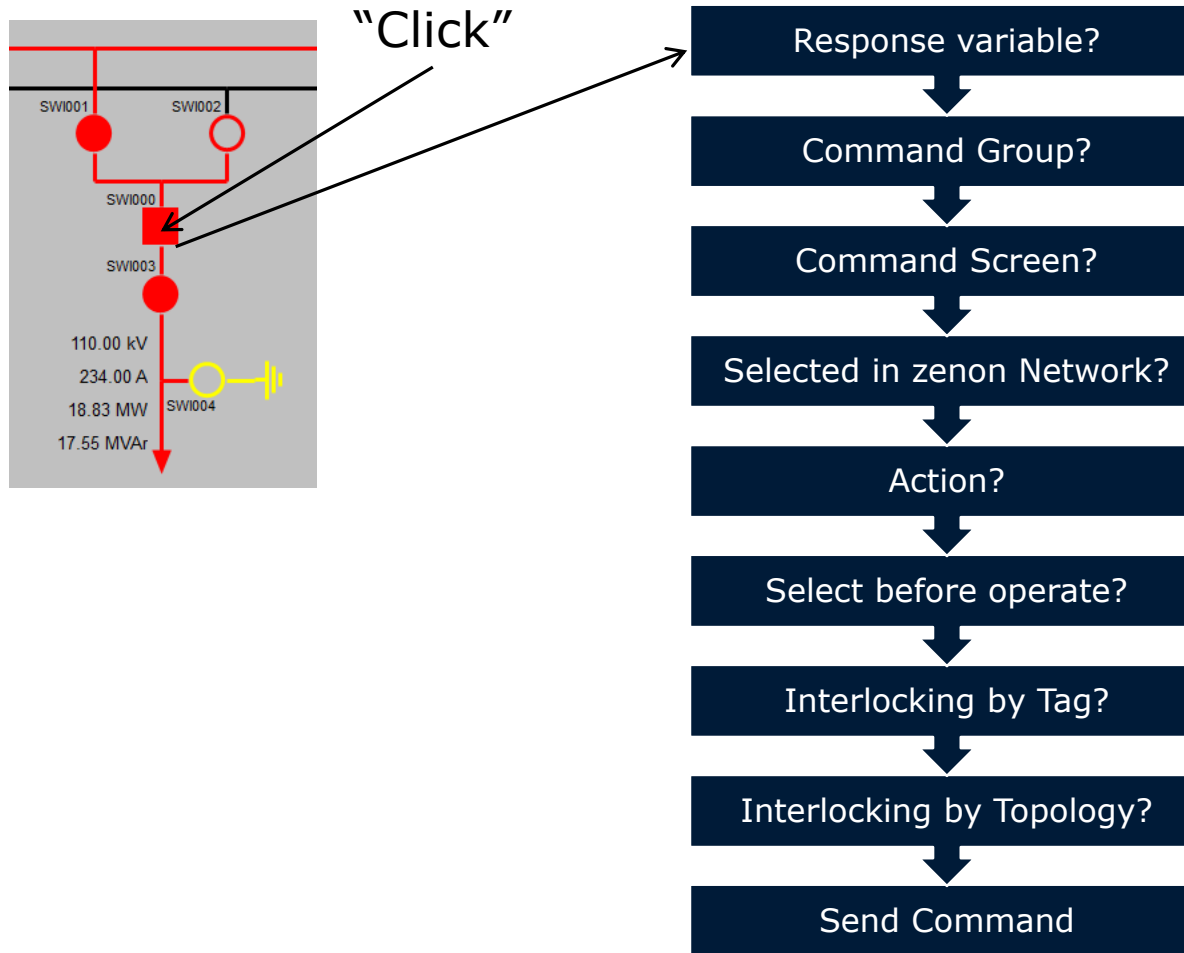
Command Control

- ▶ One or two stage commands
 - SBO
- ▶ Two-hand control
 - Ctrl-key
- ▶ Timeout functionality
- ▶ Automatic consideration of Interlocking
- ▶ Accessible directly at the element, by function call or context menu
- ▶ Complete documentation in the events list
- ▶ Breaker tripping detection

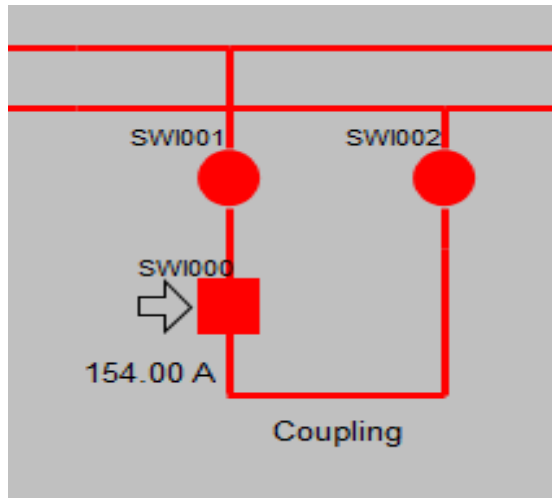




Command Processing Intelligence



Command Control (2)



Switch Gear
Identification
STA000_XXXXKV_DIR004_SWI003_XXXXRV

Interlockings
Active interlocking

Select / execute

CLOSE	OPEN
	Cancel

Switch Gear
Identification
STA000_XXXXKV_DIR004_SWI003_XXXXRV

Interlockings
Active interlocking

Select / execute

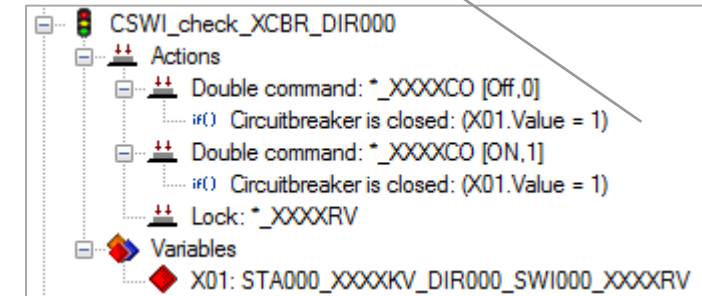
CLOSE	OPEN
Confirm	Cancel

Operate

Command Control (3)

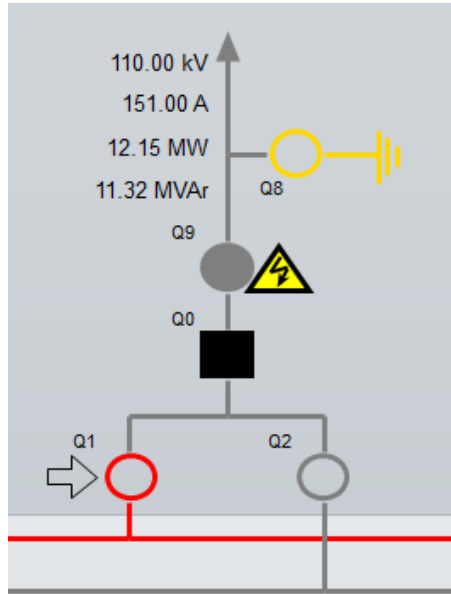
- ▶ Interlocking triggered by the process
- ▶ Current process data dictates available commands
- ▶ Avoids unwanted malfunction
- ▶ Supports the user in his actions
- ▶ Bay-spanning interlocking

IF Expression is TRUE then Command-Action is Interlocked



Condition	
Name:	Circuitbreaker is closed
Logical link:	(X01.Value = 1) ...
Interlocking text:	Circuitbreaker is closed
☐ Unlockable	

Command Control (4)



Interlockings

Circuitbreaker is closed

Lift interlocking

Text	Active	Unlockable	Unlocked	Type
Circuitbreaker is closed	Yes	No	No	Action interlocking
Disconnecter under load	Yes	Yes	No	Topological interlocking
Voltage towards ground	No	No	No	Topological interlocking
Switching operation in area with undefined status	No	No	No	Topological interlocking
Area with undefined status would increase	No	No	No	Topological interlocking
Area would become unsupplied	No	No	No	Topological interlocking

Select / execute

CLOSE

OPEN

Cancel

Unlock all

Interlocking

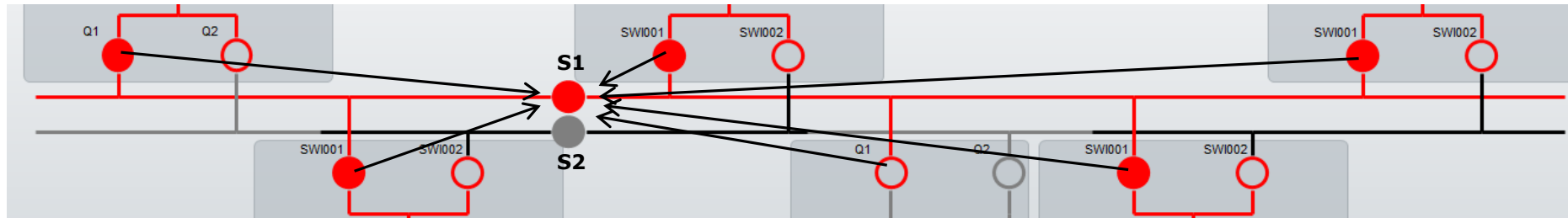
- ▶ Define interlocking logic within zenon command action

or

- ▶ Use interlocking result (BOOL flag) of IED

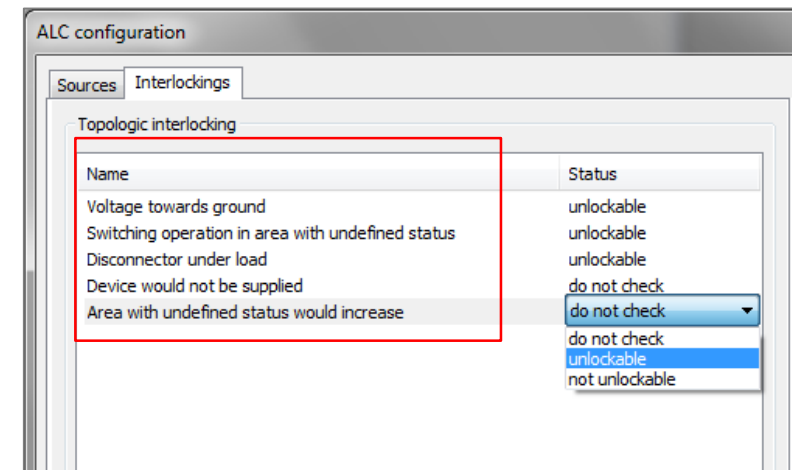
Bay spanning interlocking – example

Switch “S1” cannot be opened or closed as long as the bay-switches connected to one side of S1 on the bus bar are in close position



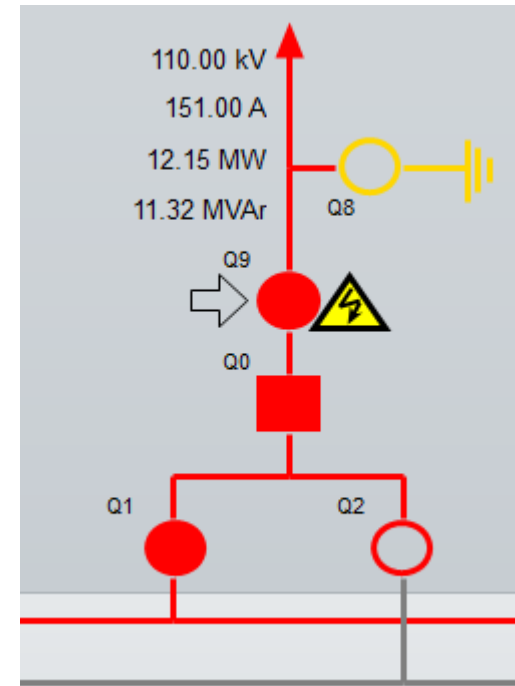
Topology check

- ▶ Automatic calculation for the topological model
- ▶ Automatically considered for any command
- ▶ Predefined escalation levels
 - Do not check
 - Unlockable
 - Not unlockable



Switch lock

- ▶ Disabled for other workstations
- ▶ Following safety rule "Prevent from switching"



Select / execute

Lock switch

User

JR

Lock code

1111

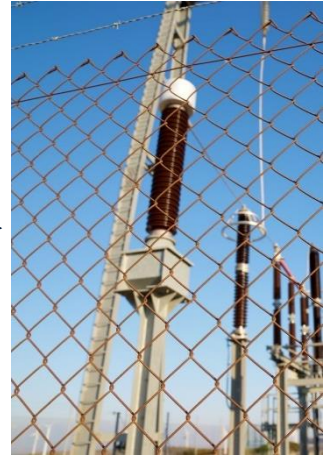
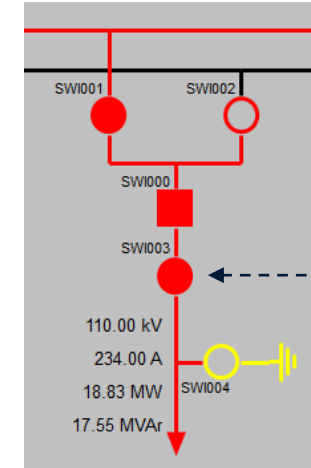
Comment:

Work to do

User	Blocking time	Comment
JR	08.01.2014 16:58:02	Work to do

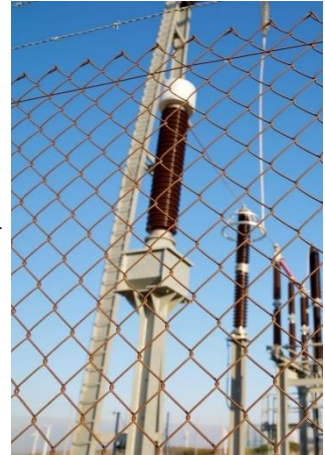
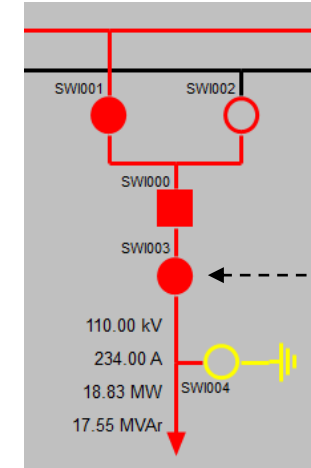
Manual Correction

- ▶ Switchgear without control and monitoring capability
- ▶ Change status in the same way as with fully controlled switchgear
- ▶ Considered interlocking
- ▶ Considered in topological model



Replace (Substitute)

- ▶ If monitoring data is invalid
- ▶ If monitoring data does show wrong status
- ▶ Overrule the remote information by REPLACEing the status
- ▶ Considered interlocking
- ▶ Considered in topological model



Interlocking List

Switchgear

Variable
380KV_DIR003_XCBR_RV

Action type
User input

Interlocking

Text	Active	Unlocks...	Unlocked	Type
Filter text	Filter...	Filter t...	Filter text	Ac*
Feeder is local	No	No	No	Action interlocking

