SIPROTEC 5
News & Updates

Georg Korger, Head of Department Protection

VAR Partner Day 2021 │ September 15 -17 │ Vienna, Austria
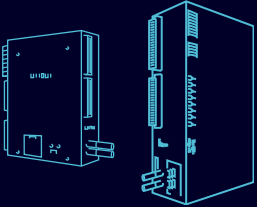
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SIPROTEC 5
Review - History of the world's leading protection technology

SIPROTEC 5
Process bus and
digital substation
2015

Cloud based
applications for
SIPROTEC
2018

SIPROTEC 5 compact
Universal Protection
2021

More than 1.6 million installed devices

2011
SIPROTEC 5
The new Benchmark
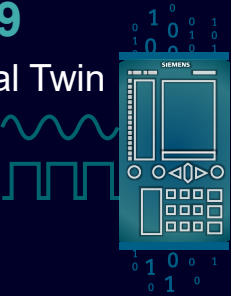for protection,
automatiion und
monitoring

2017
SIPROTEC 5 IoT
Interface to
MindSphere

2019
Digital Twin

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SIPROTEC 5
Portfolio

Line protection
- Distance and Line differential protection
- 7SA8, 7SD8, 7SL8

Over current and feeder protection
- 7SJ81/82/85/86

Paralleling device / Breaker management
- 7VE85, 7VK87

Generator and motor protection
- 7UM85, 7SK82, 7SK85

Fault recorder
- 7KE85

Transformer differential protection
- 7UT8
- 2 -5 winding Transformer
- Integrated voltage regulator Transformer monitoring

Busbar protection
- 7SS85 centralized
- 7SS85 distributed

Bay control unit and Merging unit
- 6MD85/86
- 6MU85

SIPROTEC 5 compact universal device
- 7SX800

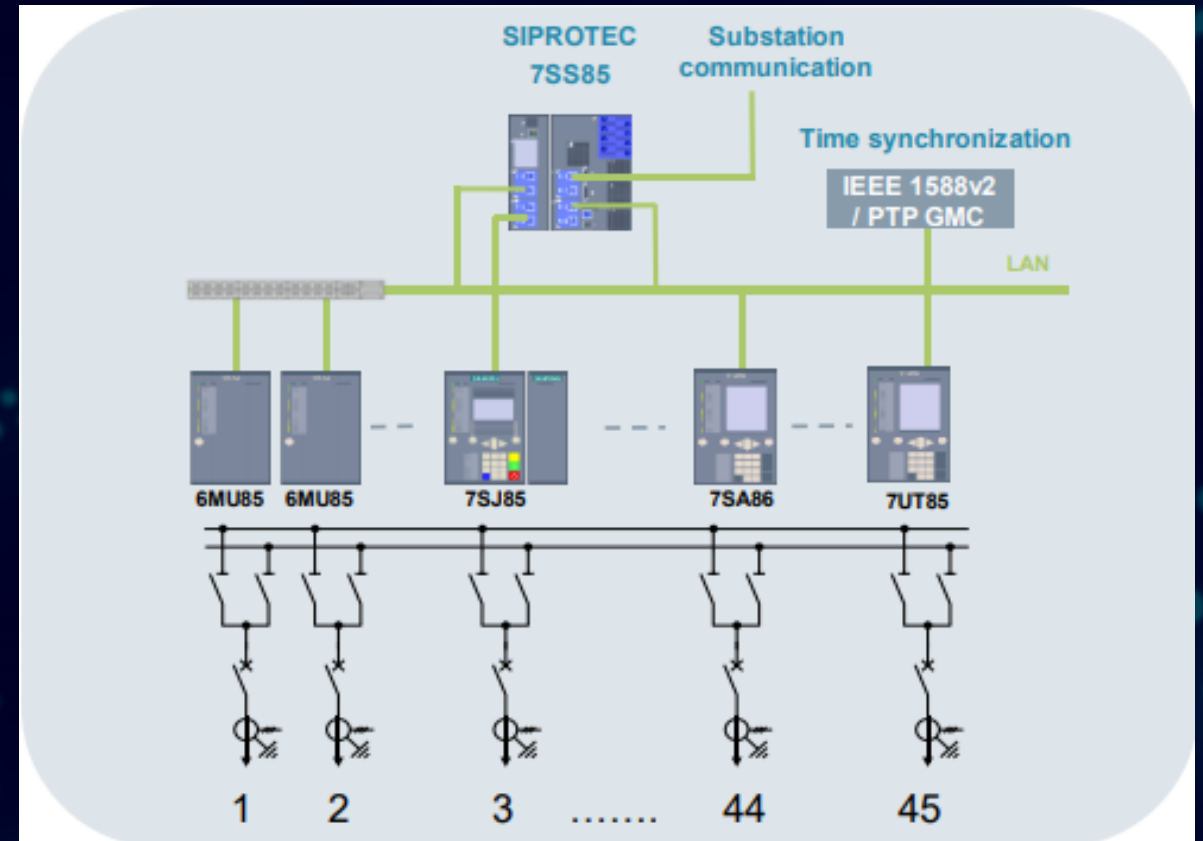## SIPROTEC 5

SIPROTEC News and Updates
Distributed Busbar Protection

Aktueller Versionsstand SIPROTEC 5 / DIGSI 5:

Distributed busbar protection for up to 45 bays /

current measuring points and 20 zones (with V8.40)

- Any modular SIPROTEC 5 device with interface module ETH-BD-2FO can be used as a bay unit for the SIPROTEC 7SS85 central unit

- Communication based on process bus [1]

- Additional protection and automation functions of the SIP 5 platform are available in the central and bay unit -> cost effiiciency or / and redundancy

