



Carl Öhlén



A modular and future proof IED concept

Rio de Janeiro
April 23-25, 2006



A global activity



- Global Center HV SA Products
 - Västerås, Sweden (IEDs & Cx)
 - Vaasa, Finland (MicroSCADA)
 - Mannheim, Germany (RTU)
- Global Center MV SA Products
 - Vasa, Finland (DA)
- Global Center SA System
 - Baden Switzerland
- Local centers
 - Allentown, U.S. (ANSI)
 - Coral Springs, U.S. (EM)
 - India, China, Russia (LP)
 - Local Engineering Centers
- Local Sales, Service & Support



A modular & future proof IED concept

- Why do we need protection and control
- Introducing the ABB application of IEC 61850
- Advantages for an open and modular concept
 - **Reliable** - Improving the grid reliability
 - **Efficient** - More than just a relay
 - **Flexible** - Exactly what you need
 - **User friendly** - Easy to select, set, install and use
 - **Informative** - Designed to communicate
 - **Forever young** - Futurproof migration



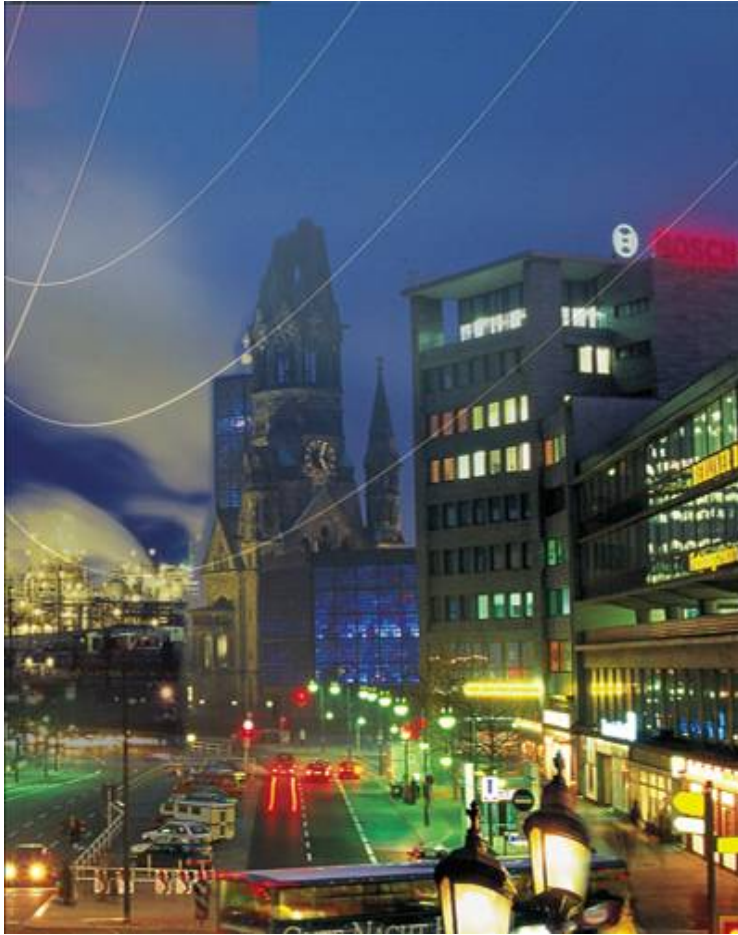
Imagine a world
without electricity

Hot summer blackouts 2003...2004...

...continued in 2005



Why do we need reliable protection & control?

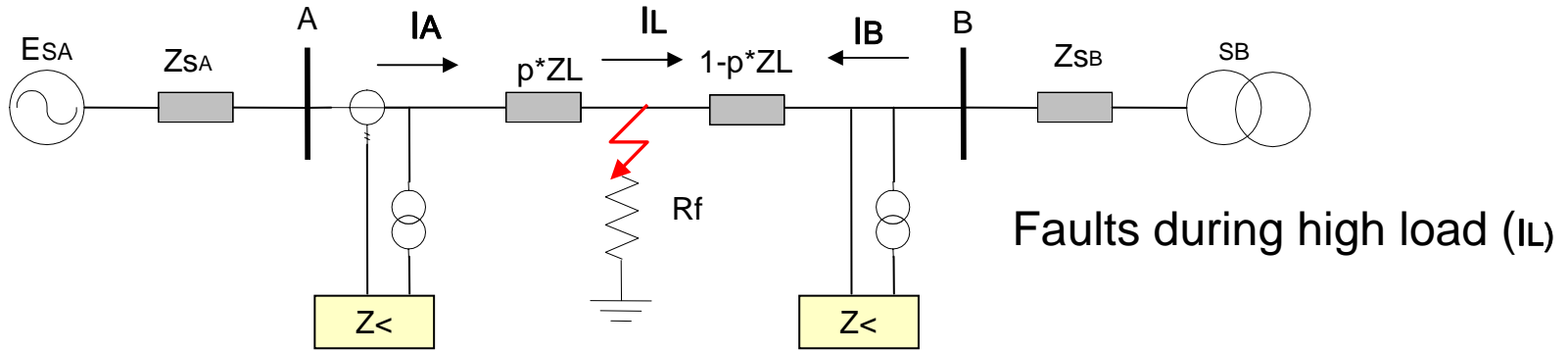


- To rapidly detect and clear all faults with minimum effect to the grid operation
- To inform about all abnormal operating conditions and initiate necessary actions
- To rapidly facilitate the automatic and/or manual restoration to normal operation
- To provide overview, information and control for efficient operation, maintenance & asset management

To detect all types of faults

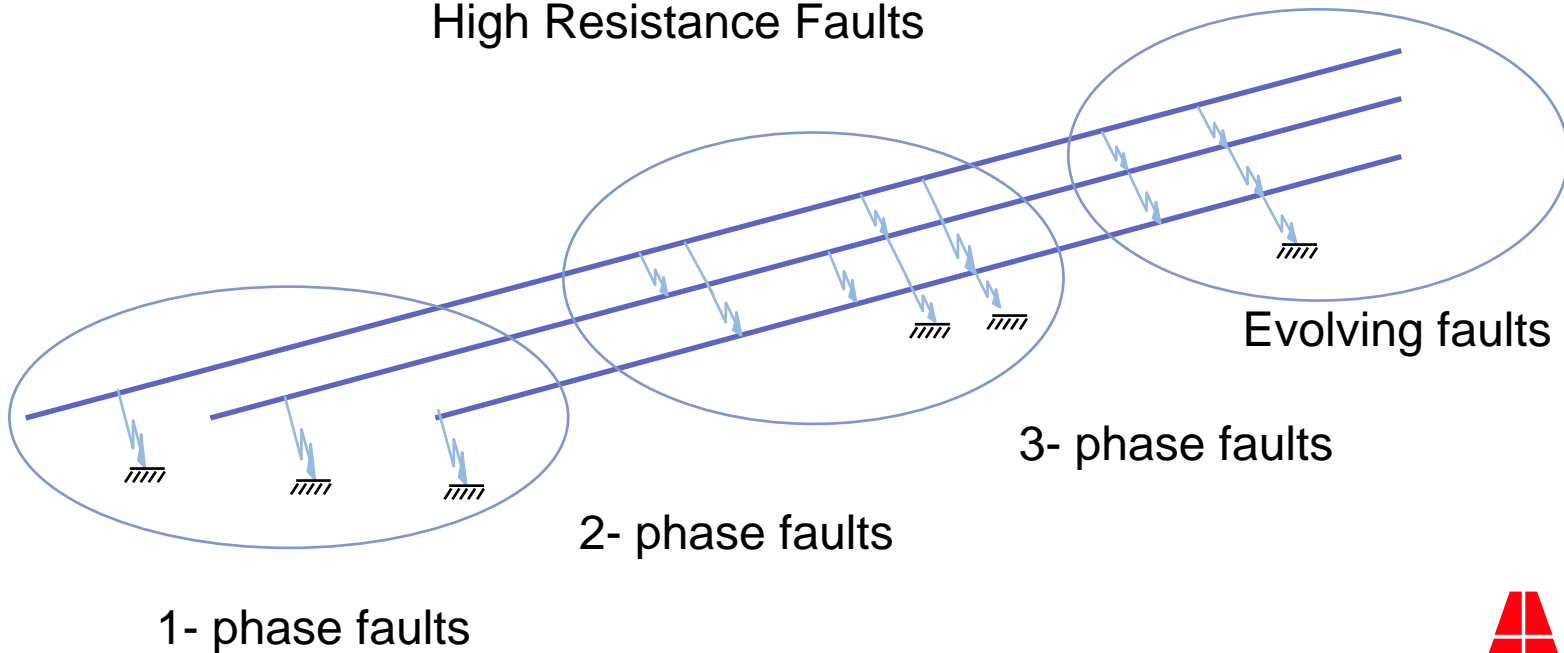
High Current & Faults with large DC component

Weak End Infeed Faults



Faults during high load (I_L)

High Resistance Faults



1- phase faults

2- phase faults

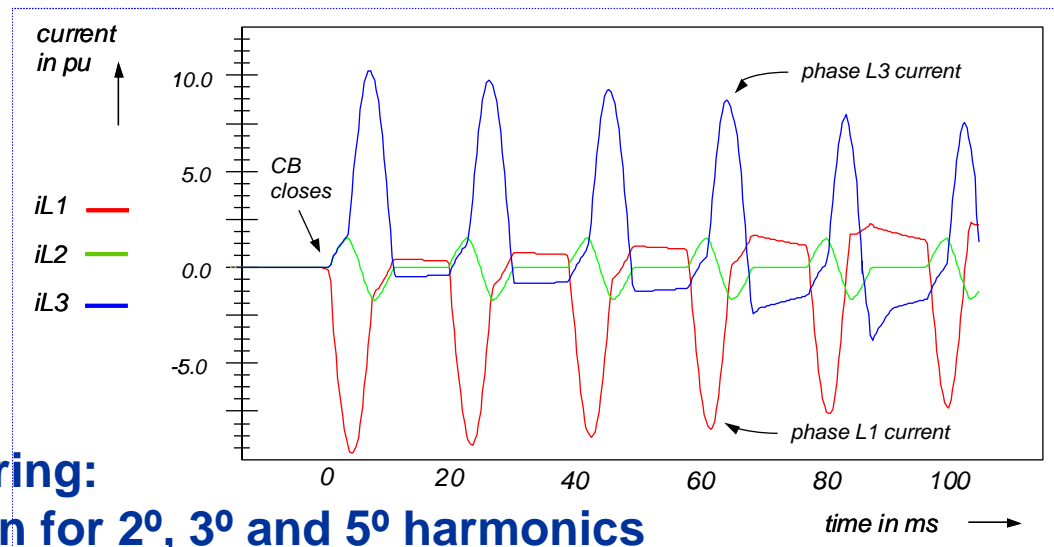
3- phase faults

Evolving faults



To operate correctly independent of transients

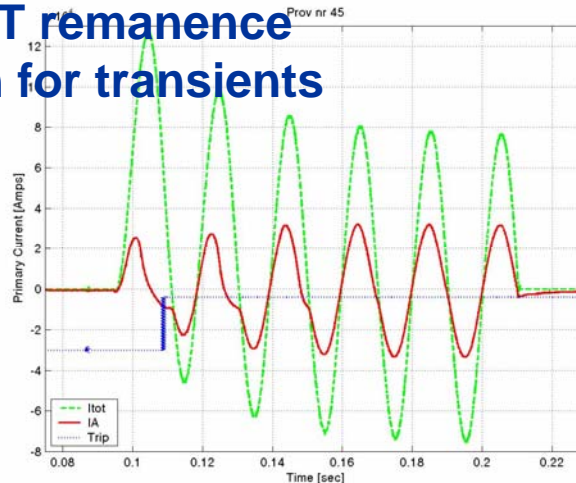
Primary Transients
e.g. Transformer Inrush
current and Power Swings



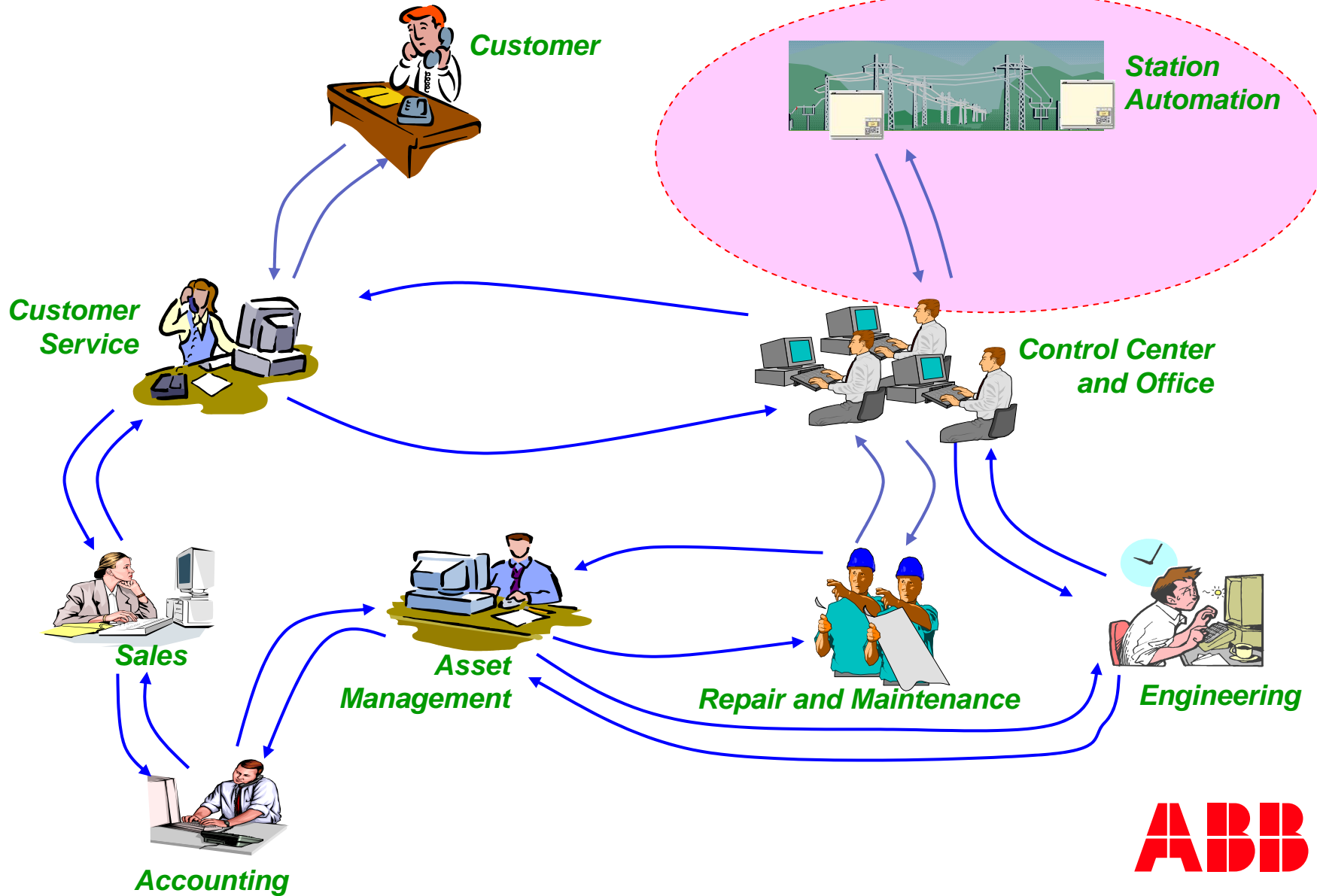
Advanced filtering:

- Compensation for 2^o, 3^o and 5^o harmonics
- Detection of CT saturation
- Detection of CT remanence
- Compensation for transients

Secondary Transients
e.g. CT saturation and
CVT transients



Correct information to act correctly



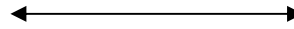
But why do we need so many protocols?

IEC61970 (CIM)

IEC60870-6 (TASE2)



Control Center



Control Center

SCADA

IEC60870-5-101

IEC60870-5-104

Metering & Billing

IEC61107

IEC62056

IEC60870-5-102

YYY

IEC 61850

Windfarms

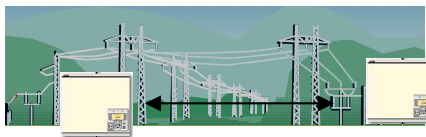
IEC51400-25

= IEC 61850

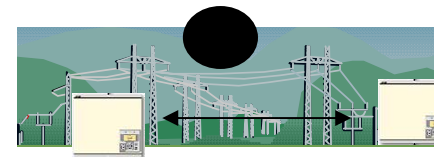
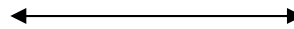
IEC G703

IEEE C37.94

WWW



Station Automation



Station Automation

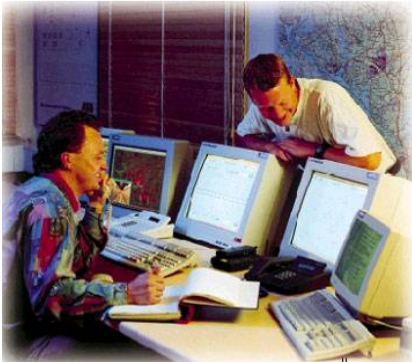
IEC 61850



What? Where? When? Who? Which?- then How?

