

DS Agile

Leading the way to Digital Substations

June 2013

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Agenda

1. Introduction : Alstom Grid Substation Automation

2. Introducing DS Agile

3. The DS Agile automation system in detail

4. Summary (main evolutions & benefits)

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1. Introduction : Alstom Grid Substation Automation

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Substation Automation Solutions (SAS) Identity Card

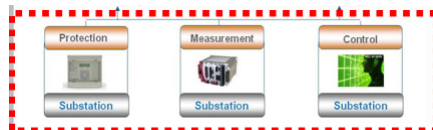


Portfolio

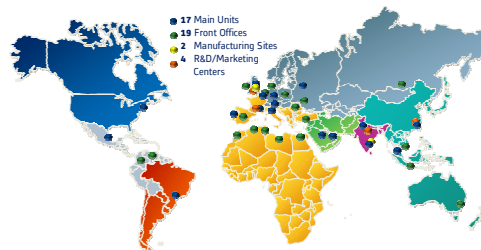
- Smart Grid applications and Digital S/S
- MiCOM Px4x & Agile Protection Relays
- DCS / CCS Automation Solutions
- Engineering & Project management
- Substations Commissioning & Refurbishment
- Customers and partners Training & Support

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Full substation automation offering



Footprint



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Alstom Grid's SAS Complete portfolio & offering

**Numerical Protection Relays
MiCOM Alstom Px40**

**MiCOM Px40 Agile Feeder
Management (2012 launch)**

**P847
Phasor Measurement Unit**

Mx70 Measurement

**Electromechanical
Hinged Armature relays**



**Digital Control System
DS Agile (2012 launch)**

**C264
Bay Controller**

Control Switches

**Legacy DCS
SPACE2000, PSCN, PACiS**

**Conventional Control
Protection panels**

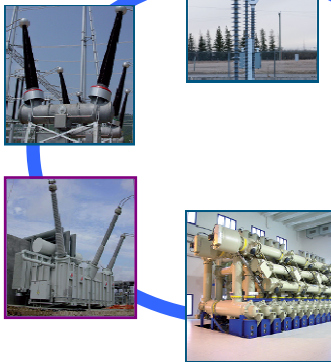
- Fully engineered Substation Automation Digital Control Systems and Smart Grid solutions
- Training, refurbishment, extension, spare parts, support and repair services
- Conventional Control Systems

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Moving towards "smart digital substations"

**Smart Primary
Equipment
IEC 61850-9**

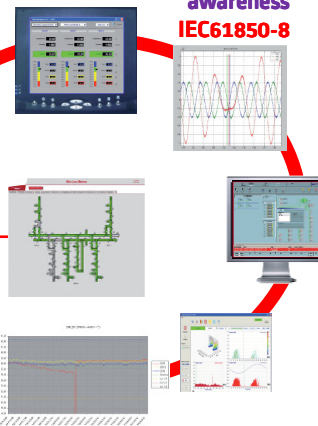


**Digital Protection
Relays
(IEC 61850)**



**Digital
Substation
Control System
"DS Agile"
(IEC 61850)**

**S/S Situational
awareness
IEC61850-8**



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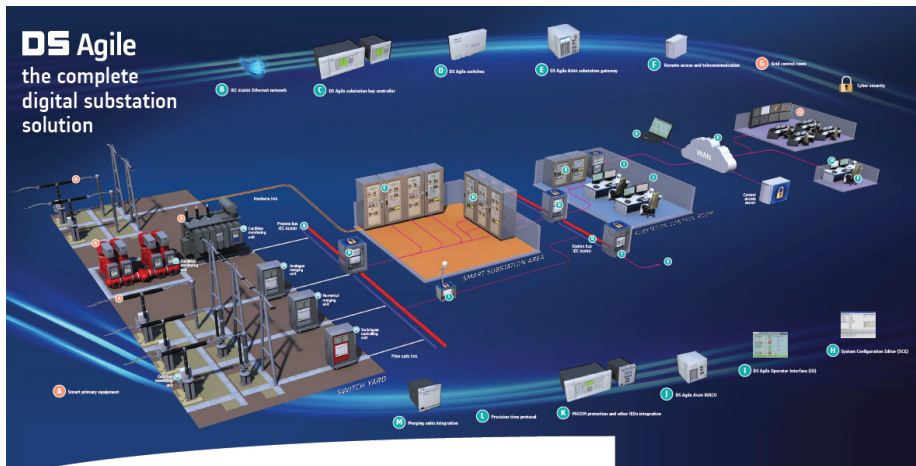
2. Introducing DS Agile