  (87B, 50BF, 62BF, 50/74, 74TC, 27/59, 25, 79, 50/51(N), 67(N), …)
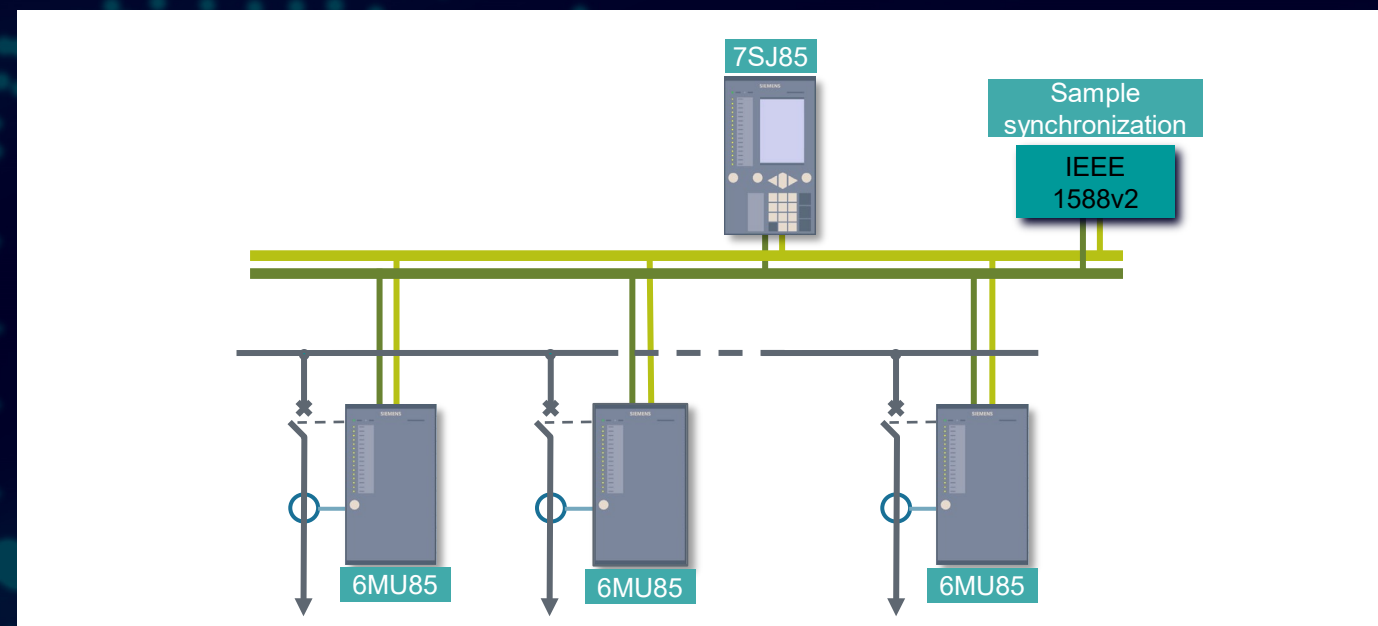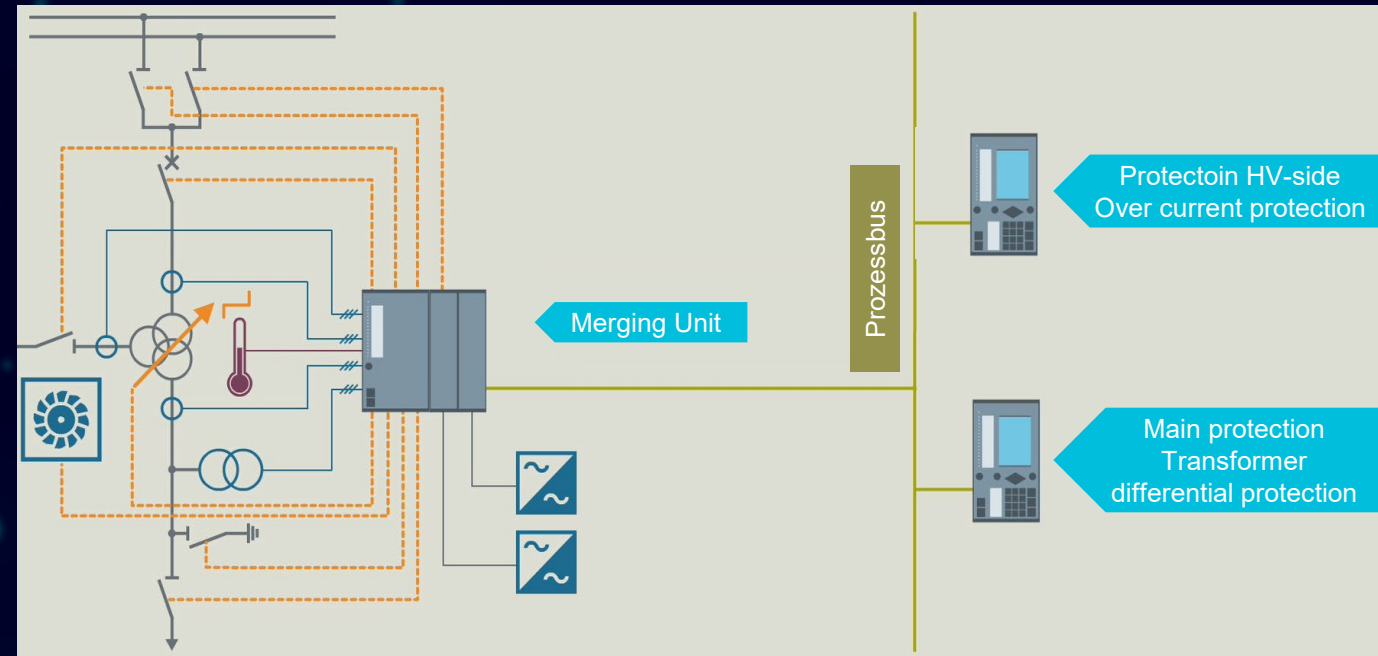
[1] acc. IEC61850 Ed. 2.1)

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SIPROTEC News and Updates
Merging Unit 6MU85

Merging Unit 6MU85

- Bay Unit for distributed busbar protection

  = central data node on process level with automation functions

- The interoperable solution between primary and secondary equipment of the substation

- Use of process bus with merging units allows multiple possibilities of new protection monitoring applications

  (i.e. centralized protection, multi-feeder protection, especially on medium voltage level or in industrial environments, …)

Prozessbus

Protectoin HV-side Over current protection

Merging Unit

Main protection Transformer differential protection

7SJ85

Sample synchronization

IEEE 1588v2

6MU85   6MU85   6MU85

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SIPROTEC News and Updates
New Interface Module – ETH-BD-2FO

Optical interface module for communication based on Ethernet-„ETH-BD-2FO"

One hardware – multiple functions (adjustable per Software) (with V8.30)

- SCADA-communication
- IEC 61850-8-1 GOOSE/MMS, DNP 3.0, Modbus TCP Slave, *104, Profinet I/O
- Processbus-Server → Sending the sampled values of current and voltage done by the merging unit
- Processbus-client→ Receiving the sampled values by the SIPROTEC 5 device on the higher level via process bus and making it available to the protection functions
- IEEE 1588v2 / PTP → allows the synchronisation of the sampled values for process bus application (1 µs) and of date and time