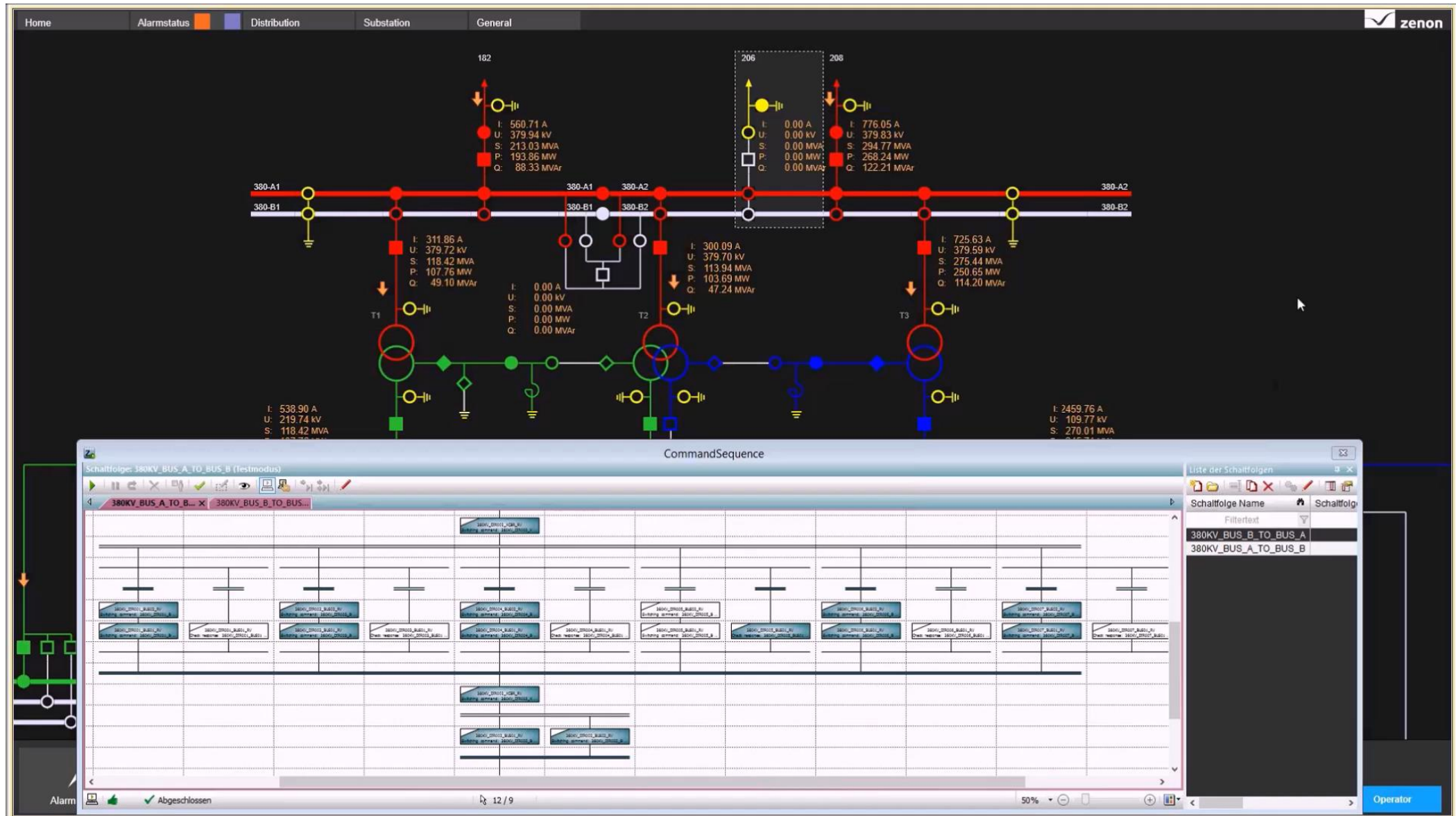
Select / operate

OPEN CLOSE Confirm Cancel

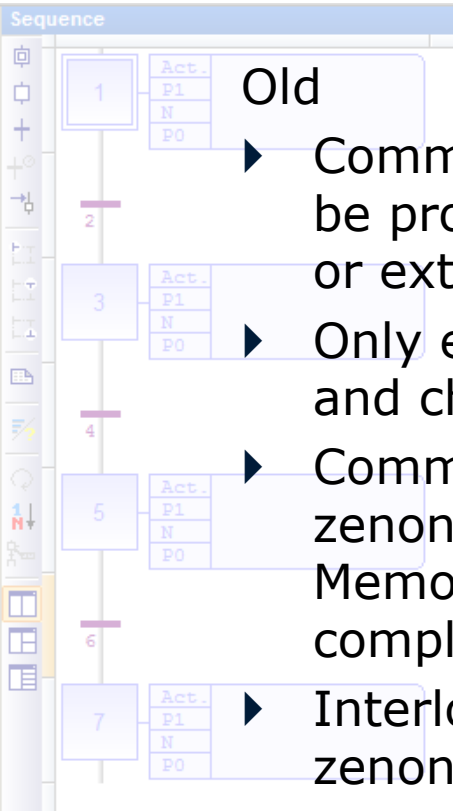
Individual column selection
Filter
Sorting

Command Sequencer

Command Sequencer



Advantages of Command Sequencer

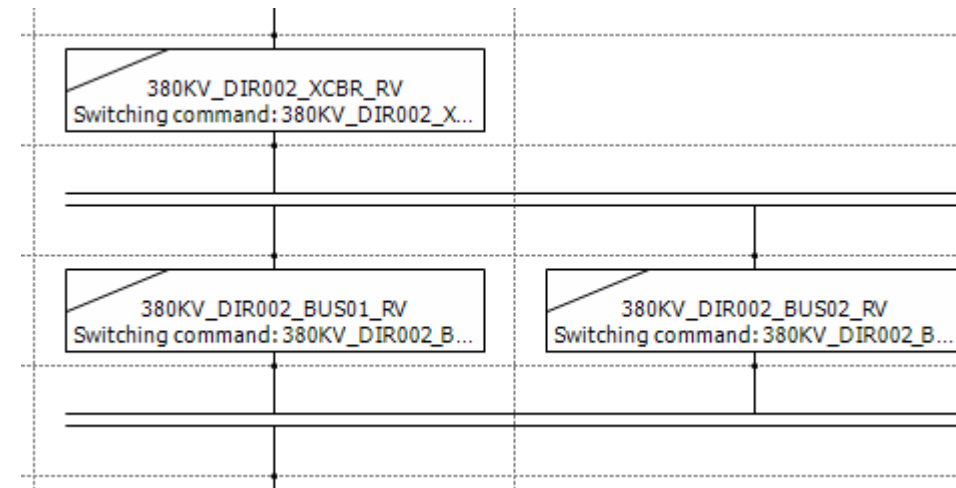


Old

- ▶ Command sequences needed to be programmed in zenon Logic or external PLC
- ▶ Only engineer is able to set up and change sequences
- ▶ Communication with IEDs via zenon Logic driver or via Shared Memory interface → additional complexity
- ▶ Interlocking programmed in zenon Logic or external PLC

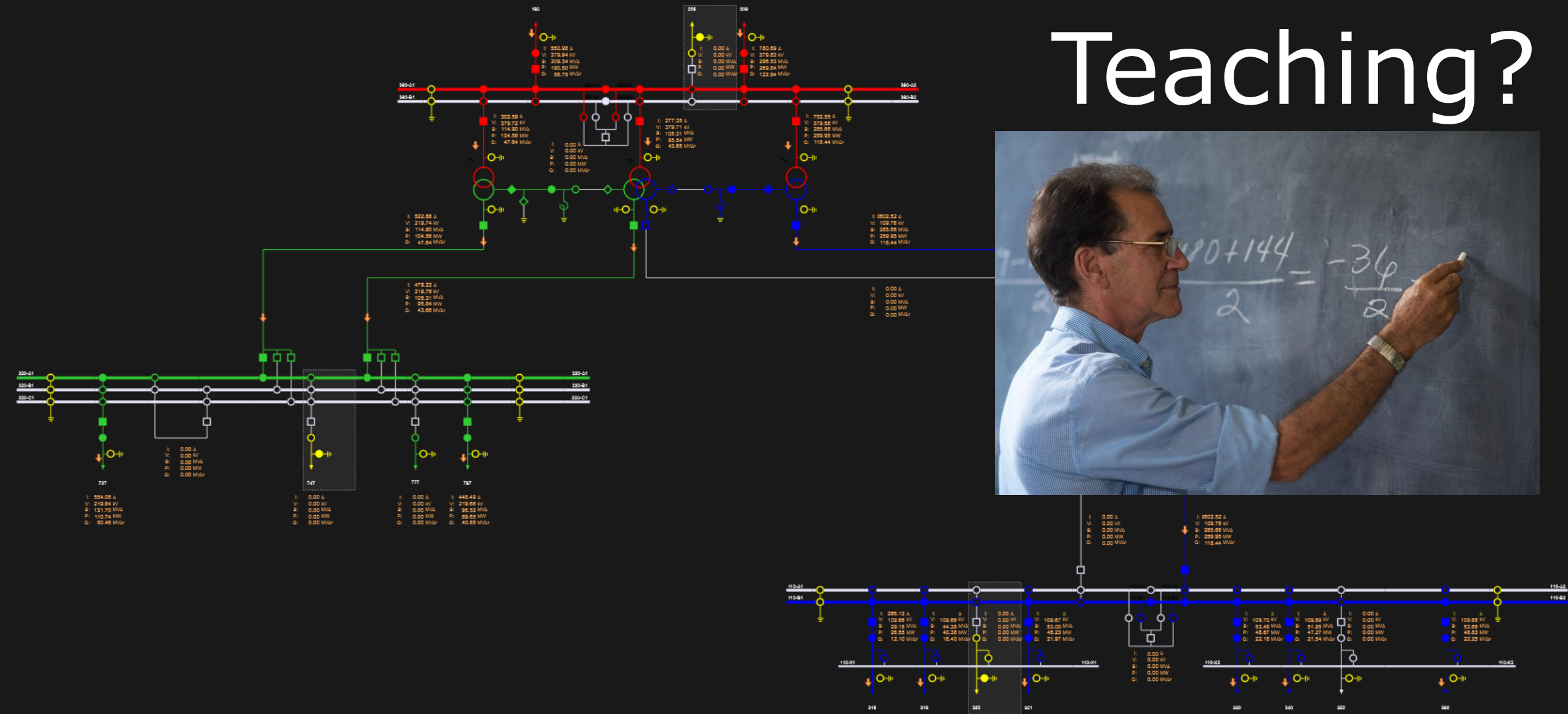
New (7.20)

- ▶ Command sequences can be created and changed by operator
- ▶ No engineer required
- ▶ Communication directly with zenon driver
- ▶ Uses interlocking capabilities of zenon Command Processing



Command Sequencer

Teaching?



Programming vs. Teaching

Home Alarmstatus Substation General

Command sequence: Disconnect from Grid (Edit mode)

*Disconnect f... x

Workspace
EE_PRO_SUBSTAT

Switchgear / Action

Switchgear	Action
220KV_DIR005*	Swi*
220KV_DIR005_BUS01_RV	Switching command: 220KV_DIR005_BUS01_CO [ON,1]
220KV_DIR005_BUS01_RV	Switching command: 220KV_DIR005_BUS01_CO [OFF,0]
220KV_DIR005_BUS02_RV	Switching command: 220KV_DIR005_BUS02_CO [OFF,0]
220KV_DIR005_BUS02_RV	Switching command: 220KV_DIR005_BUS02_CO [ON,1]
220KV_DIR005_BUS03_RV	Switching command: 220KV_DIR005_BUS03_CO [OFF,0]
220KV_DIR005_BUS03_RV	Switching command: 220KV_DIR005_BUS03_CO [ON,1]
220KV_DIR005_EARTH_RV	Switching command: 220KV_DIR005_EARTH_CO [ON,1]
220KV_DIR005_EARTH_RV	Switching command: 220KV_DIR005_EARTH_CO [OFF,0]
220KV_DIR005_LINE_RV	Switching command: 220KV_DIR005_LINE_CO [ON,1]
220KV_DIR005_LINE_RV	Switching command: 220KV_DIR005_LINE_CO [OFF,0]
220KV_DIR005_XCBR_RV	Switching command: 220KV_DIR005_XCBR_CO [OFF,0]
220KV_DIR005_XCBR_RV	Switching command: 220KV_DIR005_XCBR_CO [ON,1]

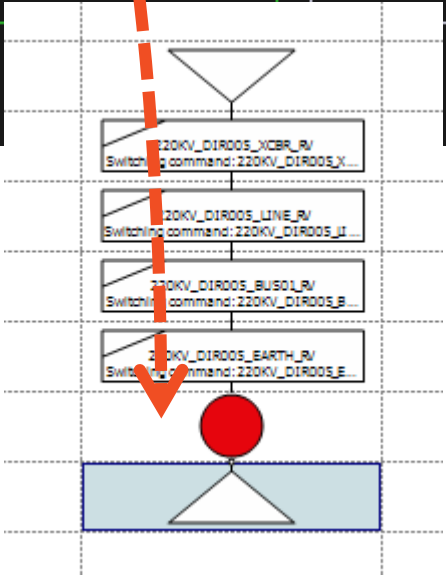
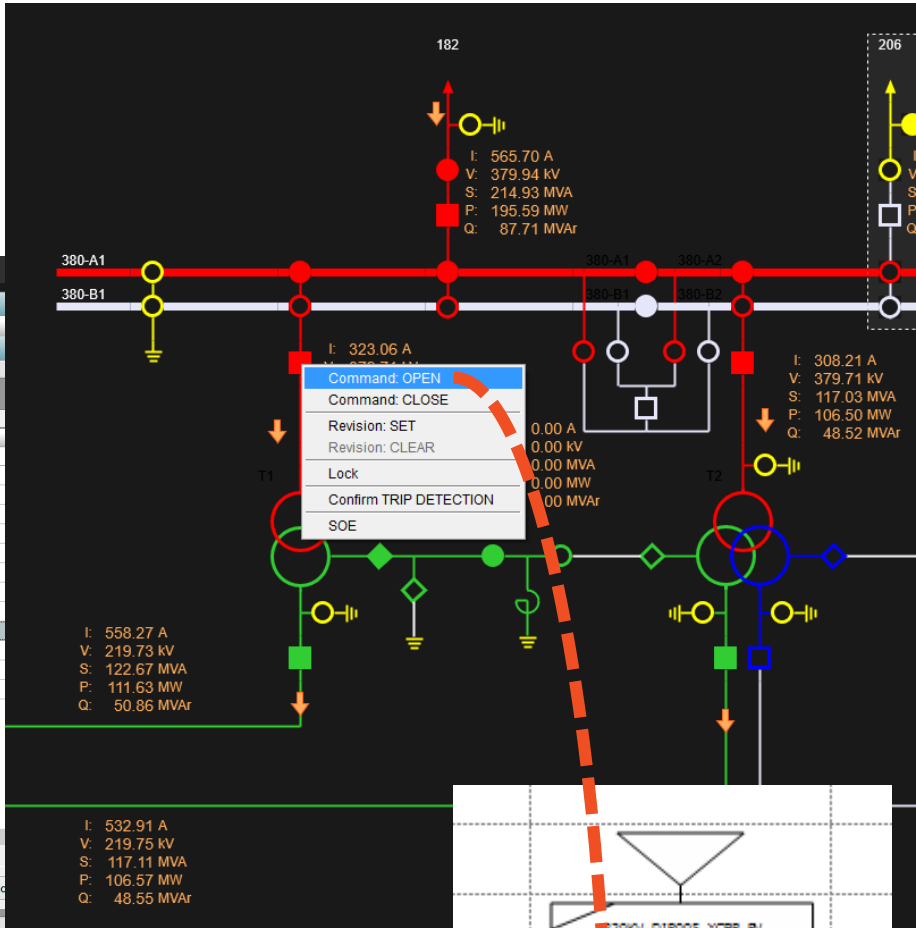
< 745 total / 12 filtered / 0 selected