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DS Agile complete system overview

DS Agile
the complete
digital substation
solution



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DS Agile complete offer

3. The **DS Agile** automation system in detail

Process bus, merging units and controllers

Alstom Ethernet switches

MiCOM Protection relays on 9.2 LE

SCE: Standardisation

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The DS Agile system in detail : Key components



A-series: Gateways and Wide Area Control Units

C-series: Bay / Switch gear Controller Units, with optional functions:
RTU, Feeder Protection, Automatic Voltage Regulator (AVR)

H-series: Manageable Ethernet Switches

MiCOM M-series: Measurement & Disturbance Recorders

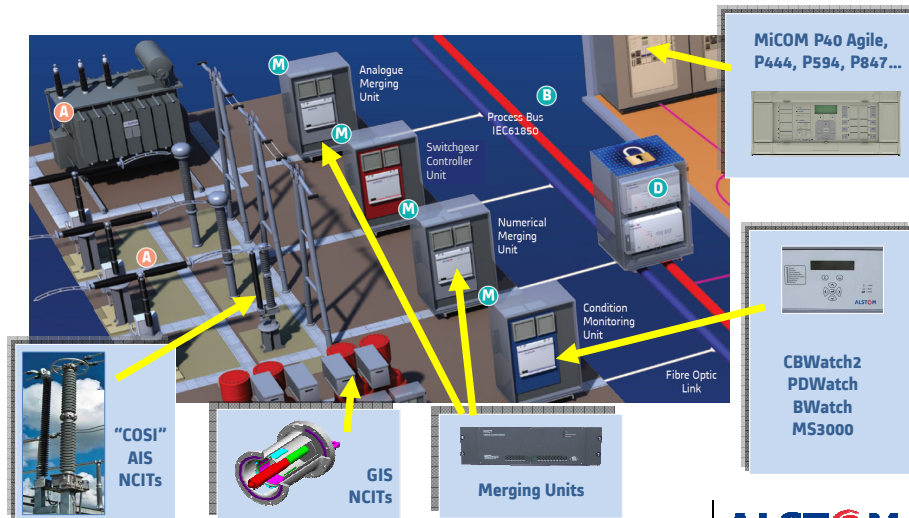
MiCOM P-series: Protection Relays

DS Agile Operator Interface (HMI)

MU Agile Merging Units for IEC 61850 process bus

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Evolutions in DS Agile : The process bus – IEC 61850 merging units and IEDs



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Evolutions in DS Agile : New switches for inter-operable architectures



DS Agile Switches

For various Ethernet redundant architectures:
ring, multi-ring, star, double-star

- Inter-operable protocols (PRP/HSR)
- Gigabit switches
- Full compliance with electrical installation constraints (IEC61850-3)
- Internal PC and bay controller switches
- External rackable switches

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Evolutions in DS Agile : C-series Bay Controllers (BCU) for process bus



C264 IEC61850 Modular Substation Bay Controller

Substation control, communication, monitoring, protection and automation functions

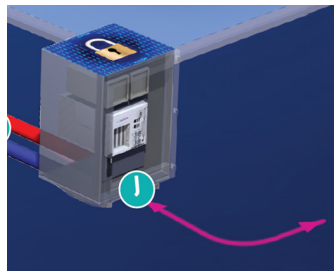
- Open platform for real-time automation schemes
- Both legacy and cutting-edge communication protocols
- LCD graphical display for local control, monitoring and maintenance
- Suitable for retrofitting and modernising existing installations



