

# Envision Digital Stations

Digitalize your substation



[siemens.com/processbus](https://www.siemens.com/processbus)

Boost efficiency and reliability

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**What's driving the energy business**



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Sicam 8 software solution**



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**Operation  
SIPROTEC DigitalTwin**



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**Cyber security**



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**Top Down Engineering  
61850**



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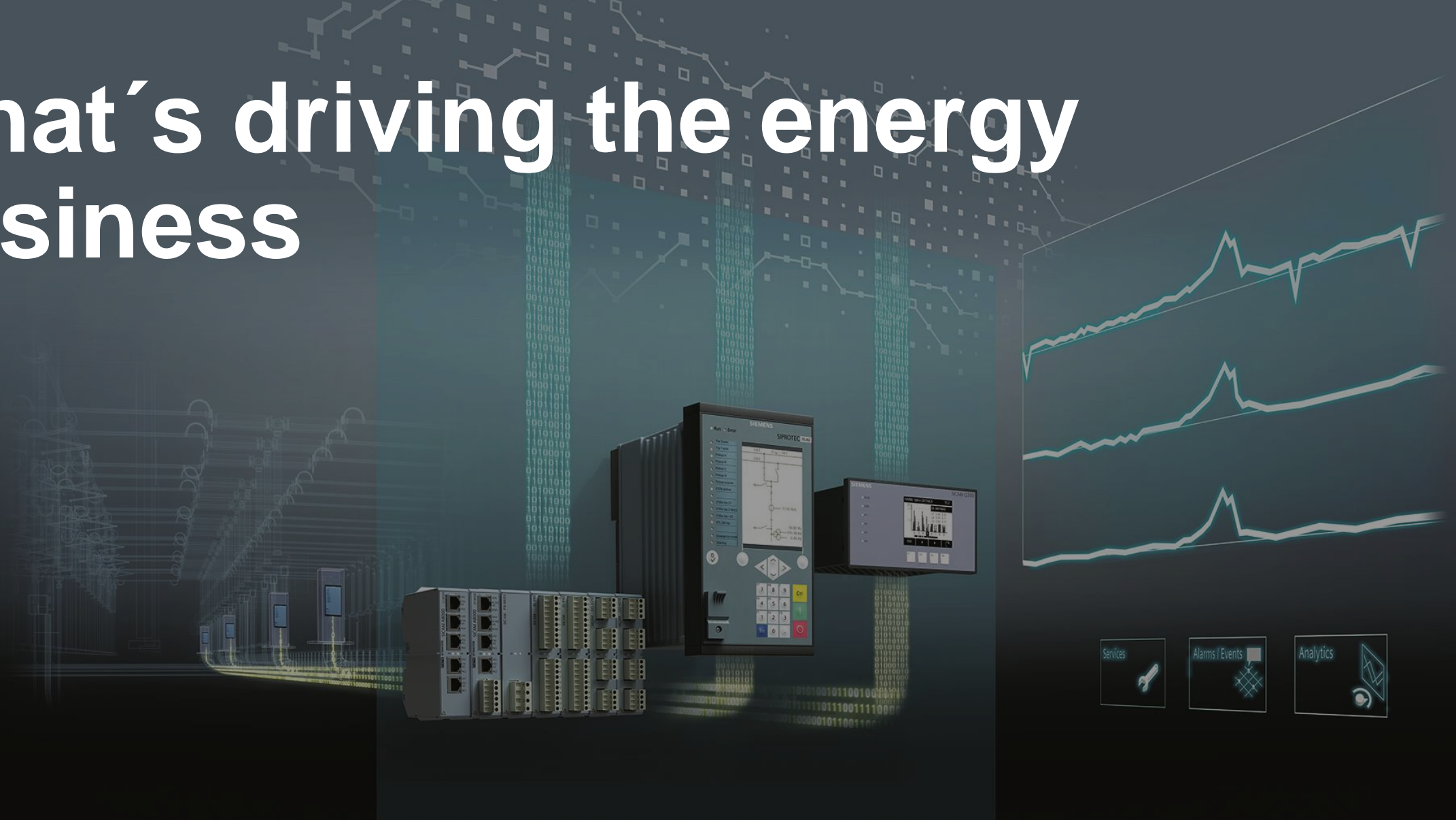
**Summary**



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SIEMENS

# What's driving the energy business



# Topics that dominate the power supply – already now and increasingly in the future

**Decentralization**

**Decarbonization**

**Digitalization**



**Resilience**

**Efficiency**

**Sustainability**

# We support you



**Resilience:** create the most resilient and secure power grids with our products



**Efficiency:** we challenge all other solutions with faster and more consistent engineering



**Sustainability:** use our technology to achieve climate targets and create a sustainable company

# How can do it?

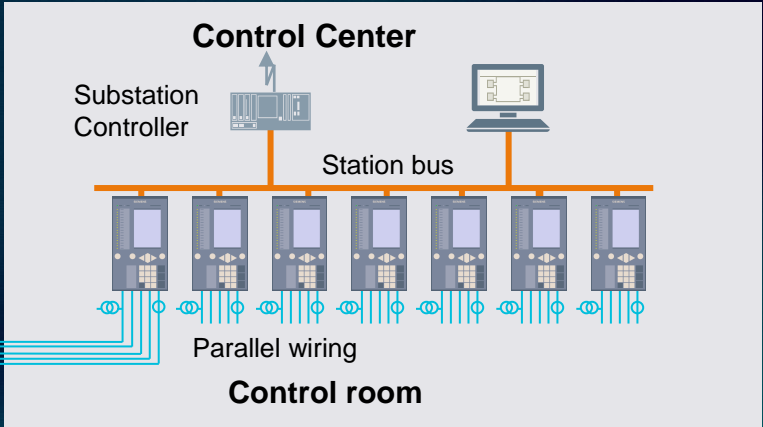




# | Protection

# Process Bus with Conventional Instrument Transformers

Past



Now

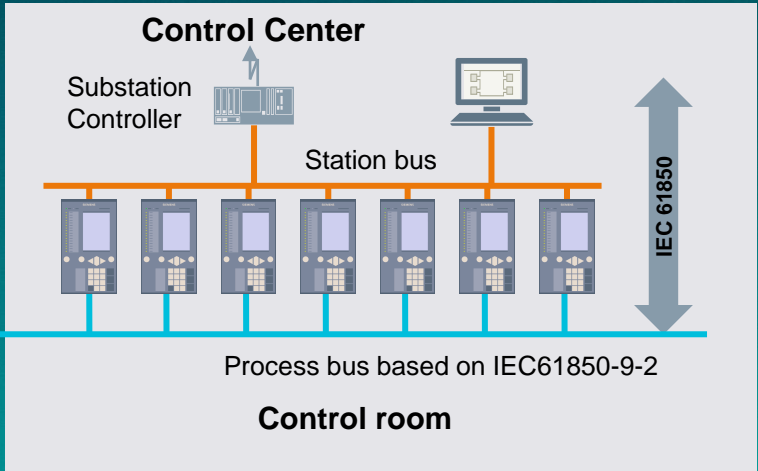


Merging Unit

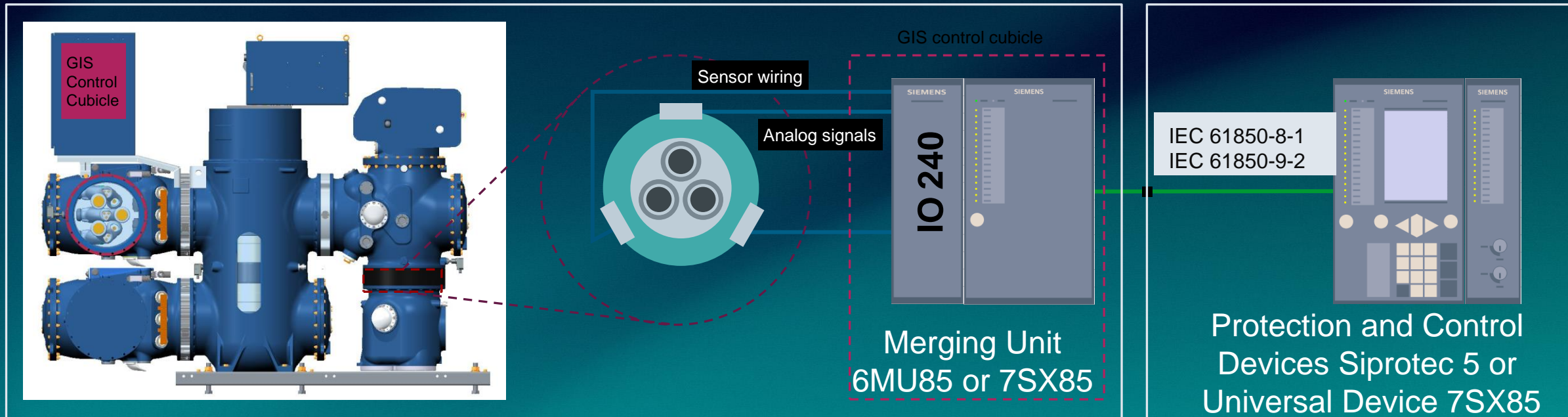


Digital signals

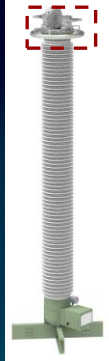
Ethernet  
IEC 61850-9-2



# Low-power Instrument Transformers – Implementation GIS



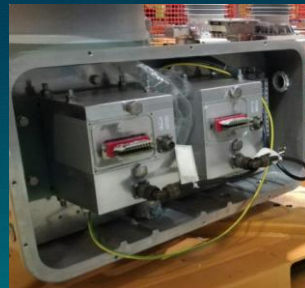
# AIS Switchgears with Trench Current Measurement



