Enabling digital substations
SAM600-IO switchgear control unit
Thomas Werner, Global Product Manager
Agenda

Digital substation and customer benefits
SAM600
  • Features and benefits
  • Application examples
Product support
References
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Digital substation and customer benefits

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Digital substation concept

Minimize or eliminate copper wiring in the switchyard
Digital substation and IEC 61850 today

- Interface to field
  - Hardwired point to point connections between primary and all secondary equipment
- IEC 61850 Station Bus
  - Replace wiring and legacy protocols between bays by digital communication

Digital substation and IEC 61850 tomorrow

- All signals digital, station and process
- Analog, status and commands
- Acquire once, distribute on a bus
Opportunities

Less space

Space reduction

30 to 60% reduced space for protection and control panels
- Same number of IEDs require less space due to absence of conventional IOs
- Higher integration of control and protection functionality allows for further space reduction

Reduction of switchyard footprint by up to 50%
- By using circuit breakers with integrated disconnecting functionality and optical current transformers

* Based on a typical conventional 400kV double busbar AIS substation compared to a modern variant using SAM600 process bus IO system and FOCS integrated in disconnecting circuit breakers.
Opportunities
Less installation and outage time

Shorter installation, less outage

40% reduction of installation time for new protection and control systems.
- Fewer panels to install
- Fewer cables to be pulled, connected and tested
Reduction of feeder outage time by 40 to 50% during secondary system upgrades
- Full system test from process IO to protection, control and SCADA system off-site
- Installation of new FO based system while station is in service
Opportunities

Pre-tested building blocks and late project customization

Pre-testing and customization

Reduction in on-site testing
- Building blocks of pre-defined, pre-tested kiosks in the factory with process electronics

Late customization
- All communication is digital based on IEC 61850
- Now new or additional wiring as project changes require updated system and device configurations
Opportunities

Safety and maintenance

**Safety and maintenance**

Digitizing all signals right at their source in the field

– Decreased risk of electrical hazards
– Maintenance of equipment in station panels without de-energizing bays

Cost Effective Maintenance

– Higher degree of supervision allows for more efficient planning of maintenance activities
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Overview

Station level
- SAS600 series of substation automation solutions with IEC 61850 station bus

Bay level
- Relion® 670 series control and protection IEDs
- Relion® REB500 busbar protection system
- UniGear Digital for MV applications
- IEC 61850 system engineering and testing tools: IET600, ITT600

Process level – NCIT
- ABB NCITs for GIS, CP-MU merging unit for ELK-CP14 and ELK-CP3 (current and voltage)
- ABB LTB with integrated Fiber Optic Current Sensor FOCS-MU (current only)

Process level – stand-alone merging units
- SAM600 modular process bus IO system
Digitizing primary signals made easy

SAM600 – ABB’s process bus IO system

For interfacing primary equipment to IEC 61850 process bus
- Connects to conventional current or voltage transformers
- Interfaces primary apparatus such as circuit breakers, disconnectors, earth switches and transformer tap changers
- Provides time synchronization (optional)
- Easily scales with the signals of the primary apparatus to be interfaced
- Ruggedized and optimized form factor for installation in cabinets close to the primary equipment
- Easy access to signals with front-facing terminals
SAM600 – ABB’s process bus IO system

Digitizing primary signals made easy

Technical features – switchgear control unit

- Binary IO interface for monitoring and control of switchgear
  - 6U 1/1x19”, 6U ½x19” form factors
  - I/O integration and control of several switching devices in the same unit
  - Supports cost savings by reduction of copper wire

Communication
- Up to 6 optical Ethernet ports supporting up to 3 redundant PRP/HSR access points
- Time synchronization via IEC/IEEE 61850-9-3
- IEC 61850-8-1 GOOSE messaging with low latency

Environmental
- Operating temp range: -40°C .. +70°C ambient for 16hrs
- Shock and endurance vibration Class 1
SAM600-IO

1/2 6U 19" variant
Usage: Interface I/O of small feeder or single breaker
- 3 slots for BIM, BOM, SOM, IOM, MIM (out of H67 series)
- Standard 4 SFPs
- Cover for LHMI service kit connector