Information and control access

Control Center
(On line)



Office

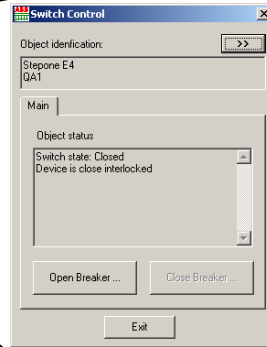
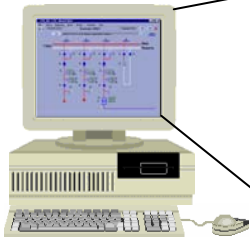
Home

Anywhere

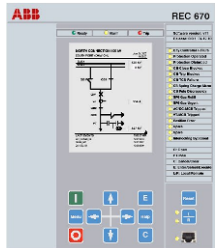
(On request)



Station HSI



IED HMI

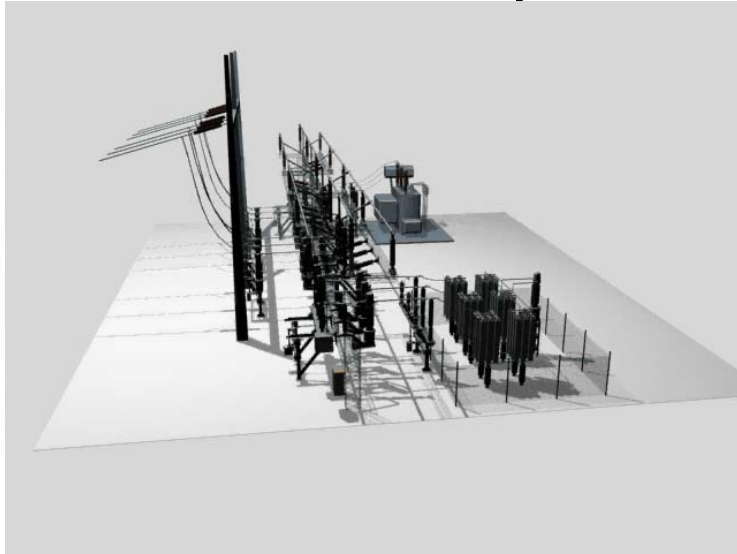


Substation
(Automatic)



Protect your assets and personnel & ensure reliable power supply

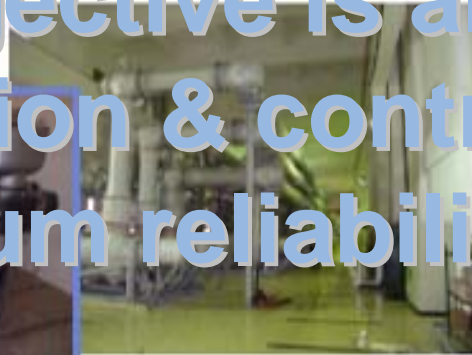
AIS industrial and utility substations



High Voltage Power Systems



The objective is always protection & control with maximum reliability & availability



GIS industrial and utility substations



A modular & future proof IED concept

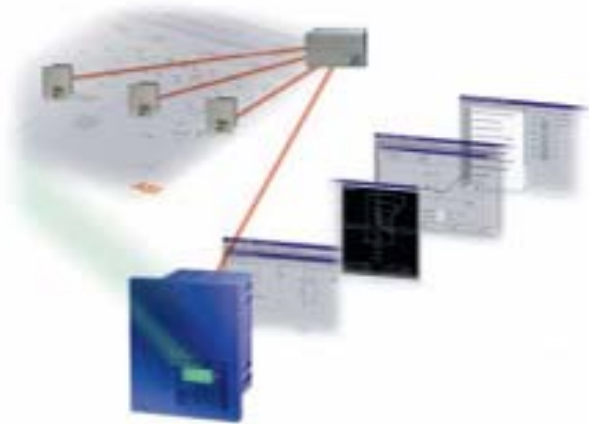
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The next step in technology for ABB



- Products for protection, monitoring and control of distribution and transmission networks & electrical processes in industries and power plants
 - Today's protection and control products are an evolution from more than 100 years of experience of relays and more than 20 years experience of numerical protection, digital communication & substation automation
 - ABB has delivered more than 10 millions relays and 500 000 IEDs to more than 100 countries on all continents
- We now introduce a unique and open concept based on the new standard = IEC 61850
- **IED 670, PCM 600 e MicroSCADA Pro**



IED = Intelligent Electronic Device



The next step in our IED evolution



- 100 – series
- 200 – series
- 300 – series
- 500 – series
- + Further enhanced algorithms
- + Further increased functionality
- + Further improved tools
- + New user friendly HMI
- + Full IEC 61850 implementation
- = Introducing IED 670

ONE powerful and open IED
for ALL transmission applications



One Future proof IED for ALL applications



A major leap in Substation Automation



IED = Intelligent Electronic Device
IED 670 for ALL protection and control of
transmission applications

REL670 = Lines and cables
RET670 = Transformers and Multiple objects
RED670 = Multi terminal networks
REC670 = Control for one or several bays
REB670 = Bus & Breaker
PCM 600 = Configuration & Monitoring
MicroSCADA Pro, Gateway & RTU

ABB introduce the first open concept
for protection and control of transmission
applications designed for the new
IEC 61850 standard



Introducing IEC 61850 for protection and control

Interoperability



The ability for IED's from one or several manufacturers to exchange information and use the information for their own functions

Free configuration



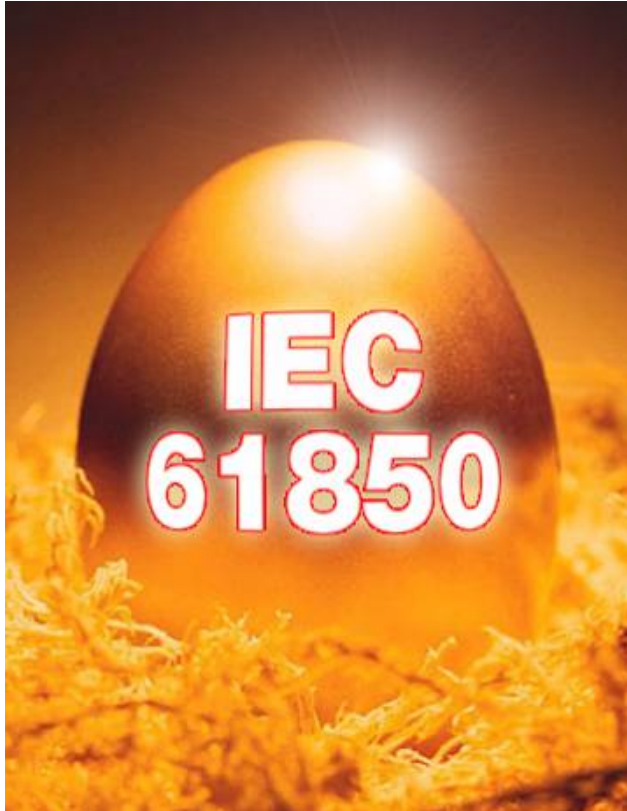
The standard shall support different architecture and allow a free allocation of functions. E.g. it must work equally well for centralized or decentralized systems.

Long term stability



The standard shall be future proof, i.e. it must be able to follow the progress in communication technology as well as evolving system requirements

What is 61850 Open Communication?



Basics:

- Ethernet 100 MBps
- Station Bus 61850 8-1
- Process Bus 61850 9-2
- Bay-to-bay communication (Goose)
- Common Object Modeling (logical nodes) and Configuration Language (SCL)

Much more than a protocol:

- Modularization and structuring of data
- Standardized Logical Nodes
- Allocation of functions to any IED
- Structured engineering & services

A reliable, simple and fast way
to build YOUR future proof
Substation Automation



"Combining the best properties in a new way..."

ABB's Experience and Status

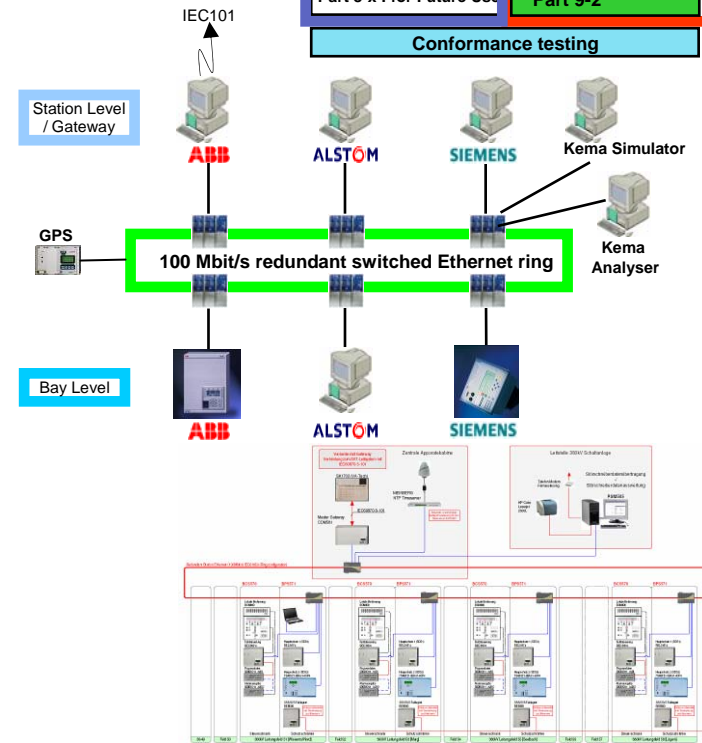
- > 20 years experience of EMS, SCADA, SA and DA solutions
 - ABB is global leader in automation
 - First Ethernet SA system & SPA 1984
 - First LON SA system 1994

- Driving force in standardization committees
 - 13 permanent members in TC57 !

- Extensive interoperability testing with Areva, Siemens and Omicron

- IEC61850 References
 - First High Voltage IEC61850 multi-vendor installation in service
 - > 50 stations on order
 - > 200 project proposals

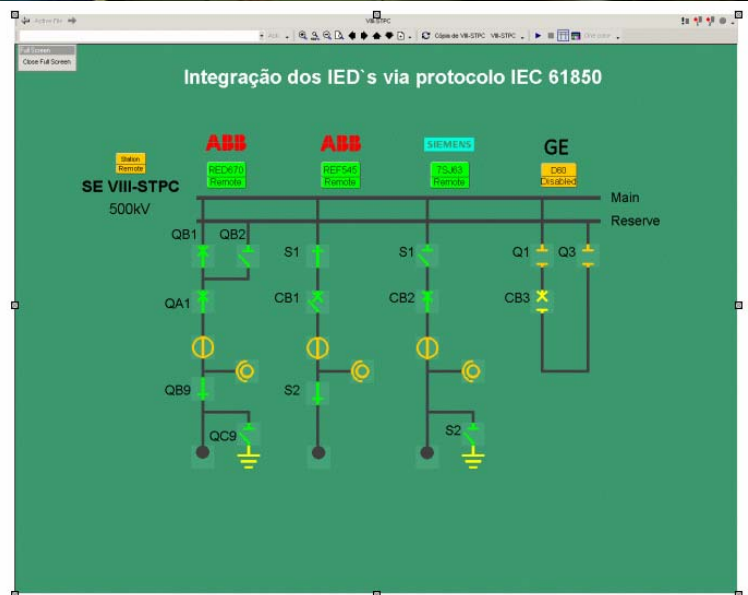
| | |
|--|------------------|
| Introduction and overview | Part 1 |
| Glossary | Part 2 |
| General requirements | Part 3 |
| System and Project management | Part 4 |
| Communication requirements | Part 5 |
| Communication model | Parts 7-1 to 7-4 |
| Substation Configuration Language (SCL) | Part 6 |
| Part 8-1 : Mapping for MMS-TCP/IP-Ethernet | Part 9-1 |
| Part 8-x : for Future Use | Part 9-2 |
| Conformance testing | Part 10 |



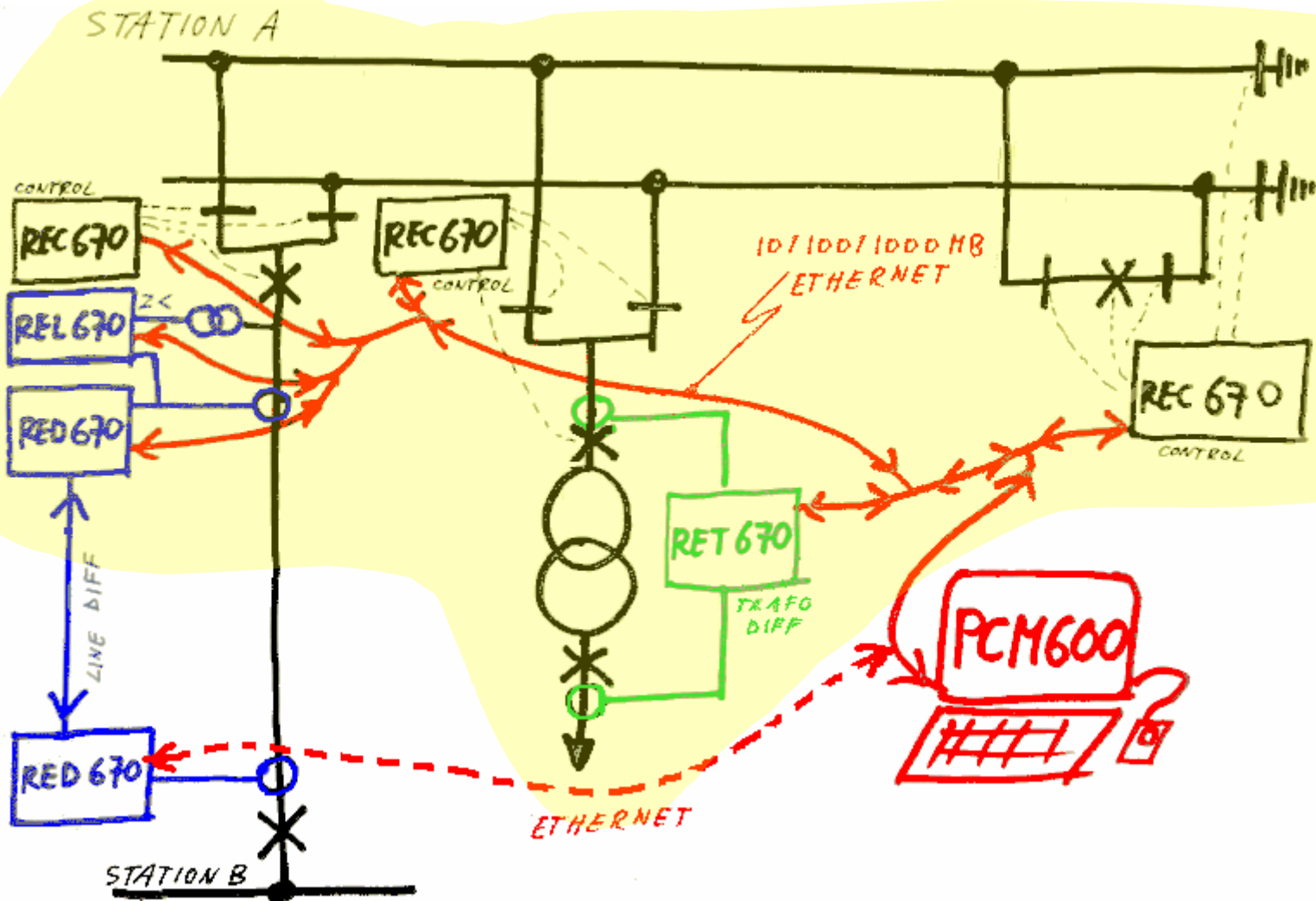
380kV Laufenburg



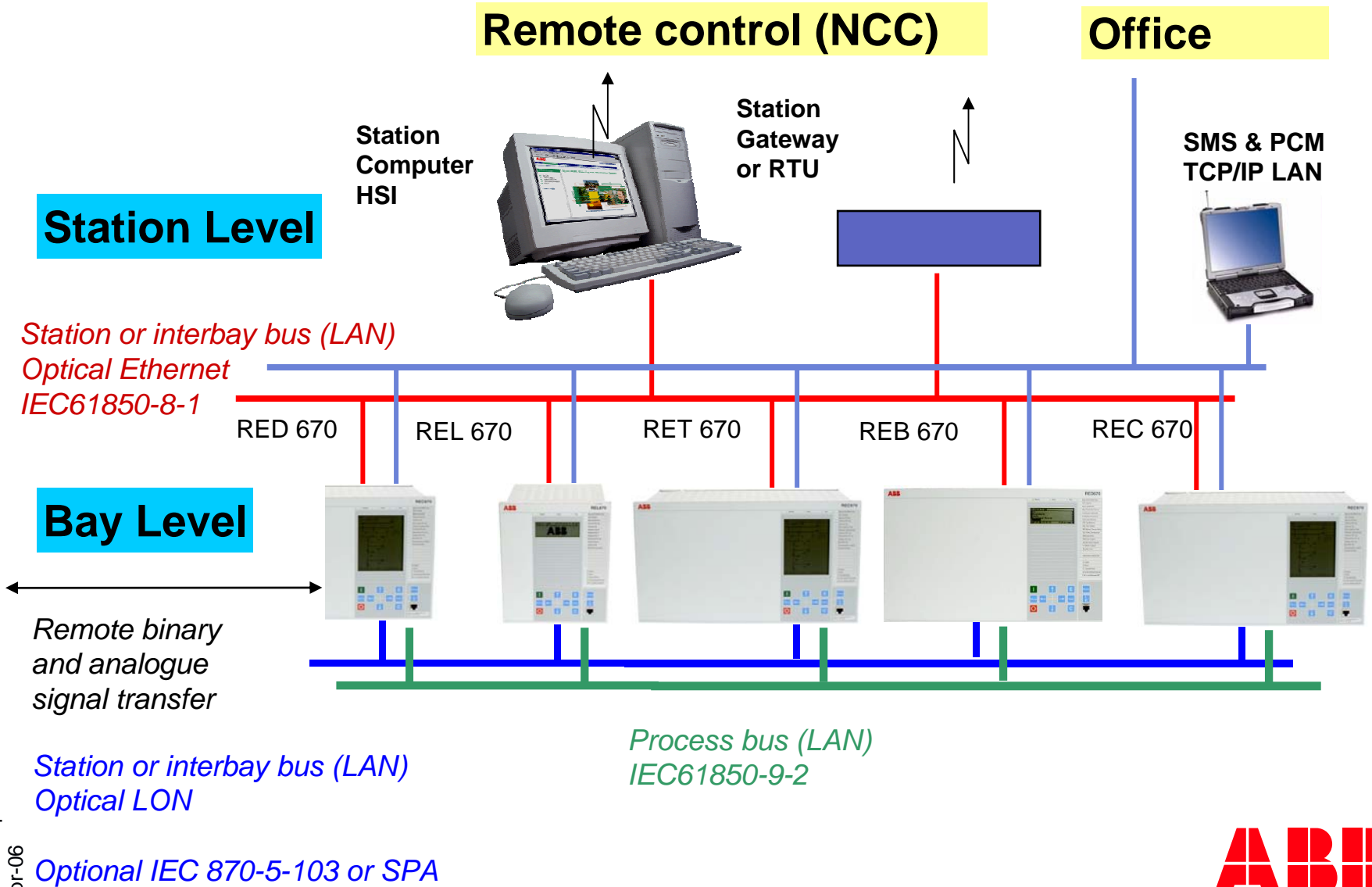
Interoperability demo (June 2005 Brazil)



Now are we ready

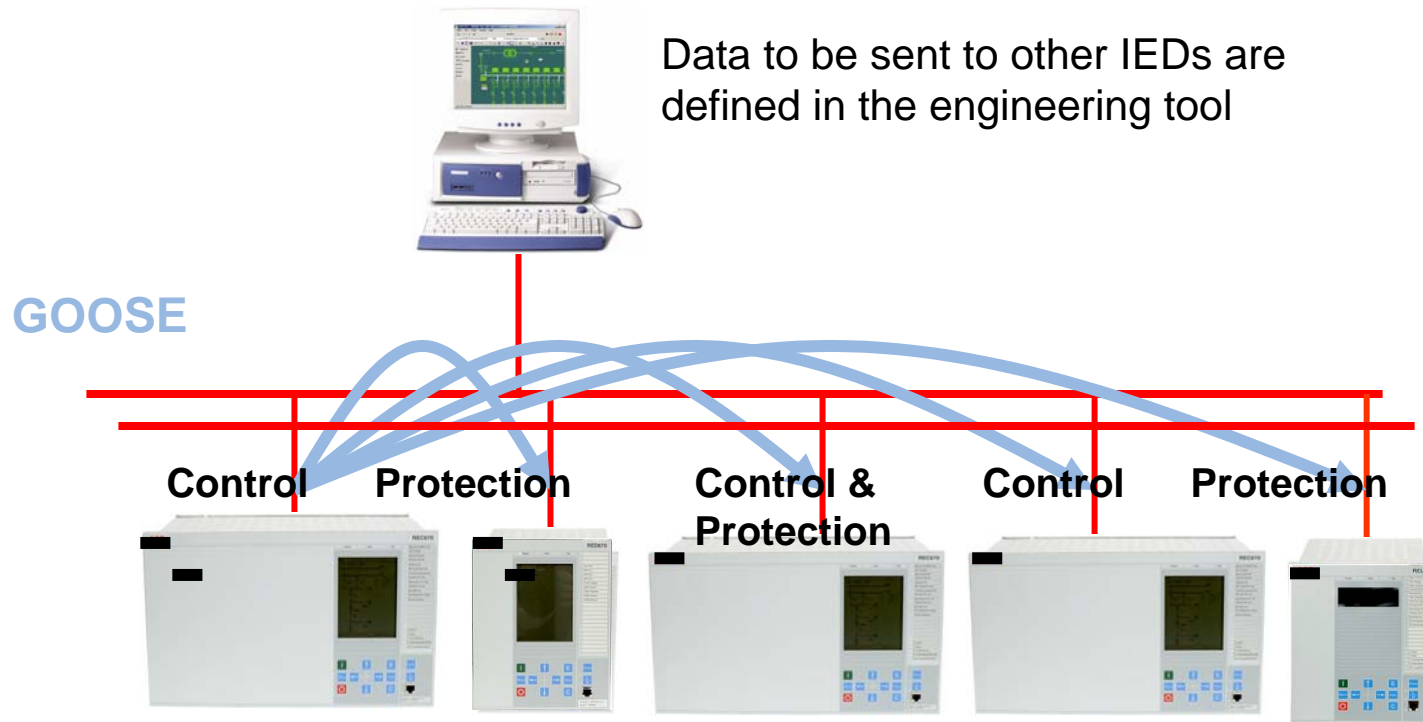


Substation Automation designed for IEC 61850



GOOSE - Horizontal communication for ALL IEDs

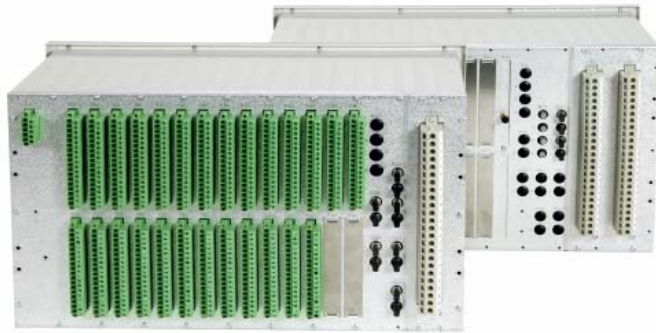
GOOSE = Generic Object Oriented System-wide Events