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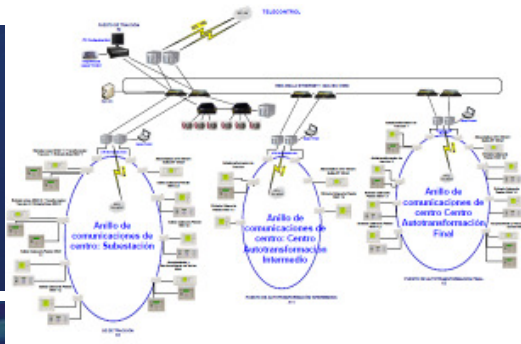
Evolutions in DS Agile : Wide Area Inter-Substation Control (WACU)



DS Agile A400 WACU

Wide Area Control Units (WACU) for inter-substation and inter-voltage exchange

- IEC 61131 PLC automation
- IEC 61850 -compliant
- Hot stand-by redundancy



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Evolutions in DS Agile : Renewed Operator Interface (HMI)



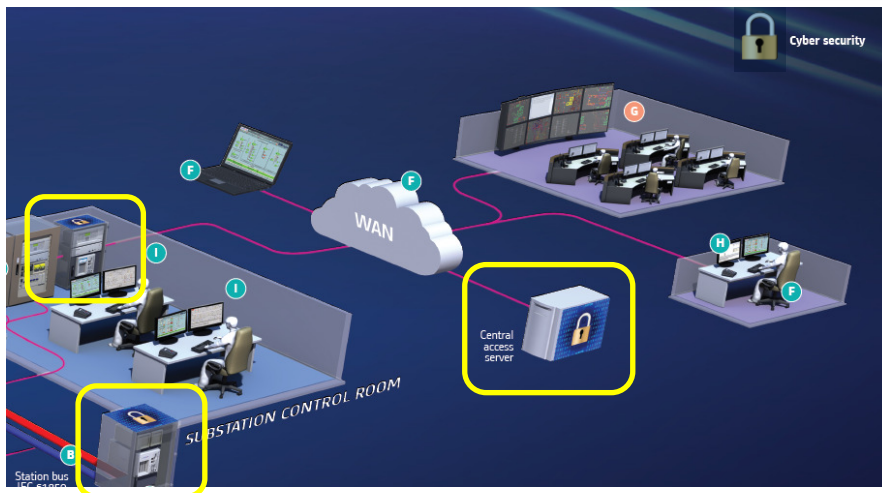
DS Agile Operator Interface (OI)

- Single-line dynamic diagram viewer and bay viewer
- Alarm viewer
- Select-before-operate configurable function
- Data monitoring, logging, archiving and curve trends
- Secure access control by user profile
- Phasor data concentrator
- Condition monitoring HMIs
- Protection and automation engineering toolsuite MiCOM S1

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Evolutions in DS Agile : Cyber-secure remote access



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3. The DS Agile automation system in detail

Process Bus, merging units and controllers

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Data Model of IEC61850

Physical Device (IED)
(Server)

↑ Implementation

Logical Device (LD)

↑ Grouping

Logical Node (LN)

Data ↓

Data (Object)