Optical  
Sensor

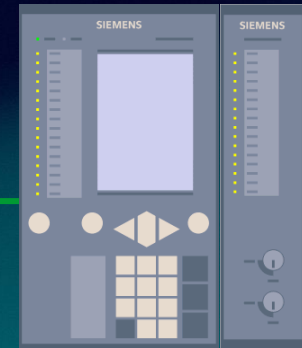


RC - Dividers



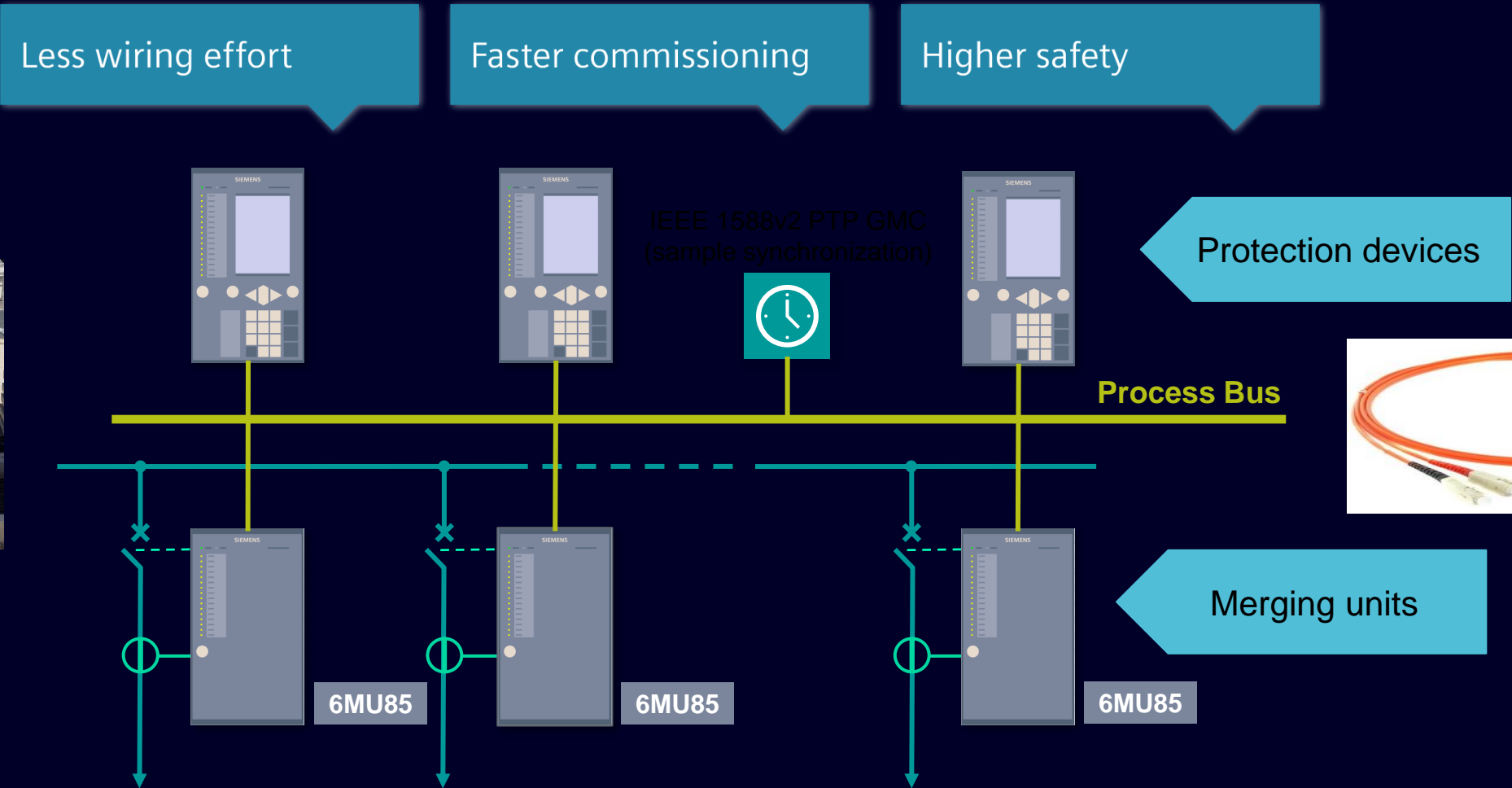
Merging Unit  
6MU85 or 7SX85

IEC 61850-8-1  
IEC 61850-9-2



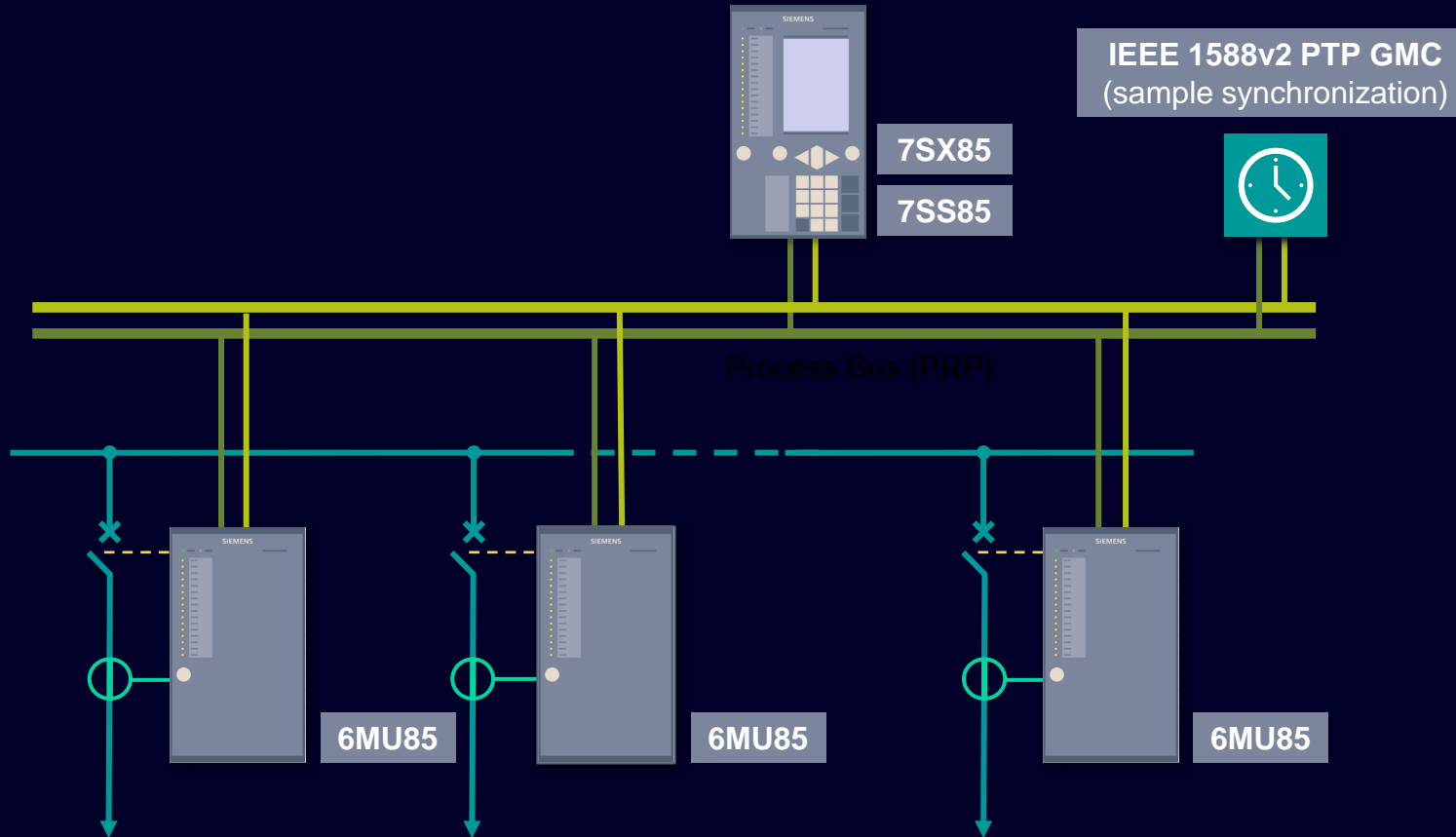
Protection and Control  
Devices Siprotec 5 or  
Universal Device 7SX85

# Principle and benefits of process bus



# Central protection for small substations

## SIPROTEC 7SX85 and SIPROTEC 7SS85



### Highlights 7SX85

12 feeder protection including  
50/51, 67/67N protection  
81 Frequency protection  
...