- Peer to peer communication
- An IED sends information by multicasting
- Only IEDs which are defined to listen (subscribers) receive this message



Modular I/O in different “boxes” and HMI



1/1 Case

Option 1:

- 1TRM = 12 AI
- ≤ 14 I/O modules

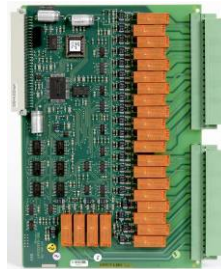
Option 2:

- 2TRM = 24 AI
- ≤ 11 I/O modules

BIM (max 11/14)



BOM (max 4)



16 binary inputs

IOM (max 6)



24 binary outputs

MIM (max 4)



6 Transducer inputs,
setting range ± 20 mA

12 binary outputs
and 8 binary inputs



The same I/O modules as in the REx5xx series



Hardware independent function library

| | | |
|----------------|-------------|---------------|
| PDIS 21 | PDIF HZ | PDIF REF |
| PDIF 87B | PDIF 87L | PDIF 87T |
| PIOC 50 | PIOC 50N | POCM 51/67 |
| PEFM 51/67N | PGPF | PUVM 27 |
| POVM 59 | PTOF 81 | PTUF 81 |
| PVPH 24 | PTTR 49 | PSCH |
| RSYN 25 | RREC 79 | RBRF 50BF |
| CSWI | MMTR | MMXU |

| | | | |
|---------|---------|---|---------------------------------|
| B24PDIF | 87B | Bus differential protection | 24 bays |
| L6CPDIF | 87L | Line differential protection | 6 x 3 inputs |
| T3WPDIF | 87T | Transformer differential protection | 3 x 2 x 3 inputs |
| REFPDIF | 87N | Low impedance differential protection | |
| HZ PDIF | 87 | High impedance differential protection | |
| ZMQPDIS | 21 | Distance protection | 5 or 2 x 2 zones Full scheme |
| PH4POCM | 51/67 | Overcurrent protection | 4 steps x 6 |
| EF4PEFM | 51N/67N | Overcurrent protection | 4 steps x 6 |
| POVM | 27/59 | Overvoltage protection | |
| PTUF | 81 | Under frequency protection | |
| PTOF | 81 | Over frequency protection | |
| PVPH | 24 | Over excitation protection | |
| LPTTR | 26 | Overload protection | |
| PGPF | XXX | Programmable general current/voltage function | Customized |
| CRBRF | 50BF | Breaker failure protection | |
| RSYN | 25 | Synchro check | |
| RREC | 79 | Auto reclosing | |
| CSWI | | Control | 6 bays / 30 objects |
| RFLO | | Fault locator | |
| RADR | | Disturbance reporting | 100 x 40 |
| MMXU | | Measurement | |
| MMTR | | Pulse counter | |

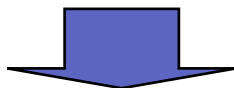
This is an example of functions included in the library. For full details please consult the buyer's guide.



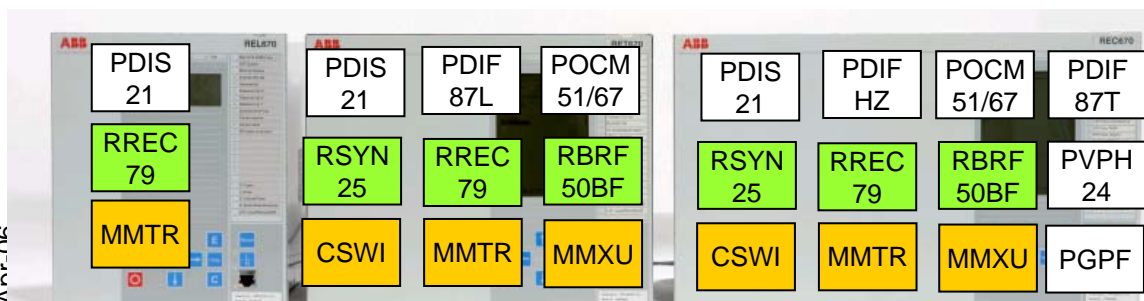
Flexible allocation of functions to any IED

| | | |
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| PDIF 87B | PDIF 87L | PDIF 87T |
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| | | | |
|---------|---------|---|---------------------------------|
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| L6CPDIF | 87L | Line differential protection | 6 x 3 inputs |
| T3WPDIF | 87T | Transformer differential protection | 3 x 2 x 3 inputs |
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| HZ PDIF | 87 | High impedance differential protection | |
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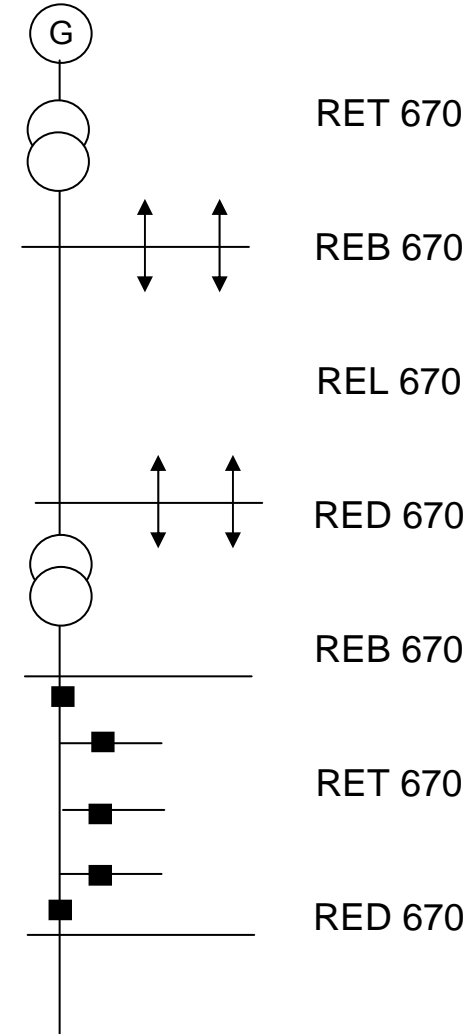
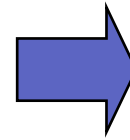
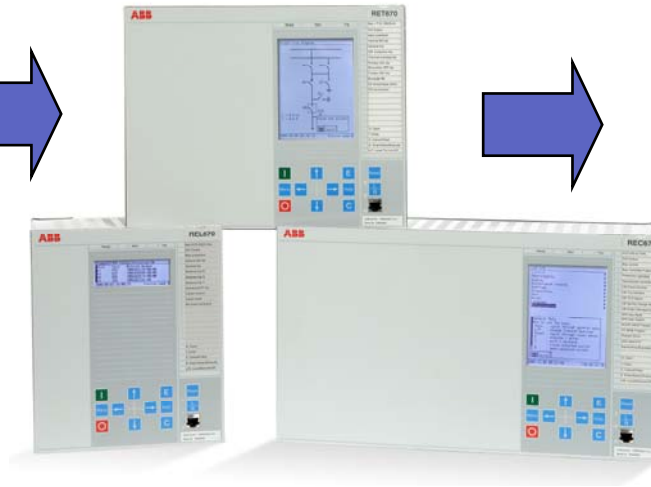
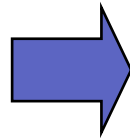


This is an example of functions included in the library. For full details please consult the buyer's guide.



Configure your “best” IED from the library

| | | |
|----------------|--------------|---------------|
| PDIS 21 | PDIF HZ | PDIF REF |
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| PIOC 50 | PIOC 50N | POCM 51/67 |
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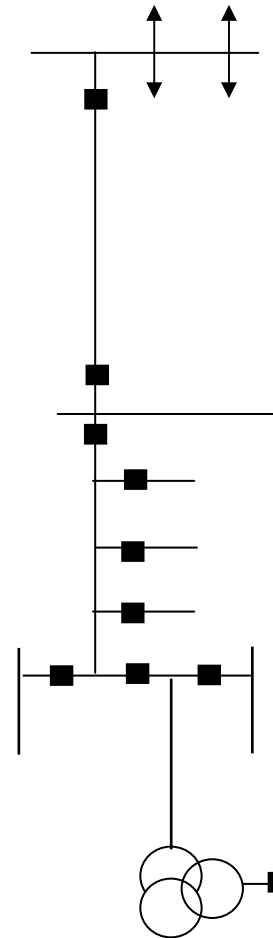
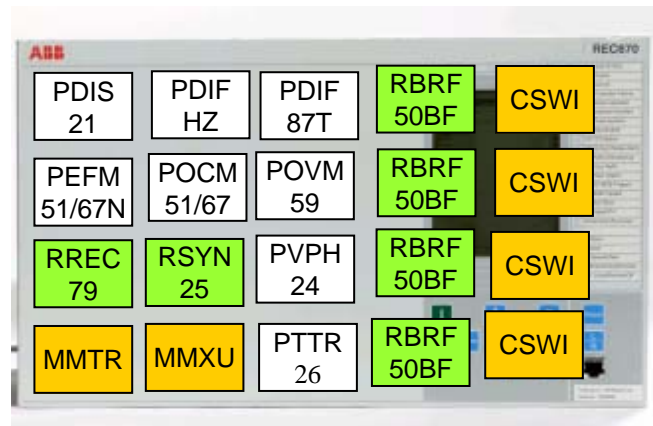
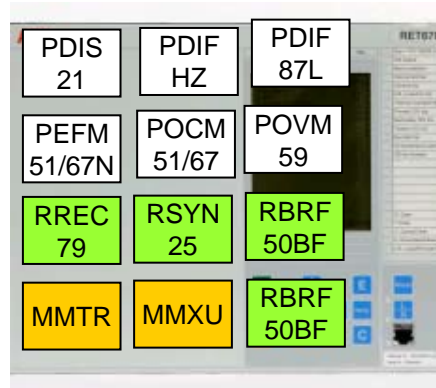
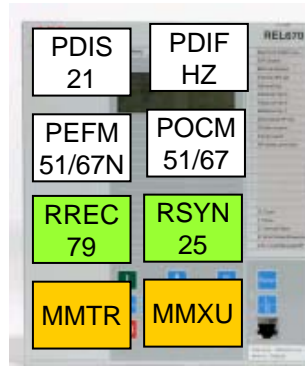
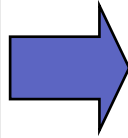
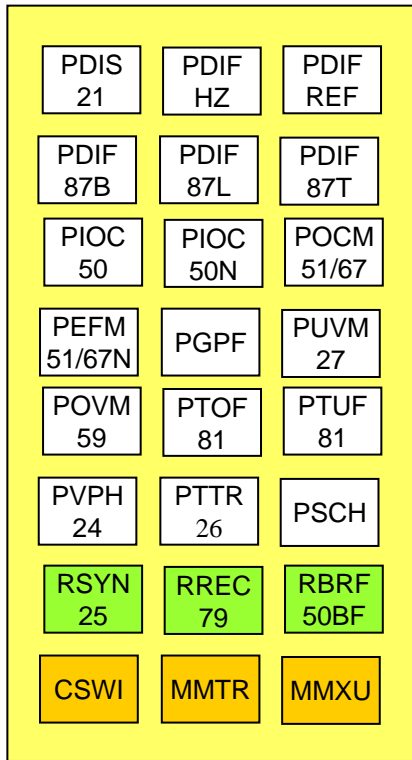


You can even configure ONE IED for transformer protection, line protection, bus protection and control at the same time

You can upgrade and change the IED at any time (even on-line over LAN/Ethernet)



Configure your "best" IED from the library



REL 670

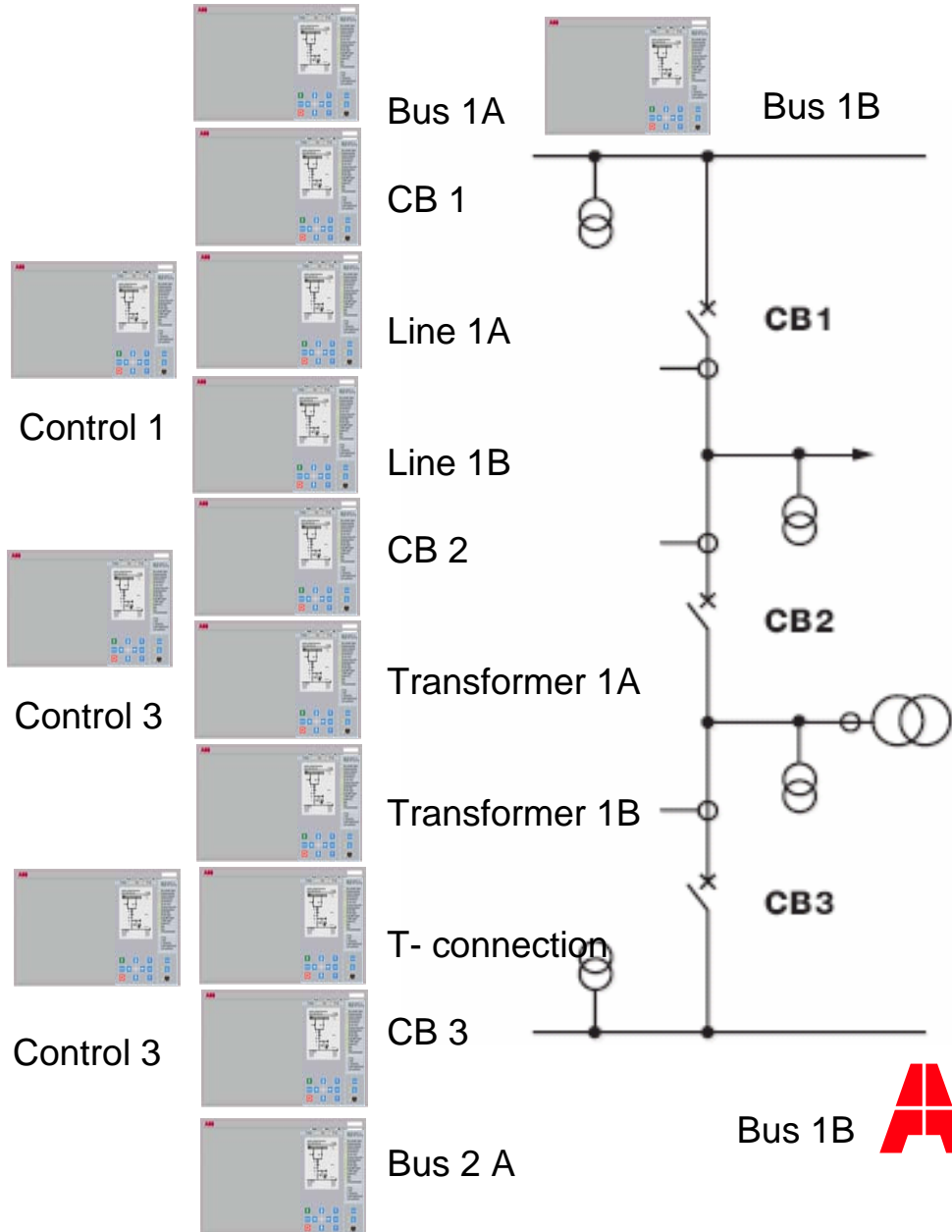
RED 670

RET 670



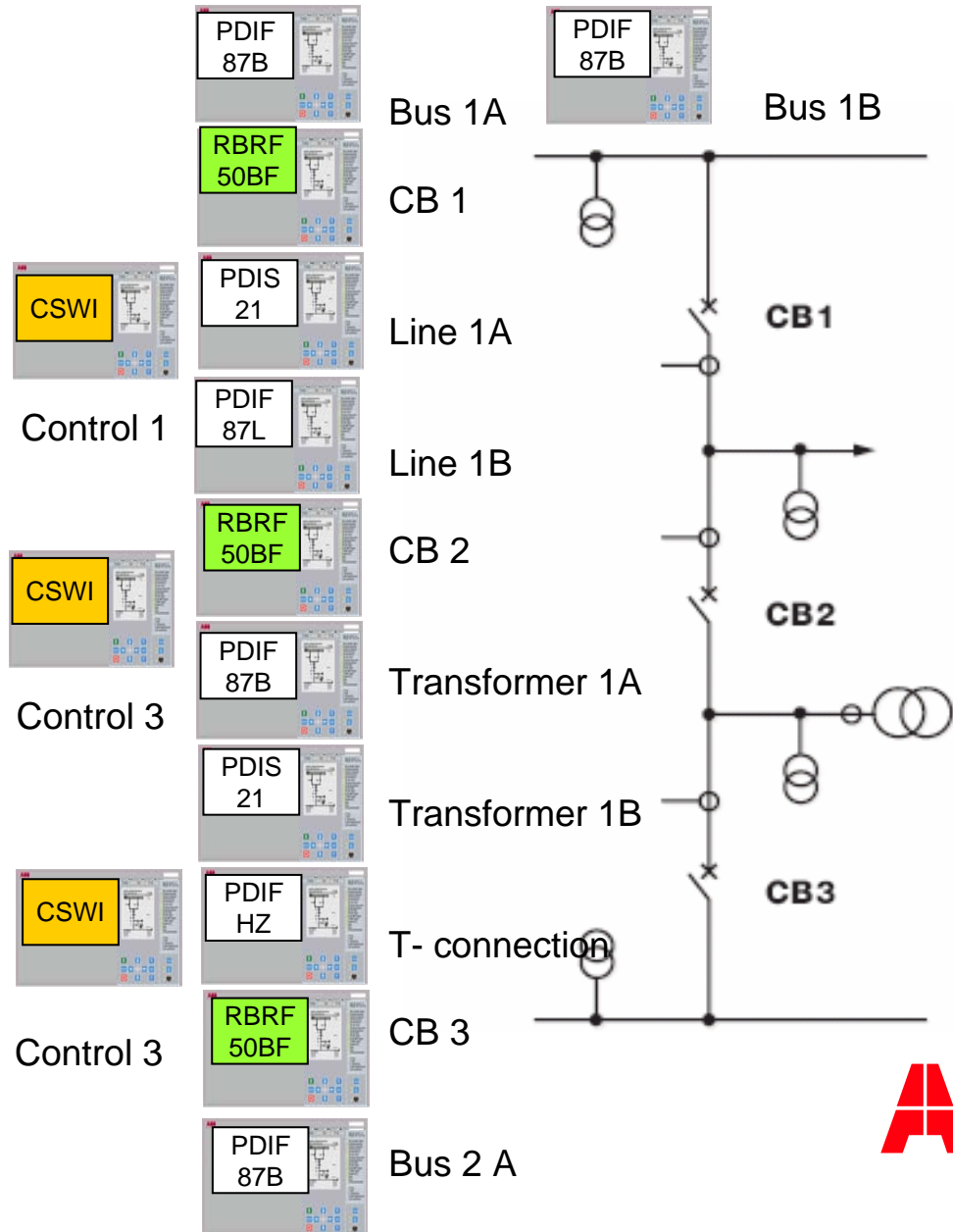
Optimize with free allocation of functions to any IED