No selection OK Cancel

11 x 11 cells / 7 elements 5/6 75%

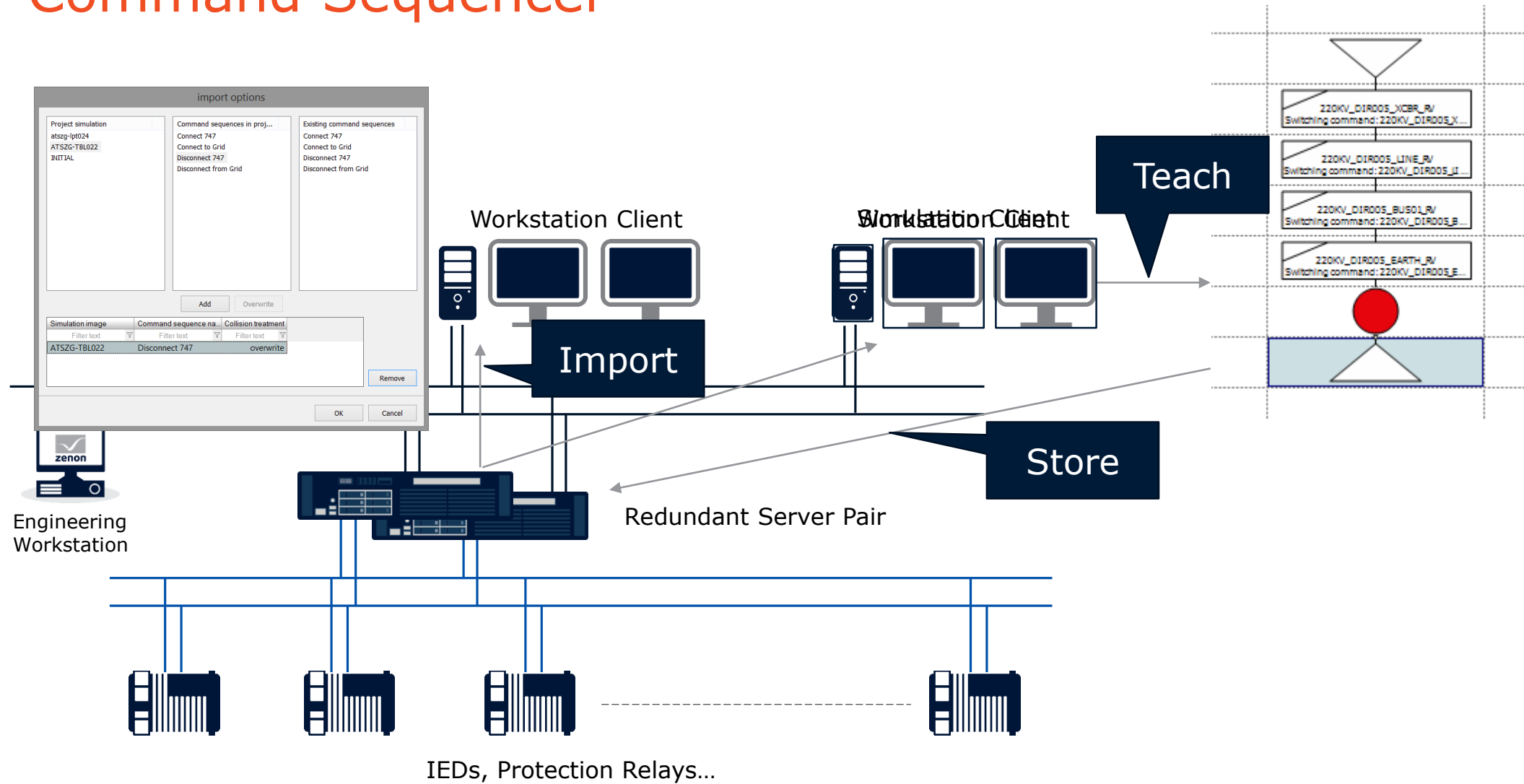
Time received	Variable name	Identification	Value	Measu...	Text
29.10.2015 16:46:23.146	110KV_DIR002_MX_I		486.91		Warning Overcurrent
29.10.2015 16:45:53.395	110KV_DIR008_MX_I		480.53		Warning Overcurrent
29.10.2015 16:46:23.146	110KV_DIR002_MX_I		486.91		Warning Overcurrent

Alarm Overview 57 Demo Supervisor English 29.10.2015 16:46:23 Standalone ? Acknowledge Open AML Screen

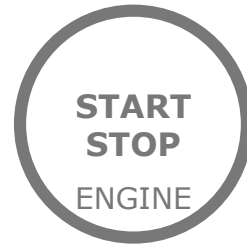


COPADATA

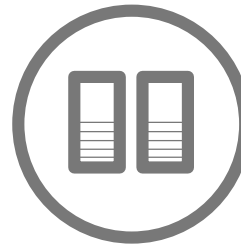
Command Sequencer



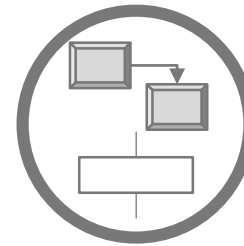
Command Sequencer – there is even more!



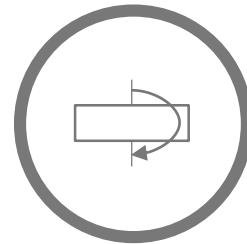
zenon Function



Redundancy



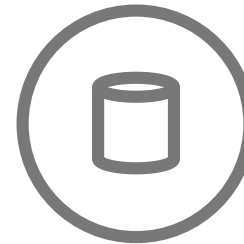
One step



Skip steps



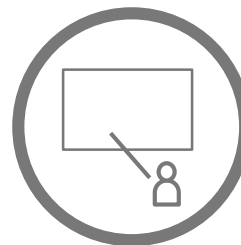
User
management



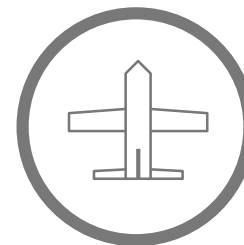
System
variables



Import/Export



Teaching



Simulation

COMTRADE Viewer

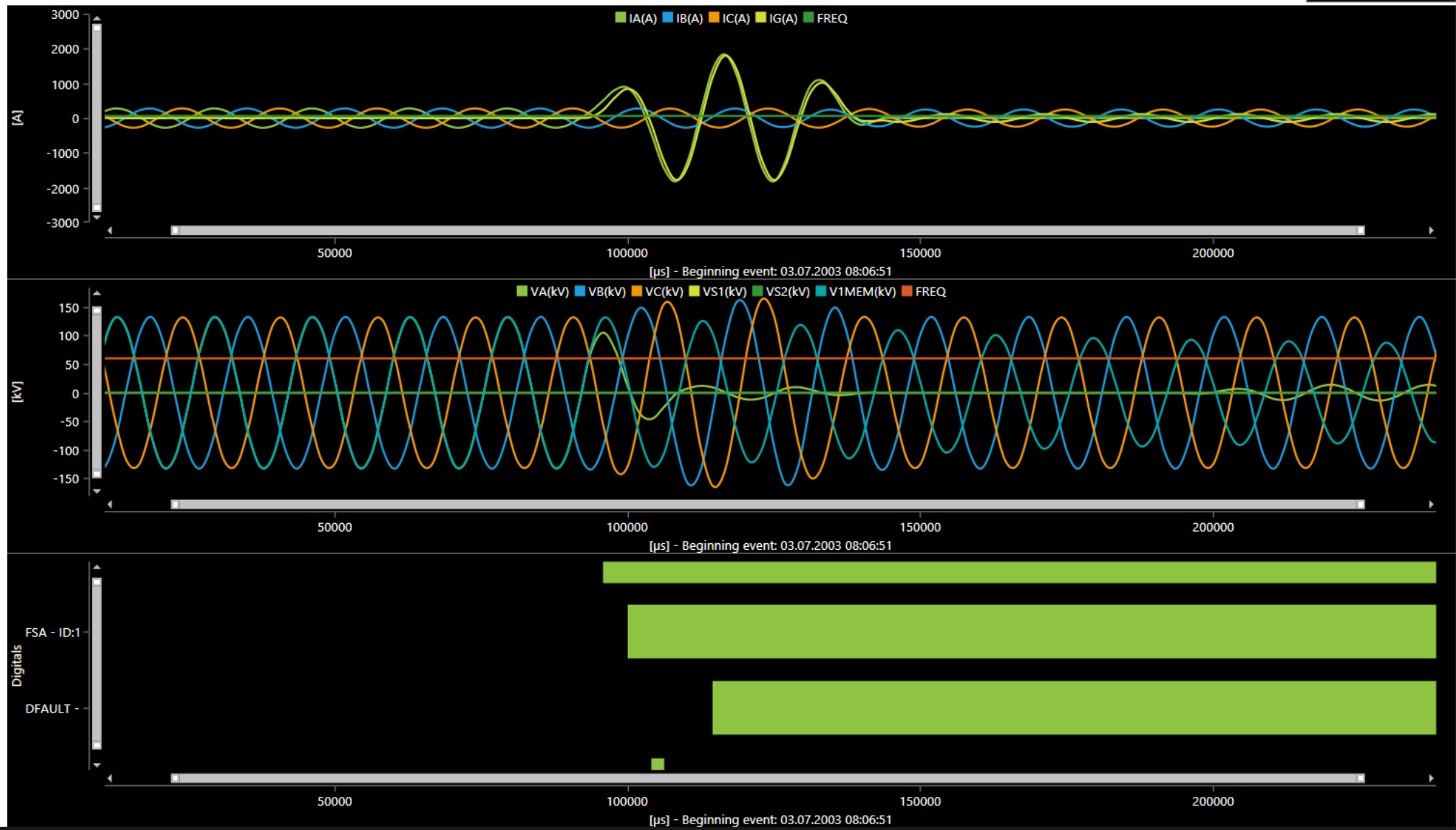
COMTRADE Viewer Control





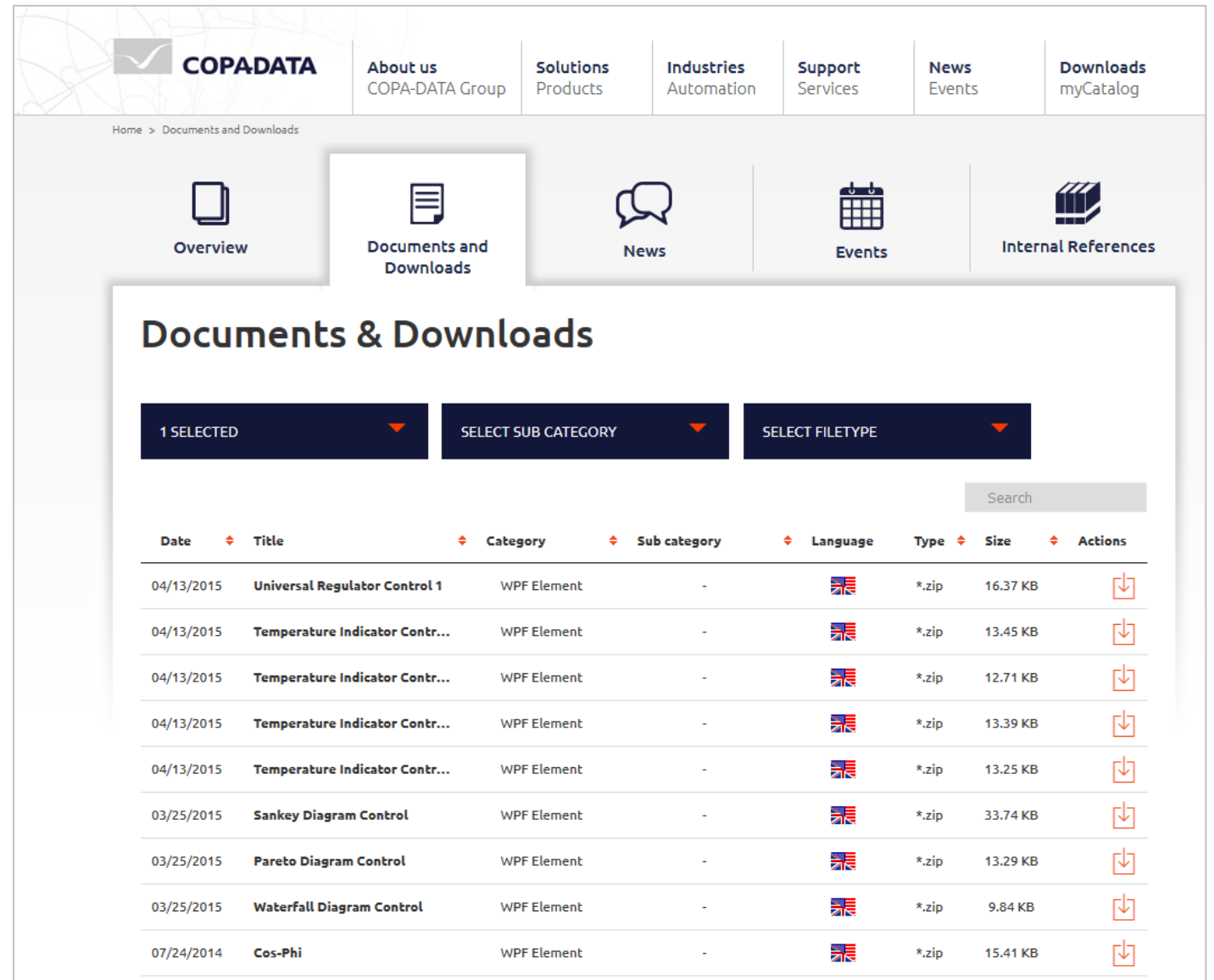
COMTRADE Viewer Configuration

CSV-Export



Where to get?