Properties ↓

Attribute

Value

example

Bay Unit

Control

CSWI Switch Control

Position

*Control Value
Status Value*

ON/OFF

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Logic Node

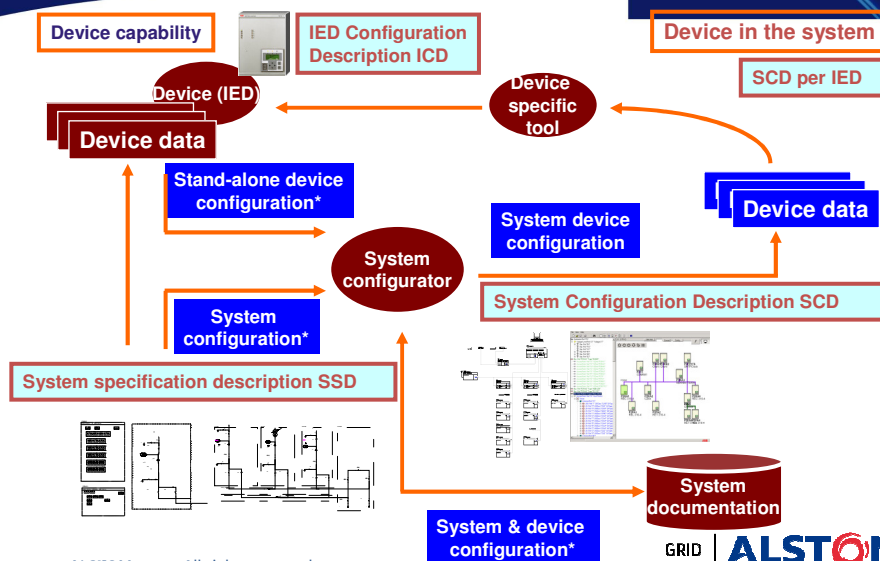
- Group of Logic Node

- | | |
|--|--|
| L System LN (2) | M Metering and measurement (8) |
| P Protection (28) | S Sensor and monitoring (4) |
| R Protection related (10) | X Switchgear (2) |
| C Control (5) | T Instrument transformers (2) |
| G Generic (3) | Y Power transformers (4) |
| I Interfacing and archiving (4) | Z Further power system equipment (15) |
| A Automatic control (4) | |

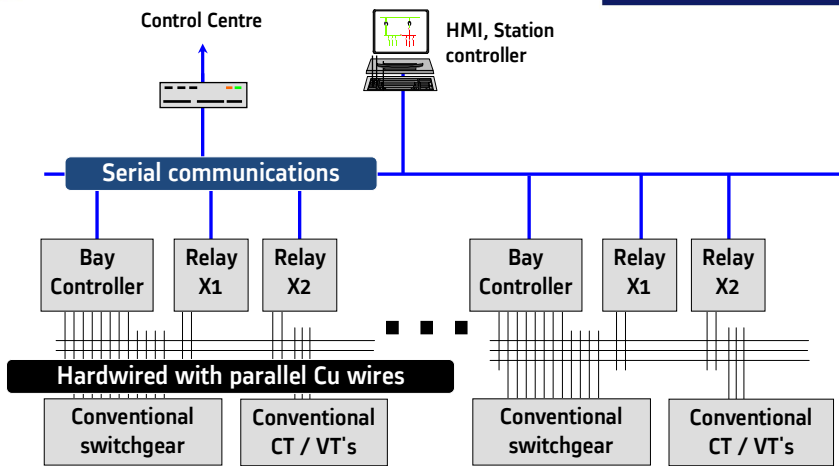
- Example of Logic Node

<i>PDIF: Differential protection</i>	<i>CSWI: Switch controller</i>
<i>RBRF: Breaker failure</i>	<i>MMXU: Measurement unit</i>
<i>XCBR: Circuit breaker</i>	<i>YPTR: Power transformer</i>