| | | |
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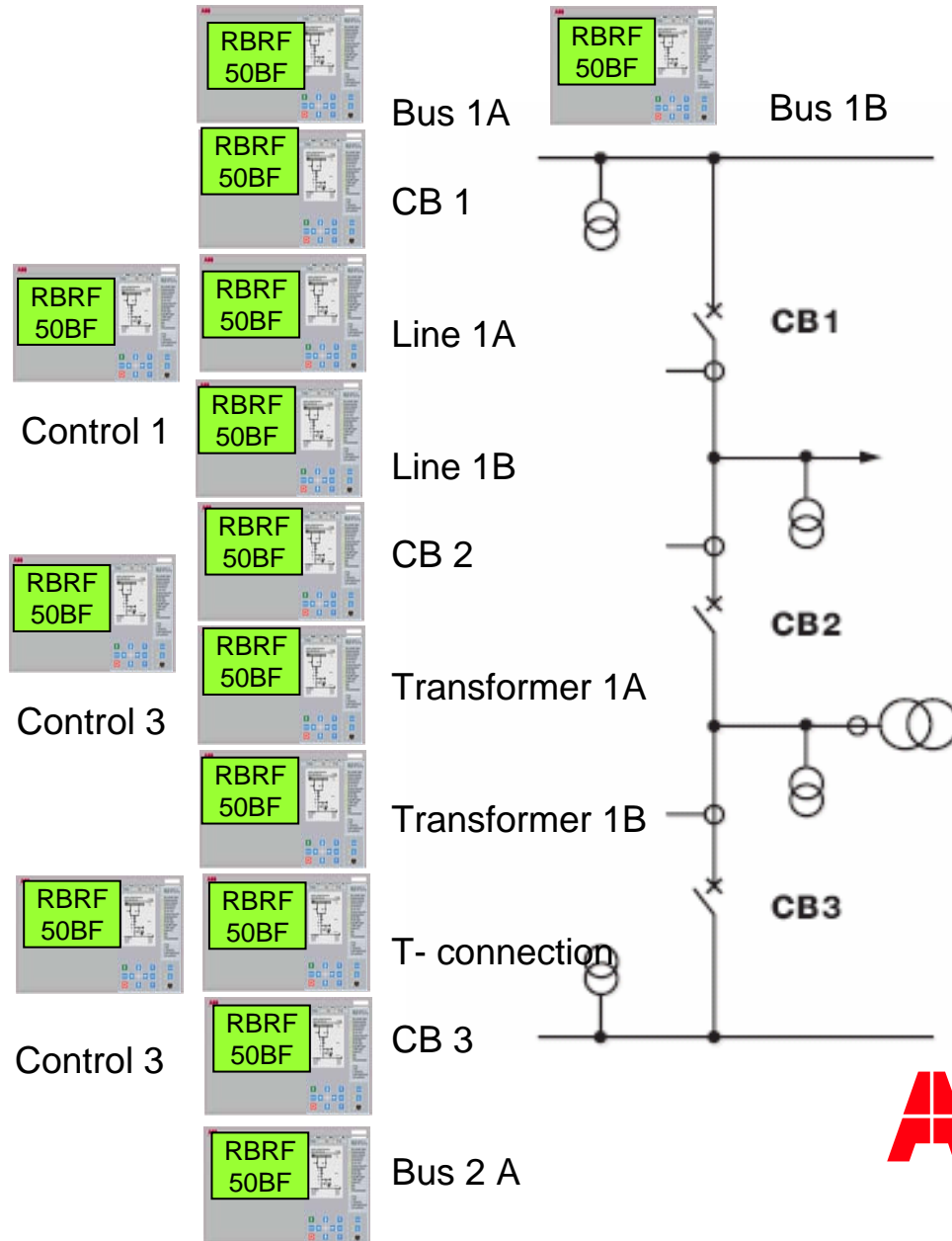
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E.g. RBRF (50BF) and PIOC (50) in all IEDs

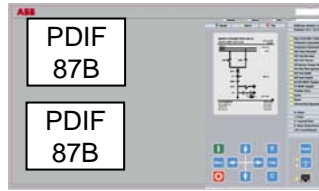
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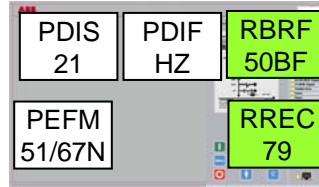
Functional integration in any IED

| | | |
|-------------|-----------|------------|
| PDIS 21 | PDIF HZ | PDIF REF |
| PDIF 87B | PDIF 87L | PDIF 87T |
| PIOC 50 | PIOC 50N | POCM 51/67 |
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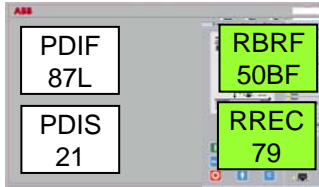
REB 670



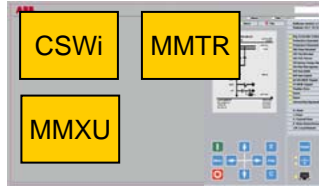
REL 670



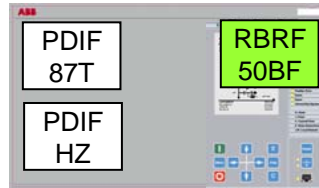
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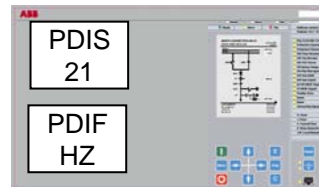
REC 670



RET 670



REL 670



Bus 1A

Bus 1B

CB 1

Line 1A

CB1

Line 1B

CB 2

CB2

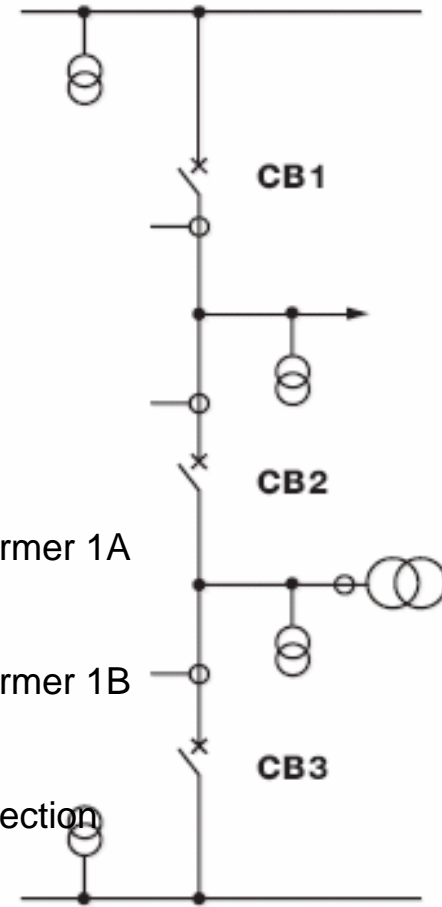
Transformer 1A

Transformer 1B

T-connection

CB 3

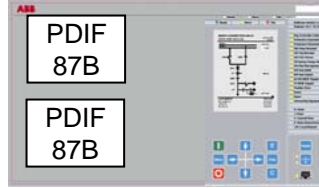
Bus 2 A



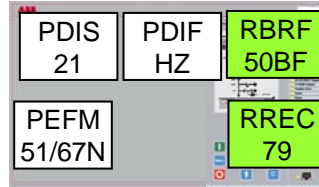
You can move, change and upgrade at any time

| | | |
|-------------|-----------|------------|
| PDIS 21 | PDIF HZ | PDIF REF |
| PDIF 87B | PDIF 87L | PDIF 87T |
| PIOC 50 | PIOC 50N | POCM 51/67 |
| PEFM 51/67N | RBRF 50BF | PUVM 27 |
| POVM 59 | PTOF 81 | PTUF 81 |
| PVPH 24 | PTTR 26 | PSCH |
| RSYN 25 | RREC 79 | RBRF 50BF |
| CSWI | MMTR | MMXU |

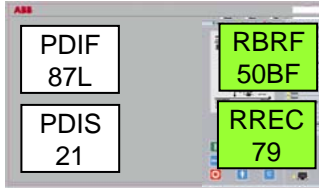
REB 670



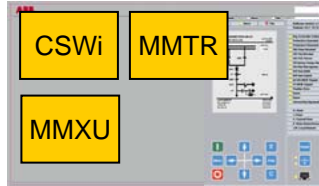
REL 670



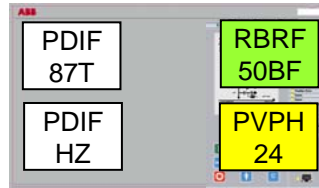
RED 670



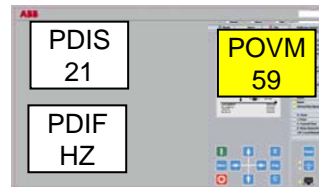
REC 670



RET 670



REL 670



Bus 1A

Bus 1B

CB 1

Line 1A

CB1

Line 1B

CB 2

CB2

Transformer 1A

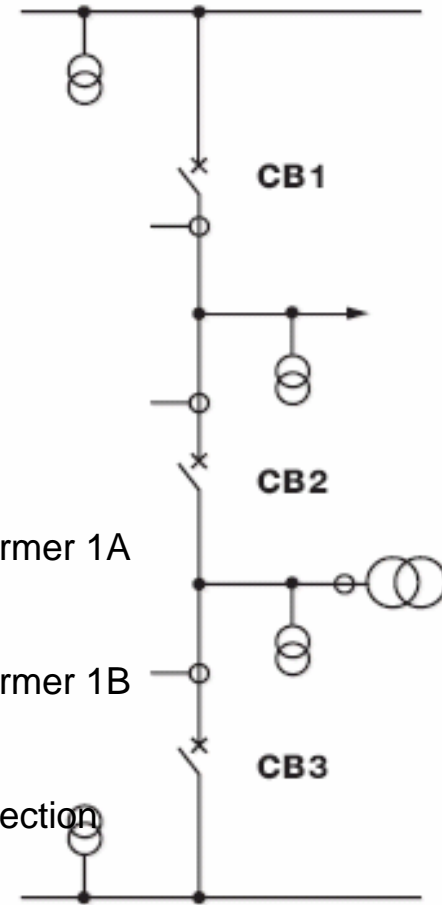
Transformer 1B

T-connection

CB 3

CB3

Bus 2 A



The old way with many “Boxes”

- Different hardware
- Different software
- Different protocol converters
- Different spare parts
- Different tools
- Different maintenance
- A lot to learn and manage



A major leap in Substation Automation



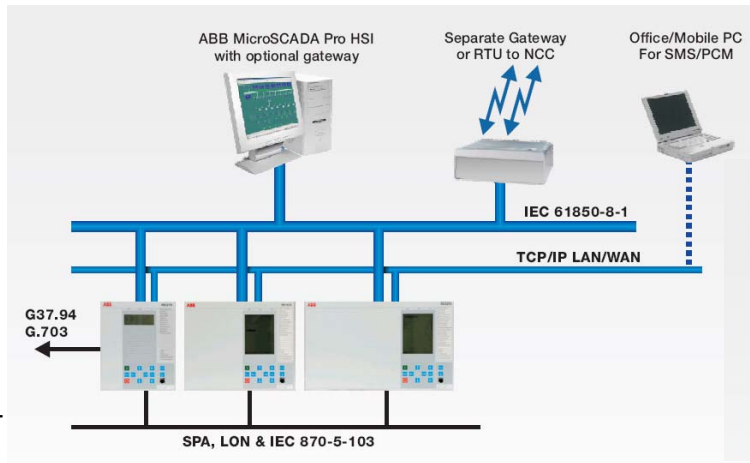
- ABB introduces the first IED concept for protection & control of transmission grids fully designed for IEC 61850 open standard
- ONE common IED of transmission class for all protection & control applications
- ONE common Application Function Library with high performing algorithms which is hardware independent
- ONE common concept for ALL transmission applications



The first SA concept designed for IEC 61850



- ONE IED 670 for ALL Transmission
 - REL 670 (Lines & Cables)
 - RED 670 (Multi terminal Networks)
 - RET 670 (Transformers & Multi objects)
 - REB 670 (Bus & Breakers)
 - REC 670 (Switchgear Bays)
- ONE PCM 600 IED tool
 - Configuration & Setting
 - Monitoring & Disturbance upload
- ONE MicroSCADA Pro
 - Substation Automation & HSI
 - Integrated or separate Gateway
- ONE SA concept designed for the IEC 61850 open standard



We can deliver what you want



- The same old Protection & Control design..
 - Separate primary and secondary protection
 - Separate control in RTU or bay controller
- ..but with improved selectivity & functionality
 - Parallel algorithms (E.g. 87T, 87, 21, 4x 51/ 67)
 - Up to 6 x 3 Restrained Inputs (87T, 87L)
- Integrated Protection & Control
 - All bay protection & control in one IED 670
 - Connected to metering & protection cores
- Optimized Protection & Control
 - Functionality requirements
 - Redundancy & service requirement,
 - HMI requirement



A modular & future proof IED concept

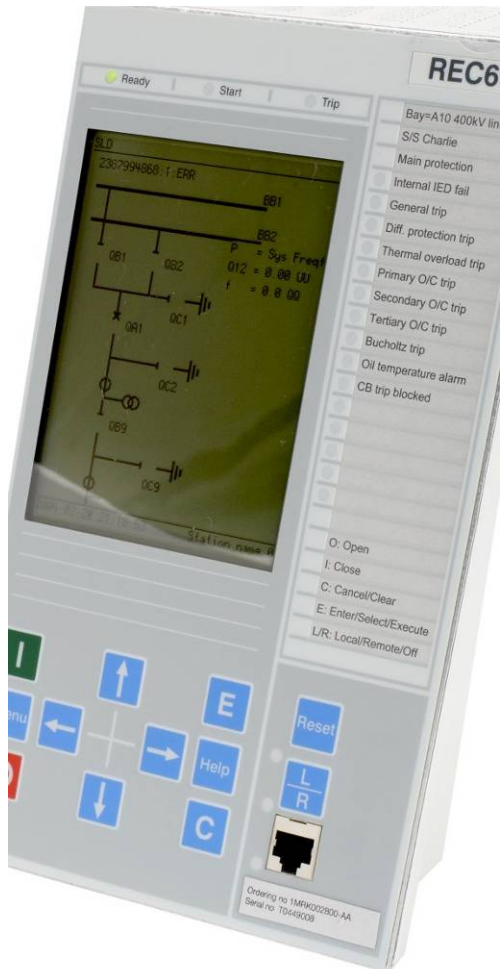
- Why do we need protection and control
- Introducing the ABB application of IEC 61850
- Advantages for an open and modular concept
 - **Reliable** - Improving the grid reliability
 - **Efficient** - More than just a relay
 - **Flexible** - Exactly what you need
 - **User friendly** - Easy to select, set, install and use
 - **Informative** - Designed to communicate
 - **Forever young** - Futurproof migration



Presenting the magic IED

More than
just a **device**

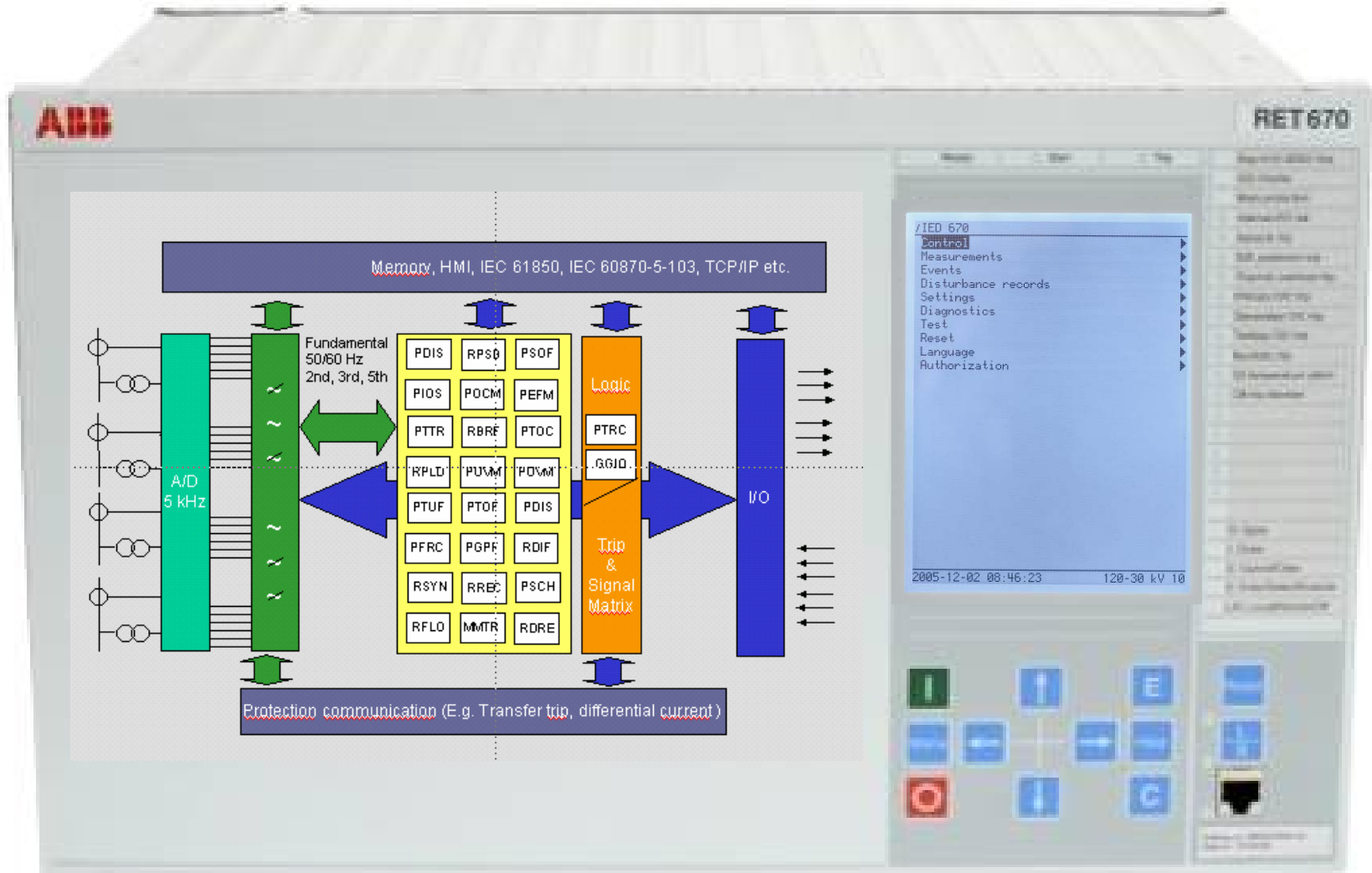
- Unique modular solution provider with ONE extensive function library & ONE expandible I/O for protection and control
- Hardware independent modular concept for ALL applications in Power Transmission Systems
- IED670 is fully designed for IEC 61850, TCP/IP and high speed Ethernet
- Can handle multiple objects and algorithms in parallel
- Provides efficient substation automation solutions for any high voltage application



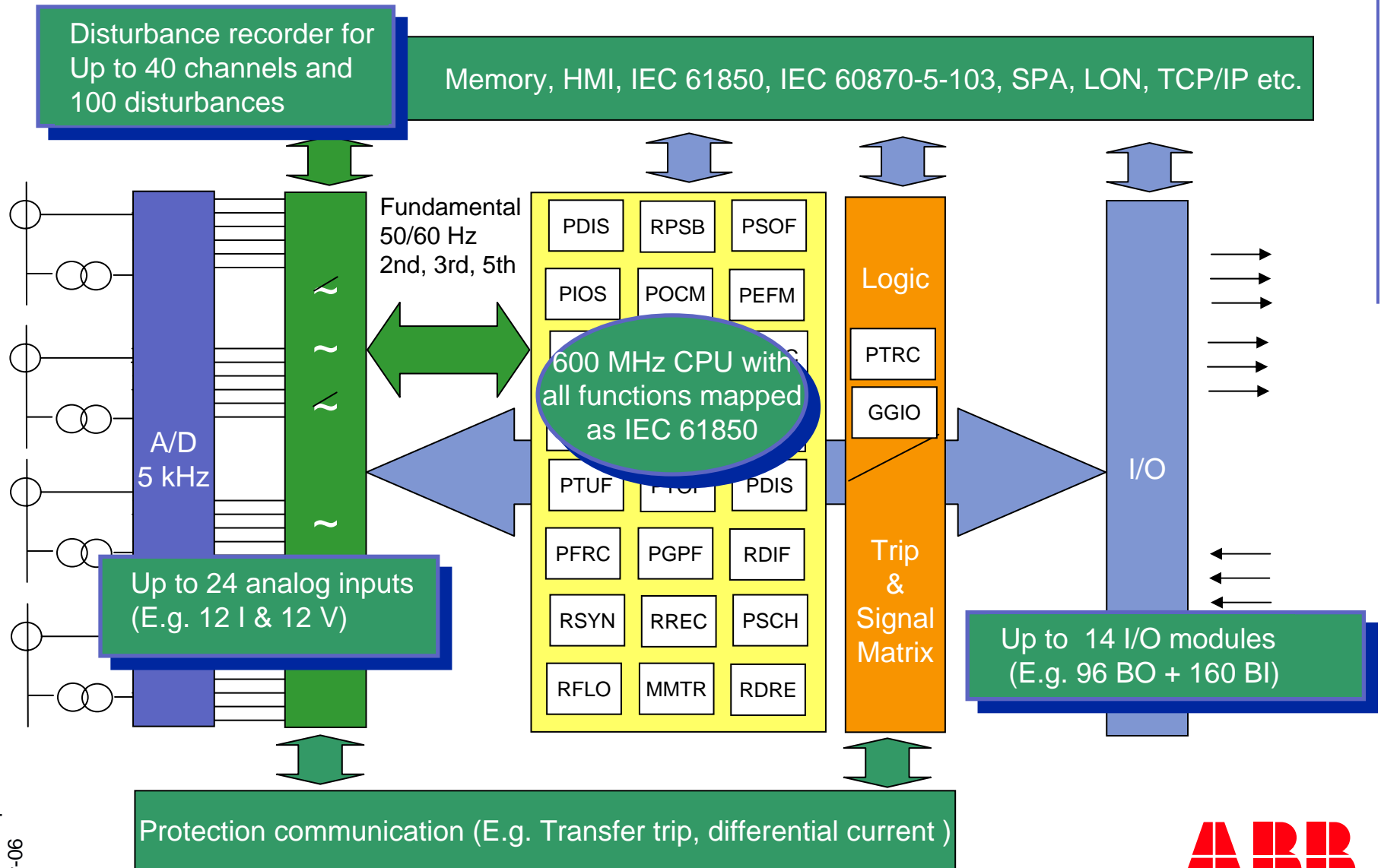
It is efficient

ABB

The most powerful “relay” ever designed



The most powerful “relay” ever designed



ONE open IED designed for IEC 61850

We are stepping
out of the box.....