  Distribution of IEEE 1588v2/PTP via ring networks (HSR or RSTP) is supported
- PMU – Phase Measuring Unit functionality
- VLAN, HSR network redundancy for process bus possible with ETH-BD-2FO
- To be used in modular SIPROTEC 5 devices
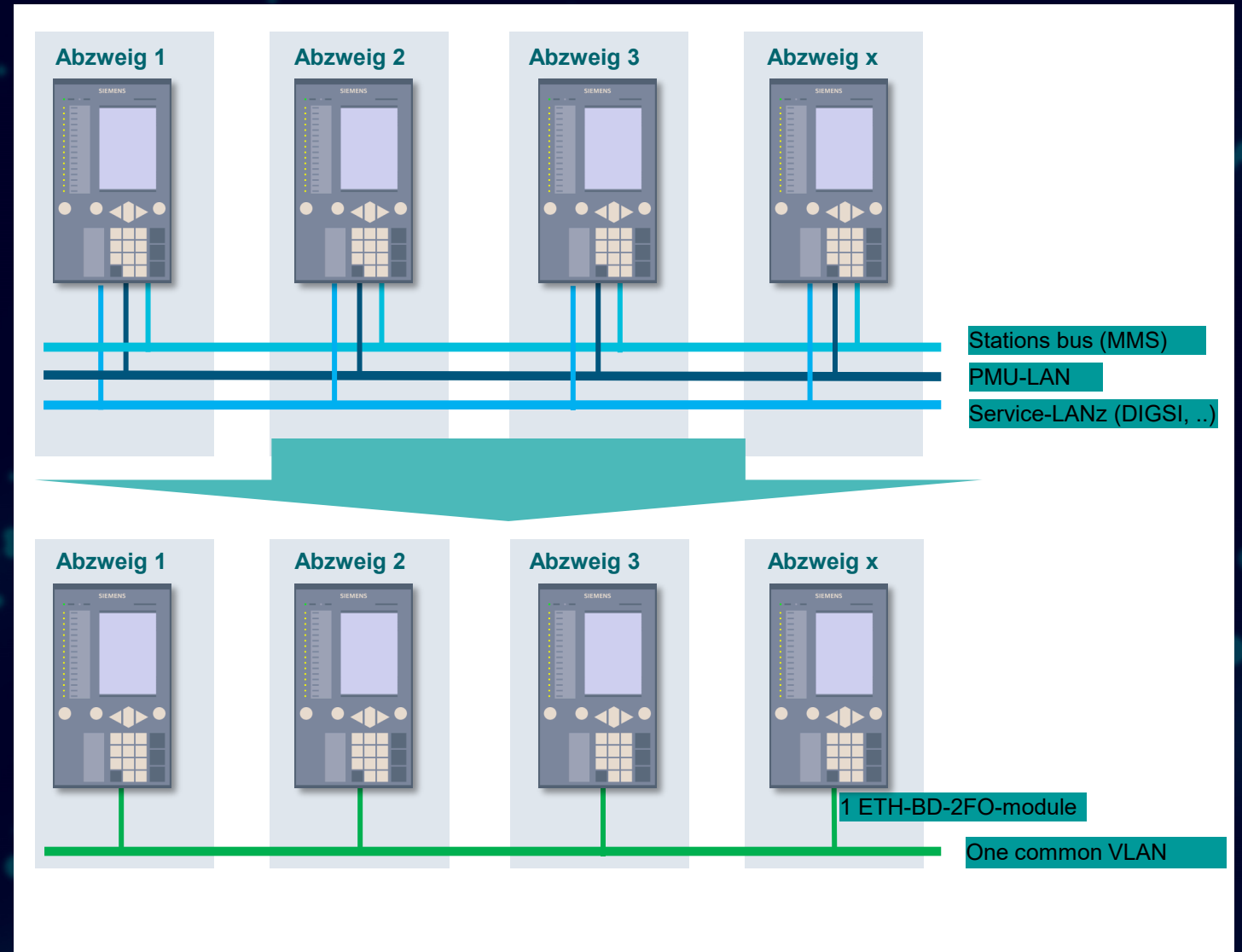
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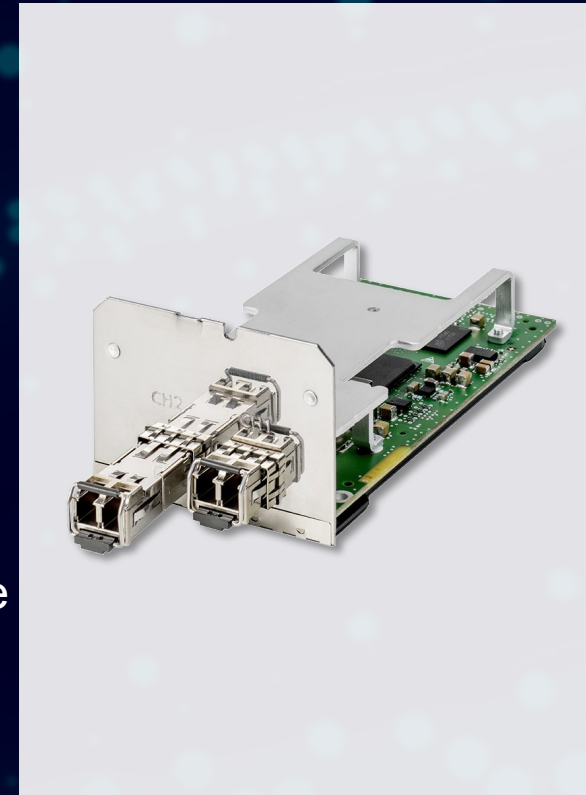
SIPROTEC News and Updates
Network Topology

Network topology VLAN

Simplifying the communication network with the modul ETH-BD-2FO:

- 1 instead of 3 networks

  Logical (VLAN-) seperation of

  - Station bus (IEC61850, *104, …)
  - PMU-Net
  - Service-LAN

    (Parametrisation, remote access,…)

  for all modular SIPROTEC 5-devices

Abzweig 1   Abzweig 2   Abzweig 3   Abzweig x

Stations bus (MMS)
PMU-LAN
Service-LANz (DIGSI, ..)

Abzweig 1   Abzweig 2   Abzweig 3   Abzweig x
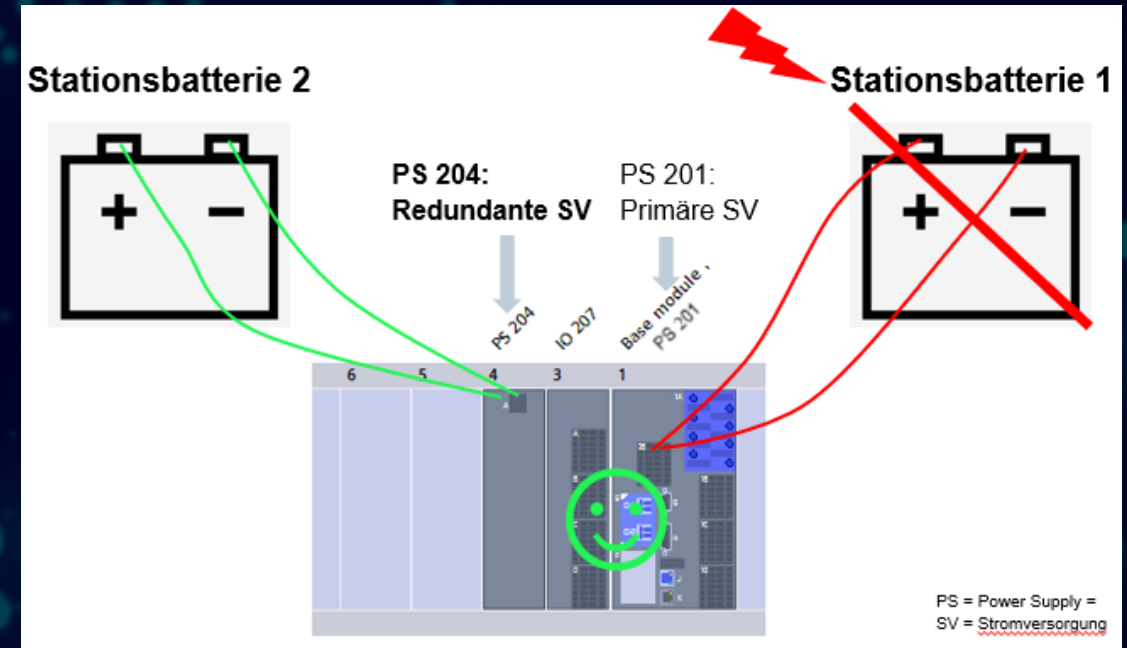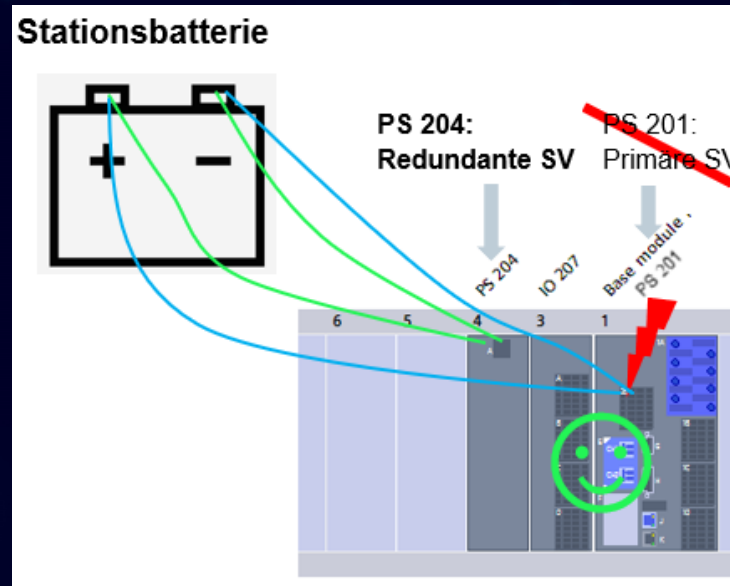
1 ETH-BD-2FO-module
One common VLAN