- ▶ Partner Area of
- ▶ www.copadata.com



The screenshot shows the COPADATA website's 'Documents & Downloads' section. The header includes the COPADATA logo and navigation links: About us (COPA-DATA Group), Solutions (Products), Industries (Automation), Support (Services), News (Events), and Downloads (myCatalog). Below the header is a breadcrumb trail: Home > Documents and Downloads. A secondary navigation bar contains icons and labels for Overview, Documents and Downloads (active), News, Events, and Internal References. The main content area is titled 'Documents & Downloads' and features three filter buttons: '1 SELECTED', 'SELECT SUB CATEGORY', and 'SELECT FILETYPE'. A search bar is located to the right of these filters. Below the filters is a table listing documents with columns for Date, Title, Category, Sub category, Language, Type, Size, and Actions. The table contains 10 rows of data, each with a download icon in the Actions column.

Date	Title	Category	Sub category	Language	Type	Size	Actions
04/13/2015	Universal Regulator Control 1	WPF Element	-	English	*.zip	16.37 KB	
04/13/2015	Temperature Indicator Contr...	WPF Element	-	English	*.zip	13.45 KB	
04/13/2015	Temperature Indicator Contr...	WPF Element	-	English	*.zip	12.71 KB	
04/13/2015	Temperature Indicator Contr...	WPF Element	-	English	*.zip	13.39 KB	
04/13/2015	Temperature Indicator Contr...	WPF Element	-	English	*.zip	13.25 KB	
03/25/2015	Sankey Diagram Control	WPF Element	-	English	*.zip	33.74 KB	
03/25/2015	Pareto Diagram Control	WPF Element	-	English	*.zip	13.29 KB	
03/25/2015	Waterfall Diagram Control	WPF Element	-	English	*.zip	9.84 KB	
07/24/2014	Cos-Phi	WPF Element	-	English	*.zip	15.41 KB	

Multi Monitor Management

Resolution Independent Engineering

Monitor management

- ▶ Perfect process overview
- ▶ No additional engineering efforts
- ▶ Flexible monitor selection
- ▶ Working with virtual monitors

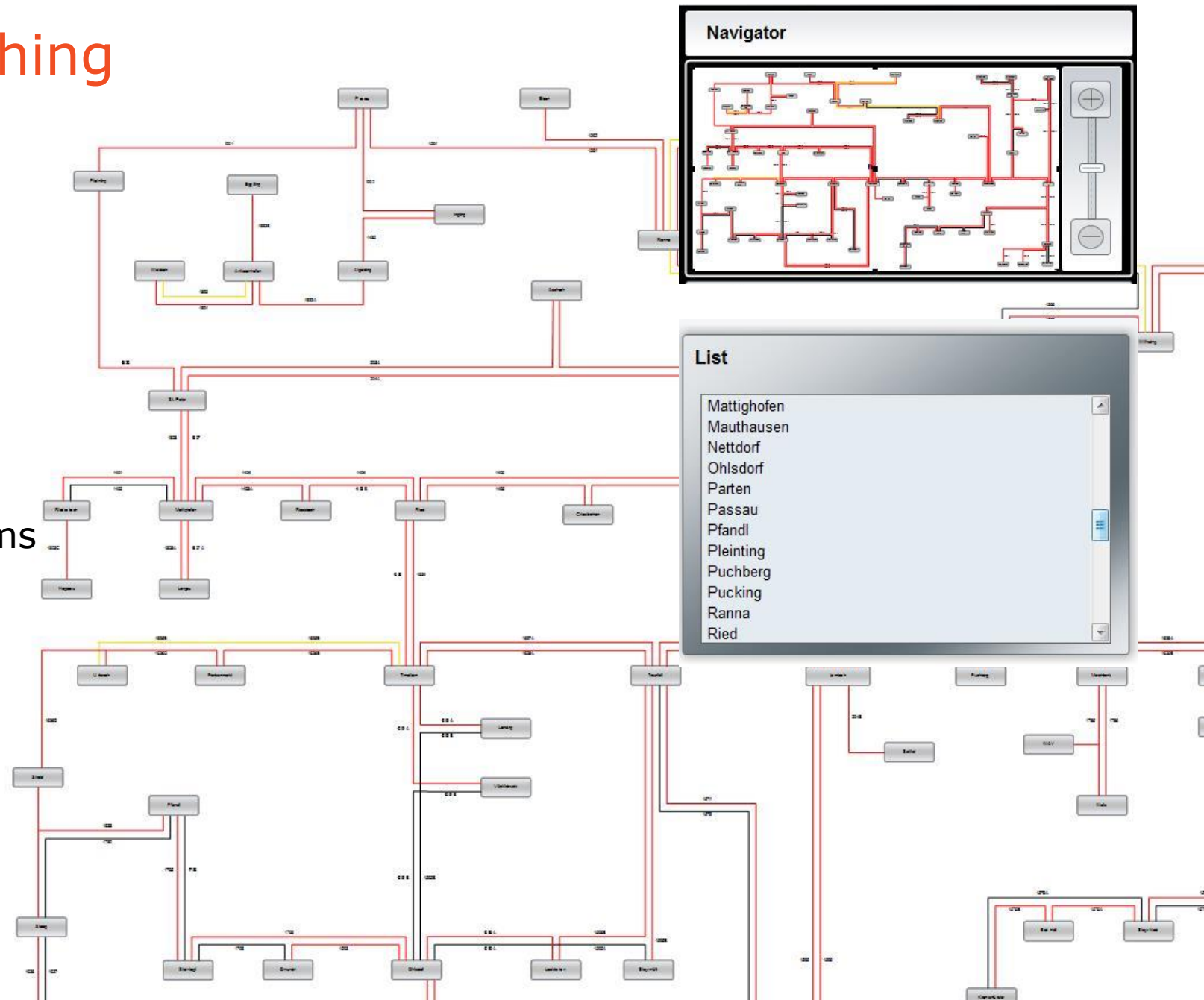


World View

Overview is everything

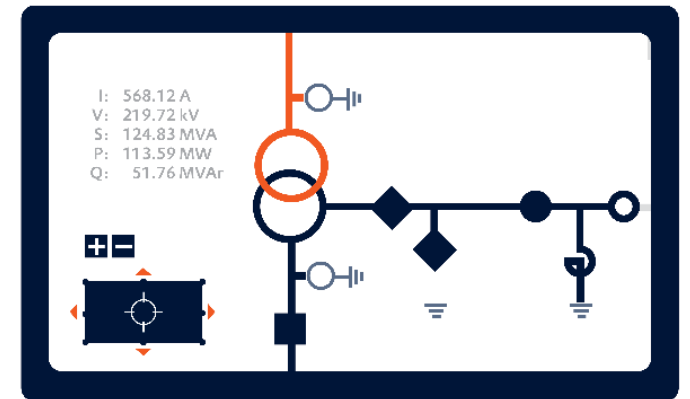
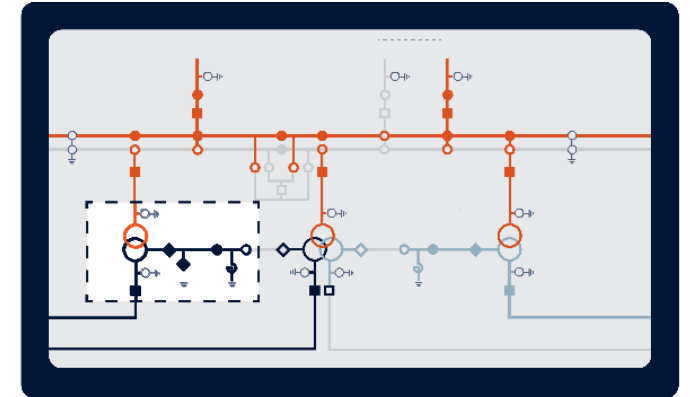
Worldview

- ▶ Zooming
- ▶ Panning
- ▶ Scrolling
- ▶ Decluttering of screen items
- ▶ Direct station selection
- ▶ Fully operational



Overview with the zenon Worldview

- ▶ Overview of the entire production environment
- ▶ Level of detail based on information requirements
- ▶ Versatile: for large production plants, various locations, etc.
- ▶ Faster response times

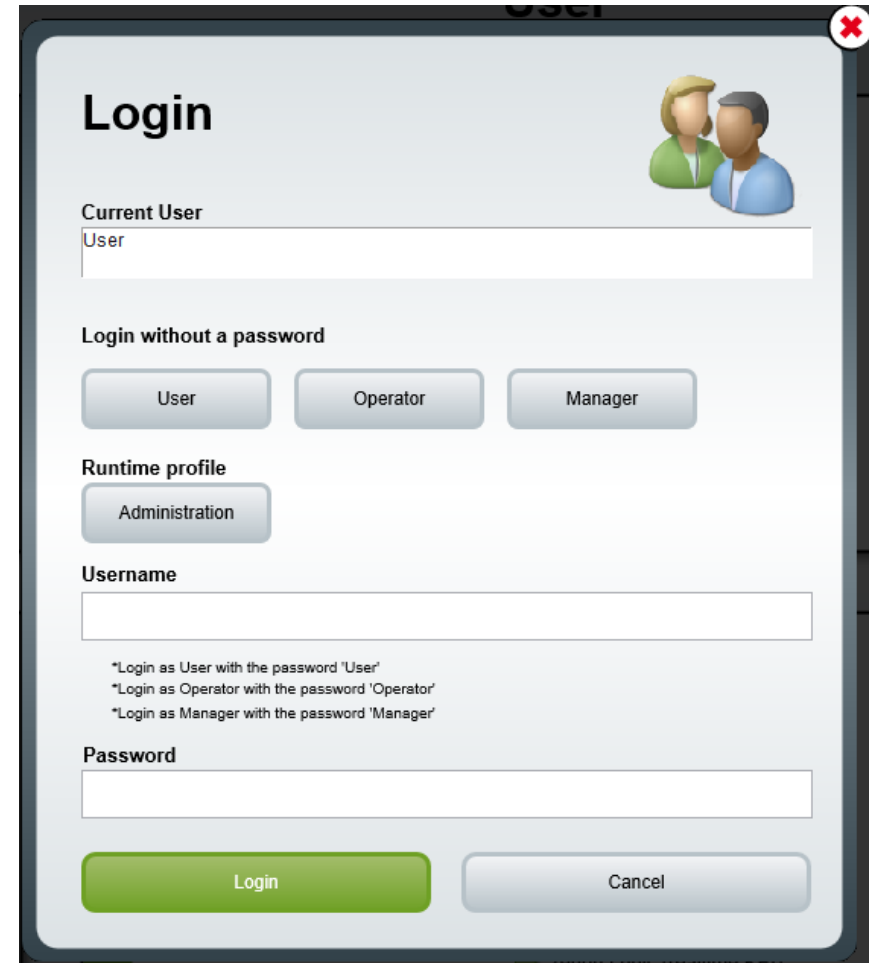


User Management & Security

Secure Access Control

User management

- ▶ zenon based
- ▶ Windows based (Active Directory or AD LDS)
- ▶ Authorization levels
- ▶ User groups
- ▶ Auto logout



Login

Current User
User

Login without a password

User Operator Manager

Runtime profile

Administration

Username

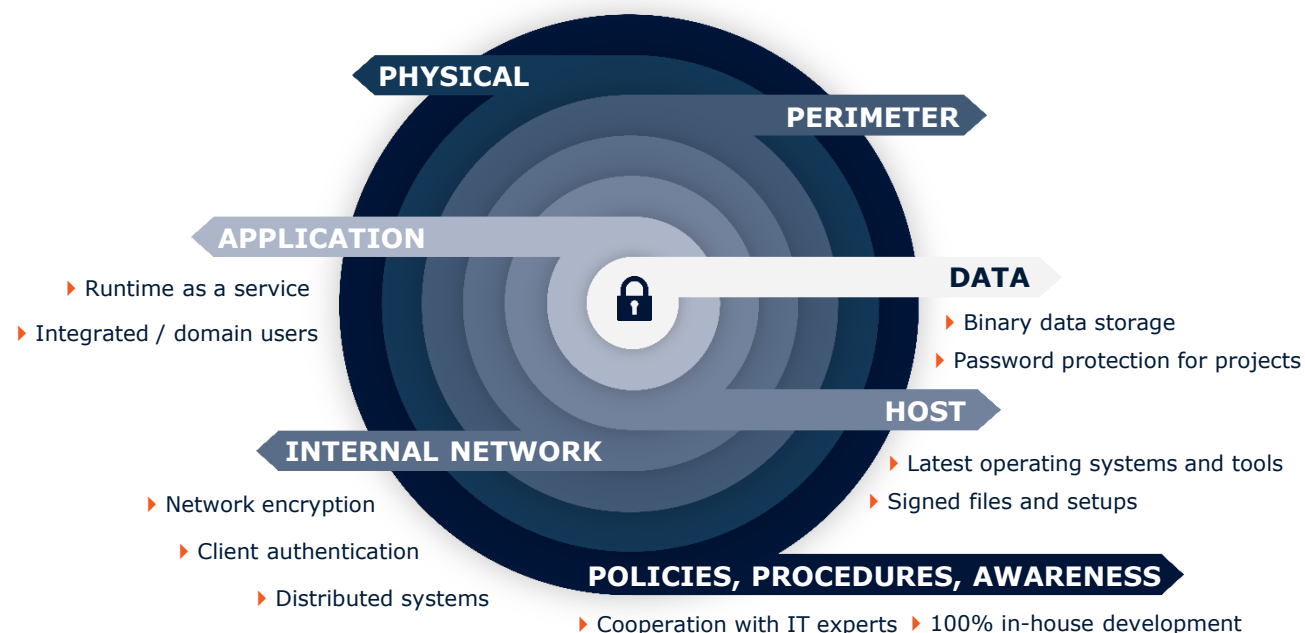
*Login as User with the password 'User'
*Login as Operator with the password 'Operator'
*Login as Manager with the password 'Manager'

Password

Login Cancel

Validated Security under IEC 62443

- ▶ Secure system architecture
- ▶ Built-in configurable security functions save time and reduce risk
- ▶ Convenient updates help you to keep up with the latest security standards
- ▶ Features provide support for the development of secure automation projects

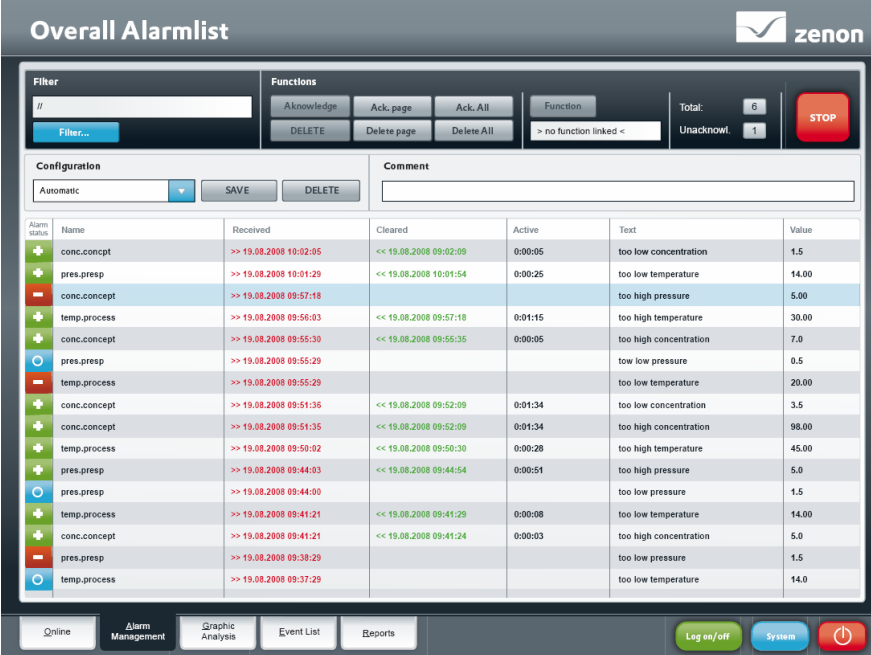


Alarm List Event List

Know what's happening – react quickly

Alarm List

- ▶ Individually configurable
- ▶ Wide range of filter settings
- ▶ Display of variable names, IDs, values etc.
- ▶ Alarm status line
- ▶ Logical grouping and prioritization
- ▶ Linked help chapters
- ▶ Alarms with obligatory acknowledgement and deletion
- ▶ Online/offline print-out
- ▶ Export (dBase, ASCII, XML, SQL)



Overall Alarmlist

zenon

Filter: // Filter...