- **State-of-the-art 600 MHz CPU**
 - Fast and accurate execution of high performance algorithms
 - Possibility to run several high performing algorithms in parallel
- **Up to 24 Analog Inputs**
 - Can handle multi breaker, multi feeder and multi winding inputs
 - Can be connected to both protection and metering cores
- **Multi page HMI & scalable I/O**
 - Can handle up to 6 bays/6 pages
 - Can handle up to 250 BI/BO
 - Can integrate both protection and control



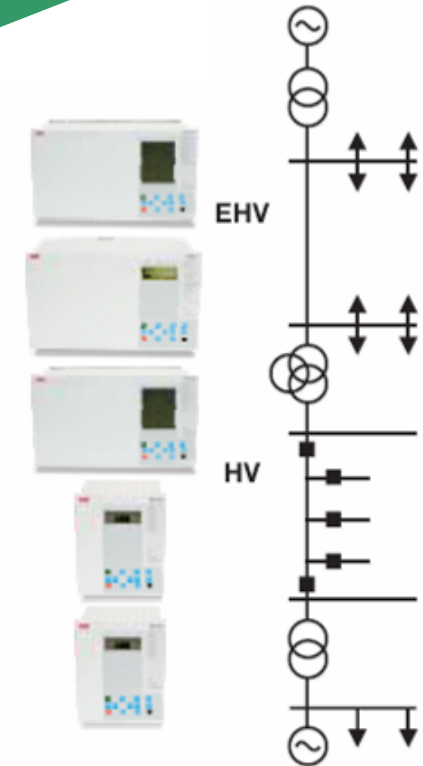
Select from the Application Function Library

.....to give you
the magic IED!

For any application!

The screenshot shows the IED670 DEMO(2) software interface. The Project Explorer on the left displays a tree structure for a substation, including Voltage Level, Bay, REL670, REx670, and various protection settings like Differential protection, Distance protection, and Current protection. The main window shows the 'REx670 - Parameter Setting' table for the ZM01 group.

| Group / Parameter Name | IED Value | PC Value | Unit | Min | Max |
|------------------------|-----------|----------|-------|-------|---------|
| Operation | | On | | | |
| IBase | 3000 | | A | 1 | 99999 |
| OperationDir | | Forward | | | |
| X1 | 30,00 | | ohm/p | 0,50 | 3000,00 |
| R1 | 5,00 | | ohm/p | 0,10 | 1000,00 |
| X0 | 100,00 | | ohm/p | 0,50 | 9000,00 |
| R0 | 47,00 | | ohm/p | 0,50 | 3000,00 |
| RFPP | 30,00 | | ohm/l | 1,00 | 3000,00 |
| RFPE | 100,00 | | ohm/l | 1,00 | 9000,00 |
| OperationPP | | On | | | |
| Timer tPP | | On | | | |
| tPP | 0,000 | | s | 0,000 | 60,000 |
| OperationPE | | On | | | |
| Timer tPE | | On | | | |
| tPE | 0,000 | | s | 0,000 | 60,000 |
| IMinOpPP | 20 | | %IB | 10 | 30 |
| IMinOpPE | 20 | | %IB | 10 | 30 |
| IMinOpIN | 5 | | %IB | 5 | 30 |



Introducing the most reliable IED ever designed

A major

leap In Grid
Reliability

- Unique high performance concept for ALL transmission applications in ONE IED
 - Global power system & substation know how “Made in ABB” ensures reliable algorithms
 - Powerful Transmission Standard IED/CPU gives faster and more accurate operation
 - Unique multiple & adaptive algorithms ensures maximum dependability and security with speed and selectivity.
 - Evolution from the well proven 316 & 500 series ensures quality
- Ensures grid reliability through innovation, experience and commitment
 - Made in ABB



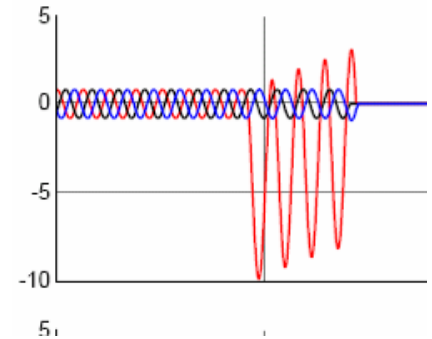
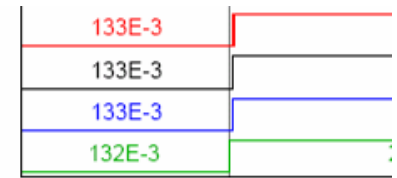
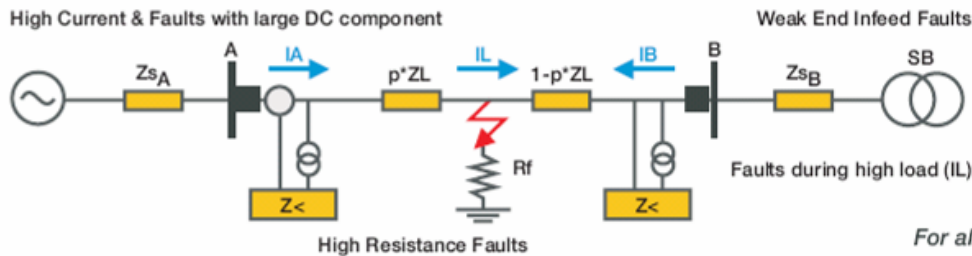
It is reliable

ABB

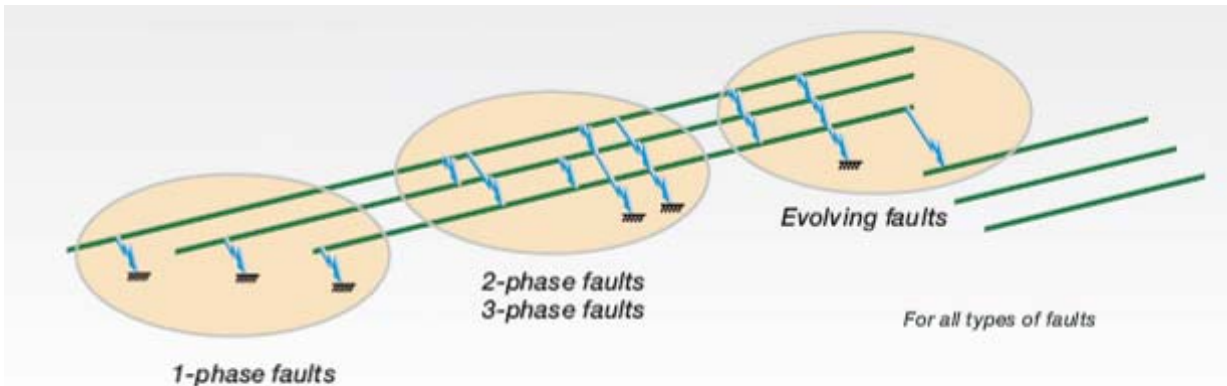
Based on Power System Know-how and experience

For maximum
grid reliability

- Reliability = Dependability + Security
- Dependability = Speed + Sensitivity
- Security = Selectivity + Stability



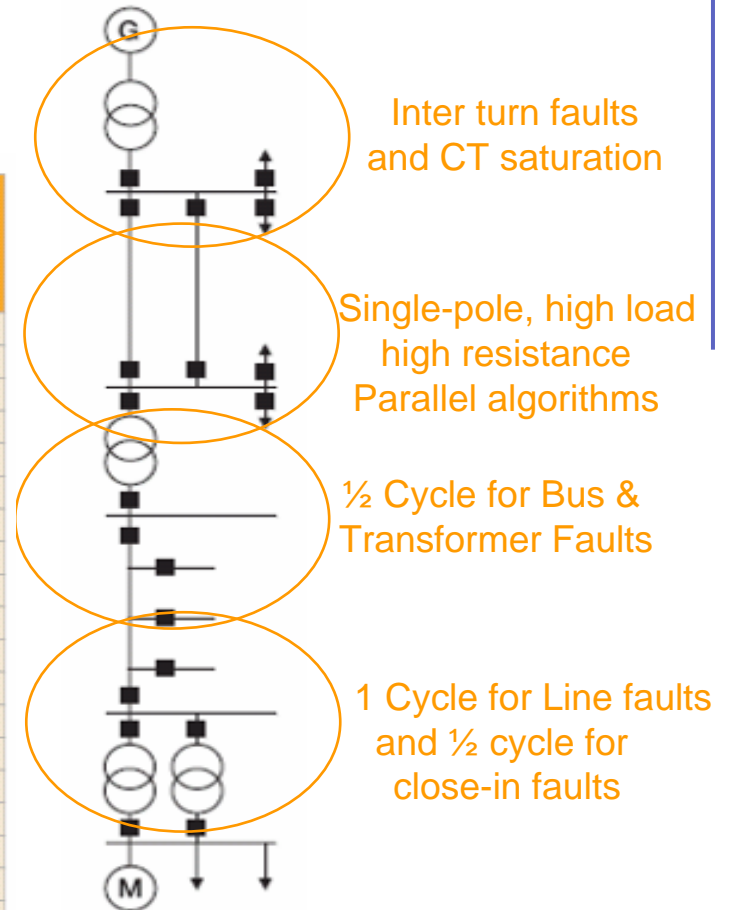
REB 670 RTDS simulation
10 ms operating time



Optimizing the protection of your network

IED 670 = Perfecting your selectivity plan

| IED 670 Main functionality and applications | REB 670 | RED 670 | REL 670 | RET 670 | REC 670 | Op. Time ms |
|---|---------|---------|---------|---------|---------|-------------|
| Full-scheme distance protection with advanced phase selection & load encroachment | | ■ | ■ | ■ | | 20 |
| Phase segregated line differential protection with adaptive communication | | ■ | | | | 20 |
| High speed & high sensitivity transformer differential protection with adaptive stabilization | | | | ■ | | 10 |
| High speed phase segregated bus differential protection with extremely low CT requirements | ■ | | | | | 10 |
| High speed summation type bus differential protection with extremely low CT requirements | ■ | | | | | 10 |
| High speed high impedance differential protection | | ■ | ■ | ■ | | 10 |
| High speed and high sensitivity restricted earthfault differential protection | | | | ■ | | 20 |
| High speed instantaneous phase and earth over current protection | | ■ | ■ | ■ | ■ | 10 |
| 4-step phase over current protection | ■ | ■ | ■ | ■ | ■ | n.a. |
| 4-step residual over current protection | | ■ | ■ | ■ | ■ | n.a. |
| 4-step directional phase and earth over current protection | | ■ | ■ | ■ | ■ | n.a. |
| Adaptive breaker failure protection | ■ | ■ | ■ | ■ | ■ | n.a. |
| Over/Under frequency | | ■ | ■ | ■ | ■ | n.a. |
| Over/Under voltage | | ■ | ■ | ■ | ■ | n.a. |
| Rate of change frequency | | ■ | ■ | ■ | ■ | n.a. |
| General Voltage/Current Protection | | ■ | ■ | ■ | ■ | n.a. |
| Auto reclosing | ■ | ■ | ■ | | | n.a. |
| Synchrocheck | | ■ | ■ | ■ | ■ | n.a. |
| High performance disturbance recorder (40 analog channels/100 disturbances) | ■ | ■ | ■ | ■ | ■ | n.a. |
| High accuracy fault locator | | ■ | ■ | | | n.a. |
| Bay control with interlocking and select before execute | | ■ | ■ | ■ | ■ | n.a. |
| Measuring and event recording | ■ | ■ | ■ | ■ | ■ | n.a. |
| Programmable logic | ■ | ■ | ■ | ■ | ■ | n.a. |
| Maximum number of breakers/bays | 24 | 2 | 2 | 6 | 6 | n.a. |
| 24 analog input channels | ■ | ■ | ■ | ■ | ■ | n.a. |



Exactly what you want

Exactly what **you** need



- Unique open system which can be configured for integrated or distributed protection & control architecture
 - Pre configured for all protection and control applications....
 - ...or freedom to distribute all functions & logical nodes in any IED
 - Unique library of optimized algorithms + “customizer” to solve special functions
- You can tailor the protection & control of your substation for the performance, redundancy and cost you want to have

It is flexible

ABB

Select your perfect hardware



Maximum quantity of I/O boards per type

Basic quantity defined in application table for available products.

| Case (TRM= Transformer module) | BIM/BIMp | IOM | BOM | MIM | GSM | Total max in case | Restriction |
|--------------------------------|----------|-----|-----|-----|-----|-------------------|---------------|
| 1/2 19" case | 3 | 3 | 3 | 0 | 1 | 3 | |
| 3/4 19" case with 1TRM | 8 | 6 | 3 | 1 | 1 | 8 | |
| 3/4 19" case with 2 TRMs | 5 | 5 | 3 | 1 | 1 | 5 | |
| 1/1 19" case with 1 TRM | 14 | 6 | 4 | 4 | 1 | 14 | BOM+MIM max 4 |
| 1/1 19" case with 2 TRMs | 11 | 6 | 4 | 4 | 1 | 11 | BOM+MIM max 4 |

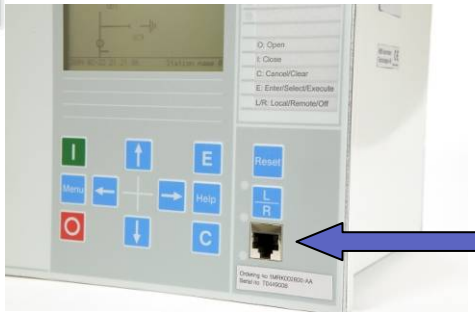
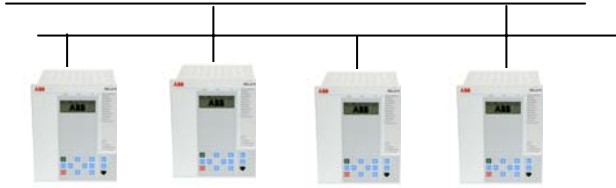
| | |
|--|--|
| BIM Binary Input Module | 16 binary inputs, 24-30, 48-60, 110-125 or 220-250 VDC |
| BIMp Binary Input Module with enhanced pulse counting capabilities | 16 binary inputs, 24-30, 48-60, 110-125 or 220-250 VDC, 40 pulses/s |
| IOM Binary In/Output Module | 8 binary inputs, 24-30, 48-60, 110-125 or 220-250 VDC, 10 trip + 2 fast signal output relays |
| BOM Binary Output Module | 24 trip and signal output relays |
| MIM mA Input Module | 6 channels, ± 5 , ± 10 , ± 20 mA, 0-5, 0-10, 0-20 or 4-20 mA |
| GSM GPS Synchronization Module | Provides accuracy better than 1 microsecond |

As pre-configured or open configuration

| Application | Arrangement | Sub-arrangement | Busbar | | Bay | | Line Differential | | Line Distance | | Transformer | |
|-------------------|-----------------------|----------------------|--|--|---|--|--|---|---------------|---|-------------|---|
| | | | PEB 670-A20 PEB 670-A31 PEB 670-B20 PEB 670-B31 | PEC 670 REC 670-A10 REC 670-A20 REC 670-A30 REC 670-B30 REC 670-C30 | RED 670 RED 670-A31 RED 670-A32 RED 670-B31 RED 670-B32 | REL 670 REL 670-A10 REL 670-A31 REL 670-A32 REL 670-B31 REL 670-B32 | RET 670 RET 670-A10 RET 670-A11 RET 670-A30 RET 670-A31 RET 670-A40 RET 670-B30 RET 670-B40 | | | | | |
| Busbar | 4 bays/2 zones | 3 phase | ■ | | | | | | | | | |
| | 8 bays/2 zones | 3 phase | ■ | | | | | | | | | |
| | 12 bays/2 zones | 1 phase | | ■ | | | | | | | | |
| | 12 bays/2 zones | 1 phase | | | ■ | | | | | | | |
| | 24 bays/2 zones | 1 phase | | | | ■ | | | | | | |
| | 12 bays/2 zones | 3 phase Summation | | | ■ | | | | | | | |
| | 12 bays/2 zones | 3 phase Summation | | | | ■ | | | | | | |
| Bay control | Open options | To be customized | | | ■ | | | | | | | |
| | 1 Circuit Breaker | Breaker Protection | | | | ■ | | | | | | |
| | 1 Circuit Breaker | Bay Control | | | | | ■ | | | | | |
| | 1 Circuit Breaker | Control & Protection | | | | | | ■ | | | | |
| | 2 Circuit Breakers | Control & Protection | | | | | | | ■ | | | |
| Transmission Line | Open options | To be customized | | | | | ■ | | | | | |
| | Station | Back up | | | | | | | ■ | | | |
| | 1 Circuit Breaker | 3 phase trip | | | | | | ■ | | | | |
| | 1 Circuit Breaker | 1 phase trip | | | | | | | | ■ | | |
| | 2 Circuit Breakers | 3 phase trip | | | | | | | | | ■ | |
| Transformer | Open options (24 A) | To be customized | | | | | | | | | | |
| | Station (12A) | Back up | | | | | | | | | ■ | |
| | Station (12 A) | Load shedding | | | | | | | | | | ■ |
| | 2 winding (12/24 A) | 1 Circuit Breaker | | | | | | | | | | ■ |
| | 2 winding (24 A) | 2 Circuit Breakers/W | | | | | | | | | | ■ |
| | 3 winding (12) | 1 Circuit Breaker | | | | | | | | | | ■ |
| | 3 winding (9I+3U) | 1 Circuit Breaker | | | | | | | | | | ■ |
| | 3 winding (24 A) | 1 Circuit Breaker | | | | | | | | | | ■ |
| Casing | 1/2 19" | | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | 3/4 19" | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | 1/1 19" | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| HMI | Text only | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | Large graphic display | 15 object /page | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Analog inputs | 6 Analog inputs | | | | ■ | | | | | | | |
| | 12 Analog inputs | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | 24 Analog inputs | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |