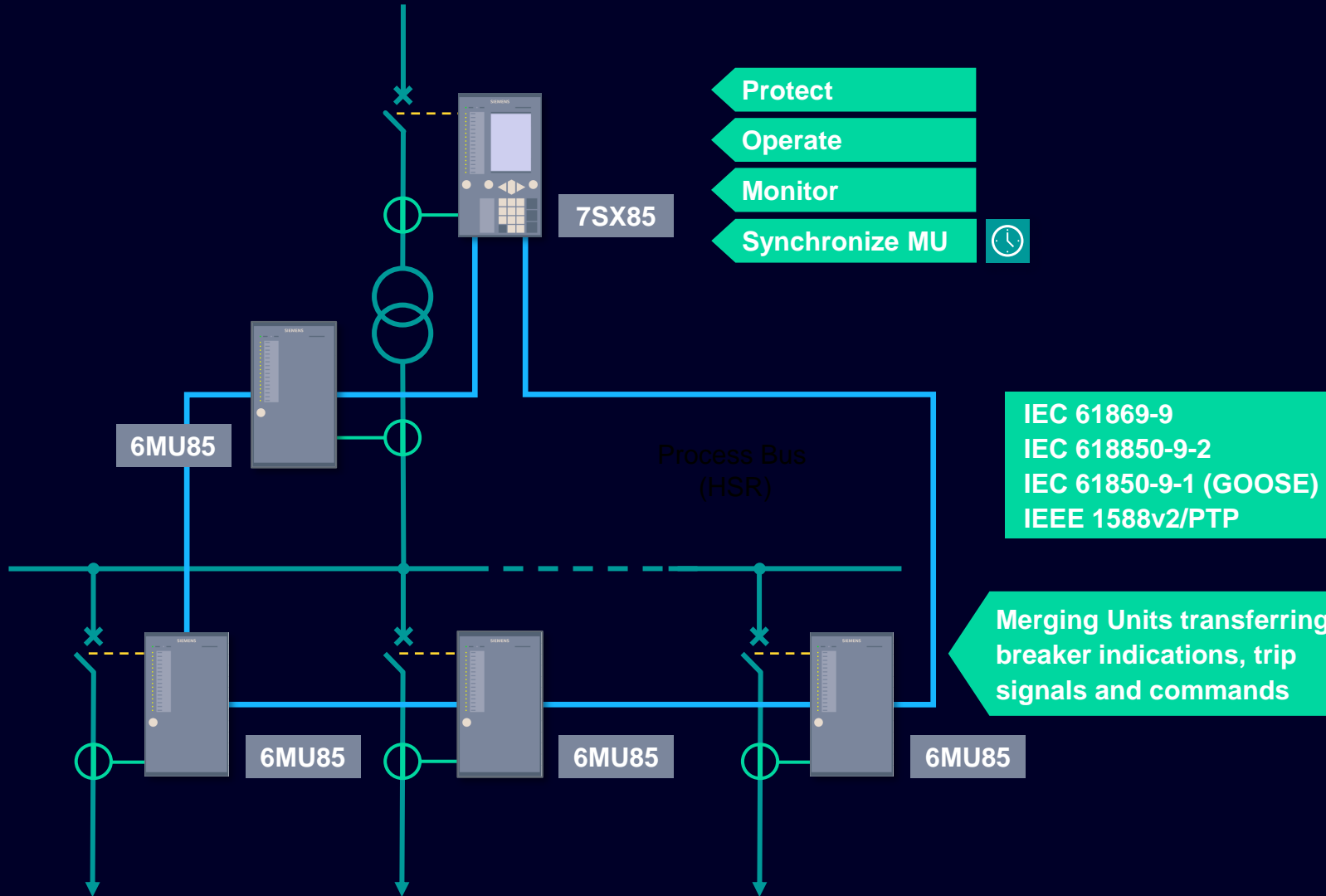
### Highlights 7SS85

10 feeder protection including

- ✓ 87B differential protection
- ✓ 21 Impedance protection
- ✓ 50/51 protection
- ✓ 81 protection
- ✓ ...

# Central protection for small substations

Mix of analog measurements and SMV's



## Highlights 7SX85

Transformer protection

Line protection

Feeder protection

- Overcurrent protection
- Directional overcurrent protection
- Frequency protection
- ....

Build in IEEE 1588v2/PTP grand master clock\* to synchronize sampled values of the Merging Units.

## Efficient and elegant distribution of voltage measurement for e.g. synchro check



Based on the breaker positions in the switchgear the Merging Units publishing the busbar voltage the feeder is connected to.

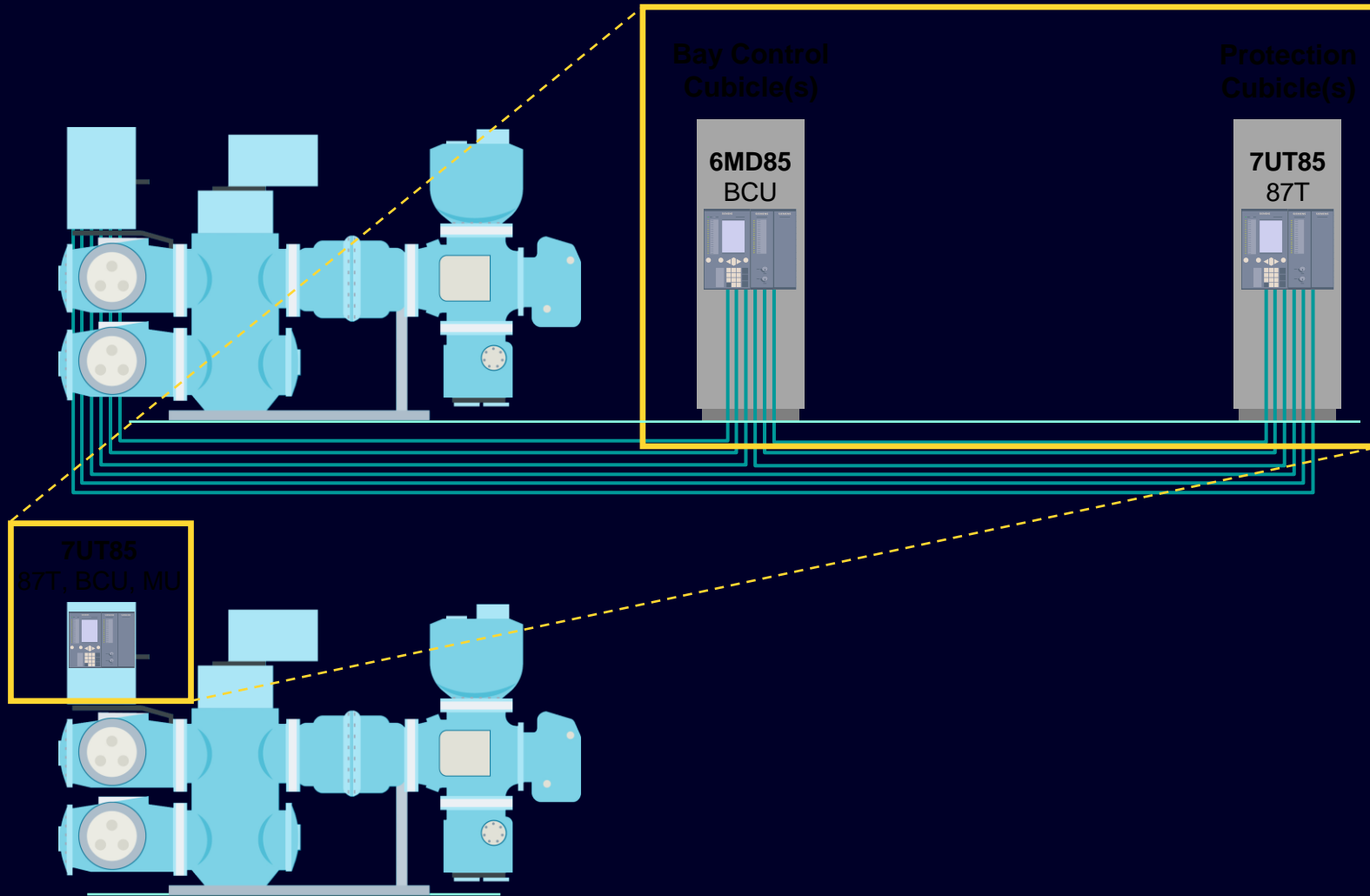
Sampled measured values for the busbar voltage are published depending on the isolator and breaker positions.

A user defined logic (CFC) in each Merging Unit ensures that only one Merging Unit at a time publishes the respective busbar voltage stream and secures the uniqueness of the same.