Configuration Process of SCL



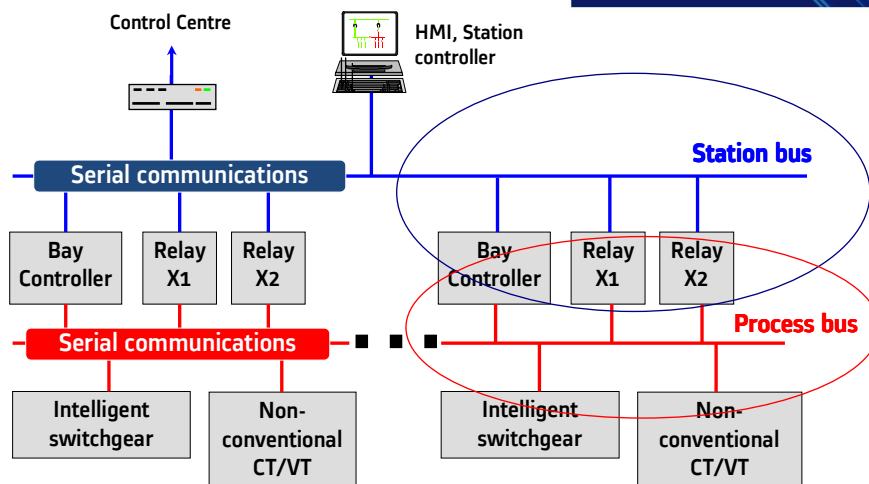
IEC 61850 standard : What it solves (i)



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IEC 61850 standard : What it solves (ii)



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DS Agile main components linked to the process bus

- 1) Merging Units (AMU, NMU)
- 2) Digital Control Unit of Primary Switchgear (SCU)
- 3) C-series Bay Controllers
- 4) Ethernet switches
- 5) IEC 61850-9-2 Protection relays and other IEDs



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DS Agile solutions : Switchgear Control Unit (SCU)

- Fast acquisition and transmission (1ms) using standard IEC61850-8-1 GOOSE messages
- Fast tripping using high-break, high-speed (1ms) output contacts
- Synchronisation through IEEE1588 PTP protocol
- Redundant Ethernet link compliant with IEC61850 PRP/HSR protocol

Interfacing all circuit breakers and other switch gear

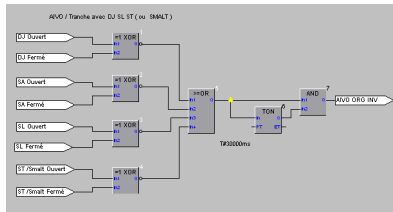
DS Agile SCU Switchgear Controller Unit



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C264 : The Bay Controller and more...



C264 main and extended functions:

1. Bay controller
2. IED's gateway
3. RTU/Gateway
4. Data Concentrator
5. PLC automation
6. Feeder Protection
7. SER Events recorder
8. Waveform/Disturbance recorder
9. Automatic Voltage Regulator
10. Ethernet switch

More than 30,000 units delivered
worldwide since 2002

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3. The DS Agile automation system in detail

Alstom Ethernet switches

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Alstom H-series : Manageable Ethernet Switches

Complete MiCOM / DS Agile H range:

- All Ethernet network architecture
 - *Star, double star*
 - *Redundant ring*
 - *Dual attachment*
 - *Self Healing, Dual Homing and PRP redundancy*
- SNMP management features
- Single and multi-mode 10/100 Mbps
- DIN- rail case with redundant power supply 24/48/60/110/220 Vcc
- Fully compliant with electrical installation constraints (IEC61850-3, IEC 60255 & IEC 1004,)
- Also as a PCI board (PC integration) or board for C264



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H-series Ethernet Switches : The right format for the right application



C264 boards



PCI board



New: Gigabit Switches



6FX + 2TX



2FX + 6TX



New: PRP RedBox

Alstom Grid
Ethernet switches offer

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3. The DS Agile automation system in detail