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SIPROTEC News and Updates
Power Supply

Redundant Power supply (with 7.90)

- 2 separate power supplies in the protection device   -   fed from 1 battery

- 2 separate power supplies in the protection device   -   fed from 2 external batteries

  - No outage of the device incase of an outage of one internal power supply

  - No outage of the device incase of an outage of an external battery

  Available for all modular SIPROTEC 5-devices (extension module PS204)

HW edition: ≥ xB:

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<u>Why „Point-on-Wave" Switching?</u> (with 7.90)

- Switching operations OFF/ON cause electro-dynamic and dielectric stress for operational equipment (i.e. inrush currents, overvoltages, …)

- The PoW function operates the CB pole-selectively and determines the optimal switching instance for each phase / pole <u>individually</u>, with an IED accuracy of ~ 50µs using high speed contact of SIPROTEC 5

- > Longer service life, aging of primary equipment reduced
- > Increased system reliability
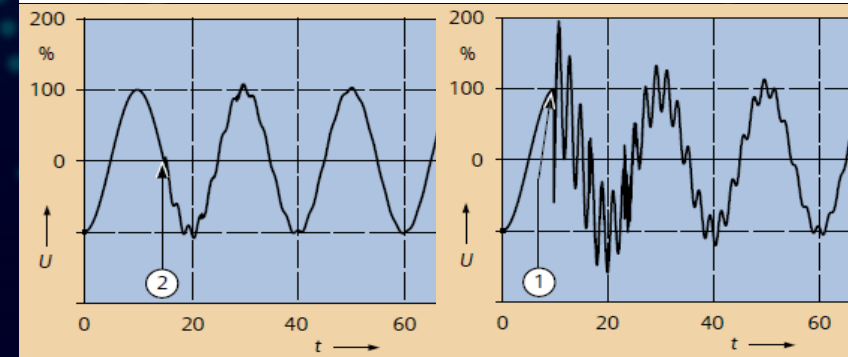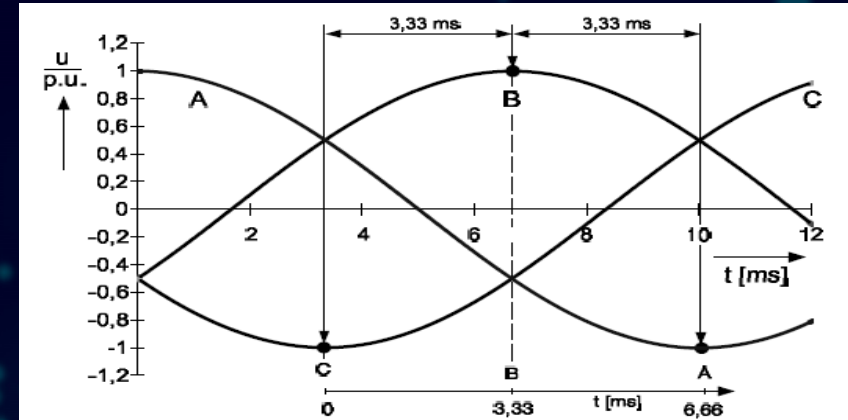
Capacitive load

Closing time optimized   not optimized

PoW with 6MD86 as „stand alone" PoW-device
PoW with 6MD86 as bay control unit + PoW-function
PoW with protection device (7UT8, 7SJ85, LineProt 7Sx87)

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PQ Functions

Power Quality Functions (with V8.40)

- Voltage **unbalance.** Comply to IEC61000-4-30 class S

- Voltage variation: dip, swell, interruption. Comply to IEC61000-4-30 class S

- Total Harmonic Distortion (THD) and harmonics up to 20th THD

- Total Demand Distortion (TDD)

- can be displayed by HMI of device and remote by DIGSI, or via protocols

- statistic values like counters, maximum values, warning signal, and log entries
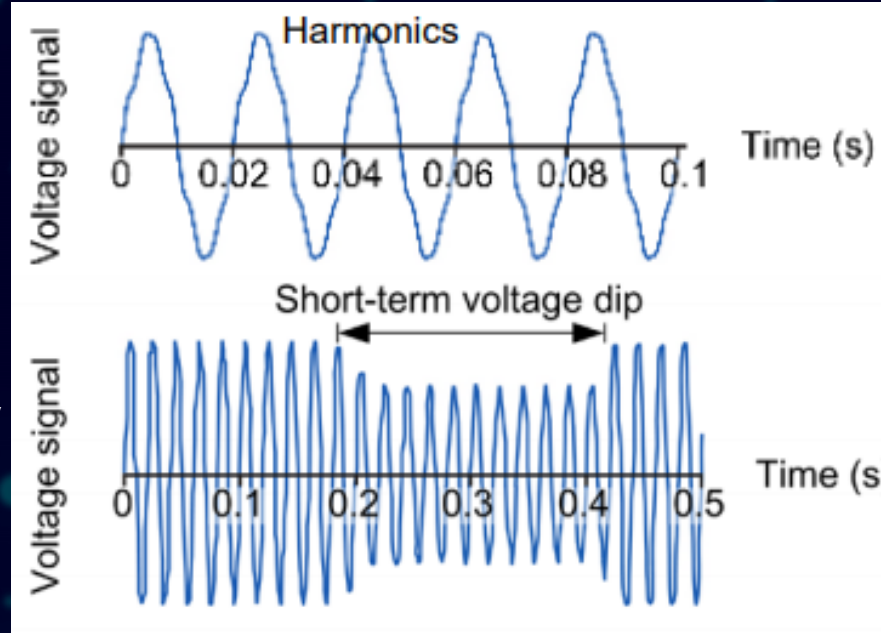
> **One SIPROTEC 5 platform and DIGSI 5 for protection, automation and power quality**

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SIPROTEC News and Updates
Slow Scan Recorder   -   Attributes

General settings

- Pre-trigger time and post-trigger time
- Maximum record time (1-90 min), manual record time
- MV averaging time (1…3000 cycles)
- Retrigger blocking time

Trigger

- Binary indications
- Measurement values (type and trigger value settings)

Routings

- Separate SSR column in configuration matrix
- Options: Not routed, **x**(routed), **t**(trigger), **xt**(routed + trigger)
- Maximum 75 MV and 100 binary indications

Memory management

- Memory demand monitoring (setting and routing check)
- Maximum 5 Mbyte per instance of SSR