## Simplified representation

# Highly integrated Process Bus solution

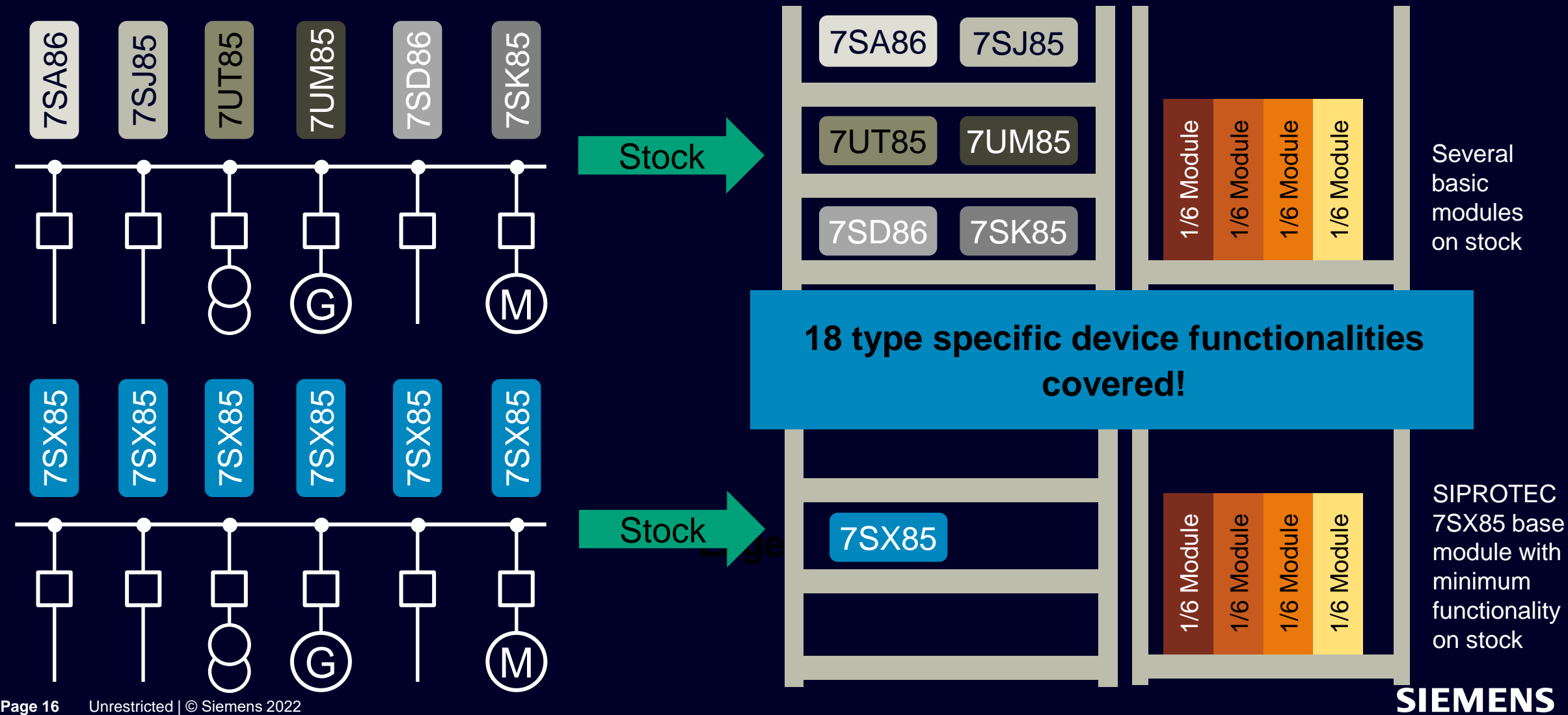
## Integration into Substation Automation System



### Wondering how to

- ✓ Reduce Substation footprint
- ✓ Eliminate cross feeder wiring
- ✓ Entire pretesting during FAT of the switchgear secondary system
- ✓ Increase the Plug and Play portion on site
- ✓ Reduce the time to operation of the substation

# Future Inside – Universal Relay





# Automation and Control Sicam 8 software solution

# How do we do it?

By continuing the SICAM A8000 success story with the next step in evolution!



**SICAM 8 – Power Automation Platform**  
**... with increased scalability!**

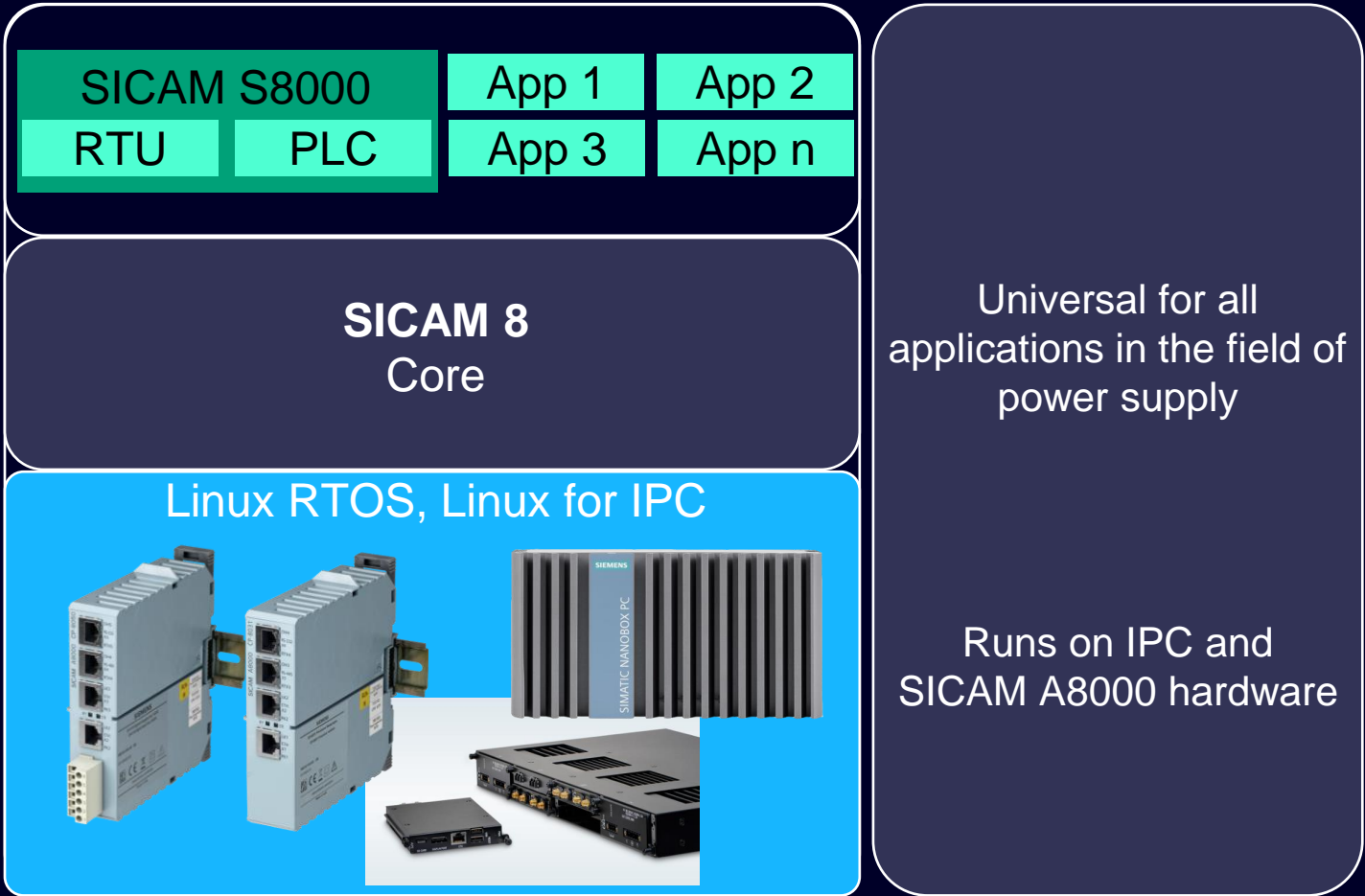
# How do we do it?

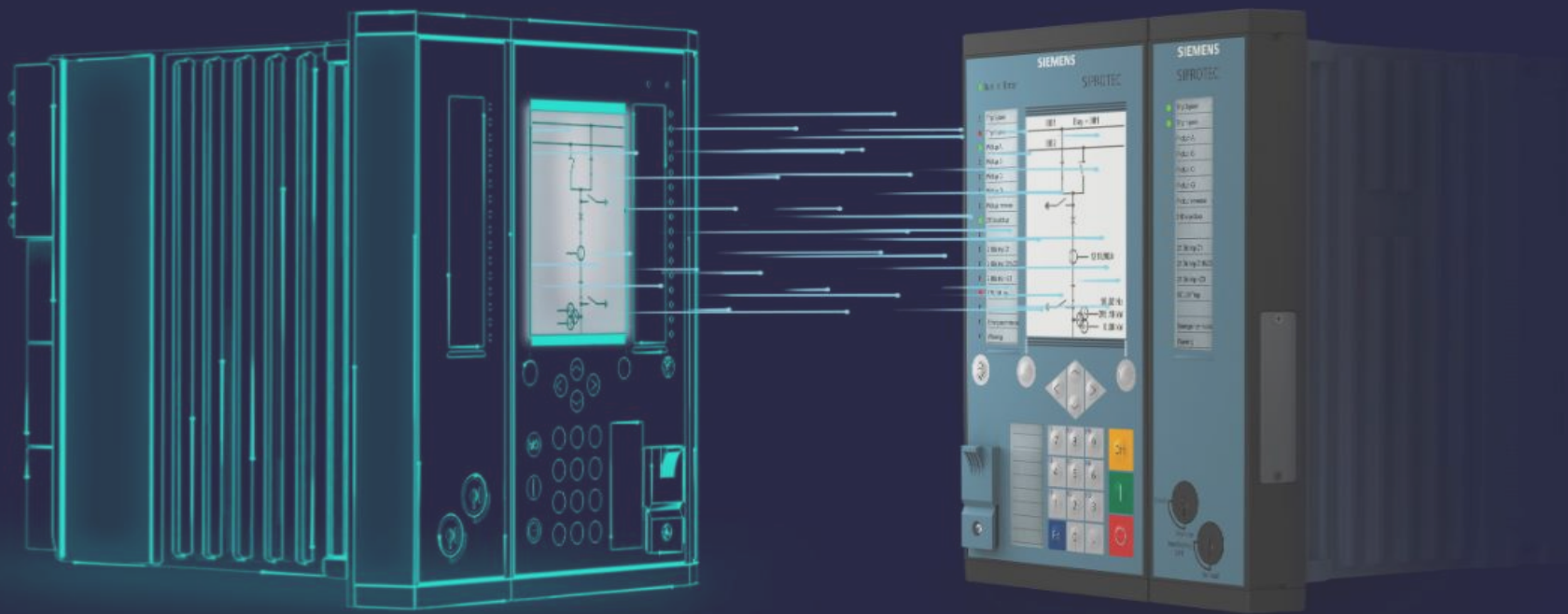
With software that can be used on different hardware with Linux operating system!