Functions: Acknowledge Ack. page Ack. All Function DELETE Delete page Delete All > no function linked < Total: 6 Unacknowl. 1 STOP

Configuration: Automatic SAVE DELETE Comment

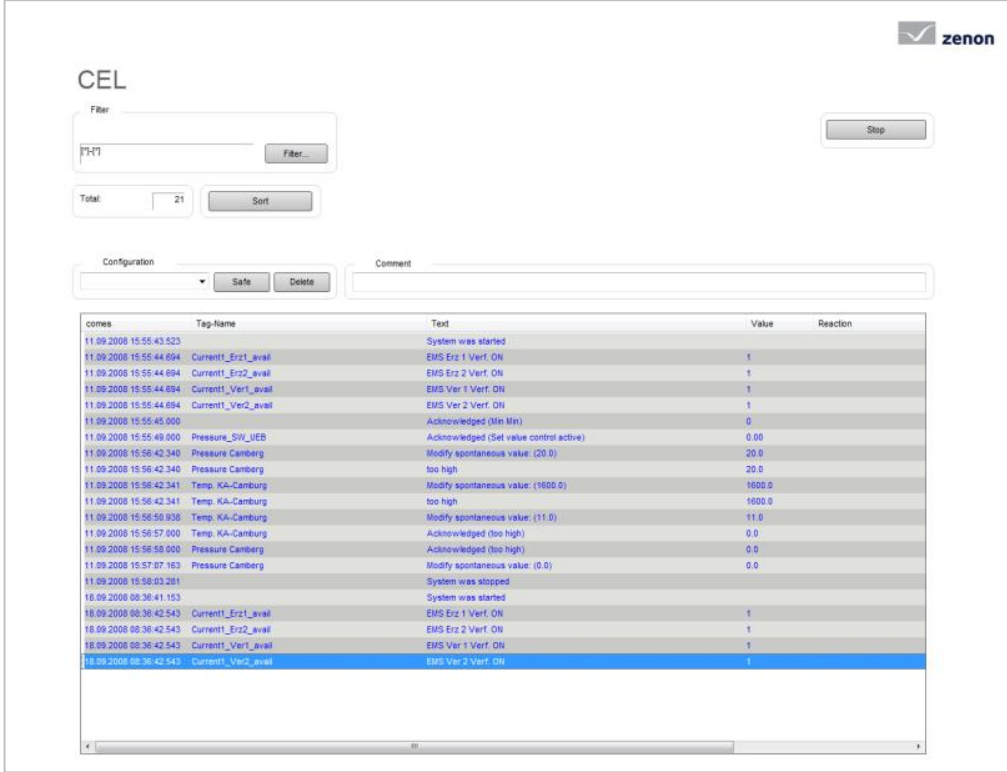
Alarm status	Name	Received	Cleared	Active	Text	Value
+	conc.concpt	>> 19.08.2008 10:02:05	<< 19.08.2008 09:02:09	0:00:05	too low concentration	1.5
+	pres.presp	>> 19.08.2008 10:01:29	<< 19.08.2008 10:01:54	0:00:25	too low temperature	14.00
-	conc.conccept	>> 19.08.2008 09:57:18			too high pressure	5.00
+	temp.process	>> 19.08.2008 09:56:03	<< 19.08.2008 09:57:18	0:01:15	too high temperature	30.00
+	conc.concept	>> 19.08.2008 09:55:30	<< 19.08.2008 09:55:35	0:00:05	too high concentration	7.0
o	pres.presp	>> 19.08.2008 09:55:29			too low pressure	0.5
-	temp.process	>> 19.08.2008 09:55:29			too low temperature	20.00
+	conc.concept	>> 19.08.2008 09:51:36	<< 19.08.2008 09:52:09	0:01:34	too low concentration	3.5
+	conc.concept	>> 19.08.2008 09:51:35	<< 19.08.2008 09:52:09	0:01:34	too high concentration	98.00
+	temp.process	>> 19.08.2008 09:50:02	<< 19.08.2008 09:50:30	0:00:28	too high temperature	45.00
+	pres.presp	>> 19.08.2008 09:44:03	<< 19.08.2008 09:44:54	0:00:51	too high pressure	5.0
o	pres.presp	>> 19.08.2008 09:44:00			too low pressure	1.5
+	temp.process	>> 19.08.2008 09:41:21	<< 19.08.2008 09:41:29	0:00:08	too low temperature	14.00
+	conc.concept	>> 19.08.2008 09:41:21	<< 19.08.2008 09:41:24	0:00:03	too high concentration	5.0
-	pres.presp	>> 19.08.2008 09:38:29			too low pressure	1.5
o	temp.process	>> 19.08.2008 09:37:29			too low temperature	14.0

Online Alarm Management Graphic Analysis Event List Reports Log on/off System

Clear overview with resolution of ms

Sequence of Events List

- ▶ Shows
 - process-relevant events
 - Error messages that cannot be acknowledged
 - zenon system messages
- ▶ Event list
 - wide range of filter settings
 - individually configurable
 - Display of variable names, ID, values, current user etc.
 - Absolute and relative time scale
- ▶ Online/offline print-out
- ▶ Export (dBase, ASCII, XML, SQL)



zenon

CEL

Filter

F5+1

Filter

Total: 21

Sort

Configuration

Safe

Delete

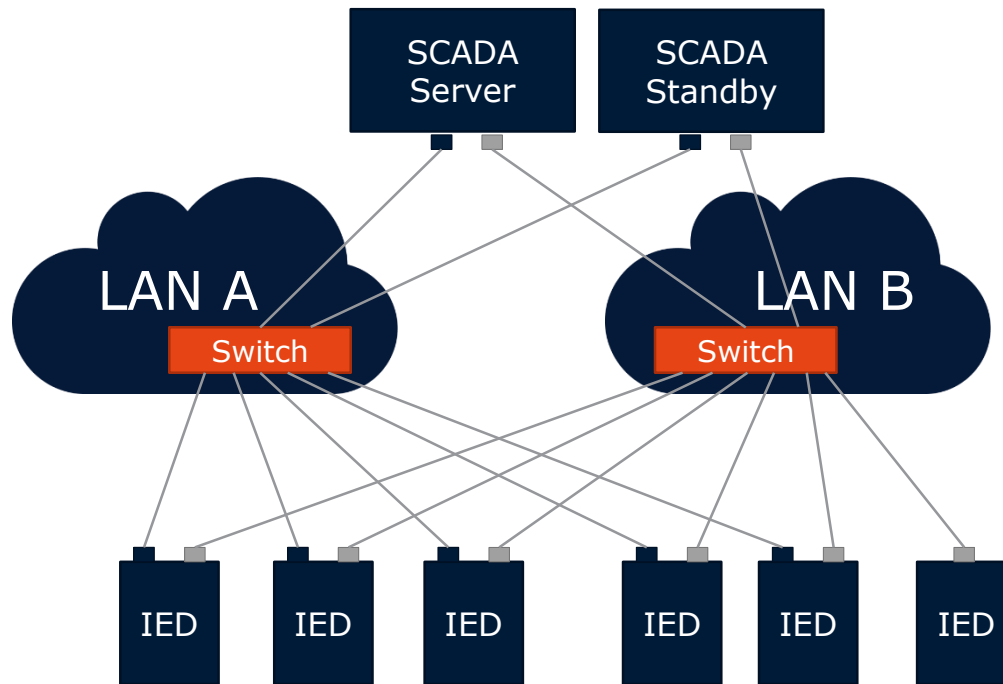
Comment

comes	Tag-Name	Text	Value	Reaction
11.09.2008 15:55:43.523		System was started		
11.09.2008 15:55:44.694	Currentt_Erz1_avail	EMS Erz 1 Ver1 ON	1	
11.09.2008 15:55:44.694	Currentt_Erz2_avail	EMS Erz 2 Ver1 ON	1	
11.09.2008 15:55:44.694	Currentt_Ver1_avail	EMS Ver 1 Ver1 ON	1	
11.09.2008 15:55:44.694	Currentt_Ver2_avail	EMS Ver 2 Ver1 ON	1	
11.09.2008 15:55:45.000		Acknowledged (Min Min)	0	
11.09.2008 15:55:49.000	Pressure_SIV_UEB	Acknowledged (Set value control active)	0.00	
11.09.2008 15:56:42.340	Pressure Camberg	Modify spontaneous value: (20.0)	20.0	
11.09.2008 15:56:42.340	Pressure Camberg	too high	20.0	
11.09.2008 15:56:42.341	Temp KA-Camburg	Modify spontaneous value: (1600.0)	1600.0	
11.09.2008 15:56:42.341	Temp KA-Camburg	too high	1600.0	
11.09.2008 15:56:56.936	Temp KA-Camburg	Modify spontaneous value: (11.0)	11.0	
11.09.2008 15:56:57.000	Temp KA-Camburg	Acknowledged (too high)	0.0	
11.09.2008 15:56:58.000	Pressure Camberg	Acknowledged (too high)	0.0	
11.09.2008 15:57:07.163	Pressure Camberg	Modify spontaneous value: (0.0)	0.0	
11.09.2008 15:58:03.281		System was stopped		
18.09.2008 08:36:41.153		System was started		
18.09.2008 08:36:42.543	Currentt_Erz1_avail	EMS Erz 1 Ver1 ON	1	
18.09.2008 08:36:42.543	Currentt_Erz2_avail	EMS Erz 2 Ver1 ON	1	
18.09.2008 08:36:42.543	Currentt_Ver1_avail	EMS Ver 1 Ver1 ON	1	
18.09.2008 08:36:42.543	Currentt_Ver2_avail	EMS Ver 2 Ver1 ON	1	