Motor start current

recorded vis the Slow Scan Recorder
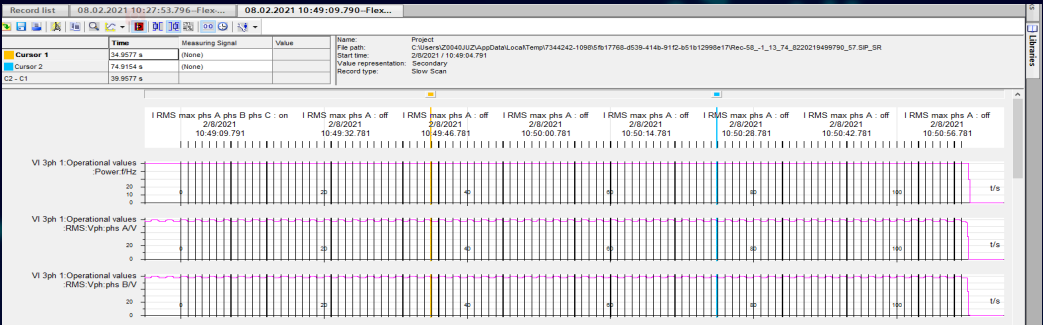
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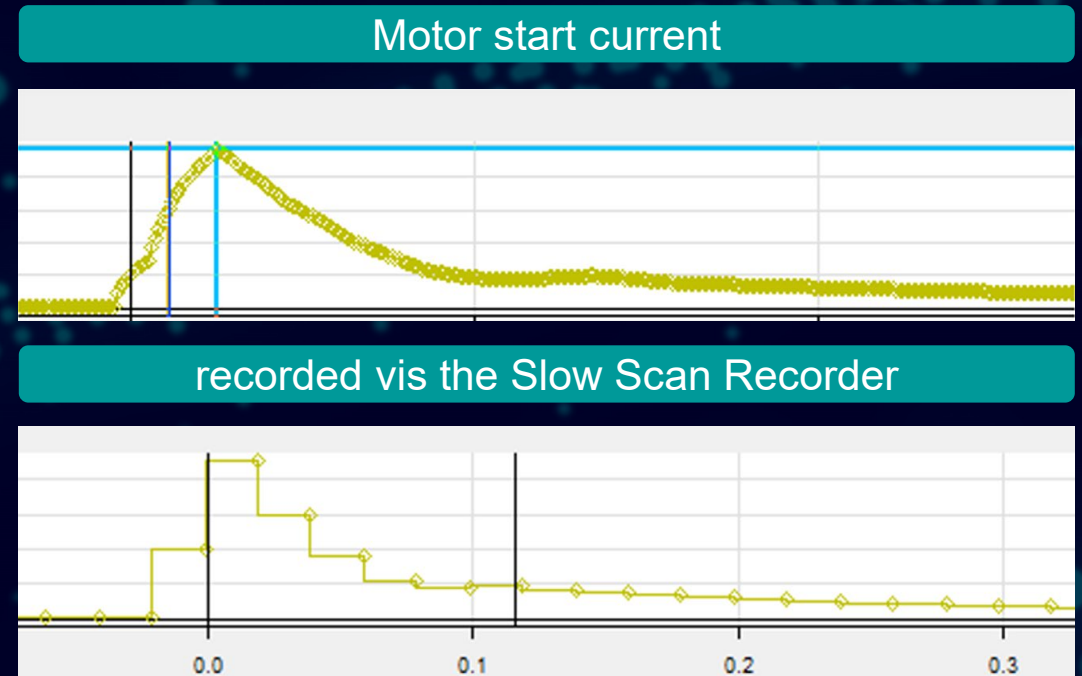
SIPROTEC News and Updates
Slow Scan Recorder - Download and Visualization

- Extended recorder types can be downloaded via DIGSI, WEB-UI and IEC61850 communication.

- Native format or COMTRADE 1999/2013

- Visualization via SIGRA or COMTRADE-viewer including all record attributes

■ Fault records only

■ Fault records and extended recorders

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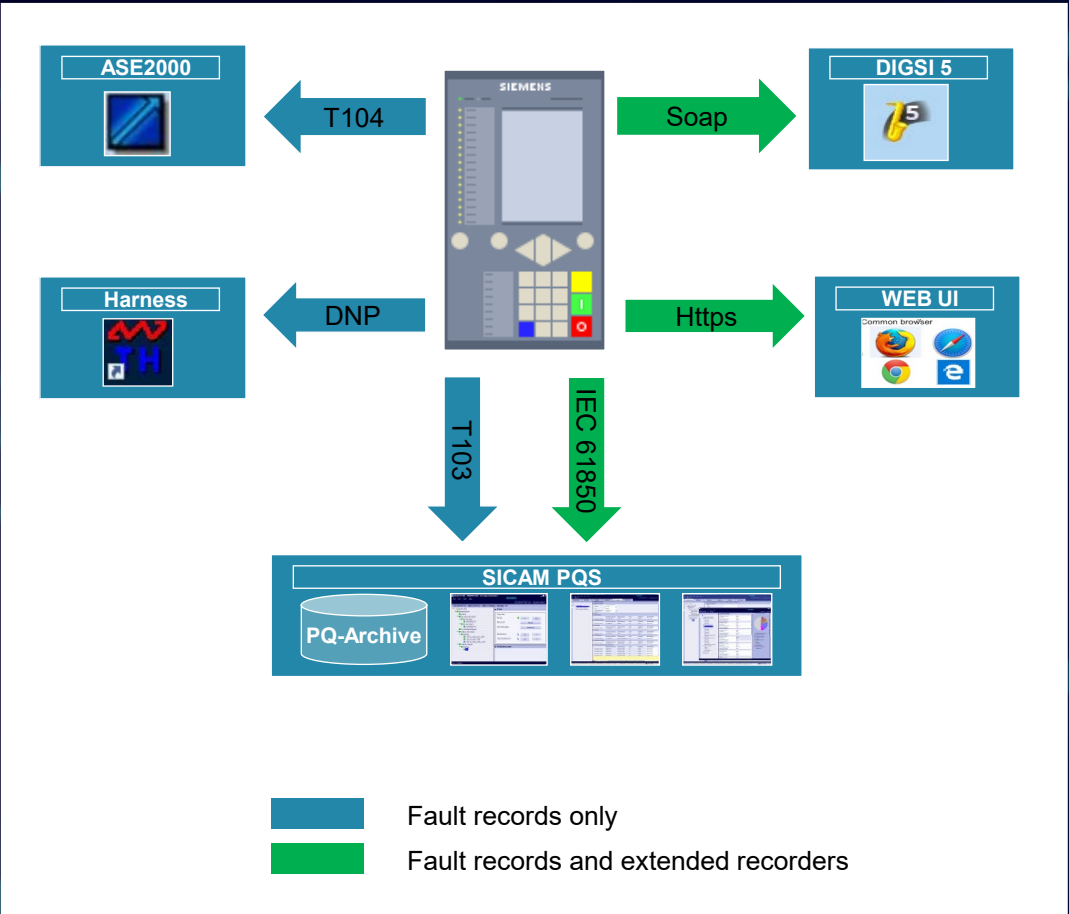
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Low Voltage Application with SIPROTEC 5

SIP 5 part:
P1X301

Direct voltage measurement low voltage networks ?

In networks with more than one infeed

or

networks which are coupled usually voltage measurement is necessary to achieve:

- Operational measuring values of voltage, power and energy
- Directional overcurrent protection
- Directional power protection / Reverse power protection
- Over- and Undervoltage protection

This is the case for almost all industry operations.