**SICAM S8000 –**  
Part of **SICAM 8 – Software Solution**

# SICAM S8000





# Operation SIPROTEC DigitalTwin

# SIPROTEC DigitalTwin

Any time and everywhere

Before updating installed devices

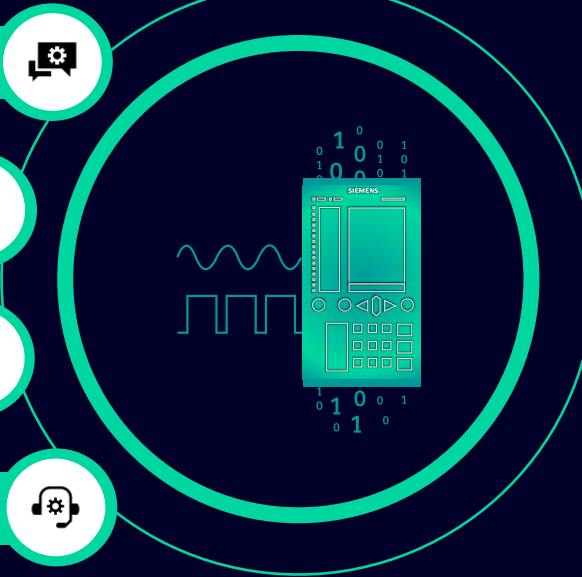
Before starting commissioning

Before building up panels

Even before purchasing devices



Additionally, you count on a 24/7 platform for training your personal



## SIPROTEC DigitalTwin



### Visualization and interaction

Front panel navigation and operation

Analog inputs (CT, VT, 20mA)

Binary inputs and outputs  
(incl. virtual wirings)

### Process data

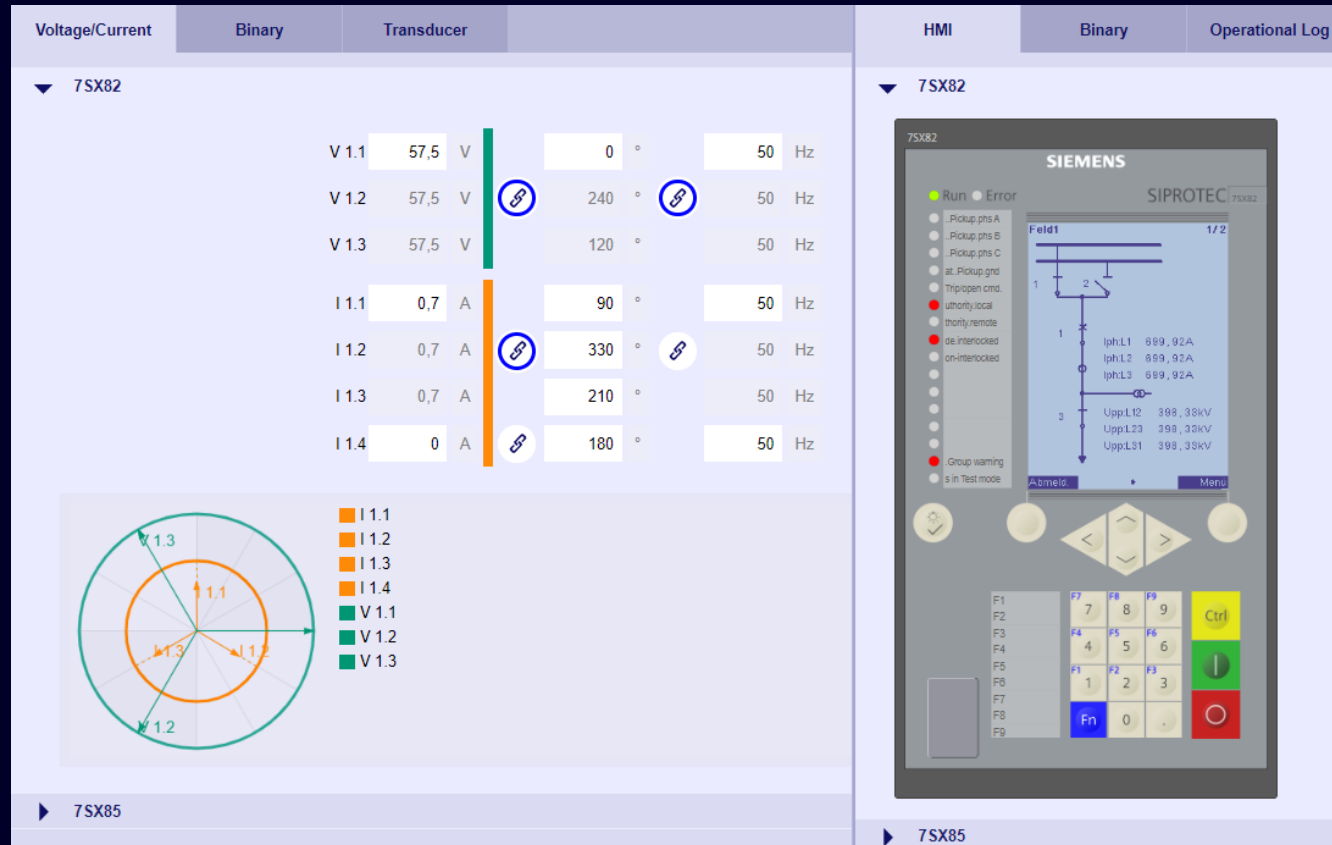
COMTRADE Replay

State Sequencer Replay

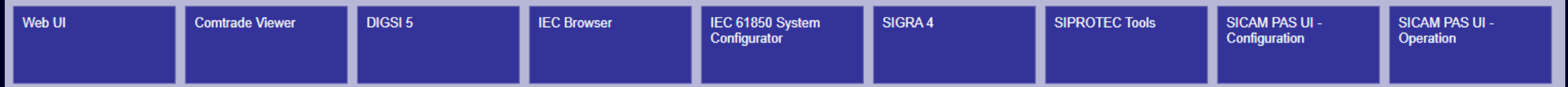


# SIPROTEC DigitalTwin

## Our digital replica of a protection relay



- Hardware free testing supporting all SIPROTEC 5 firmware versions
- Saves time and resources – protection relay configurations can be pre-tested even before equipment ordering
- Possibility to test CFC, GOOSE and replay disturbance recorders
- Integration test with third party devices through the VPN connection





# Assets Management SIPROTEC Dashboard

# SIPROTEC Dashboard answers your questions



Do I instantly see location and tripping details of your grid faults?

How long does it take to notice events in my protection devices?

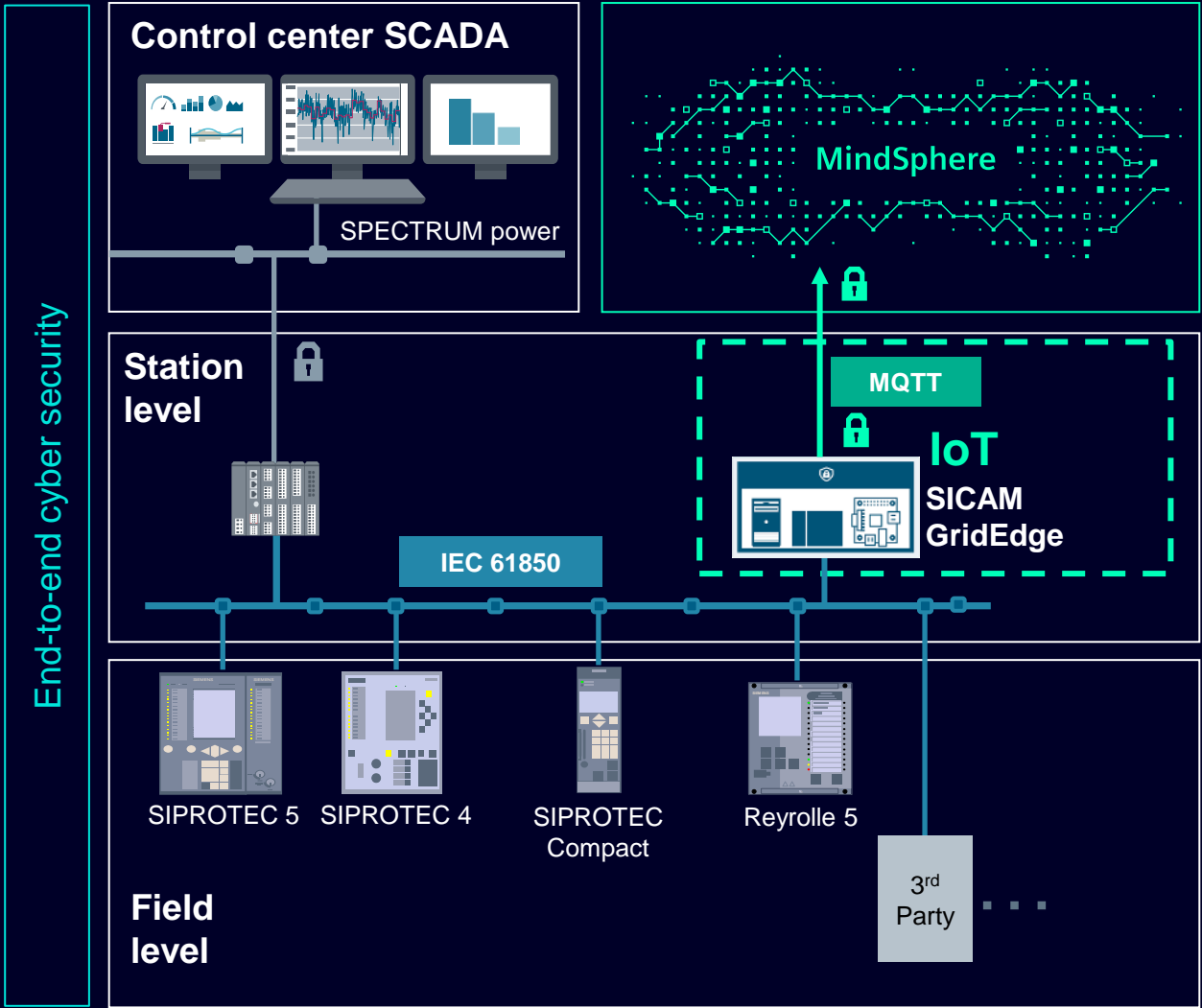
How can I access immediately my fault records for root cause analysis?