PRP



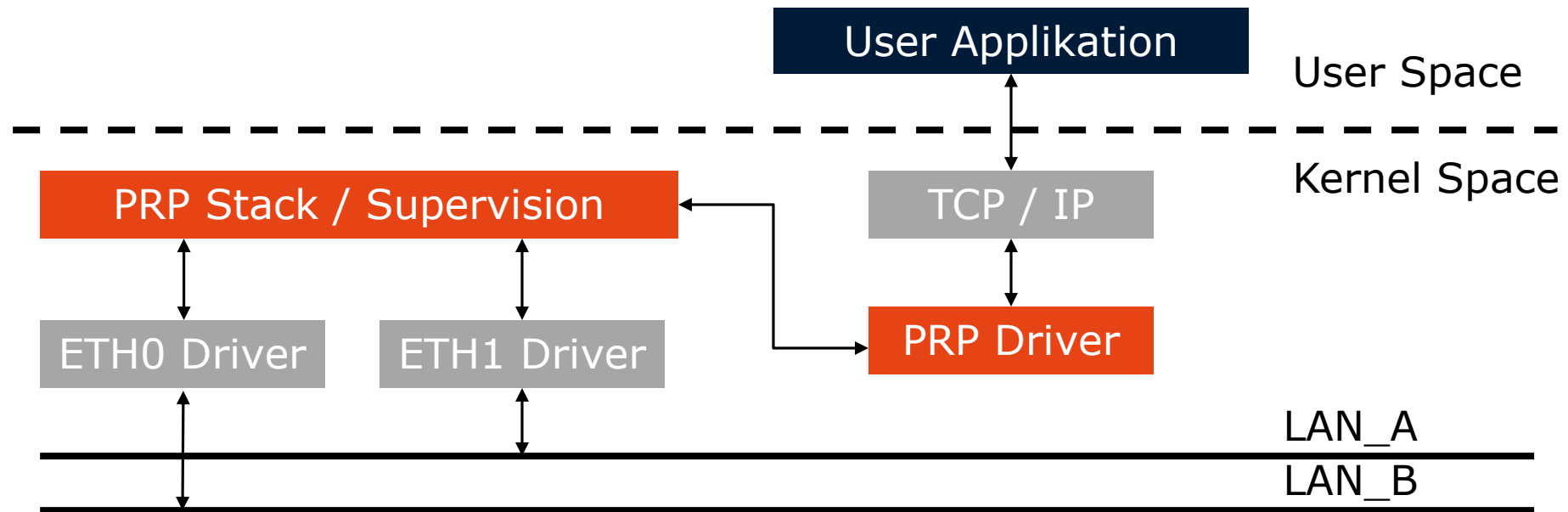
PRP – Parallel Redundancy Protocol



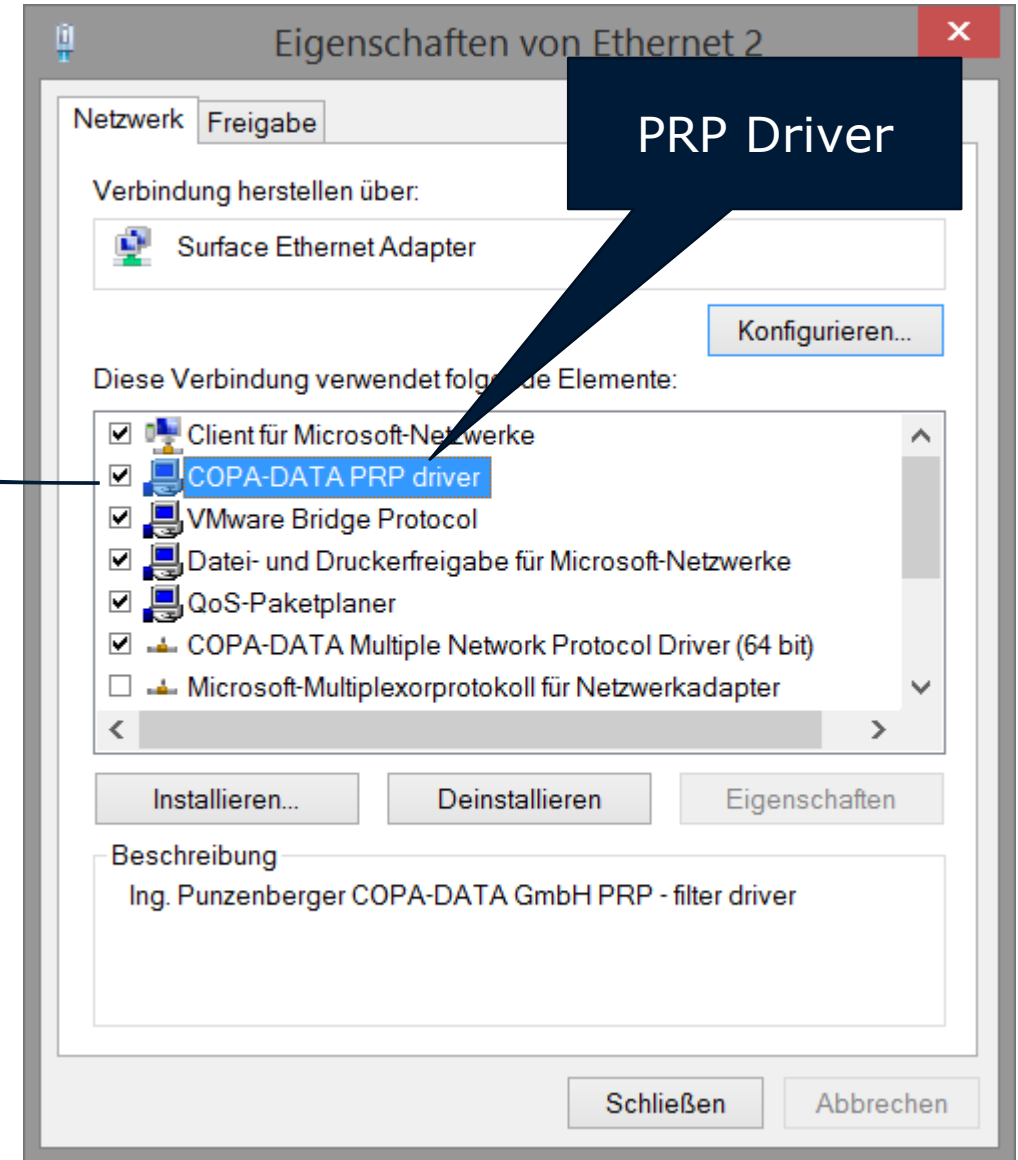
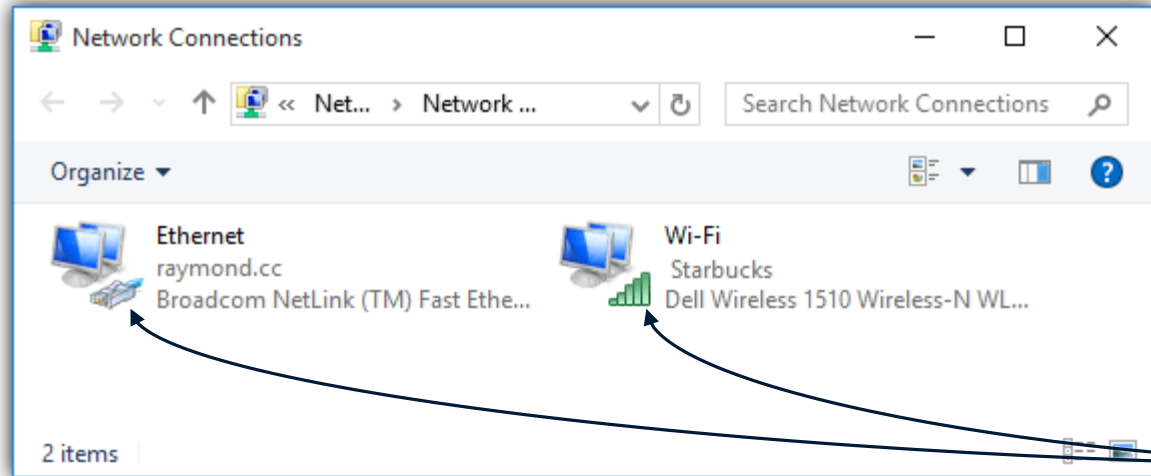
Supported Operating Systems



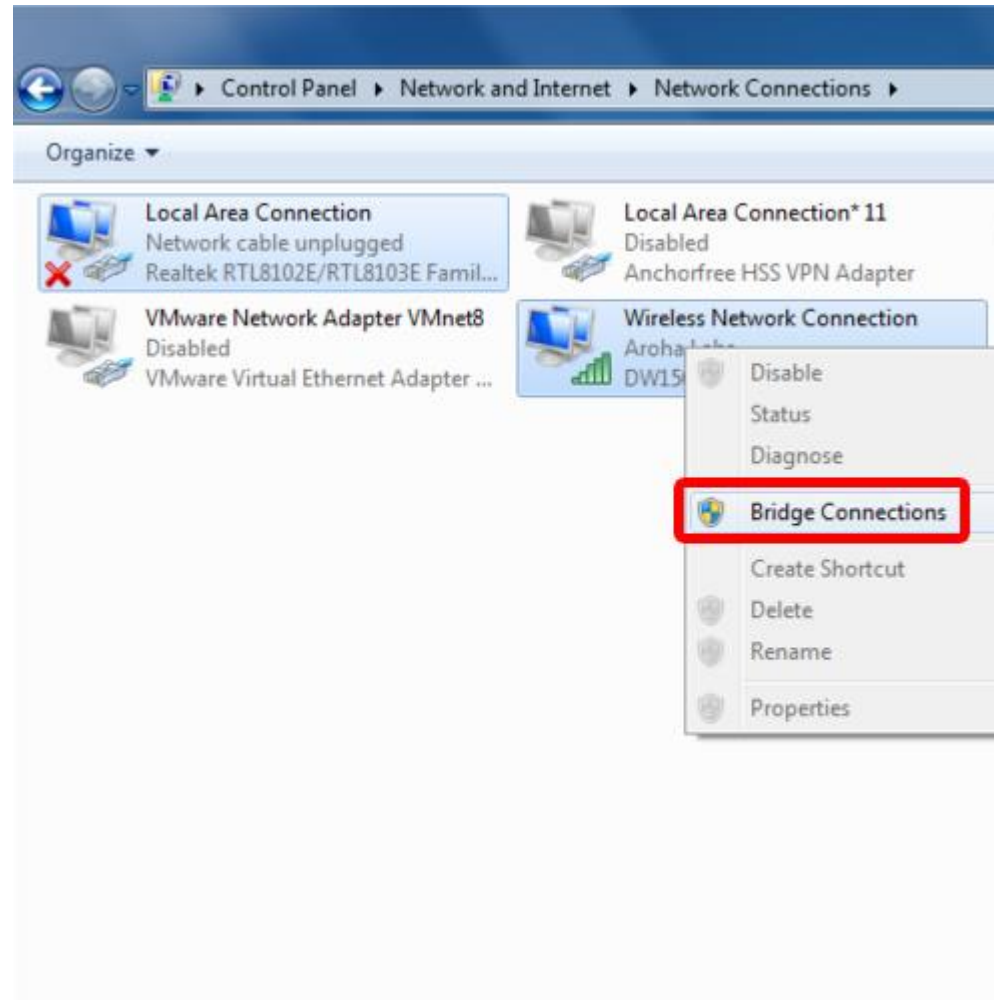
How the COPA-DATA PRP Driver Works



Install PRP Driver for the Two Adapters



Bridge the Network Adapters

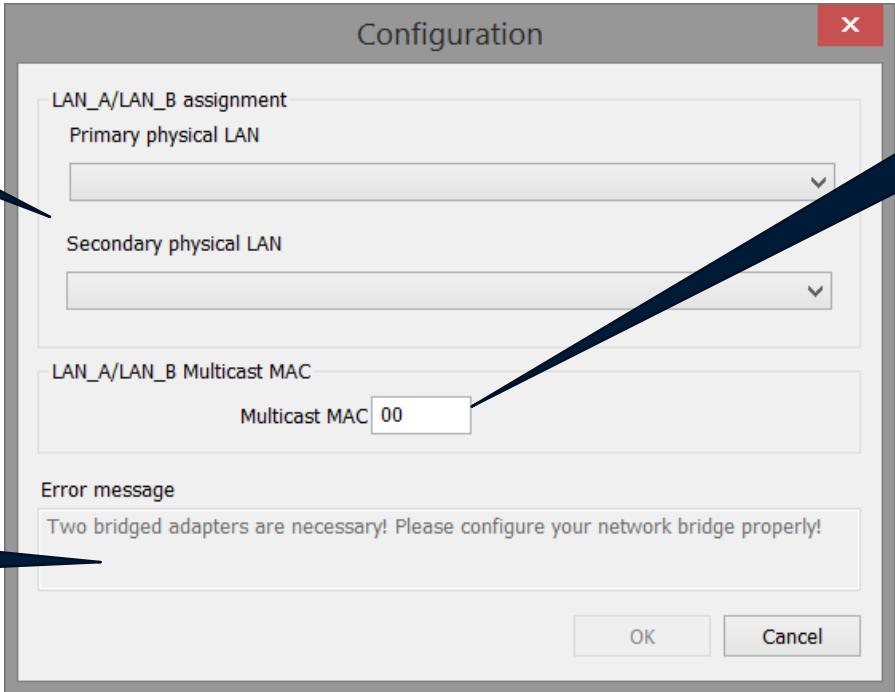


Configure LANs and Multicast MAC

LAN assignment

Multicast MAC Address

Error messages (if any)



The screenshot shows a 'Configuration' dialog box with the following sections:

- LAN_A/LAN_B assignment**
 - Primary physical LAN: A dropdown menu.
 - Secondary physical LAN: A dropdown menu.
- LAN_A/LAN_B Multicast MAC**
 - Multicast MAC: A text input field containing '00'.
- Error message**
 - A text area containing the message: 'Two bridged adapters are necessary! Please configure your network bridge properly!'.

At the bottom of the dialog are 'OK' and 'Cancel' buttons.

See how PRP Works

The image shows a software window titled "PRP Configuration and Diagnostics". It contains a "Statistics" section with the following fields:

- Send count:** A text box containing the message "Das System kann die angegebene Datei nicht find". A callout points to this field with the text "Sent Ethernet frames".
- Receive count:** A text box. A callout points to this field with the text "Received Ethernet frames".
- Error count:** A text box.
- Mismatch count:** A text box. A callout points to this field with the text "If frames do not match".
- Link status:** A text box.

Below the statistics section, there are two columns labeled "LAN_A" and "LAN_B", each containing four empty text boxes corresponding to the "Receive count", "Error count", "Mismatch count", and "Link status" labels.

At the bottom of the window, there are two buttons: "Configuration" and "Exit".

Callouts on the left side of the window provide additional context:

- A callout points to the "Send count" field with the text "Sent Ethernet frames".
- A callout points to the "Error count" field with the text "Faulty Ethernet frames".
- A callout points to the "Link status" field with the text "Active: PRP works" and "Inactive: Receiving no PRP supervision frames".

Development System (Editor)

Graphic Editor

The screenshot displays the zenon Energy Edition software interface for a project named "EE_PRO_SUBSTATION". The interface is divided into several panes:

- Project Manager:** A tree view on the left showing the project structure, including "Variables", "Drivers", "Data Types", "Reaction Matrix", "Allocations", "Alarm", "Measuring Units", "Screens", "Frames", "Font Lists", "Styles", "Color Palettes", "Symbol Library", "Functions", "Language File", "Historian", "Recipes", "Batch Control", "Time Control", "zenon Logic (IEC 61131-3)", "Production & Facility Scheduler", "Programming Interfaces", "Interlockings", "Command Processing", "Load Management", "Message Control", "Menus", "Report Generator", "User Administration", "SAP Interface", and "Files".
- Table:** A table in the center-left pane listing variables and their file names. The table has columns for "Status", "Kennung", "Description", and "File name".

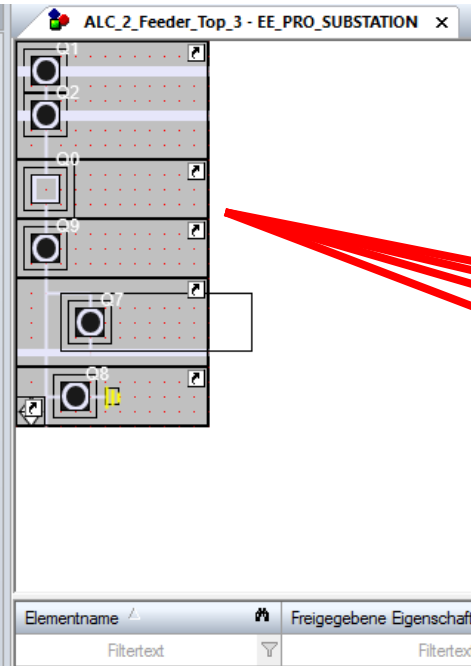
Status	Kennung	Description	File name
	IEC61850		IEC850
	IEC850_zenIED		IEC850
	SNMP Driver		SNMP32
	Treiber für interne Variablen		Intern
	Treiber für Mathematik-Variablen		MATHDR32
	Treiber für System-Variablen		SYSDRV
	zenon Logic: GSE_SUBSCR		STRATONNG
	zenon Logic: Metering		STRATONNG
- Network Topology:** A large diagram on the right showing a complex electrical network with various components like transformers, breakers, and lines. The diagram is labeled with "102", "206", and "208". It includes detailed data for each component, such as "I: 3000.00 A", "U: 3000.00 kV", "P: 3000.00 MW", and "Q: 3000.00 MVar".
- Properties:** A pane at the bottom left showing the properties of the selected element, "IEC850_zenIED". It includes fields for "General", "Identification", "Description", "File name", "Configuration", "Equipment Groups", and "External reference".
- Output Window:** A pane at the bottom right showing the output of the software, including messages about creating runtime files for the project "EE_PRO_SUBSTATION".

The status bar at the bottom indicates "Ready", "Mouse pointer: 1794/753", and "No element active".