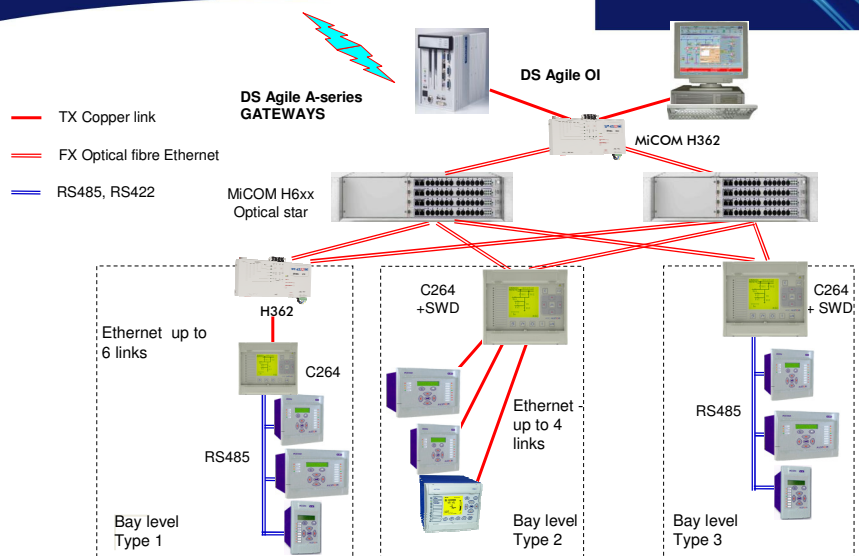
Alstom Ethernet switches

Double star: Dual Homing and PRP

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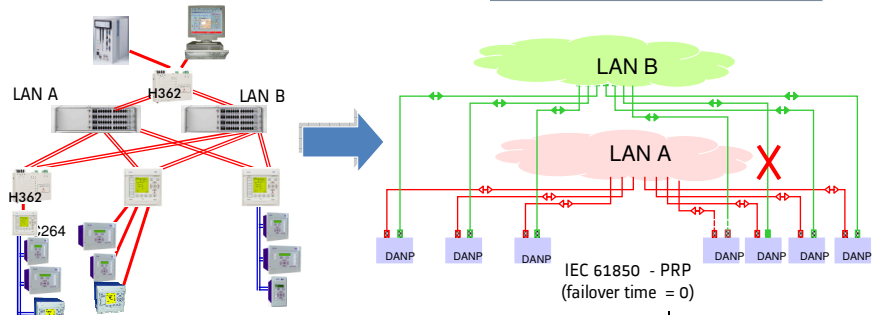
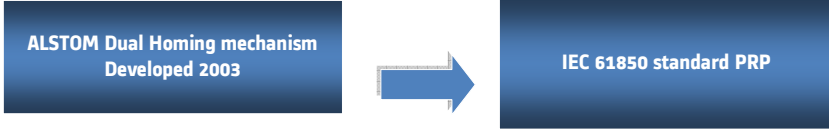
Double Star architecture : Alstom Dual Homing



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Alstom Grid Dual Homing now becomes 'PRP'

PRP = Parallel Redundancy protocol (IEC 61850 std.)



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3. The DS Agile automation system in detail

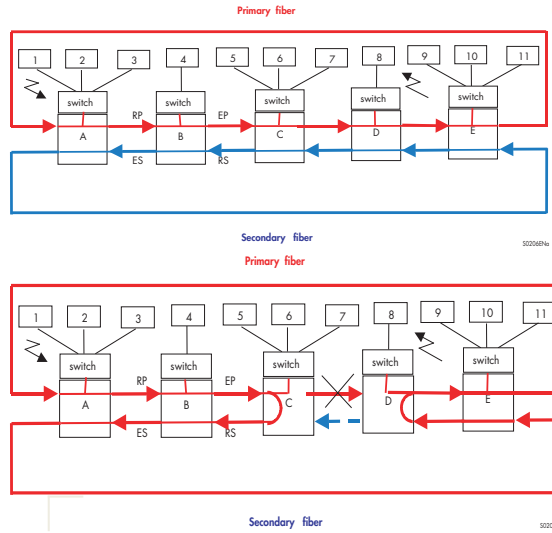
Alstom Ethernet switches

Self-Healing and HSR Redundant Ring vs. RSTP

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Alstom's Self-Healing redundant ring management : the fastest in the market



Self healing
<1ms (could be as short as 4µs)

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Alstom's Redundant Ring to evolve into 'HSR'

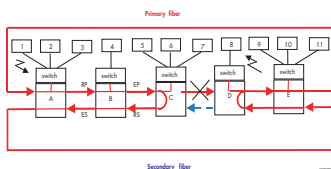
HSR = High-availability Seamless Redundancy protocol (IEC 61850 std.)