New solution: Voltage divider - no VT needed
                            integrated in modular terminals

Magnitude correction set in DIGSI 5

- > No value transformation required by the user

7SJ82

Secondary side

100k

100k

100k

AC 176 V

AC 265 V

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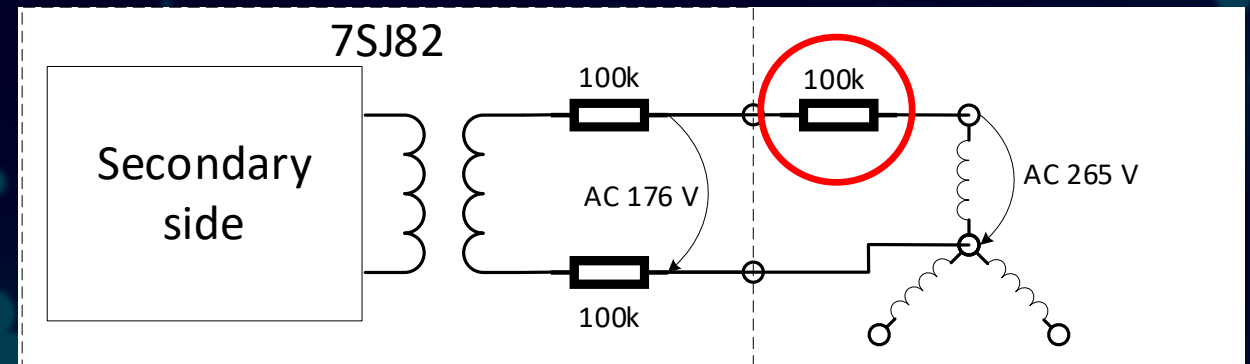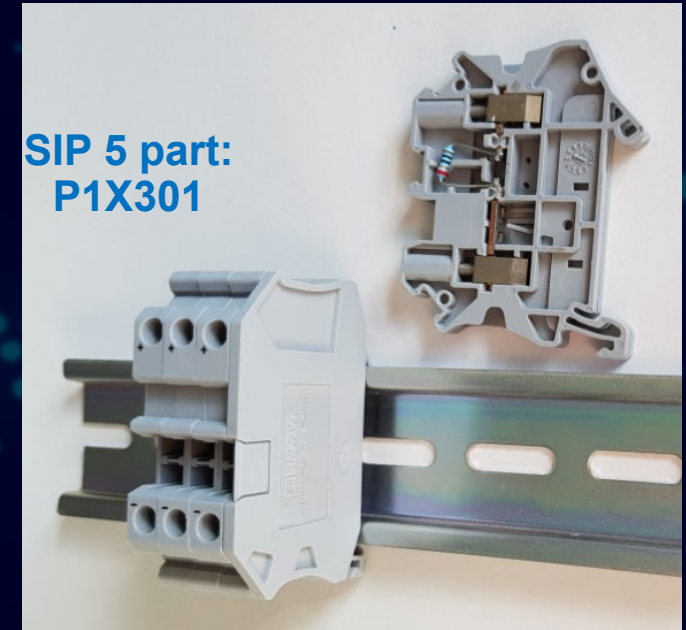
SIPROTEC News and Updates
Advanced protection communication –
Differential-/protection communication via IP based Communication networks (with V8.60)

- New communication protocol on the ETH-BD-2FO module
  - protocol according to UDP/IPv4 standard
  - Suitable for MPLS-TP, MPLS-TE, WAN, Ethernet…

  - Supports IEEE1588 PTP running on the same module

- Direct connection to communication networks
  (via routers or switches) without expensive line-cards
   or similar

- Real parallel line protection with two separate differential protection functions
- Only available on SIPROTEC 5 Modular

IP-Network

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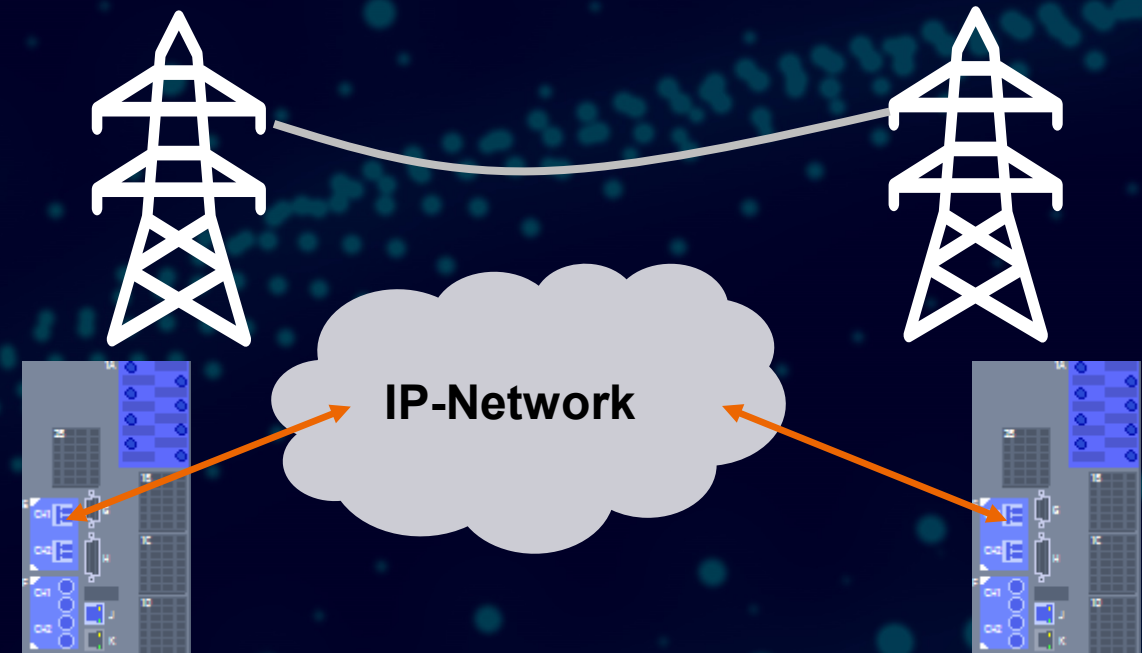
SIPROTEC News and Updates
DIGSI 5 / Engineering

Easier filtering of routing information –

Favorites settings - Simplify of complexity (since V8.30)

- User can set routing filter to his needs
  - Binary inputs, F-Keys and LEDs

- User can define favorite settings
  - All relevant settings for one bay on one screen
  - Reduced risk of changing wrong parameters