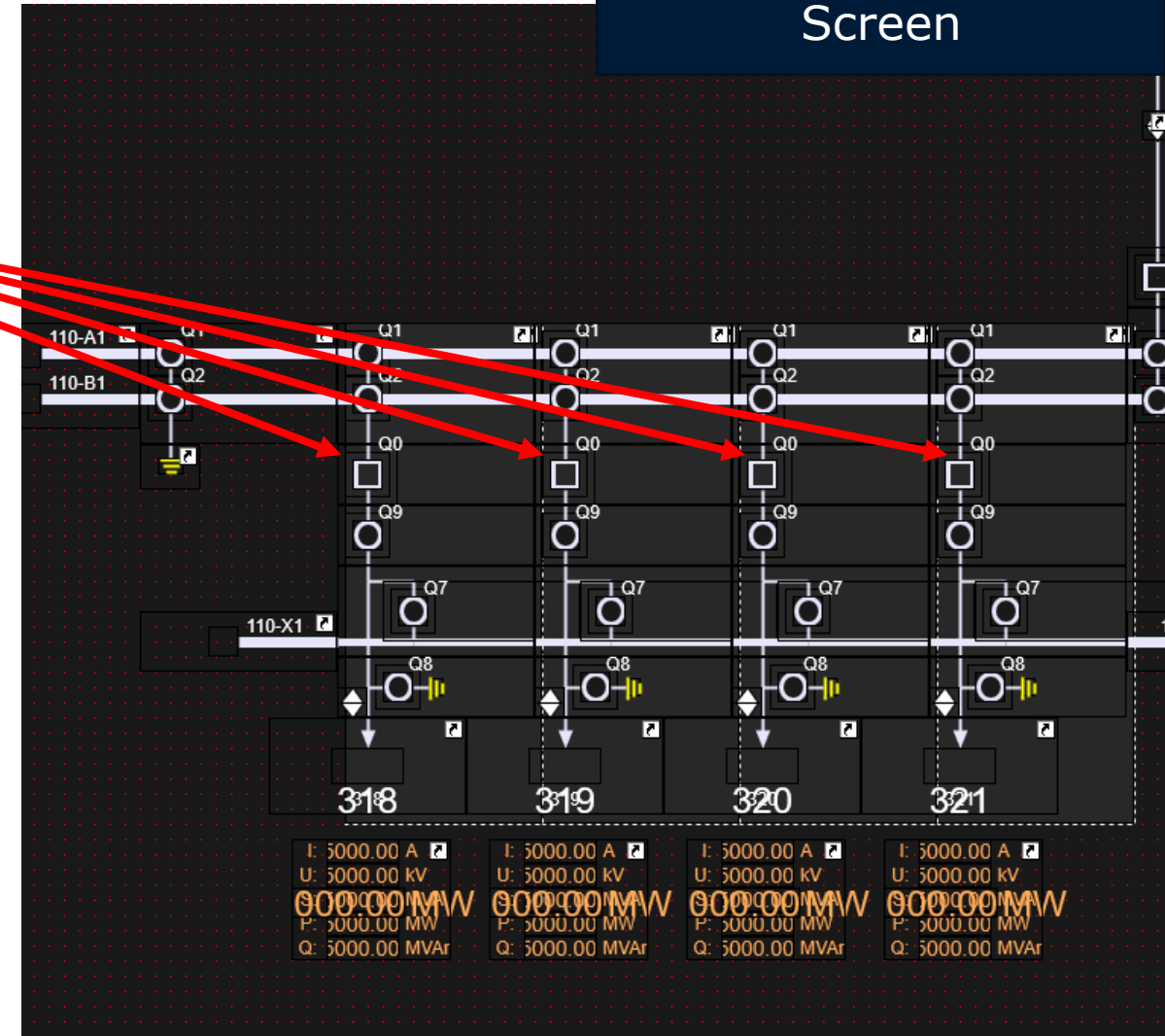
Object Templates

Symbol Library

Elementname	Vorschau	Kategorie
Filtertext	Filtertext	Filtertext
ALC_2_Feeder_Top_2		
ALC_2_Feeder_Top_3		
ALC_2_Terminator_Left		
ALC_2_Terminator_Right		
ALC_3_Feeder_Top		
ALC_3_Feeder_Top_1		
ALC_3_Feeder_Top_1_1		
ALC_3_Terminator_Left		
ALC_3_Terminator_Right		
ALC_CommandSelect		
ALC_CS WI		



Screen

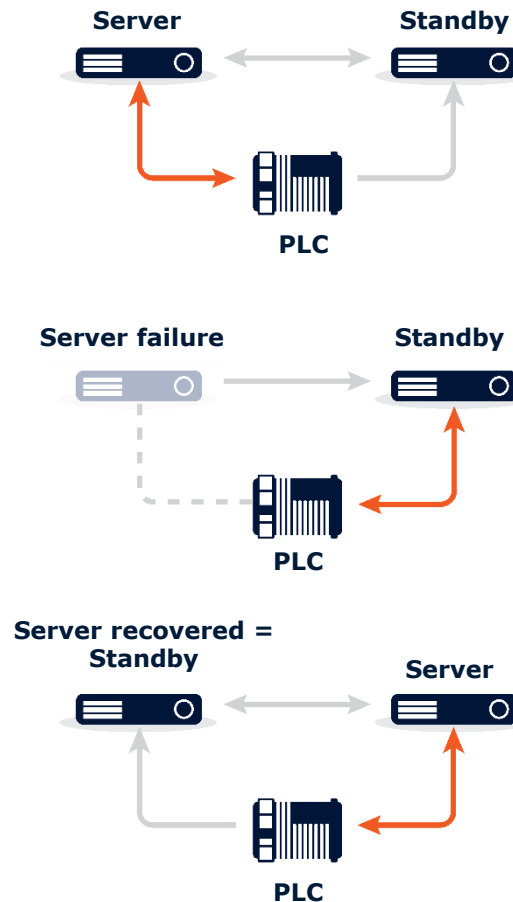


Redundancy

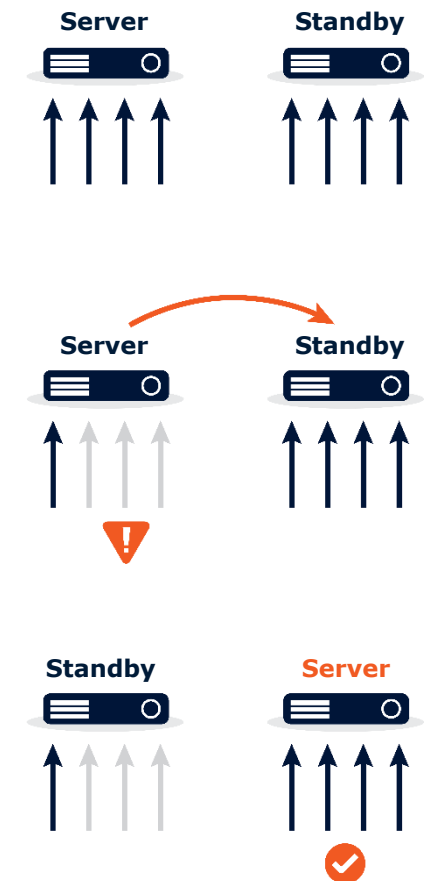
Redundancy – Simple and Effective

- ▶ Maximum data consistency
- ▶ Robust and secure
- ▶ Seamless redundancy, out-of-the-box
- ▶ Minimized sources of error and risk