ALSTOM Self-healing mechanism

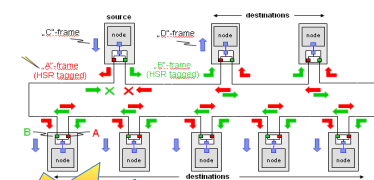


IEC 61850 standard HSR

Alstom Redundant Ring



Self healing <1mS
(could be as short as 4µs)



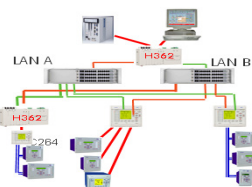
Coming soon

IEC61850 - HSR
 (failover time = 0)

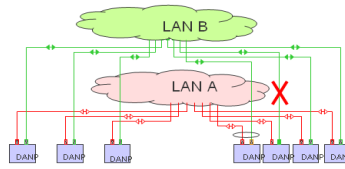
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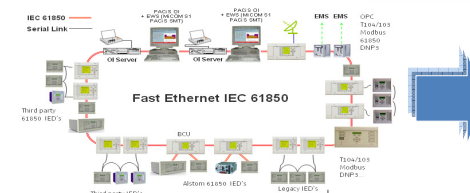
Alstom Grid's Ethernet redundant protocols evolve with IEC 61850



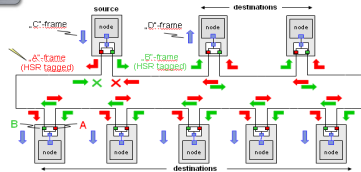
ALSTOM Redundant Star
(failover time = 0)



IEC 61850 PRP
(failover time = 0)



ALSTOM Redundant Ring
(failover time < 4µs)

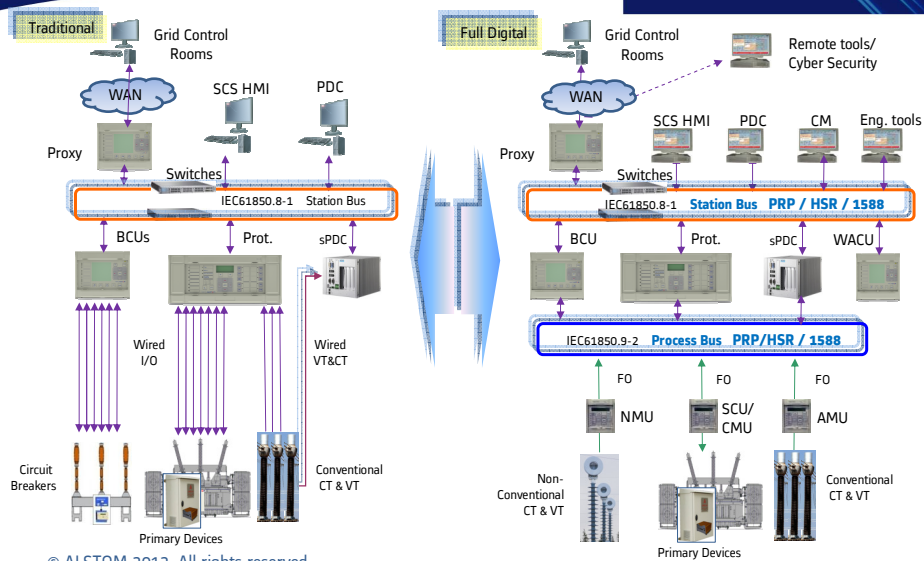


IEC 61850 - HSR
(failover time = 0)

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DS Agile: suitable for both conventional hardwired and fiber-optics process bus architectures