What are the contact conditions of my circuit breakers?

Is the firmware in our devices up-to-date or is there a cyber security problem?

# SIPROTEC Dashboard

## Technical Setup



The right side of the slide features a background image of a power plant with high-voltage towers and insulators. Overlaid on this are two smartphones displaying the SIPROTEC Dashboard app. The left phone shows a map view with locations like "BLN North", "BLN East", and "BLN South", along with a list of "Latest Unacknowledged Alarms". The right phone shows a detailed view of "BLN Central" with a "View Station Details" button and another alarm list.

- ✓ Enhanced transparency of systems and device status
- ✓ Predictive maintenance, optimization of services and resources
- ✓ Increased availability of energy supply

# SIPROTEC Dashboard

All relevant protection device information in your pocket

## Grid spanning Fault Management and Analysis

- Fault notification and analysis presented in a map view of the complete grid
- 24/7 fault record analysis to localize incidents/ faults in a fast and reliable way

## Circuit Breaker Condition Monitoring

- 24/7 Circuit breaker condition monitoring
- Benchmarking enables the user to identify circuit breaker performance issues at an early stage

## Protection Device Management

- Live visualization of protection device measured values & benchmarking
- Protection device information and health status monitoring
- Fault Logs and settings

## OPEX savings

- Improved grid profitability based on circuit breaker condition monitoring
- Reduced OPEX by quick and efficient grid spanning fault log analysis
- Reduced OPEX by preventing outages

## Event Report

- 24/7 transparency of relay trips and Fault Logs
- Fault Record/ COMTRADE visualization & download option
- Benchmarking of Fault Records

## E-mail or SMS notifications

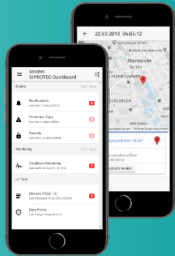
- E-mail or SMS notifications for fast fault clearance



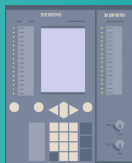
# SIPROTEC Dashboard



Enables power grid operators to manage SIPROTEC, Reyrolle and even 3rd party devices  
Optimize their operation and maintenance activities



## SIPROTEC Dashboard MindSphere Application



## SIPROTEC Protection device



### Data Transparency

Dashboard overview screen with multiple views:

- Map view of your complete grid incl. alarms/ trips
- Station view
- Device and measurement data view

Consolidated list of grid events:

- Trips
- Fault records (COMTRADE)
- Asset information
- Condition monitoring insights



### Grid Analysis

- Fault record and fault log root cause analysis
- Device firmware cross-check
- Setting changes analysis

Basic CB Condition Monitoring:

- I<sup>2</sup>t circuit breaker statistics
- Contact wear status
- Operation counter
- Inactivity
- Statistic analysis

# | Cyber security

# Cyber Security

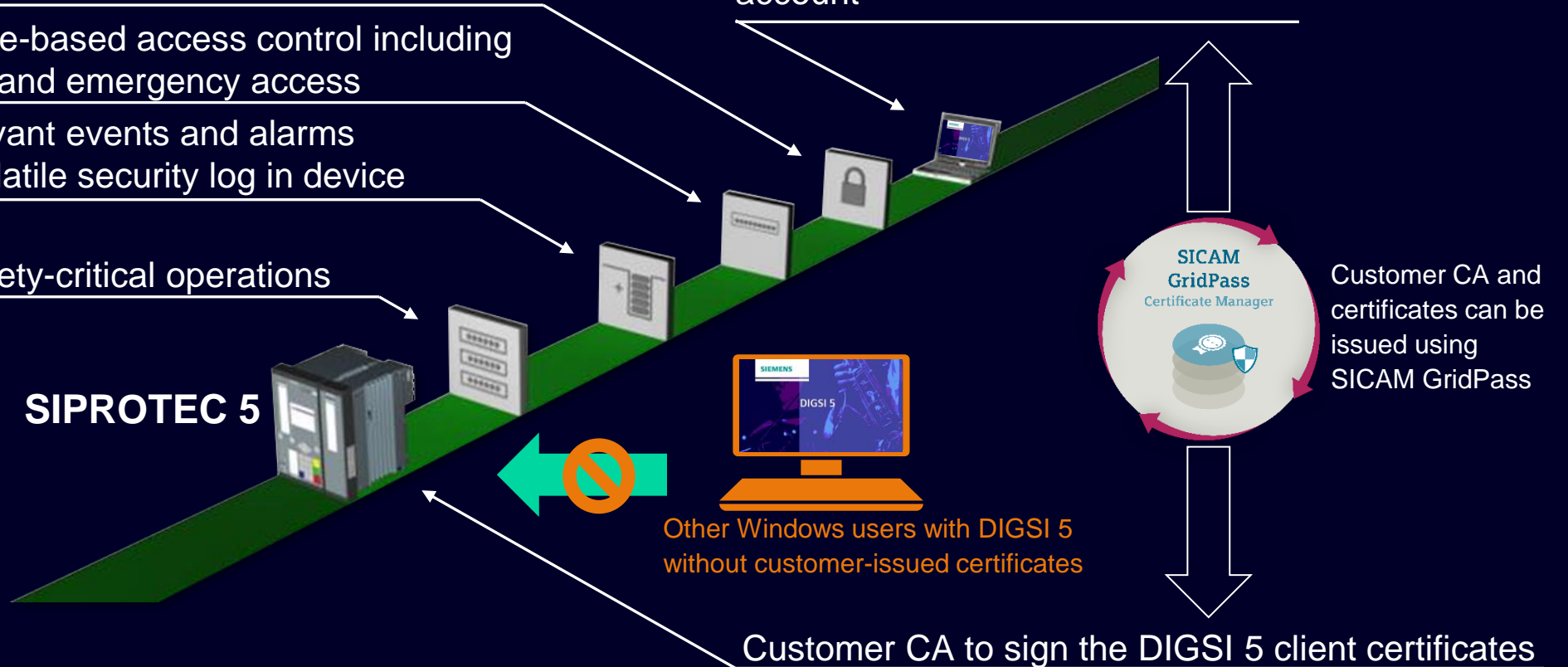
Only DIGSI 5 installations that connect using certificates signed by customer's CA are permitted

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



# Cyber Security

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



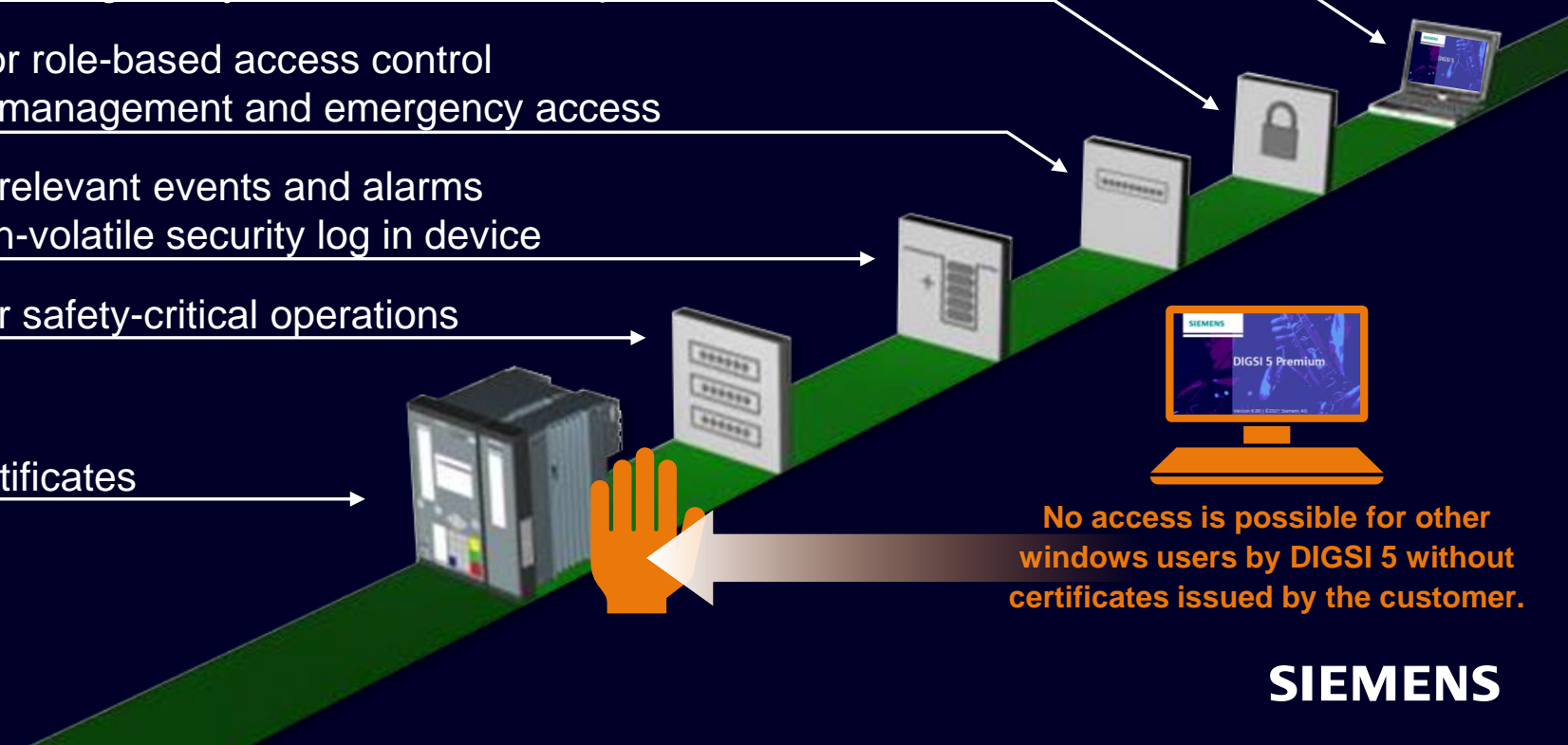
Mutually authenticated und encrypted communication between DIGSI 5 and the SIPROTEC 5 device. Only DIGSI 5 installations that connect using certificates signed by customer's CA are permitted

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

Customer CA to sign the DIGSI 5 client certificates



No access is possible for other windows users by DIGSI 5 without certificates issued by the customer.