SEAMLESS REDUNDANCY

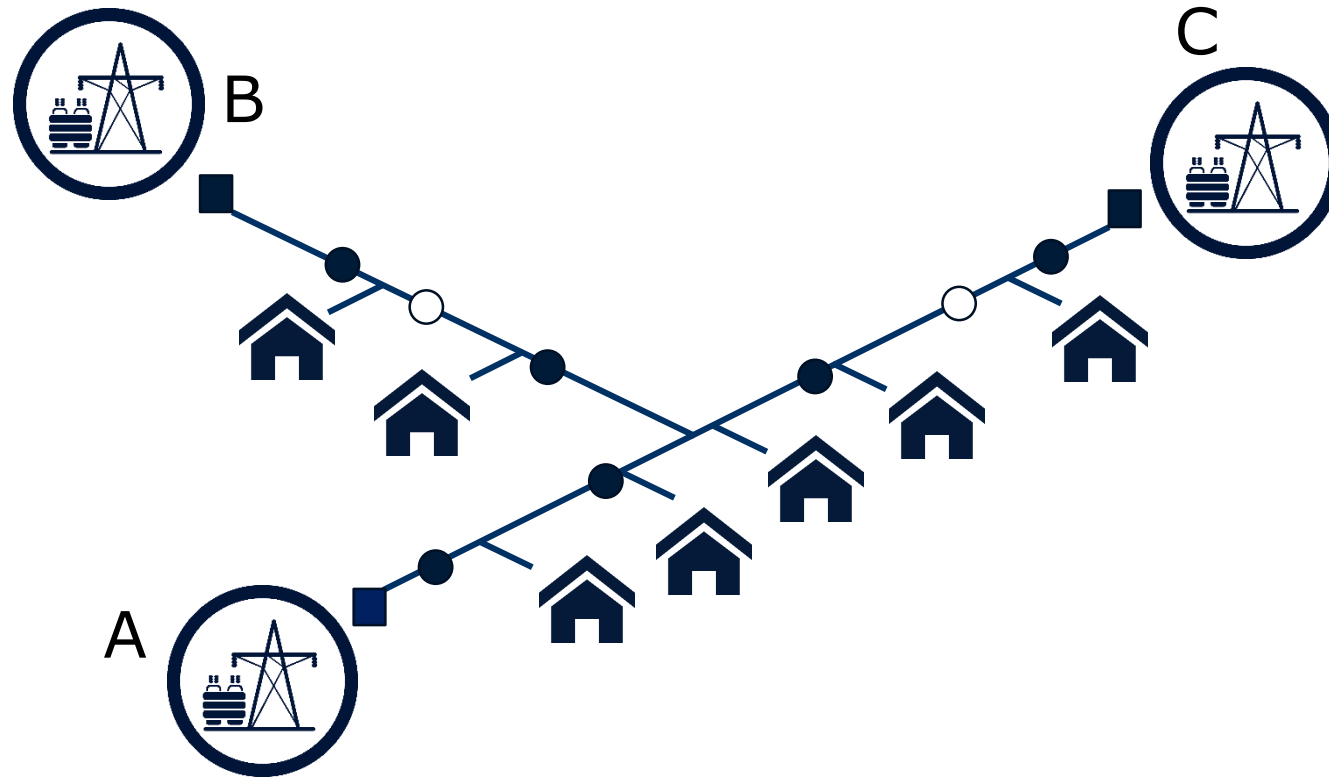


RATED REDUNDANCY

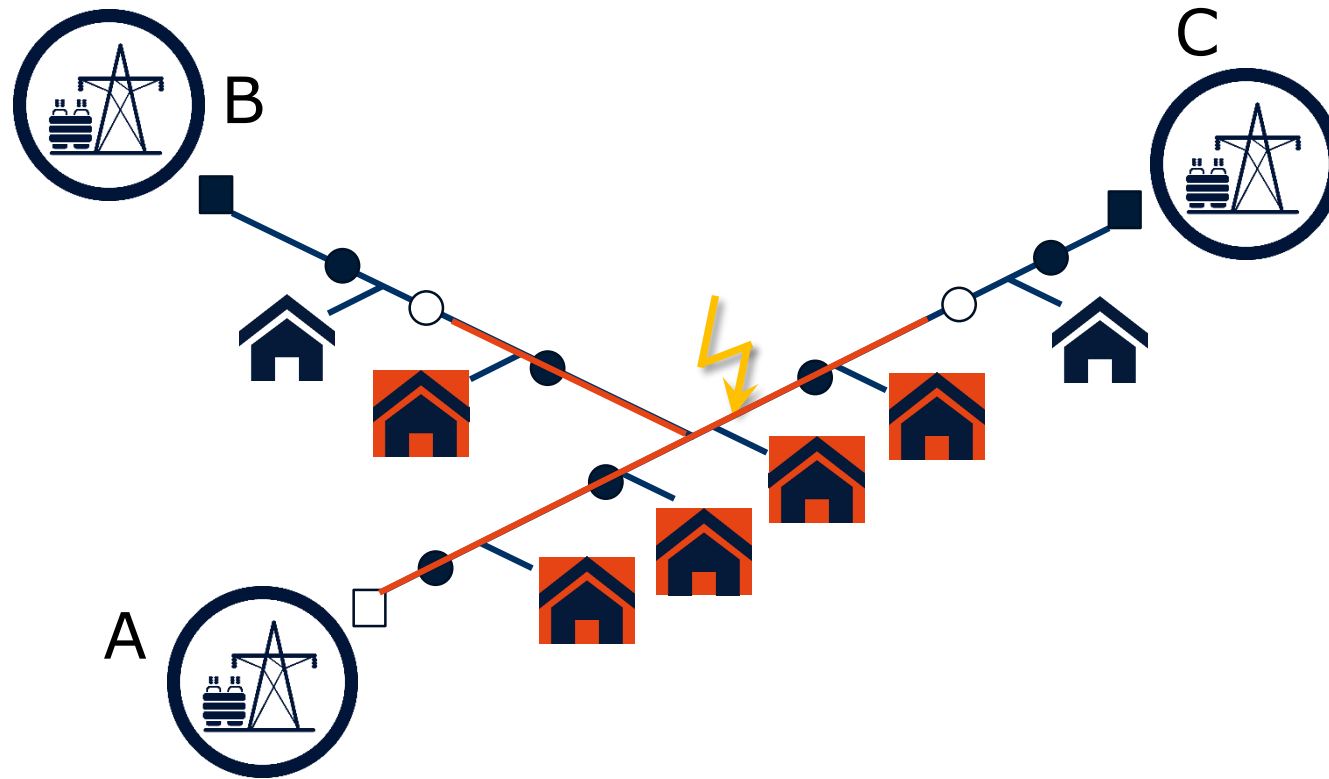


Impedance based Fault Location

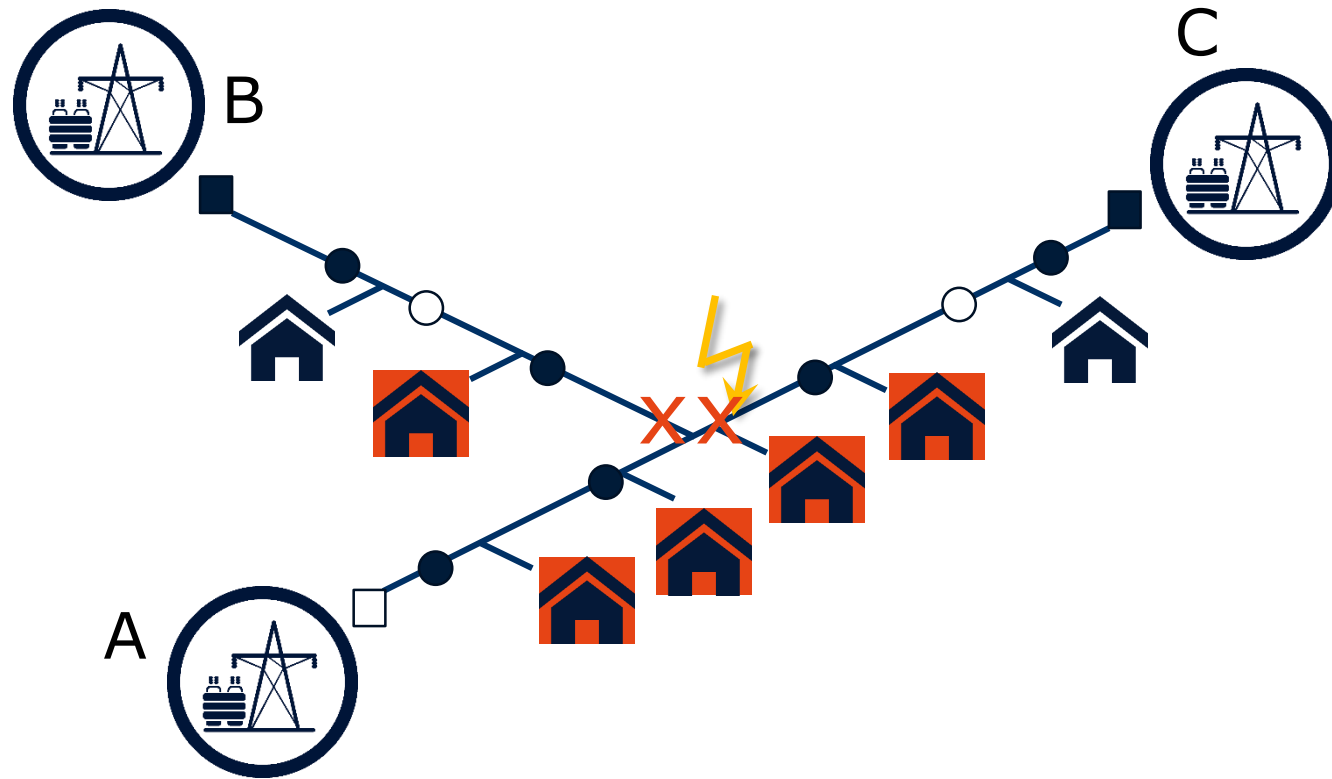
Fault location: Detection



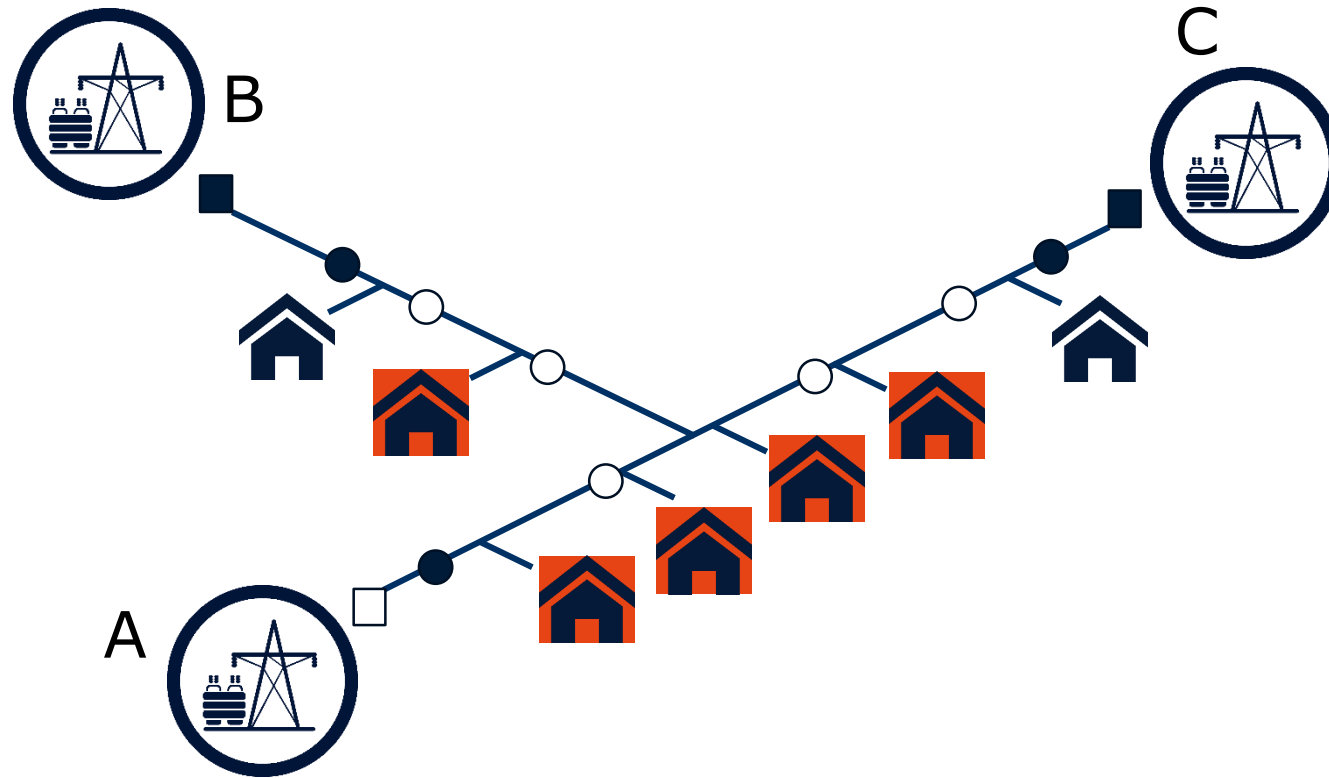
Fault location: Detection



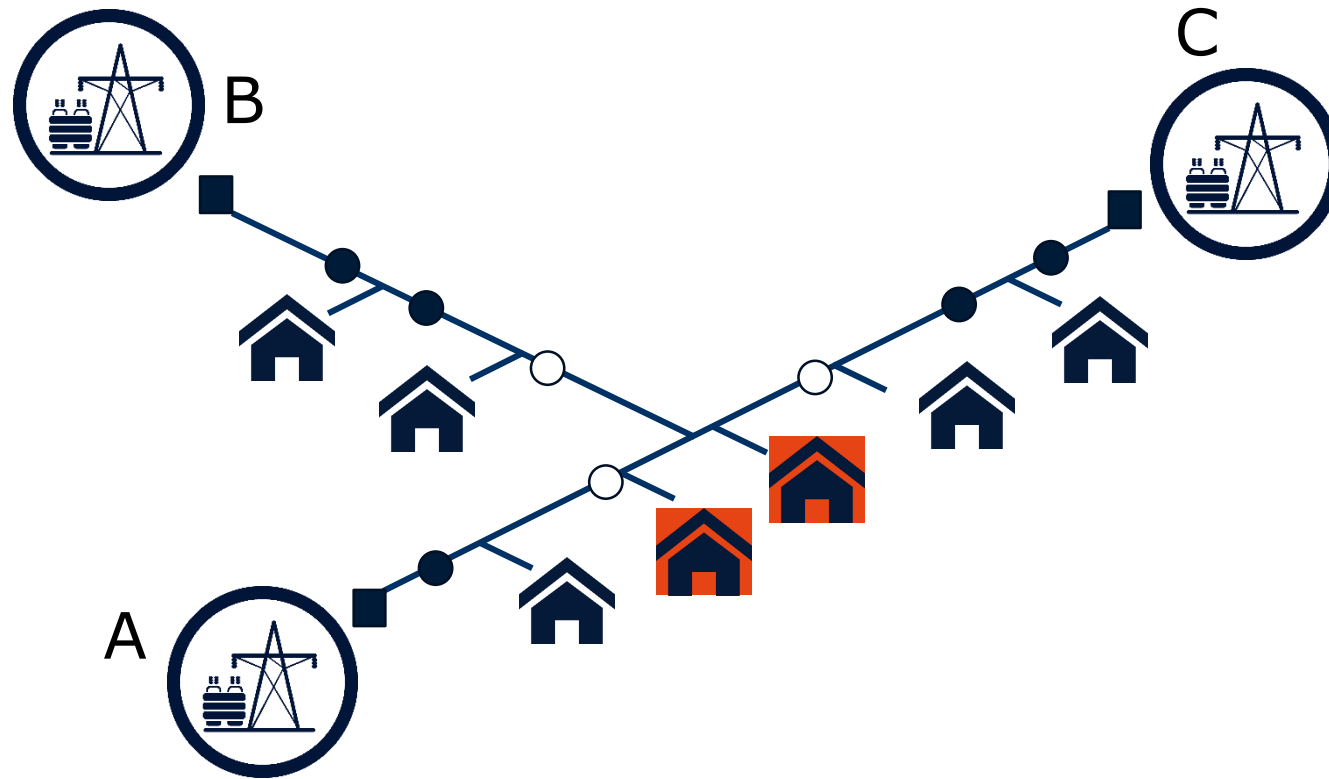
Fault location: Location



Fault location: Isolation



Fault location: Restoration



Fault location

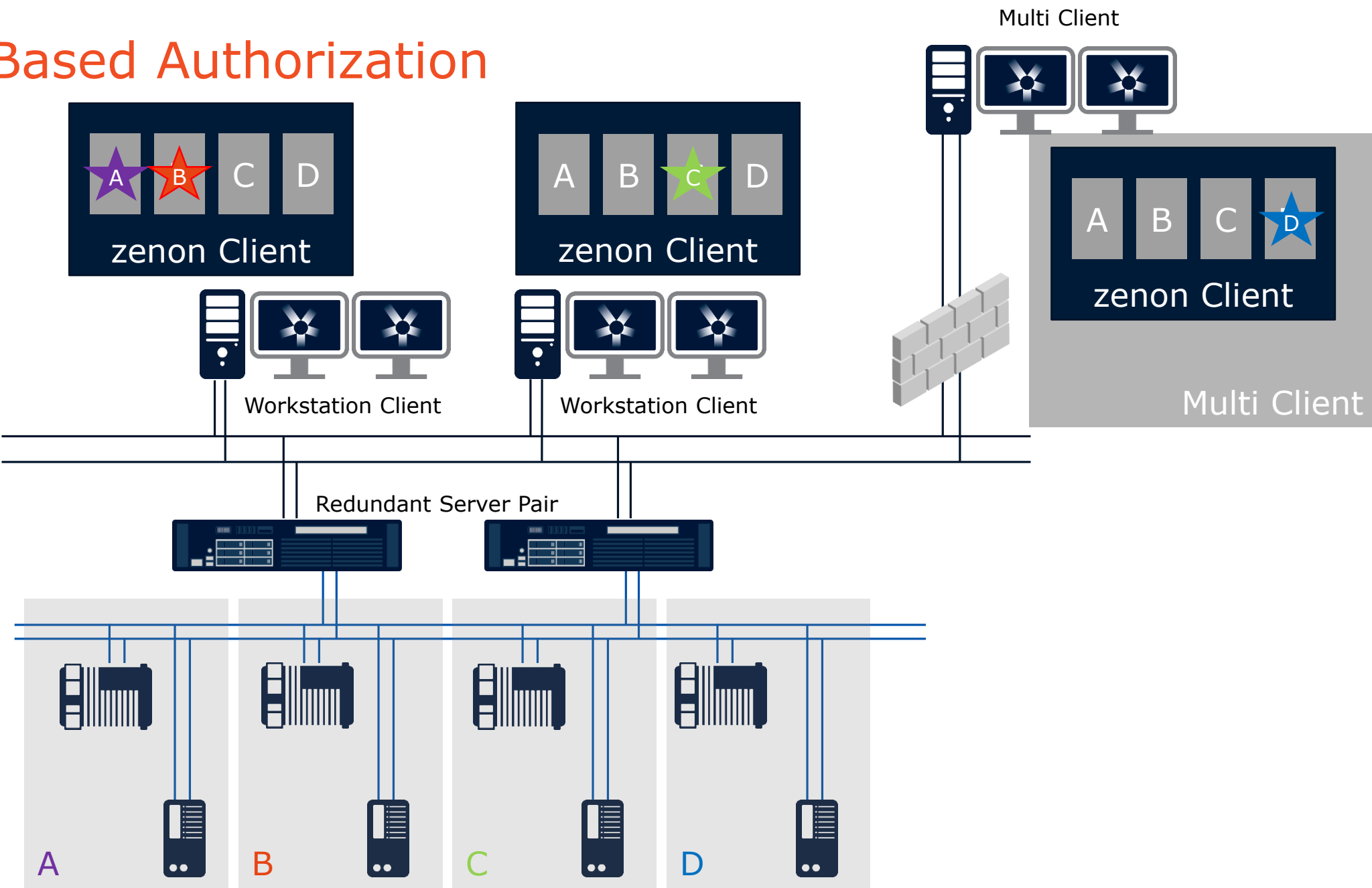


Fault location

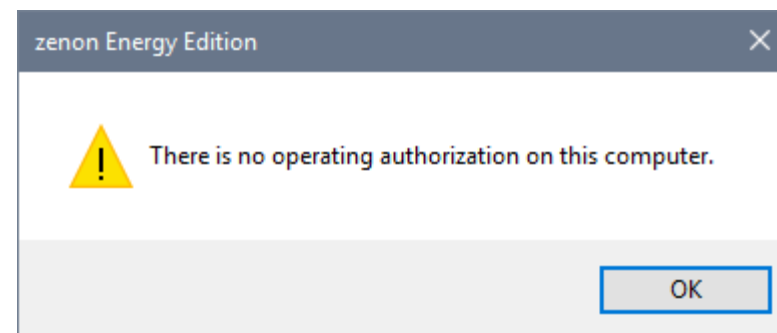
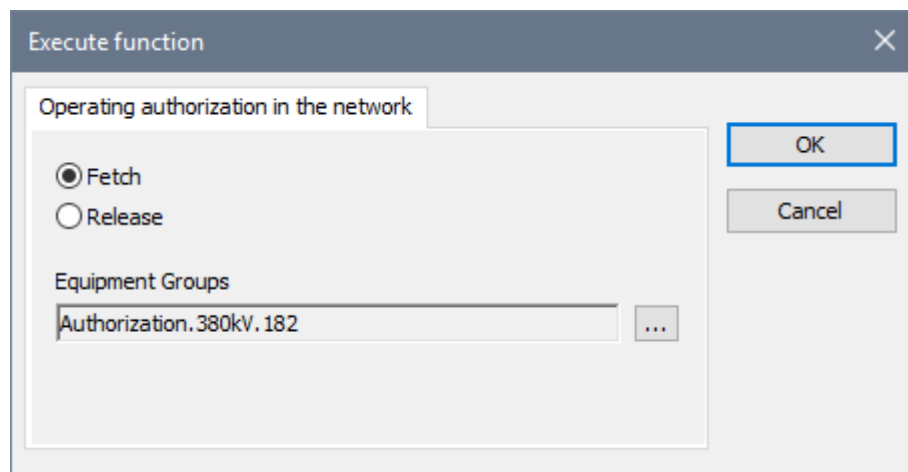
- ▶ Part of the Topology Package (DMS Package)
- ▶ Only star or ring topologies

Authorization

Model Based Authorization



Fetch and Release



Off Normal

Off-Normal (NORM/ABNORM)

	Current status	Normal status	Status flags	Indication
	Closed (1)	Closed (1)	SPONT, NORM	OK
	Open (0)	Closed (1)	SPONT, NORM, N_NORM	Not OK
	Closed (1)	Open (0)	SPONT, N_NORM	Not OK
	Open (0)	Open (0)	SPONT	OK

NORM is representing the value of the Normal switch status
 If Normal status is 0 (Open) then NORM=0 (invisible)
 If Normal status is 1 (Closed) then NORM=1 (visible)

Off Normal

► Normal Status can be set in Editor and in Runtime

► Runtime:

- Command Processing
- Recipe Group Manager

Default condition
☒ Active Normal value: OFF ▼

Switch	Summer Profile	Winter Profile
Switch A	1	0
Switch B	1	0
Switch C	0	1
Switch D	0	1



COPADATA