1/1 6U 19" variant
Usage: Interface I/O of large feeder (trafo) or backup for complete 1 ½ BB diameter
- 14 slots for BIM, BOM, SOM, IOM, MIM (out of H67 series)
- Standard 4 SFPs
- Cover for LHMI service kit connector
SAM600-IO
Mounting variants

**Swing-frame mount**
- Use of standard mounting kit
- Empty front-plate facing user, connectors on the back

**Wall-mount**
- Optional wall-mount kit for SAM600-IO
- Makes use of existing mounting kit for fixating the device
- Wall-mount kit is fixed to cubicle mounting plate from back in a first step
SAM600-IO
LHMI service kit

Usage
- LHMI embedded in a rugged carrying case
- Connects to SAM600-IO through (covered) LHMI connector in TRM slot
- Available as accessory

Usage
- Display HW status and configuration
- Enable recovery and firmware updates through “front port“
SAM600-IO

Functionality and options

**Functionality**

Switchgear operations

- Basic package with 1 XCBR (3 phase) and 18 SXSWI instances
- Optional package with +2 XCBR (3 phase)
- Supervision, breaker cond monitoring

Logic

- All logic functions from ACT (tripping, trip matrix, boolean, timers)
- Disturbance records

Communication and time sync

- HSR, PRP, IEC/IEEE 61850-9-3
**SAM600 – the digital substation enabler**

Application example – line feeder

- One SAM600-IO device for interfacing I/O for complete primary apparatus for feeder
- SAM600 merging units according to voltage and current instrument transformers
- Process bus realized between process and bay level through HSR
- Supports IEC/IEEE 61850-9-3 time sync, GOOSE and 9-2LE traffic
- SAM600 also supports integration of existing equipment via single links and PPS replication, e.g. FOCS sensor
SAM600 – the digital substation enabler

Application example – transformer feeder

Transformer feeder arrangement

- One SAM600-IO device for interfacing I/O for complete primary apparatus for feeder
- SAM600 merging units according to voltage and current instrument transformers
- Process bus realized between process and bay level through HSR
- Supports IEC/IEEE 61850-9-3 time sync, GOOSE and 9-2LE traffic
- SAM600 also supports integration of existing equipment via single links and PPS replication, e.g. FOCS sensor
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Product information

On the web

User documentation

Full set of user documentation available on ABB website
- Product guide
- Manuals
- Wiring diagrams
- Type test certificate
- IEC 61850 conformance documents
Product training

Trainings

Training course CHP157 available at ABB University CH
Roll-out to other locations during H2/2018

Topics
- Introduction to digital substation
- Relevant standards and technologies
- System aspects for designing robust digital substations
- Introduction to SAM600 & configuration
- Troubleshooting
- Practical exercises on SAM600 demo system, stepwise setup of a 9-2LE and GOOSE application with REC670
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Digital substations

Highlights, worldwide

- **UK, 2018**
  - SAM600, FOCS
  - 670 series, 3rd party

- **US, 2016**
  - DTB with FOCS, SAM600, 670 series

- **Brasil, 2017**
  - SAM600
  - 670 series

- **Switzerland 2009**
  - GIS NCIT
  - 670 series

- **Switzerland 2011**
  - GIS NCIT
  - 670 series, 3rd party

- **CZ, 2017**
  - FOCS, SAM600

- **India, 2017**
  - SAM600
  - 670, 615 series

- **Czech Republic, 2017**
  - FOCS, SAM600

- **Germany, 2012**
  - DCB with FOCS, 670 series
  - 3rd party NCIT, REB500

- **Sweden, 2010**
  - DCB with FOCS
  - 670 series

- **Sweden, 2013**
  - AIS 3rd party NCIT
  - 670, 630, 615 series

- **Australia, 2011**
  - GIS NCIT
  - 670 series, REB500

- **Australia, 2017**
  - GIS NCIT, 3rd NCIT
  - 670 series

- **Taiwan, 2014**
  - SAM600
  - 670 series, 3rd party

- **Taiwan, 2017**
  - SAM600
  - 670 series, 3rd party

- **CN, 2016** (several)
  - DCB with FOCS
  - 3rd party

- **US, 2016**
  - DTB with FOCS
  - SAM600, 670 series

- **Australia, 2009**
  - GIS NCIT, 3rd NCIT
  - 670 series

- **3 more projects in AU are under execution**

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* Under execution
Contact us for support

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