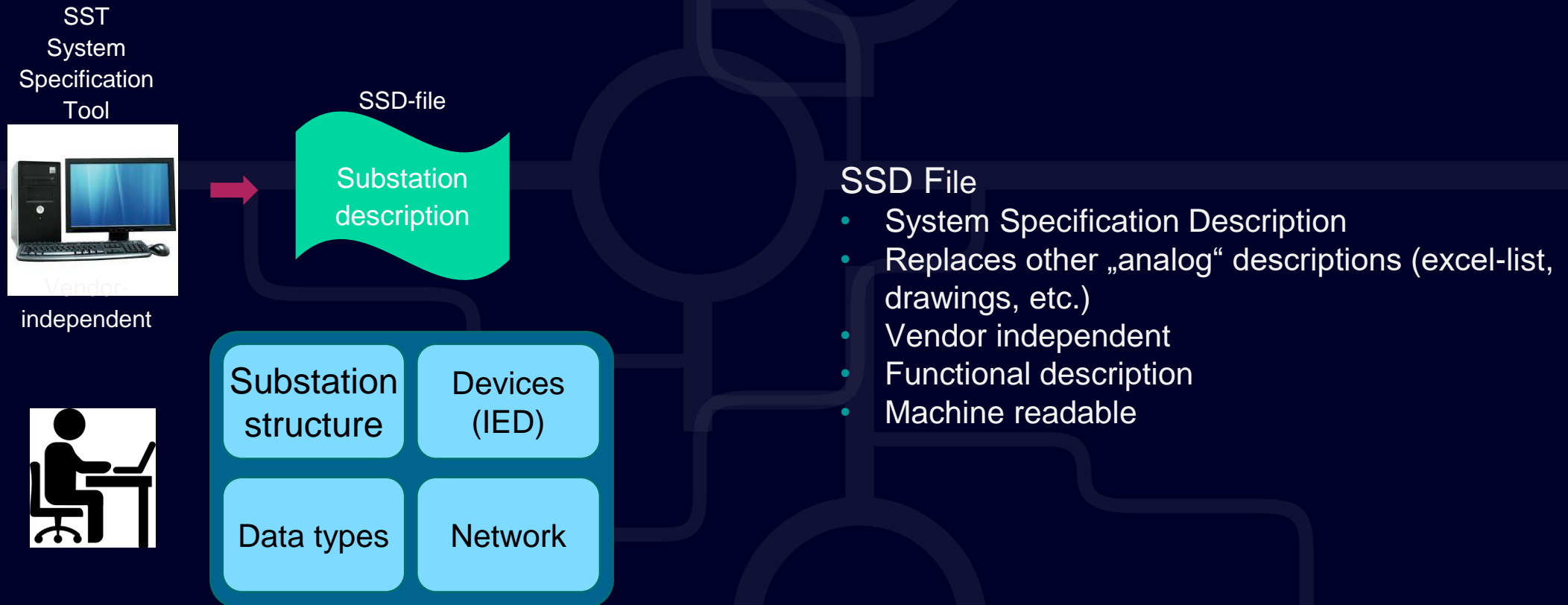


The image displays a Siemens 6ES7 618-0EG00-0AB0 PLC system. It features a large, multi-bay rack on the right with various modules, including a power supply, CPU, and I/O modules. A smaller, single-bay unit is positioned to the left. A central control unit with a screen and buttons is connected to the main rack via orange cables. The background is dark blue, and the Siemens logo is visible in the bottom right corner.

# Top Down Engineering 61850

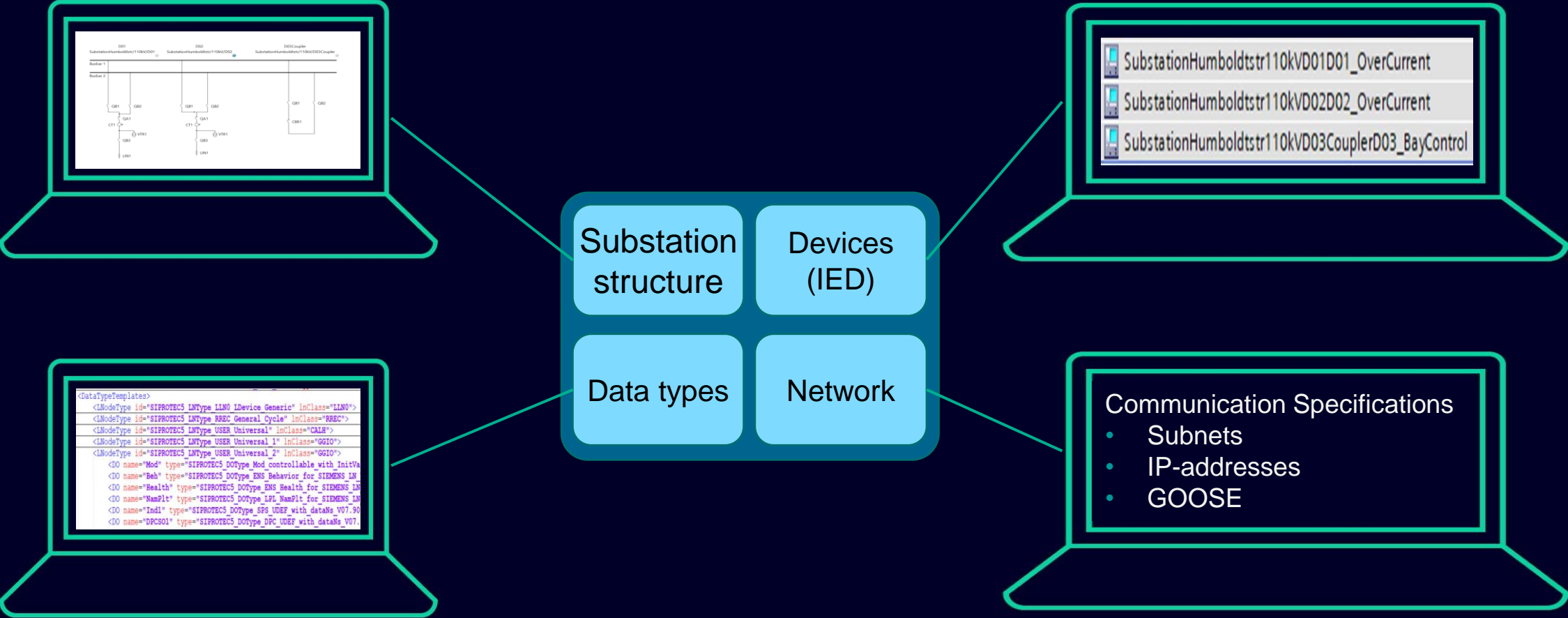
# Top-Down-Engineering in IEC61850 - introduction