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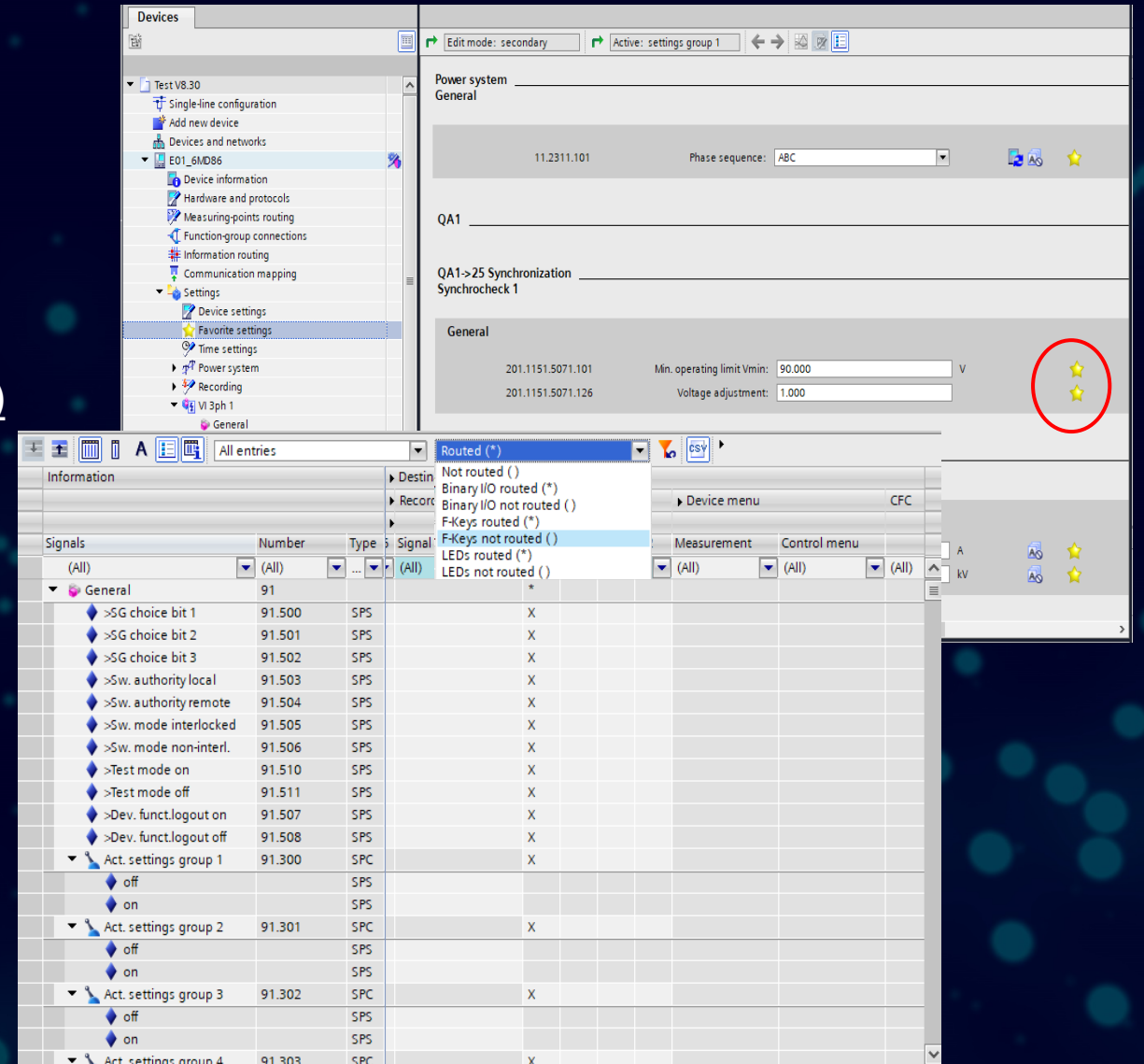
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DIGSI 5 (with V8.60, V8.80)

- DIGSI 5 "Compact" License extended:

  DIGSI 5 "Compact" License allows now up to 8 non-modular devices in one project.

  (price only handling fee)

	Compact
Project Editing	
Maximum number of devices per project	o (1 modular device or 8 non-modular devices)[1]

1 Either 8 non-modular SIPROTEC 5 devices or 1 modular device

- Print of Process data:

  When connected to online device, the following can

  be printed:

    - Measurements (primary, secondary, percentage)
    - Logs
    - Indications
    - Device information from online device

- DIGSI 5 Compare improvements

    - Compare across projects
    - Compare Display Pages

- Automatic creation of user defined LNs

- Simplified process bus engineering

- CFC chart partitions

    - 6 partitions with 6 sheets per CFC plan
    - Better structuring, faster opening of large charts

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Web UI - Easy, fast and secure access to device V8.30

- Monitoring:
  - Logs and Measurements
  - Centralized view on warnings, alarms and inactive functions
  - Device diagnosis data
- Download of:
  - Logs or records (as CSV or COMFEDE files)
- Parameterization:
  - Change of settings within an active setting-group
- Display of:
  - Indication of all information
  - Vector diagrams, single line diagrams and device display pages
  - Device diagnosis data
- Secure:
  - https connection
  - Access defined per port
  - Controlled by RBAC

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Mindsphere / Dashboard / IoT connectivity
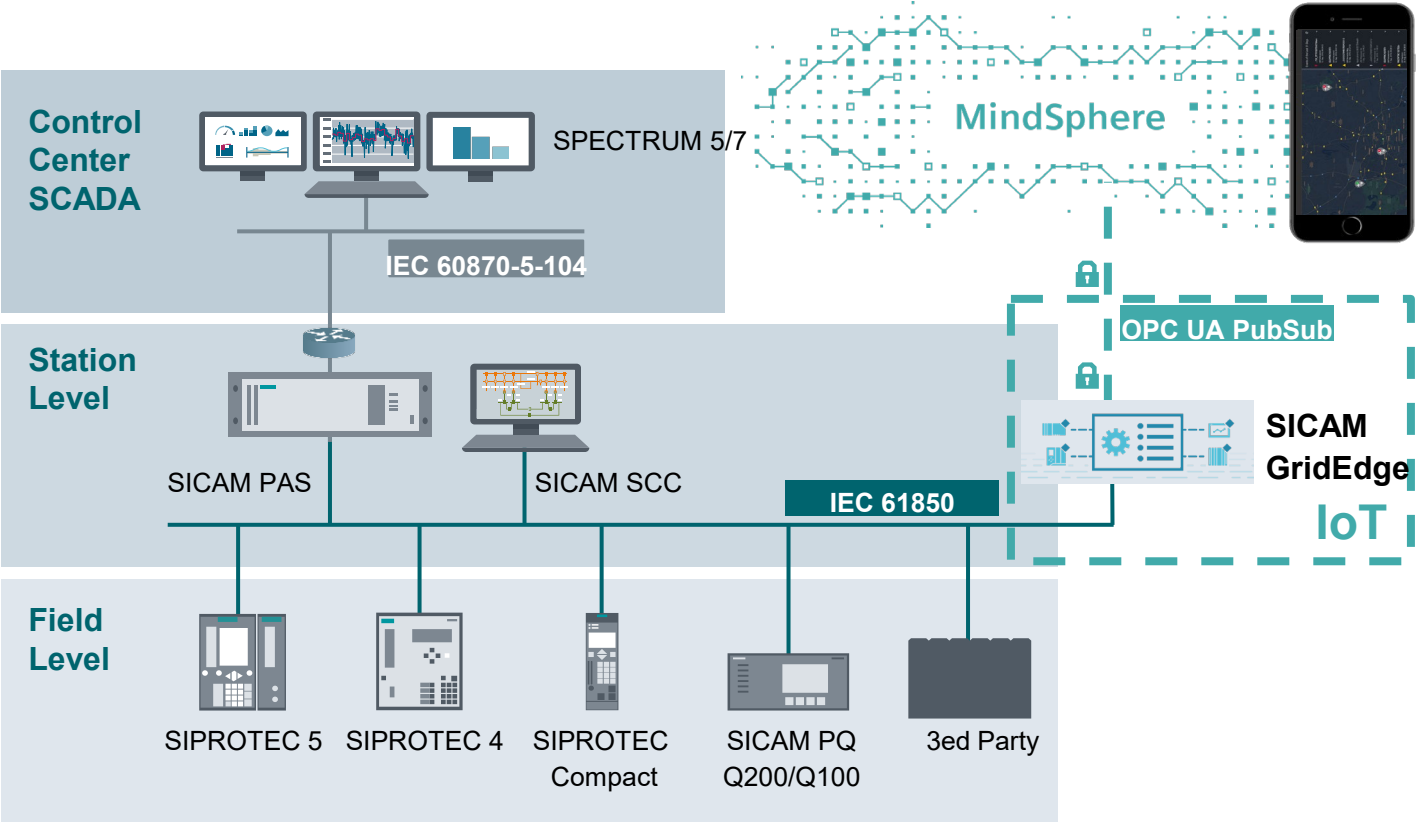
- Connecting SIPROTEC and SICAM to MindSphere