ONE modular concept for ALL applications



- Select your preferred architecture
 - Integration, Redundancy etc.
- Establish type & number of IEDs
 - REL, RED, RET, REC, REB
- Decide IED functionality
- Identify the need for I/O
- Select the size ($\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{1}$)
- Select type of HMI
- Select communication
- Download your configuration
- Set I/O input to your primary circuits
- Adjust setting & commission

Ready to operate but you can change and update at any time



Right information in right time for right actions

Designed to **communicate**



- Unique information management of data, disturbances and events with seamless integration to TCP/IP, MicroSCADA Pro and via ABB powerful gateway concept
- Monitoring communication for up to 40 analog channels and 100 disturbances per IED
- Protection communication with built in analog and binary remote communication (transfer trip + Id)
- Control communication with built in optical Ethernet ports (2 + 2) for IEC 61850
- Improved availability and asset management through right information, in right time, to the right user, for right decisions



It is informative

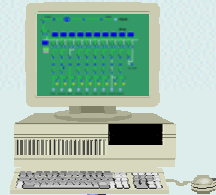


IEC 61850 Made in ABB

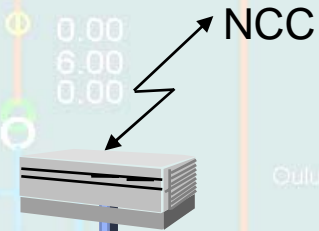
Remote SMS workplace
with PCM 600



Operators workstation
MicroSCADA Pro
SYS 600 (with GW)



Separate Gateway/RTU
COM 500, COM 610,
COM 581 or RTU 560

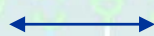


Oulunseutu
Varayhteys
Fingrid 110kV
Kalajo- Pirkkala

IEC 61850-8-1

TCP/IP

Remote Binary
and Analog
communication



Optional
SPA/LON
IEC 870-5-103

Heikkilän-
kangas
linatti
Kivi-
harju
Joutsen-
kaari
Vara
Kivi-
niemi
Hätäla
Kuurna-
puisto
Oma-
käyttö
Kaakkurin-
polku
Höyhen-
kuja
Mittaus

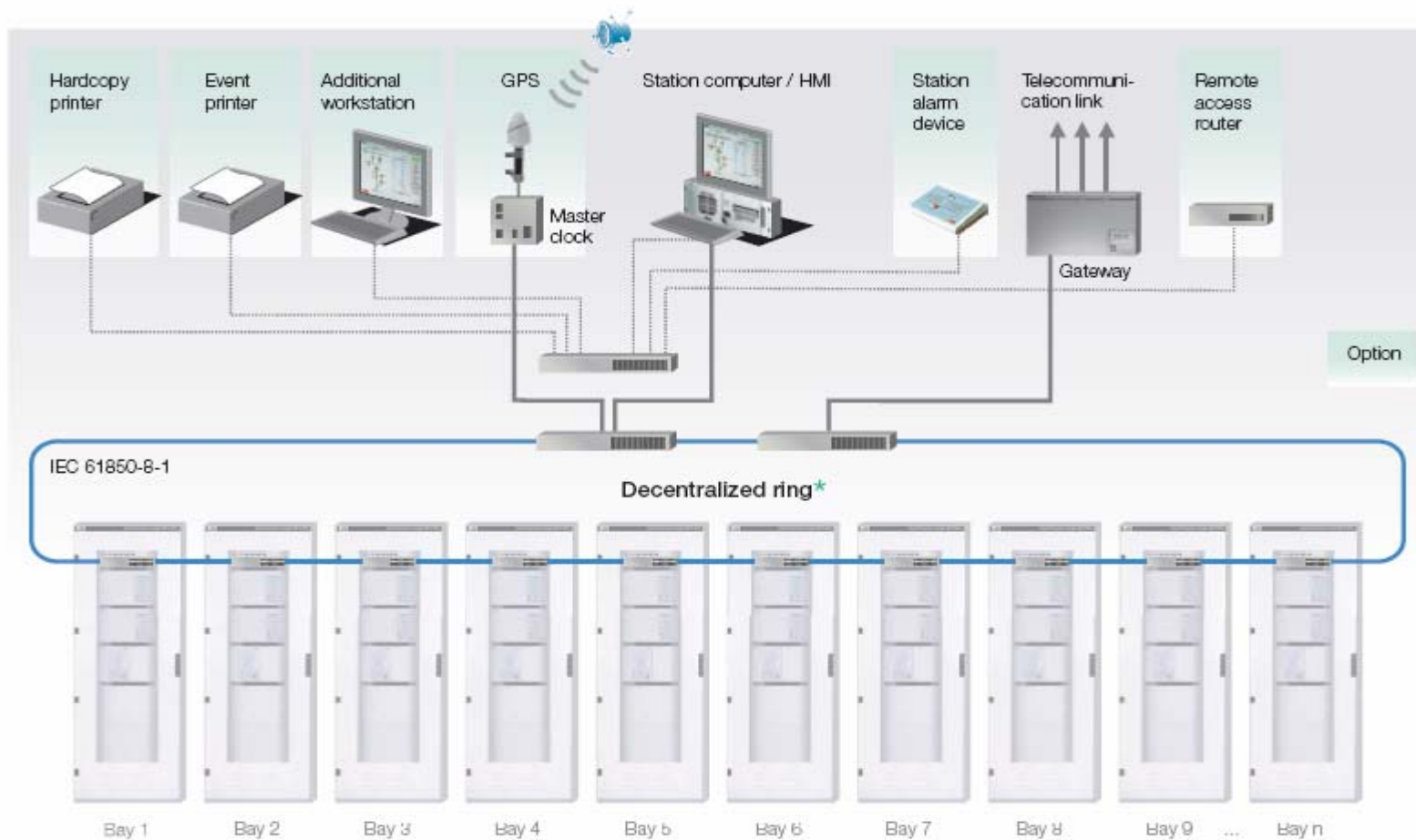
MicroSCADA Pro with new graphics

The screenshot displays the MicroSCADA Pro interface for a power system. The background features a schematic diagram with busbars labeled J02 through J06 and breakers labeled Q01 through Q02. A 'Thumbnail' window in the top-left corner provides a smaller view of the entire system. Two primary windows are overlaid on the main diagram:

- Switch Control Window:** This window is used to manage the state of a specific breaker. It shows the 'Object identification' as 'Rivers Wilbur Q0'. Under the 'Main' tab, the 'Object status' is reported as 'Switch state: Closed' and 'Object is simulated'. It includes buttons for 'Open Breaker ...', 'Close Breaker ...', and 'Exit'.
- Measurement Window:** This window displays real-time data for a specific measurement point. The 'Object identification' is 'Rivers Wilbur ME1'. Under the 'Measured Values' tab, it shows:
 - Current L1: 5 A (Normal)
 - Neutral I0: 0,0 A (Normal)Below the text, there are two bar graphs: 'Current L1' with a scale from -1 to 11 and 'Neutral I0' with a scale from 0,0 to 0,0. The 'Exit' button is located at the bottom of this window.

On the right side of the interface, the text 'Varayhteys Fingrid 110kV Kalajoki- Pirkkala johtoon' is visible. The background diagram also shows busbars E02, E03, and E04 with associated breakers and ground symbols.

Example of ABB SA solution



IED 670 Communication options

■ = Basic ● = Basic, 1-of □ = Optional 3 = Number of modules/Maximum no. of options

| Application | Arrangement | Sub-arrangement | Busbar | | | | | Bay | | | | | Line Differential | | | | | Line Distance | | | | | Transformer | | | | | | | | | | | | | | | |
|--|-------------------------|---------------------------------|-------------|-------------|-------------|-------------|-------------|---------|-------------|-------------|-------------|-------------|-------------------|---------|-------------|-------------|-------------|---------------|---------|-------------|-------------|-------------|-------------|-------------|---------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|---|---|---|---|--|
| | | | REB 670-A20 | REB 670-A31 | REB 670-B20 | REB 670-B21 | REB 670-B31 | REC 670 | REC 670-A10 | REC 670-A20 | REC 670-A30 | REC 670-B30 | REC 670-C30 | RED 670 | RED 670-A31 | RED 670-A32 | RED 670-B31 | RED 670-B32 | REL 670 | REL 670-A10 | REL 670-A31 | REL 670-A32 | REL 670-B31 | REL 670-B32 | RET 670 | RET 670-A10 | RET 670-A11 | RET 670-A20 | RET 670-A30 | RET 670-A31 | RET 670-A40 | RET 670-B30 | RET 670-B40 | | | | | |
| Control & Supervision | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SPA communication protocol | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| LON communication protocol | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| IEC 60870-5-103 communication protocol | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| IEC 61850 generic communication I/O functions, parameter setting | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Horizontal communication via GOOSE for interlocking | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| FTP access with password | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Single command | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Multiple command and transmit | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| SPA/IEC 60870-5-103 and LON (SLM) communication ports | 2 channels | plastic, plastic/glass or glass | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | |
| IEC 61850-8-1 (OEM) communication ports | 1 channel or 2 channels | glass | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | |
| Binary signal transfer | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Analog data transfer | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Scheme communication logic | Distance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Scheme communication logic | DEF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Line data communication module C37.94 | 3/65/130 km | basic | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | optional | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | |



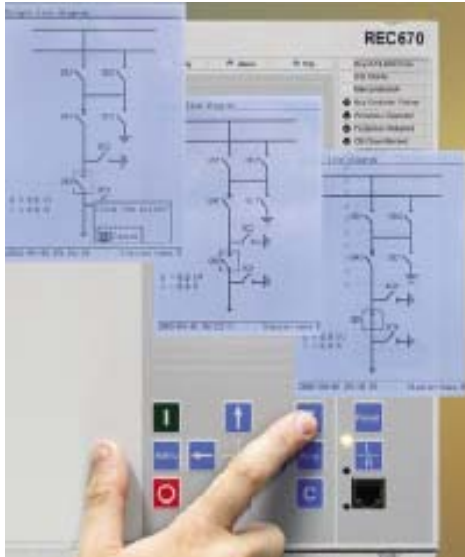
IED 670 Control options

■ = Basic ● = Basic, 1-of □ = Optional 3 = Maximum no. of options

| Application | Arrangement | Busbar | | | | | Bay | | | | | Line Differential | | | | | Line Distance | | | | | Transformer | | | | | | | | | |
|--|--------------------|-------------|-------------|-------------|-------------|-------------|---------|-------------|-------------|-------------|-------------|-------------------|---------|-------------|-------------|-------------|---------------|---------|-------------|-------------|-------------|-------------|-------------|---------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | | REB 670-A20 | REB 670-A31 | REB 670-B20 | REB 670-B21 | REB 670-B31 | REC 670 | REC 670-A10 | REC 670-A20 | REC 670-A30 | REC 670-B30 | REC 670-C30 | RED 670 | RED 670-A31 | RED 670-A32 | RED 670-B31 | RED 670-B32 | REL 670 | REL 670-A10 | REL 670-A31 | REL 670-A32 | REL 670-B31 | REL 670-B32 | RET 670 | RET 670-A10 | RET 670-A11 | RET 670-A20 | RET 670-A30 | RET 670-A31 | RET 670-A40 | RET 670-B30 |
| Control & Supervision | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Current circuit supervision | | | | | | | 5 | | ■ | ■ | ■ | 2 | ■ | ■ | ■ | ■ | 2 | | ■ | ■ | ■ | ■ | 5 | | | ■ | ■ | ■ | ■ | ■ | |
| Fuse failure supervision | | | | | | | 4 | ■ | | ■ | ■ | 3 | ■ | ■ | ■ | ■ | 3 | ■ | ■ | ■ | ■ | ■ | 4 | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Synchrocheck and energizing check | | | | | | | 6 | ■ | | ■ | ■ | 2 | ■ | ■ | ■ | ■ | 2 | □ | ■ | ■ | ■ | ■ | 6 | ■ | | | | ■ | ■ | ■ | ■ |
| Autorecloser | | 2 | □ | □ | □ | □ | 6 | ■ | | □ | □ | 2 | ■ | ■ | ■ | ■ | 2 | □ | ■ | ■ | ■ | ■ | | | | | | | | | |
| Apparatus control for single bay | max. 8 apparatuses | | | | | | ● | | ■ | ■ | | □ | □ | □ | | | □ | | □ | □ | | | □ | | | | | | | | |
| Apparatus control for single bay | max 15 apparatuses | | | | | | ● | | | ■ | | □ | | | □ | □ | | | | | □ | □ | | | □ | □ | □ | □ | □ | □ | |
| Apparatus control for up to 6 bays | max 30 apparatuses | | | | | | ● | | | | ■ | | | | | | | | | | | | □ | | | | | | | | □ |
| Logic rotating switch for function selection and LMHI presentation | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Tripping logic | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Trip matrix logic | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Configurable logic blocks | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Fixed signal function blocks | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Event counter | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Fault locator | | | | | | | □ | | | □ | □ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | | | | | | | | | |
| Measurements | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Event function | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Disturbance report | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Logic signal status report | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Pulse counter logic | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

IED 670 is designed for YOU

Easy to handle



- Unique, simple and fast interaction via built in multi page HMI, Ethernet connection & LAN TCP/IP with different user access

- Ready to use & fast to deliver products with simple setting and signal matrix tool
- ONE common Protection & Control IED Manager (PCM 600) and one common MicroSCADA Pro
- ONE IED to learn, ONE IED to apply, ONE IED to operate , ONE IED to maintain

- Simple to manage for all users

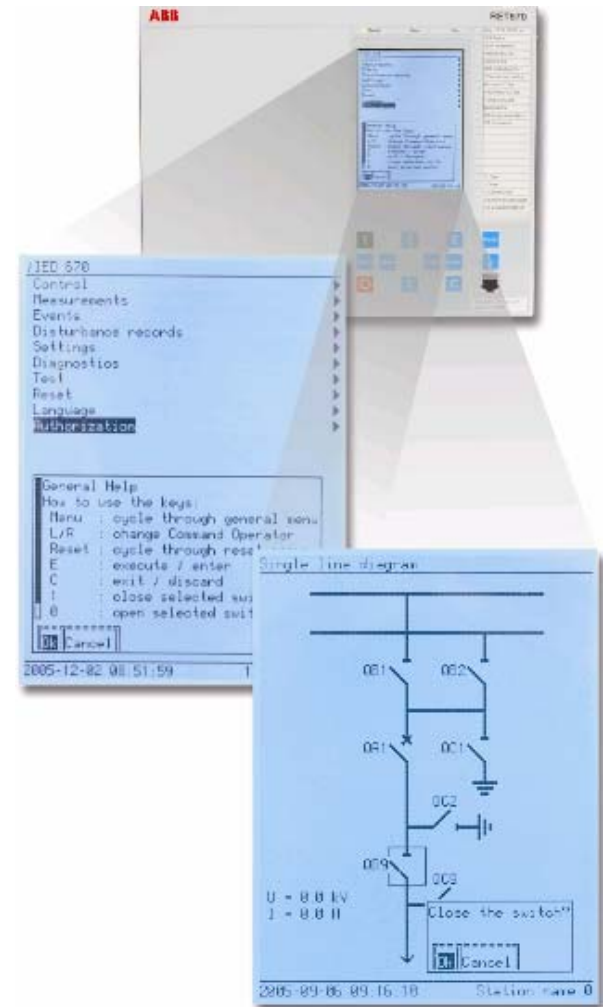


It is user friendly



Local HMI and local/remote PC access

| Function | HMI (Text display) | HMI (Large display) | PCM 600 IED Manager 1MRK003395-AA | PCM 600 Engineering 1MRK003395-BA | PCM 600 Engineering Pro 1MRK003395-CA |
|---|--------------------|---------------------|--------------------------------------|--------------------------------------|--|
| Read on-line measuring values | ✓ | ✓ | ✓ | ✓ | ✓ |
| Read stored events (1000) | ✓ | ✓ | ✓ | ✓ | ✓ |
| Read stored fault locator values | ✓ | ✓ | ✓ | ✓ | ✓ |
| Read stored disturbance recorder values | | | ✓ | ✓ | ✓ |
| Upload stored disturbance recorder values (Manual) | | | ✓ | ✓ | ✓ |
| Upload stored disturbance recorder values (Automatic) | | | ✓ | ✓ | ✓ |
| Disturbance report generation (Automatic) | | | ✓ | ✓ | ✓ |
| Read setting groups parameters (6) | ✓ | ✓ | ✓ | ✓ | ✓ |
| Change setting groups | ✓ | ✓ | ✓ | ✓ | ✓ |
| Write setting group parameters | ✓ | ✓ | ✓ | ✓ | ✓ |
| Change lock (Block via BI) | ✓ | ✓ | | | |
| Test mode selection (Block/Activate functions) | ✓ | ✓ | | | |
| IED diagnostics (Internal events) | ✓ | ✓ | ✓ | ✓ | ✓ |
| Object status (closed, open, value) | | ✓ | | | |
| Object control (close, open) | | ✓ | | | |
| Authorization (Password for Local/Remote) | ✓ | ✓ | | | |
| Bay graphical display | | ✓ | | | |
| Multi page (6) bay graphical display | | ✓ | | | |
| Multi page (6) bay graphical display editor | | | ✓ | ✓ | ✓ |
| Signal matrix tool (Link I/O) | | | ✓ | ✓ | ✓ |
| IEC 61850-8 communication configuration (CCT) | | | | ✓ | ✓ |
| IEC 61131-3 graphical configuration | | | | ✓ | ✓ |



Protection & Control IED Manager PCM 600



- Project Manager
- Application Configuration (CAP)
- SCL file export/import
- Parameter Setting (PST)
- Signal Matrix (SMT)
- Graphical Display Editor (GDE)

- Disturbance Handling (DH)
- Task Scheduler (Scheduler)
- Monitoring (MON)
- Event Viewer (EV)