## Basic idea



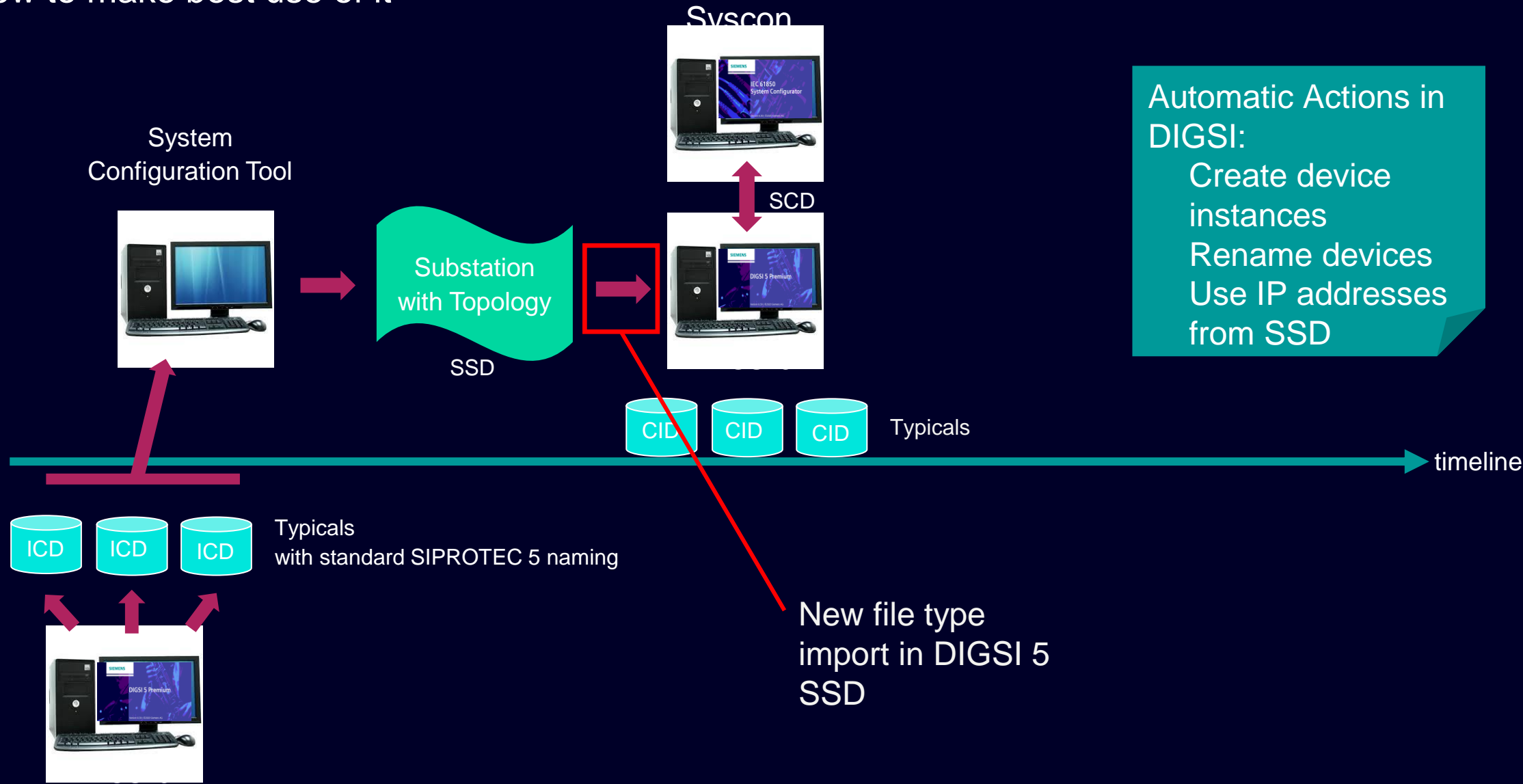
# Top-Down-Engineering in IEC61850 – introduction

## Structure of SSD file



# Top-Down-Engineering in IEC61850 – introduction

How to make best use of it

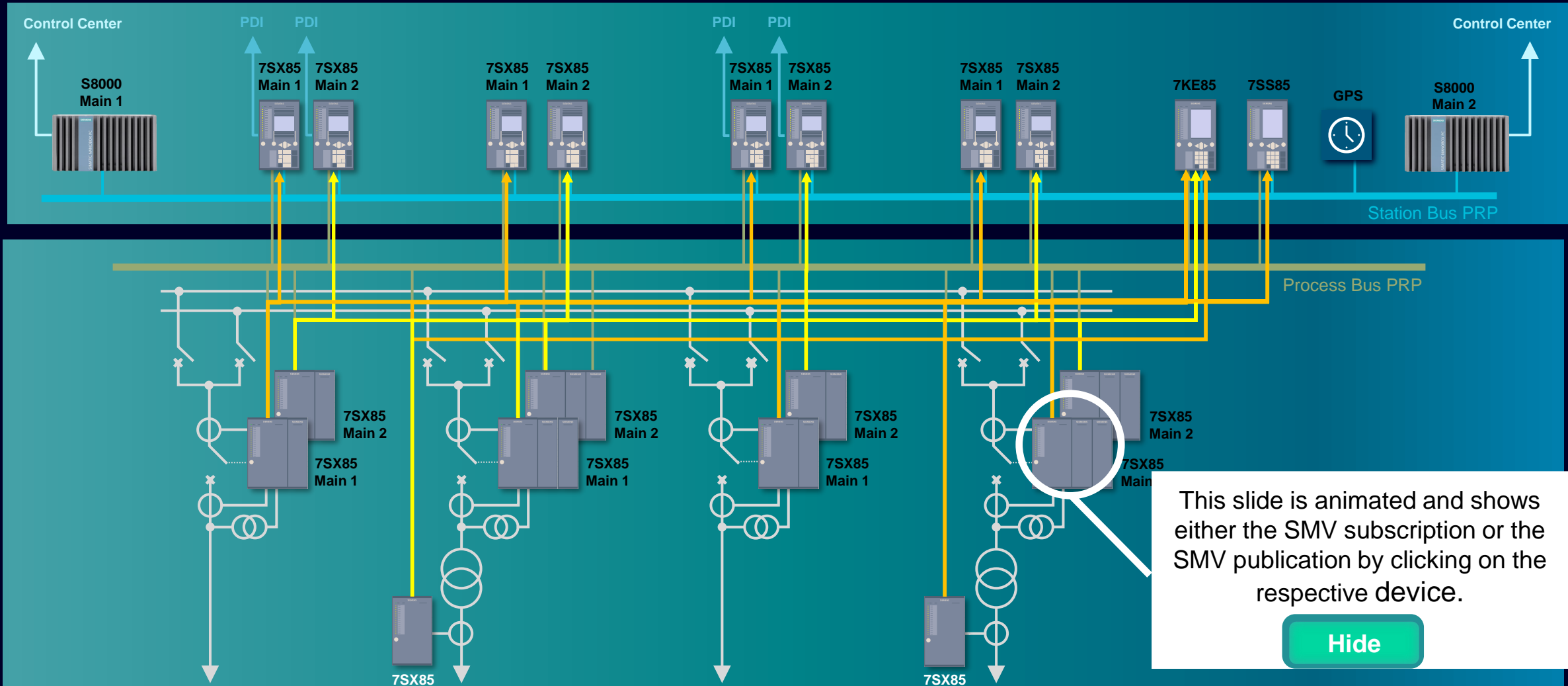


# Summary



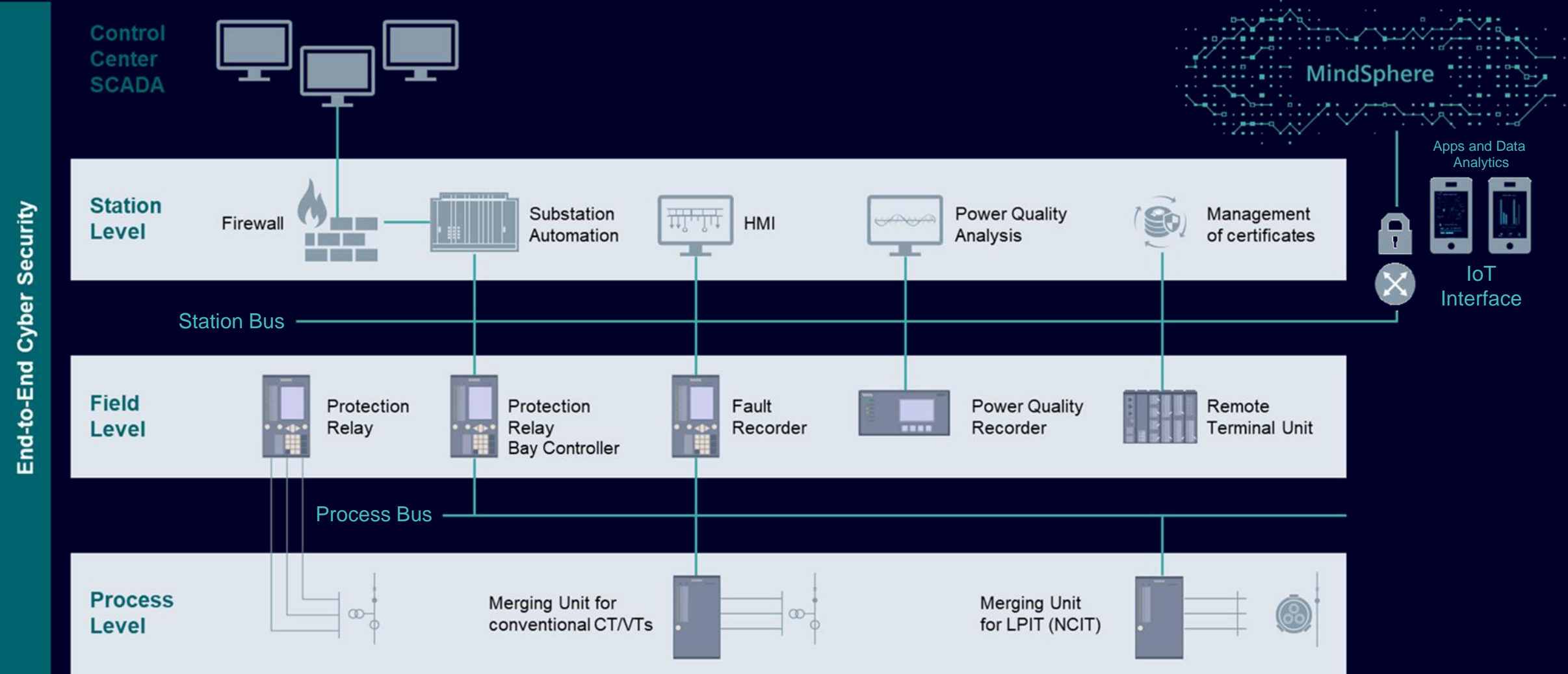
# IEC 61850

## Full digital Energy Automation System



# Digital Substation

## Process Bus Overview



# Contact

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