- Easy IoT connection with the standardized protocol OPC UA PubSub

- Visualize and analyze data with the applications of our Grid Diagnostics Suite:

- SIPROTEC devices in a map view on a smartphone in order to analyze:

  - status and condition messages

  - protection trips

  - safety or security events

  - From any where at any time

SIPROTEC News and Updates
Integrated Cyber Security – always on board

Mutually authenticated und encrypted communication
between DIGSI 5 and the SIPROTEC 5 device
Only DIGSI 5 installations that connect using certificates
signed by customer's CA are permitted

Device-side support for role-based access control including
central user management and emergency access

Recording of security-relevant events and alarms
over Syslog and in non-volatile security log in device

Confirmation codes for safety-critical operations

Client authorization: Customer-issued
Client certificate in the Windows User
account

SIPROTEC 5

SICAM
GridPass
Certificate Manager

Customer CA and
certificates can be
issued using
SICAM GridPass

Other Windows users with DIGSI 5
without customer-issued certificates

Bay level

Customer CA to sign the DIGSI 5 client certificates
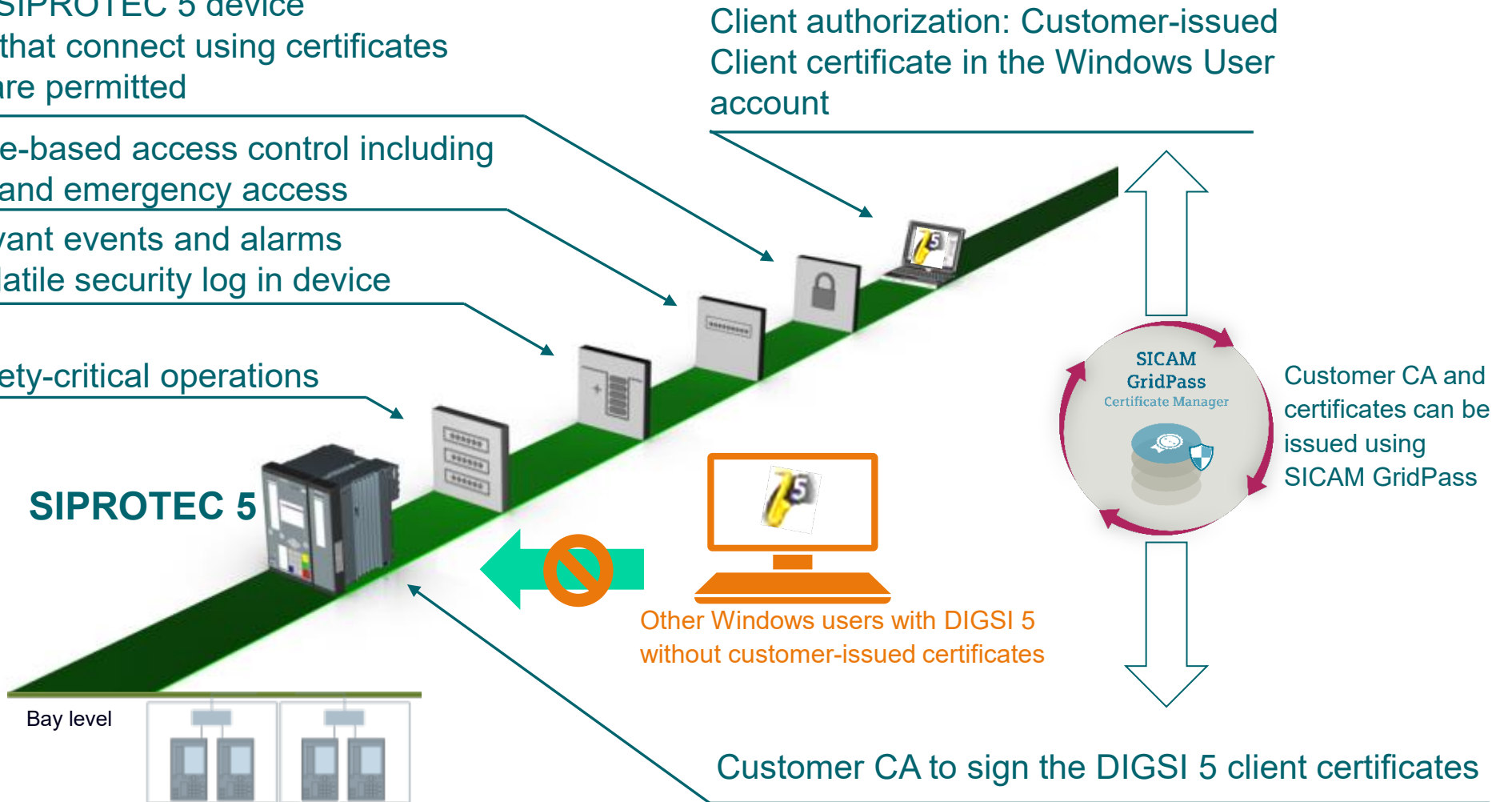
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Versions / Lead times / Phase Outs

- DIGSI 5   V8.80
- SIGRA: V4.61
- DIGSI 4   V4.94, HF1
- Price adjustments with: 01.10.2021
- SIPROTEC 5:   +3%
- SIPROTEC 5 compact: 0%
- SIPROTEC compact: +3%
- DIGSI: +3%
- SIPROTEC 4:   +10%
- Delivery situation: SIP4, SIP5 modular, SIP5 compact no deviations
  - SIP 5 non modular: lead time deviations in September 2021, lead times back on normal level by October 2021 using additional production capacities
- Product lifecycles   SIPROTEC 4

Product	Date of Phase-out announcement	Date of product cancellation	Successive/substitute product
7SJ63	30.09.2020	30.09.2022	7SJ82, 7SJ85, 7SJ64
7MD61, 6MD63	30.09.2020	30.09.2022	6MD85, 6MD66
7UM61	30.09.2020	30.09.2022	7UM85, 7UM62
7SJ61	30.09.2021	30.09.2023	7SX800, 7SJ82
7SJ62	30.09.2021	30.09.2023	7SX800, 7SJ82
7UT612	30.09.2021	30.09.2023	7UT82, 7UT85

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SIPROTEC News and Updates
Where to find and get information

Protection relays for digital substations:
https://new.siemens.com/global/en/products/energy/energy-automation-and-smart-grid/protection-relays-and-control.html

Easy Protection Device Selector:
Find the right protection relay - New devices for Digital Substation
https://proselector.azurewebsites.net/

Easy relay retrofit selector
Find the right substitute for your existing protection relays - Retrofit – Get the latest technology
https://proselector.azurewebsites.net/retrofit

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