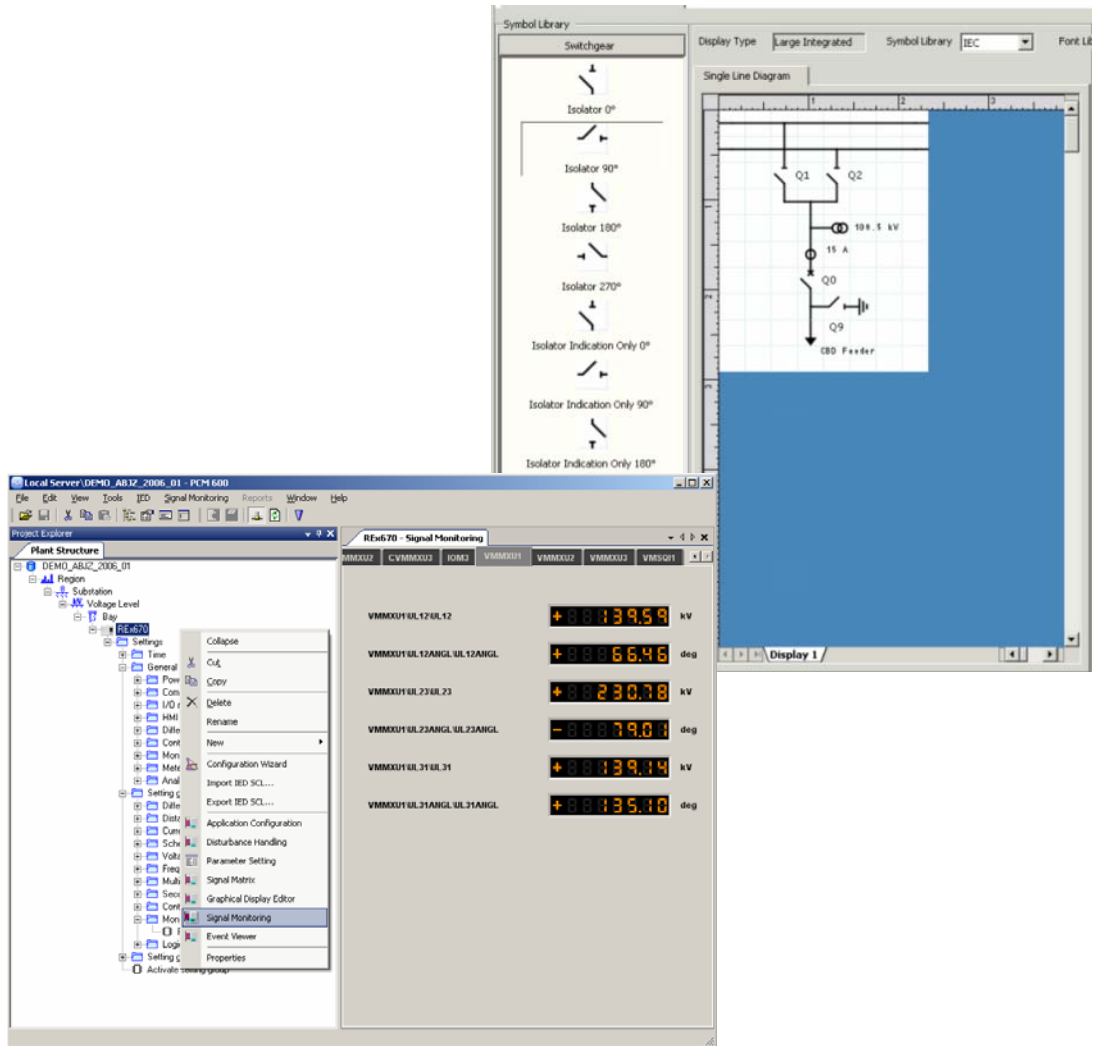
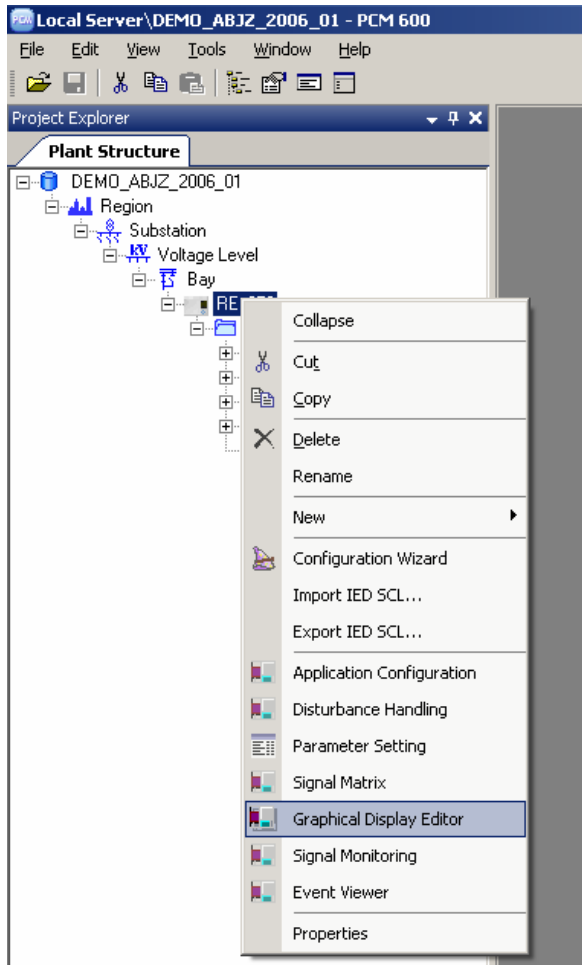
Protection & Control IED Manager PCM 600

The screenshot shows the 'PCM ABB - PCM 600' application window. The 'Project Explorer' on the left displays a hierarchical tree structure under 'ABB' > 'Region Västmanlands' > 'Substation Västerås East'. The selected component is 'A = REC670'. A context menu is open over this component, listing various actions such as 'Collapse', 'Cut', 'Copy', 'Delete', 'Rename', 'New', 'Configuration Wizard', 'Import IED SCL...', 'Export IED SCL...', 'Application Configuration', 'Disturbance Handling', 'Parameter Setting', 'Signal Matrix', 'Graphical Display Editor', 'Signal Monitoring', 'Event Viewer', and 'Properties'. A red arrow points from the 'Signal Matrix' option in the menu to the right-hand screenshot.

The screenshot shows the 'Signal Matrix' configuration window for 'A = REC670'. The window title is 'A = REC670 Ne... - Signal Matrix'. It features a 'BIM Slot 3 / X0' diagram at the top with 15 slots. Below the diagram is a table with the following data:

| POSITION (1) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|----------------|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| QA1-OPEN | | | | | | | | | | | | | | | | |
| QA1-CLOSED | | | | | | | | | | | | | | | | |
| QB1-OPEN | | | | | | | | | | | | | | | | x |
| QB1-CLOSED | | | | | | | | | | | | | | | | |
| QB2-OPEN | | | | | | | | | | | | | | | | |
| QB2-CLOSED | | | | | | | | | | | | | | | | |
| QB9-OPEN | | | | | | | | | | | | | | | | |
| QB9-CLOSED | | | | | | | | | | | | | | | | |
| QC9-OPEN | | | | | | | | | | | | | | | | |
| QC9-CLOSED | | | | | | | | | | | | | | | | |
| - SUPERVIS (1) | | | | | | | | | | | | | | | | |
| MCB_WA2-OK | | | | | | | | | | | | | | | | |
| MCB_L-OK | | | | | | | | | | | | | | | | |
| FAULTSIGNAL1 | | | | | | | | | | | | | | | | |

Protection & Control IED Manager PCM 600



PCM 600 Disturbance Handling Tool

PCMLocal Server\test - PCM 600

File Edit View Tools Customize IED Report Window Help

Project Explorer Plant Structure

test

- Region
 - Substation
 - Voltage Level
 - Bay
 - Dist12
 - FHT
 - Dist64 (noheader)
 - Dist64
 - ATWR End 1
 - REx67B
 - Max

- Substation

ATWR End 1 - Disturbance Handling **REx67B - Disturbance Handling**

Recordings

| | Stn Name | DRP Id | Trig Date | Trig Time | Chann | Rec | Trig Ch | Fault |
|---|-------------|--------|-----------|-----------|-------|-----|---------|-------|
| ▶ | F7rhult fac | 0 | 1999-08- | 13:49:36. | 58 | | | |
| | Air Tawar | 2 | 2004-02- | 02:28:55. | 96 | | | |
| | RTDS Test | 0 | 2004-12- | 10:43:26. | 29 | 999 | DFL-StL | |
| | Prov med | 0 | 2004-12- | 13:49:48. | 29 | 999 | DFL-StL | |
| | Test case 4 | | 1994-09- | 16:07:57. | 136 | 124 | CH03_1 | < 0,5 |

Available Recordings in IED

| | Stn Name | Obj Name | IED Name | DRP Id | Trig Date Time | Rec |
|--|-------------|----------|----------|-----------|----------------|------------------|
| | Air Tawar | 2 | 2004-02- | 02:28:55. | 96 | |
| | RTDS Test | 0 | 2004-12- | 10:43:26. | 29 | 999 DFL-StL |
| | Prov med | 0 | 2004-12- | 13:49:48. | 29 | 999 DFL-StL |
| | Test case 4 | | 1994-09- | 16:07:57. | 136 | 124 CH03_1 < 0,5 |

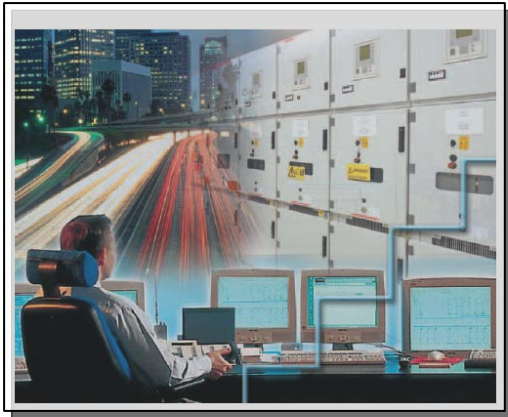
IED 670 pre-configured for transmission

- REL670 – Line/Cable
 - 1 or 2 CB – 1 or 3 phase
- RED670 – Multi terminal
 - 1 or 2 CB – 1 or 3 phase
 - 3 or 5 line ends
- RET670 – Transformer
 - 2 Winding - 1 or 2 CB/w
 - 3 Winding – 1 or 2 CB/w
- REC670 – Bay
 - 1 or 2 Breaker
 - 1 ½ Breaker
- REB670 - Bus
 - 3-phase for 8 feeders
 - 1-phase for 24 feeders
 - Summation for 24 feeders



State-of-the art IED “Made in ABB”

Future ^{proof}
concept



- A unique & open concept with ONE IED, ONE library, ONE MicroSCADA Pro and ONE common tool fully designed for IEC 61850 open standard
- Designed for 61850 from the start – and not an after thought
- Unique application function library independent of hardware & mapped in IEC61850 allows future upgrades
- Clear migration path for IEDs and MicroSCADA Pro with SPA, LON, IEC 60850-5-103, OPC, TCP/IP
- Adds value to your investment for the total life cycle



It is forever young



Comparing communication protocols

■ = Basic □ = Available as option with process bus

| | IEC 61850 | IED 670 Implementation | IEC 60870-5-101 | IEC 60870-5-103 | IEC 60870-5-104 | DNP 3.0 | LON |
|---|-----------|---------------------------|-----------------|-----------------|-----------------|---------|-----|
| Information management | | | | | | | |
| Basic real time values | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Protection | ■ | ■ | | ■ | | | ■ |
| Control | ■ | ■ | ■ | | ■ | ■ | ■ |
| Real time sampled values | ■ | □ | | | | | |
| Real time bay-to-bay commands | ■ | ■ | | | | | ■ |
| Fixed functionality | | | ■ | ■ | ■ | ■ | ■ |
| Free allocation of functions to any IED | ■ | ■ | | | | | |
| Data modelling | ■ | ■ | | | | | |
| Self description | ■ | ■ | | | | | |
| Vendor independent data interoperability | ■ | ■ | ■ | ■ | ■ | ■ | |
| Vendor independent application interoperability | ■ | ■ | | | | | |
| Parameter group setting | ■ | ■ | | ■ | | | ■ |
| Parameter setting | ■ | ■ | | | | | ■ |
| Disturbance recorder uploading | ■ | ■ | | | | | ■ |
| IEC open standard | ■ | ■ | ■ | ■ | ■ | | |
| Future proof | ■ | ■ | | | | | |



KEMA Certificate and inter operability

BKW®
BKW FMB Energie AG

ABB

SIEMENS

05000000

To Whom It May Concern

29th August 2005

Reference: Substation Automation and Protection Project for
Substation Meiringen 50kV with IEC 61850-8-1

Dear Sirs,

This serves to confirm that BKW FMB Energie AG, Switzerland, is building the 50kV substation Meiringen with a ABB decentralized numerical busbar protection type REB500 and the Siemens type SICAM PAS substation automation system, both with IEC 61850-8-1 communication protocol.

The tests conducted have shown that the busbar protection and the substation automation system communicate properly via the established link according to the new IEC 61850-8-1 standard.

Yours faithfully,


Luigi Scoca

BKW FMB Energie AG


Jürgen Westerfeld

ABB Schweiz AG


Kai Köhl

Siemens Schweiz AG



IEC 61850 Certificate Level A¹

No. 90500055-Consulting 2006-0190

Issued to:
ABB Power Technology AB
SA Products
S-721 59 Västerås
Sweden

For the product:
IED 670 1.0
Software version 1p1r12
Hardware version 1MRK002800-AA

Issued by: 

The product 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 product's protocol and model implementation conformance statements: "1MRK114-320, rev D; IED 670 PICS - IEC 61850 Protocol Information Conformance Statement, 1MRK114-210, rev H; IED 670 series - IEC 61850 MICS, and technical issue (TKCS) and extra information for testing (PDLIT) "1MRK114-316, rev J; IED 670 PDLIT - IEC 61850 Protocol Extra Information".

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 International Users Group Device Test procedures):

| | |
|--|--|
| <ul style="list-style-type: none"> 1 Basic Exchange (15/23) 2 Data Sets (2/5) 3 Substitution (3/3) 4 Setting Group Selection (2/3) 6 Buffered Reports (13/15) | <ul style="list-style-type: none"> 9ab GOOSE (14/20) 12a Direct Control (4/11) 12d Enhanced SBO Control (0/18) 13 Time Synchronization (4/4) |
|--|--|

This Certificate includes a summary of the test results as carried out at ABB Västerås, Sweden with UniCasim 61850 version 2.12.03 test system running test suite "61850 Conformance Test V2.12.01". UniCA 61850 analyzer version 4.13.00. The test is based on the UCA International Users Group Device Test Procedures version 1.1. This document has been issued for information purposes only, and the original paper copy of the KEMA report No. 90500055-Consulting 2006-0140 will prevail.

The test have been carried out on one single specimen of the products as referred above and submitted to KEMA by ABB Power Technology. 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, March 2, 2005



S.J.L.M. Jansson
Managing Director KEMA Consulting



R. Schimmel
Certification Manager

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

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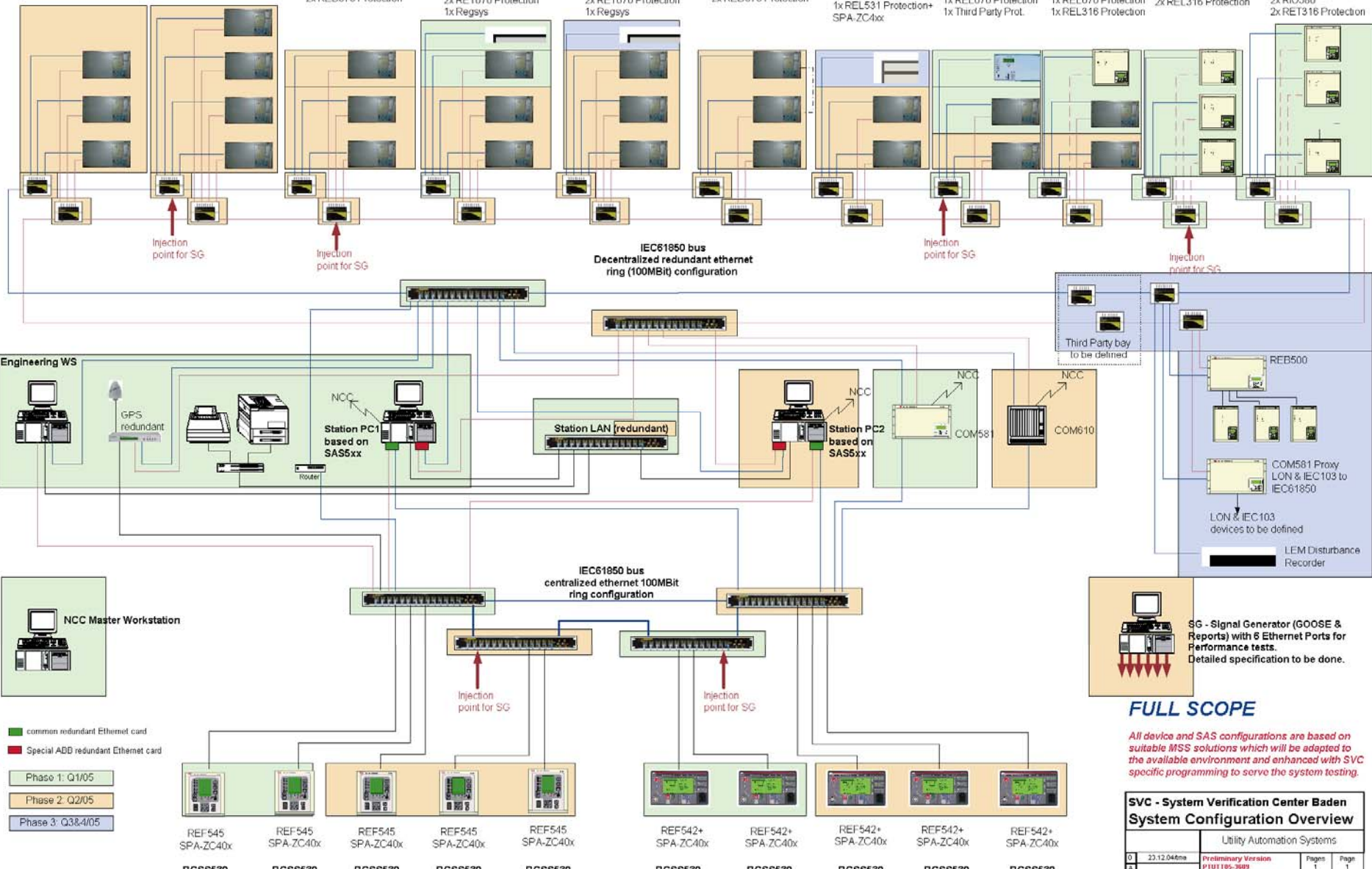
KEMA Nederland B.V.
Utrechtseweg 310, 6912 AR Amhem, P.O. Box 9035, 6900 ST Amhem, The Netherlands.
Telephone + 31 26 285 6142, Telefax + 31 26 515 405, Email kema@kema.com

ABB

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20-Apr-06

ABB System Verification Center

- BCS575**
1 1/2 Breaker
3x REC670 Control
- BPS581**
1 1/2 Breaker
4x REL670 Protection
- BCS570 / BPS570**
bus coupler double BB
1x REC670 Control
2x REB670 Protection
- BCS570 / BPS573**
transformer bay
1x REC670 Control
2x RET670 Protection
1x Regsys
- BCS570 / BPS573**
transformer bay
1x REC670 Control
2x RET670 Protection
1x Regsys
- BCS590 / BPS572**
line bay double BB
1x REC670 Control
2x RED670 Protection
- BCS570 / BPS571**
line bay double BB
1x REC670 Control
1x REL670 Protection
1x REL531 Protection+
SPA-ZC4xx
- BCS570 / BPS571**
line bay double BB
1x REC670 Control
1x REL670 Protection
1x Third Party Prot.
- BCS570 / BPS571**
line bay double BB
1x REC670 Control
1x REL670 Protection
1x REL316 Protection
- BCS570 / BPS571**
line bay double BB
1x REC316 Control
2x REL316 Protection
- BCS570 / BPS573**
transformer bay
1x REC316 Control
2x RIO580
2x RET316 Protection



- Green box: common redundant Ethernet card
- Red box: Special ABB redundant Ethernet card
- Phase 1: Q1/05
- Phase 2: Q2/05
- Phase 3: Q3&4/05

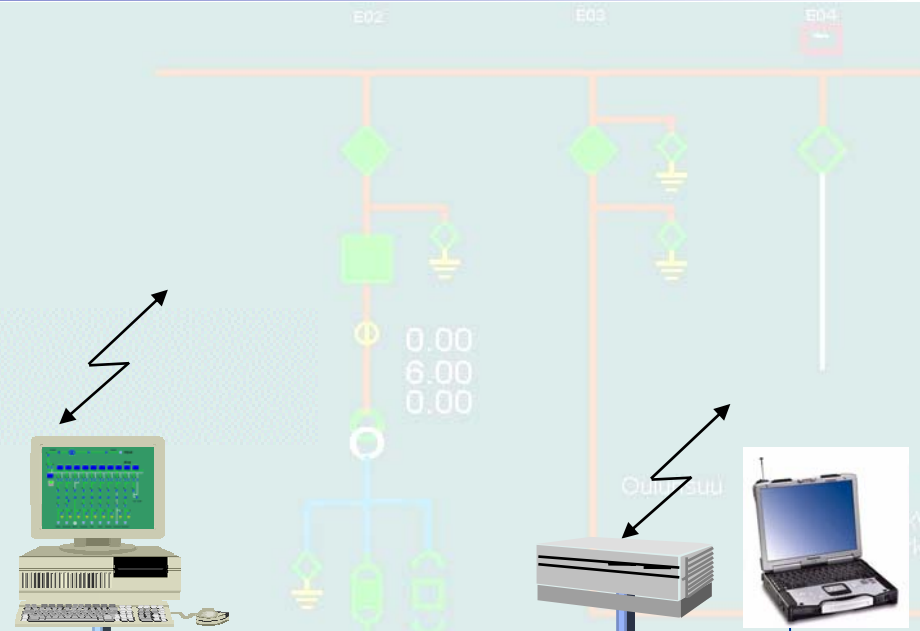
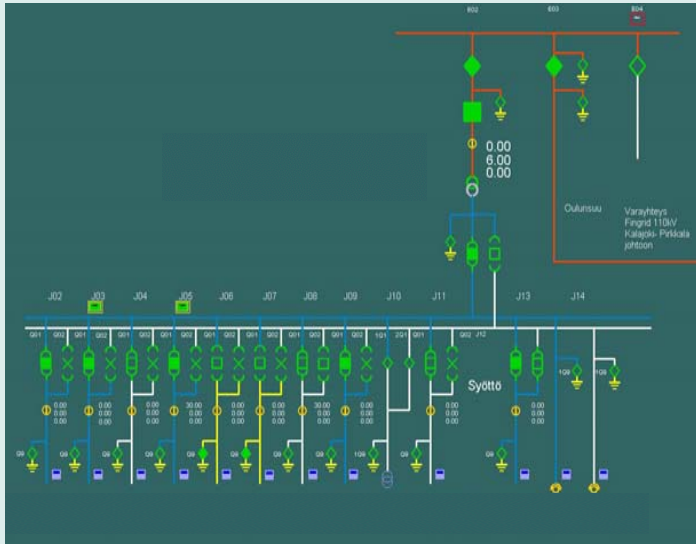
FULL SCOPE

All device and SAS configurations are based on suitable IEC61850 solutions which will be adapted to the available environment and enhanced with SVC specific programming to serve the system testing.