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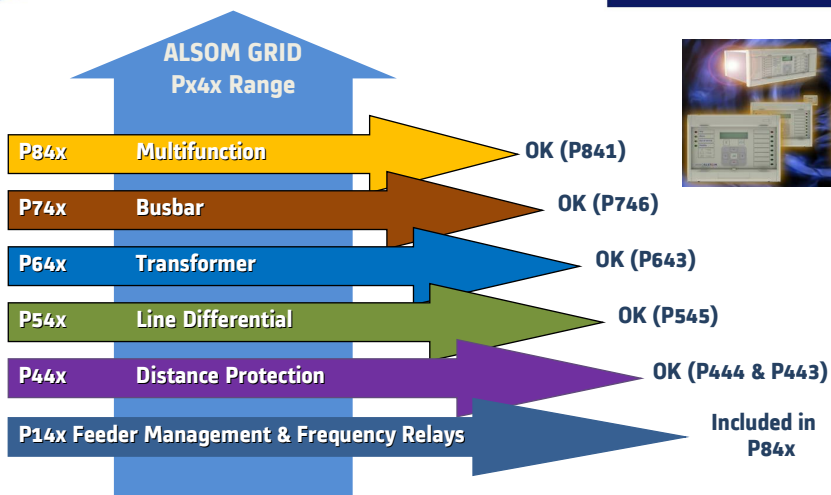
3. The DS Agile automation system in detail

MiCOM Protection relays on 9.2 LE

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MiCOM Alstom protection relays, now on IEC 61850-9-2LE



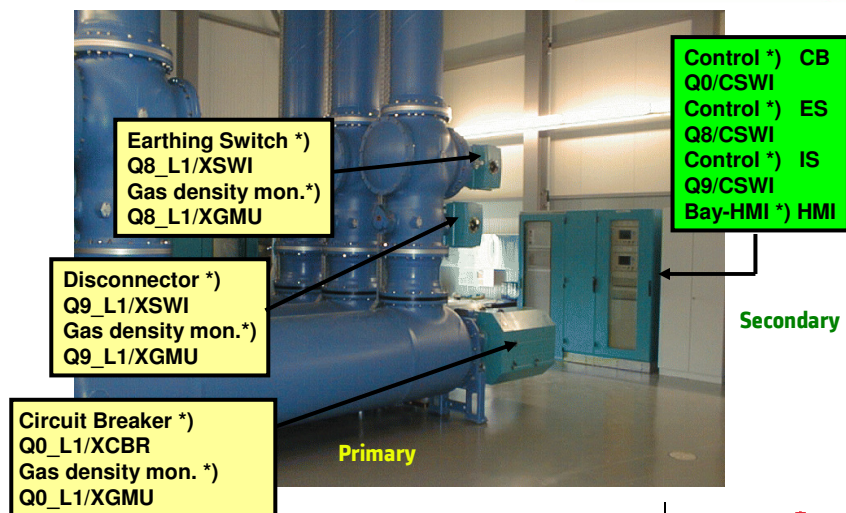
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3. The DS Agile automation system in detail

SCE: Standardisation

Digital Substation model for Protection and Control of Substation



Benefits from Standardisation

Reduce engineering cost	Automatic database generation
Reduce maintenance cost	Always same type of bays, same functions and equipments Same spare parts and training
Reduce cubicle wiring cost	Always same schematics and wiring
Reduce FAT cost	Thanks to pre-qualification of standard bays
Reduce Risk	Avoid introducing errors by new design

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4. Summary (main evolutions & benefits)

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Summary: DS Agile main evolutions & benefits

- PRP / HSR switches for redundant communication protocols
- Merging Units for IEC 61850 (8-1 & 9-2LE) standard process bus
- Wide-area control units (WACU)
- Complete digitalization of all the substation
- Fully inter-operable and scalable architecture
- Integrated condition monitoring of primary and secondary devices
- Cyber-secure local and remote operation
- Optimal asset management through full substation situational awareness
- Wide-area inter-substation and inter-voltage automation

New solutions...

= Higher value!

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Thanks for your attention !



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