SVC - System Verification Center Baden System Configuration Overview

| Utility Automation Systems | | | |
|----------------------------|-------------|---------------------|--------|
| 0 | 23.12.04/mn | Preliminary Version | Page 1 |
| A | | P101185-3689 | Page 1 |

Migration Made in ABB with LON



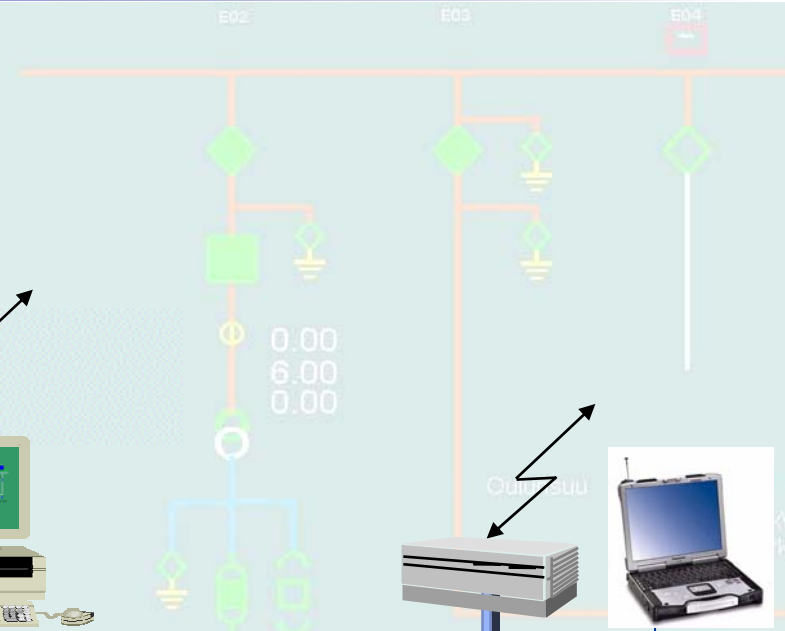
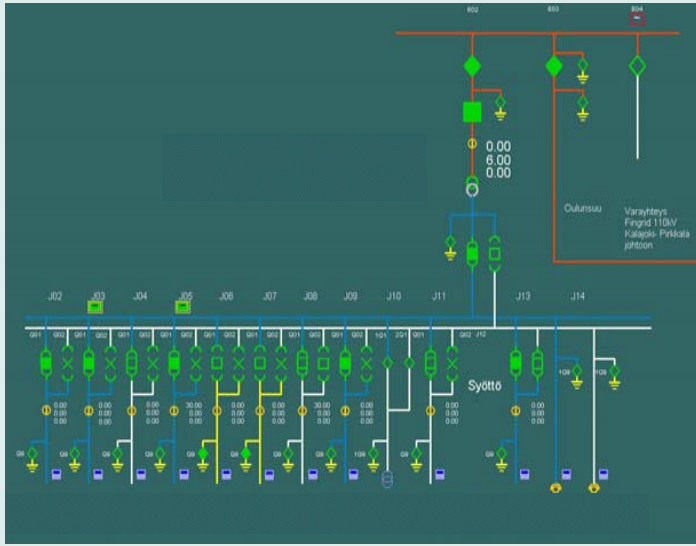
LON

TCP/IP

Optional SPA
IEC 870-5-103

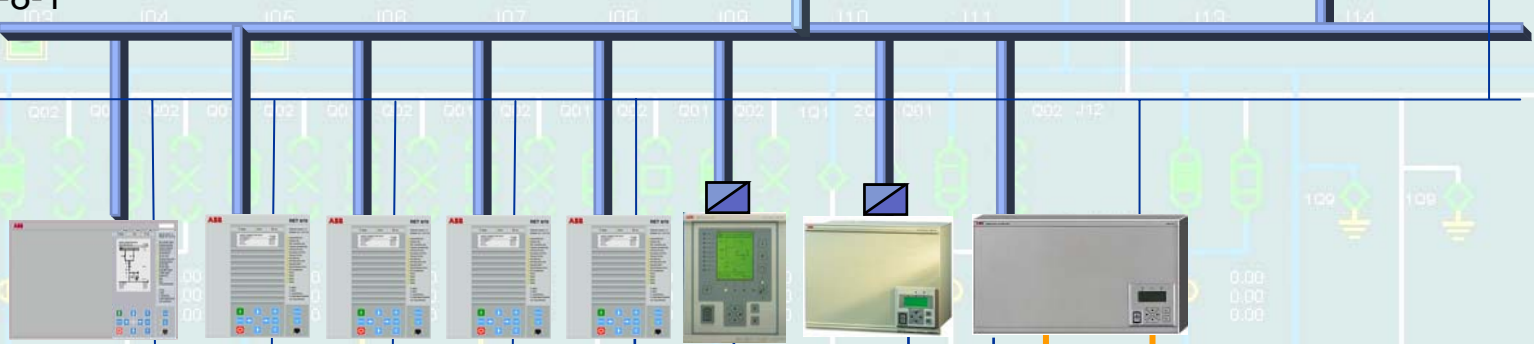
Heikkilän-
kangas linatti Kivi- Joutsen- Kivi- Kuurna- Oma- Kaak- hen-
harju kaari Vara niemi Häätä puisto käyttö polku kuja Mittaus

Migration Made in ABB with IEC 61850



IEC 61850-8-1

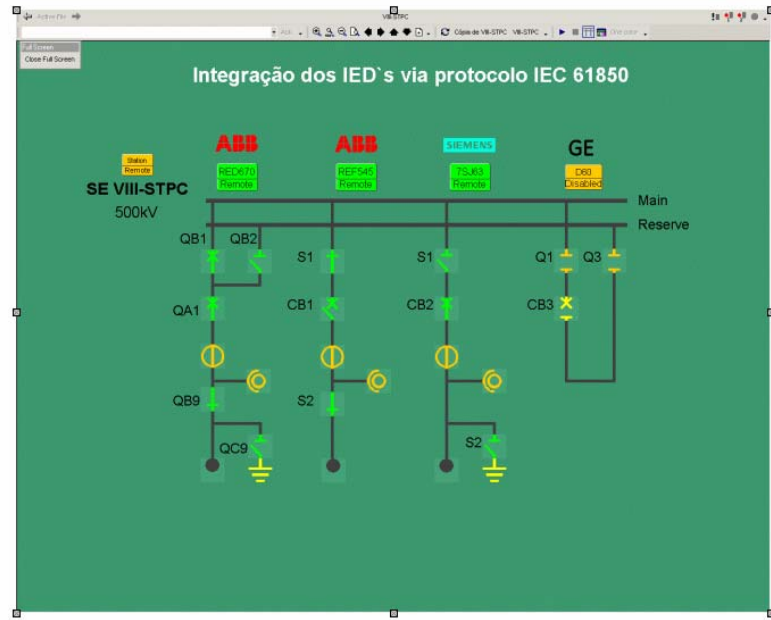
TCP/IP



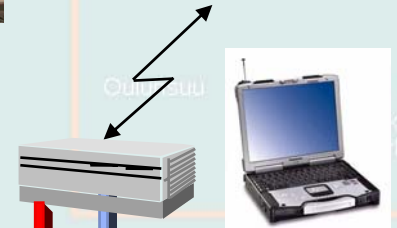
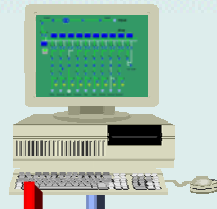
Optional SPA/LON
IEC 870-5-103

- Heikkilän-kangas
- linatti
- Kivi-harju
- Joutsen-kaari
- Vara
- Kivi-niemi
- Hätäjä
- Kuurma-puisto
- Oma-käyttö
- Kaak-polku
- hen-kuja
- Mittaus

Interoperability Made in ABB

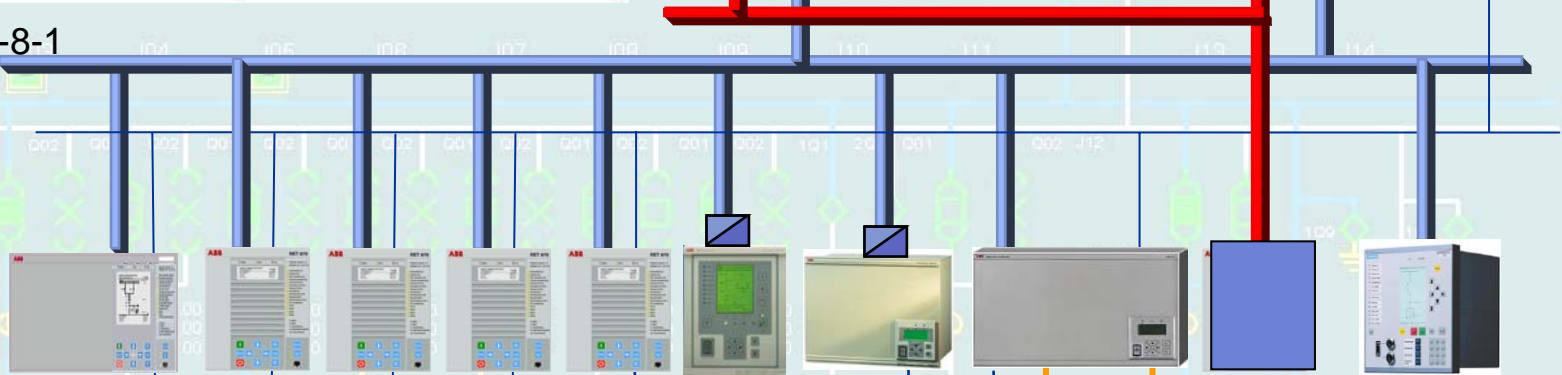


Omicron test plan with Goose



IEC 61850-8-1

TCP/IP



Third party IED

Optional SPA/LON
IEC 870-5-103

Other protocol (IEC 870-5-103, DNP 3.0 etc.)

IED 670 deliveries and FAT



Brazil: IED 670, MicroSCADA Pro and LON

India: IED 670, MicroSCADA Pro and IEC 61850



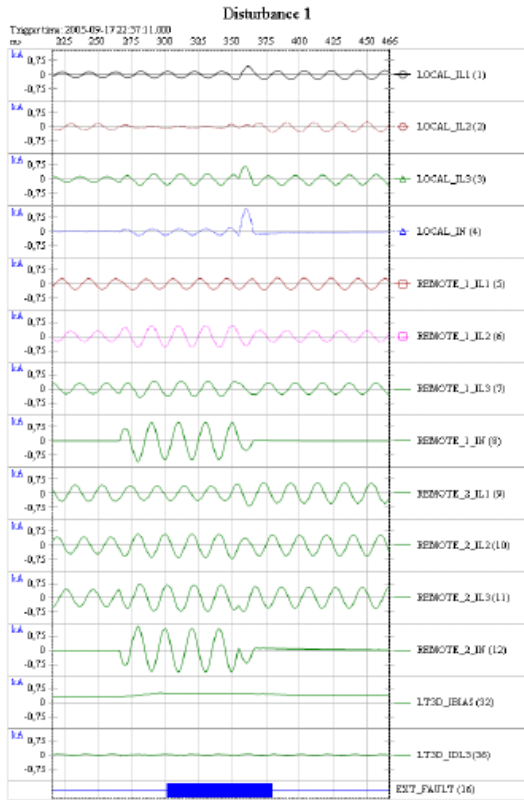
IED 670 deliveries and FAT

Norway RED 670 installation

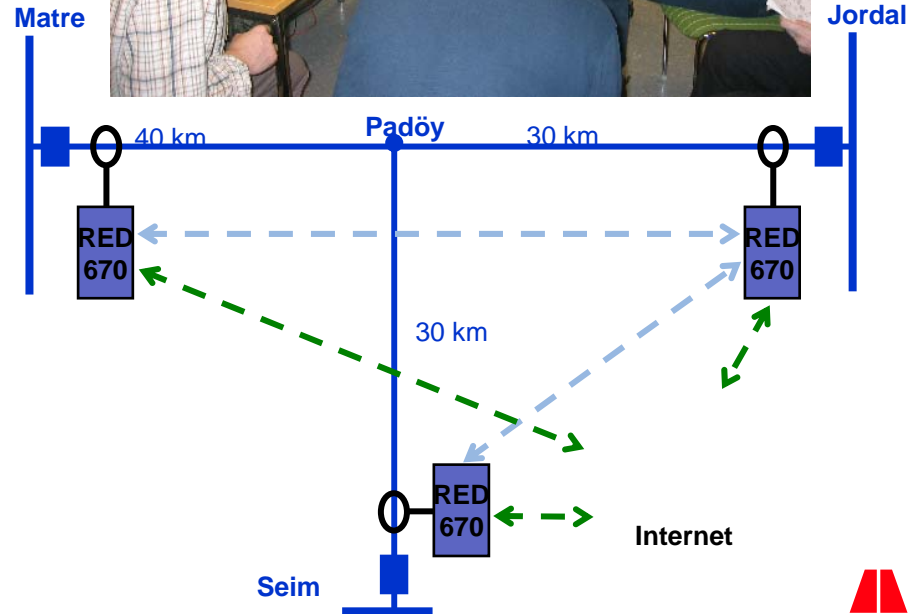
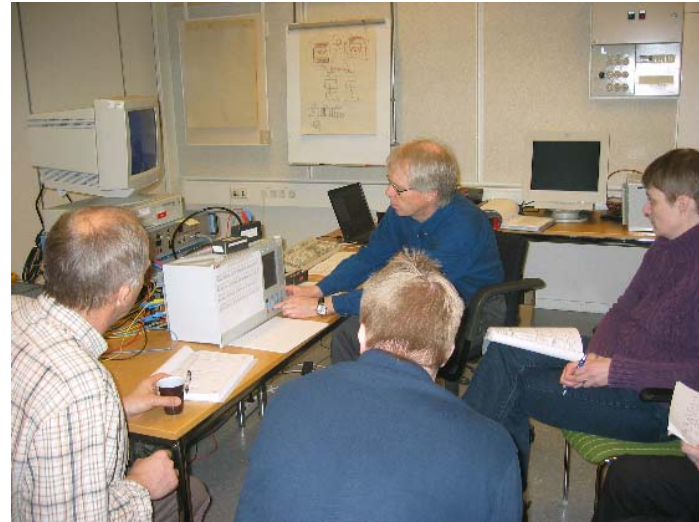
Finland REB 670 FAT



ABB - Disturbance Report



Recording file: 20050917_374
Date: 2005-09-17 22:37:11
Station: Bay, Jordal
Template: C:\PCMDatabases\CR\templates\default.xml



Two Gold medals



Selected ABB IEC 61850 References

ABB's IEC 61850-compliant solutions around the globe

TERNA SICAS Program for 380/220/150kV S/Ss, Italy

Large-scale standardization of IEC 61850-compliant solutions

Creation, homologation and supply of:

- 40 type-tested bay control and protection solutions
- High-quality user interface, standard logics and sequencer
- Incorporation of 3rd party IEDs and units with IEC 61850 communication interfaces

Efficient project implementation

EGL 380 kV Laufenburg Substation, Switzerland

The world's first HV substation with IEC 61850-compliant SA

Stepwise retrofit of seven out of 17 bays:

- New control and redundant protection
- Gateway to existing station HMI
- Integration of 3rd party Main 2 IEDs with IEC 61850 communication interfaces

Sustainable concept for easy migration of remaining bays/station HMI.

DEWA Frame contract, Dubai

Supply of 20 IEC 61850-based SA systems

State-of-the-art systems for new 132/11 kV S/Ss:

- Short lead times realized by highly qualified project team
- Redundancy concept, independent key components and physically separated communication networks
- Proven technology and functionality

Safeguarded investment into interoperable systems for any make of switchgear.

NEK refurbishes its HV S/Ss Dobrudja & Varna, Bulgaria

The first 400/220/110 kV S/Ss to be refurbished obtain IEC 61850-compliant SA

- Different configurations: double busbar, 1½ c.b., ring
- Redundant station servers and operator workstations in hot standby mode
- Integration of some 70 new REx670 IEDs and four REB500 numerical busbar protection systems
- Integration of 110 kV signals via RTU as well as existing REL521 line protection

Optimal life cycle management through future-proof retrofit concept

Seneloc's Hann 90/30kV S/S, Senegal

Refurbishment of Seneloc's most important substation

- New IEC 61850-compliant bay control and protection
- Redundant station level system
- Integration with Network Control and Dispatching Centers

Future-proof solution for existing 90kV AIS as well as new 30kV GIS

Turnkey 400/132kV GIS S/S in Fujairah, UAE

ADWEA's new substation will be controlled and monitored by an IEC 61850-compliant system featuring:

- Redundant Station HMI for all substation automation applications
- Bay control unit REC670 for all control applications and all voltage levels
- Homologated protection systems based on REx500 and 316*4 series including each one REB500 system for busbar resp. breaker failure protection

State-of-the-art solutions with proven applications

ENELVEN's and ENELCO's Solar & Médanes S/Ss, Venezuela

IEC 61850 is key to the utilities' strategy for SA throughout their grids

- Uniform system architecture with redundant station level for high availability
- Redundant Ethernet ring with switches for direct connection of all control & protection IEDs with IEC 61850 communication interface
- High-quality operator interface with proven applications for control and monitoring of the entire 138/24 kV & 115/13.8 kV S/Ss

Enhanced efficiency with harmonized SA systems for new and retrofit substations

MEW's Financial Harbour, Sitra & Buqayyah S/Ss, Bahrain

The three 220/66/11 kV GIS substations will strengthen the grid and increase the reliability of the power supply

- Redundant Station HMI with redundant, independent gateways
- One product family, REx670, for Control and Protection
- Bay/Section control unit REC670 for all three voltage levels
- REB500 busbar and breaker failure protection (220 kV) with IEC 61850 communication interface
- Integration of 3rd party protection IEDs via IEC-103/IEC 61850 converter

IEC 61850 introduced in ABB's first substations for MEW Bahrain

Six new HV substations for PGCIL, India

400/220 kV GIS S/S at Mahanabagh, 400/220 kV AIS S/Ss at Bhatapora, Fatehabad, Raigarh and Rajgarh, 400 kV AIS S/S at Bina

PGCIL's new substations will be controlled and monitored by IEC 61850-based SA systems featuring:

- Redundant Station HMI using MicroSCADA Pro
- One product family, REx670, for Control and Protection
- REC670 bay control unit for all voltage levels
- REB500 numerical busbar protection system with IEC 61850 communication interface
- Integration of 3rd party Main 2 IEDs on IEC 61850 platform
- Redundant gateways for integration with Network Control and Dispatching Centers

The customer's philosophy as well as requirements for functionality and availability are being met

220/132/33kV S/S for Sohar Industrial Area, Oman

Automation with verified IEC 61850 implementation for new GIS substation

- Redundant Station HMI
- Scalable bay control unit REC670 for all three voltage levels

Enhanced operational efficiency and safety through optimized solution

- New installation
- Retrofit/migration

