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Digital Substation Solutions

Supporting the development of Smart Grids

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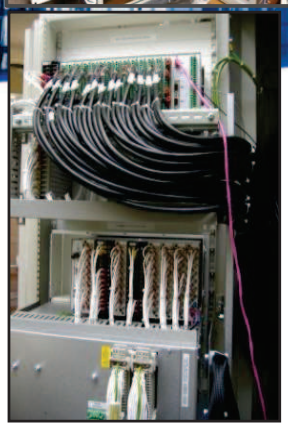
Wiring, wiring, wiring.....



- Safety issues – equipment isolation, touch and step potentials, EMC
- Copper – raw material cost has increased 400% in 10 years
- Material cost – cubicle wiring and test costs, labour cost per wire end termination
- Schematic design - verification cost, excessive on-site work content
- Civil work costs – trays, troughing, cable access/egress...

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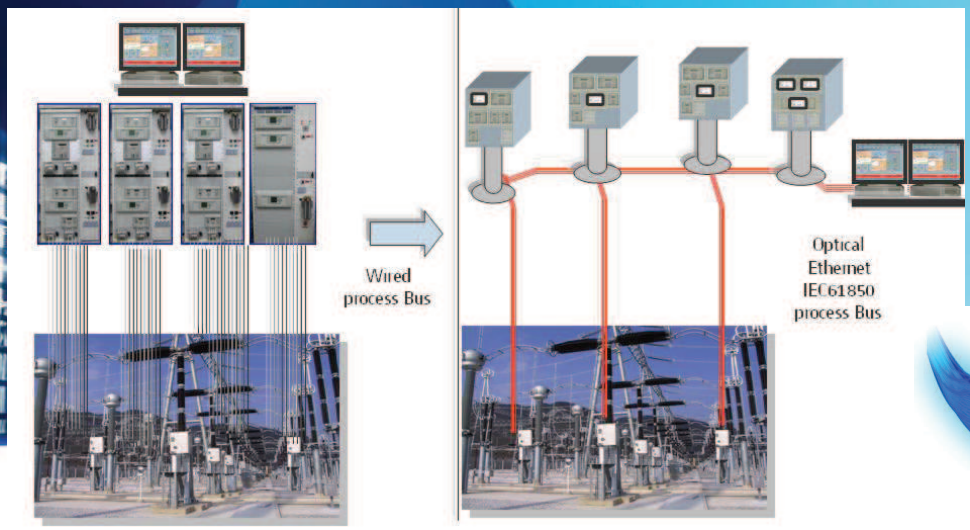
From Conventional to Digital Substation



Suppress copper wiring on Station Bus

Suppress copper wiring between IEDs and Primary Equipment

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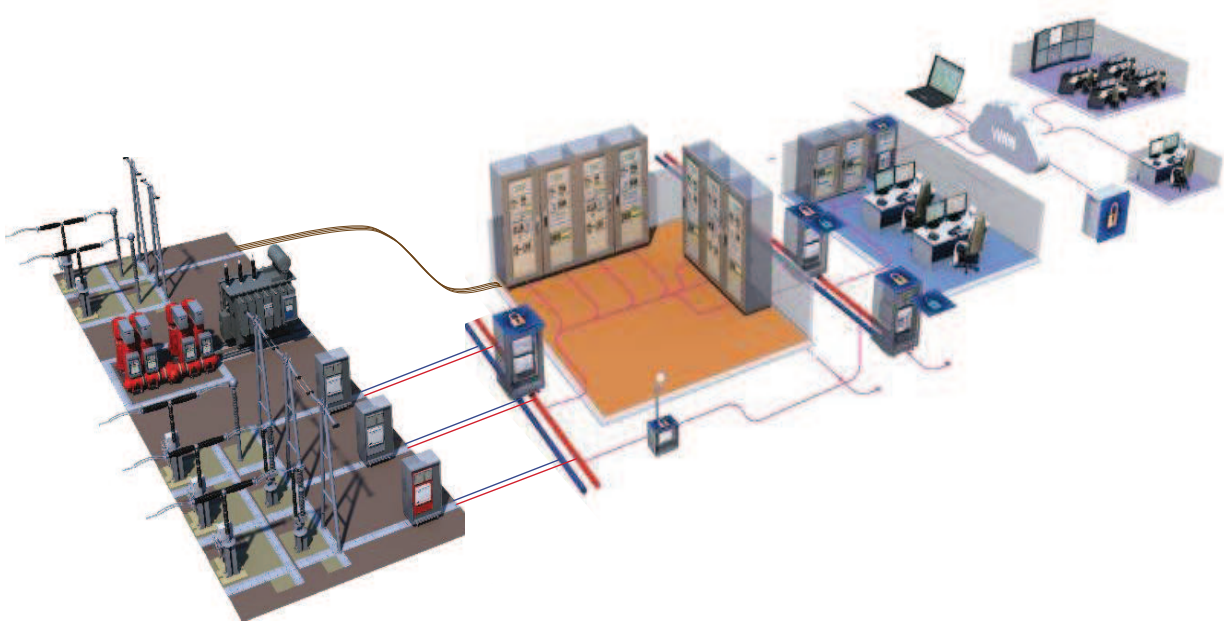
DS Agile architecture



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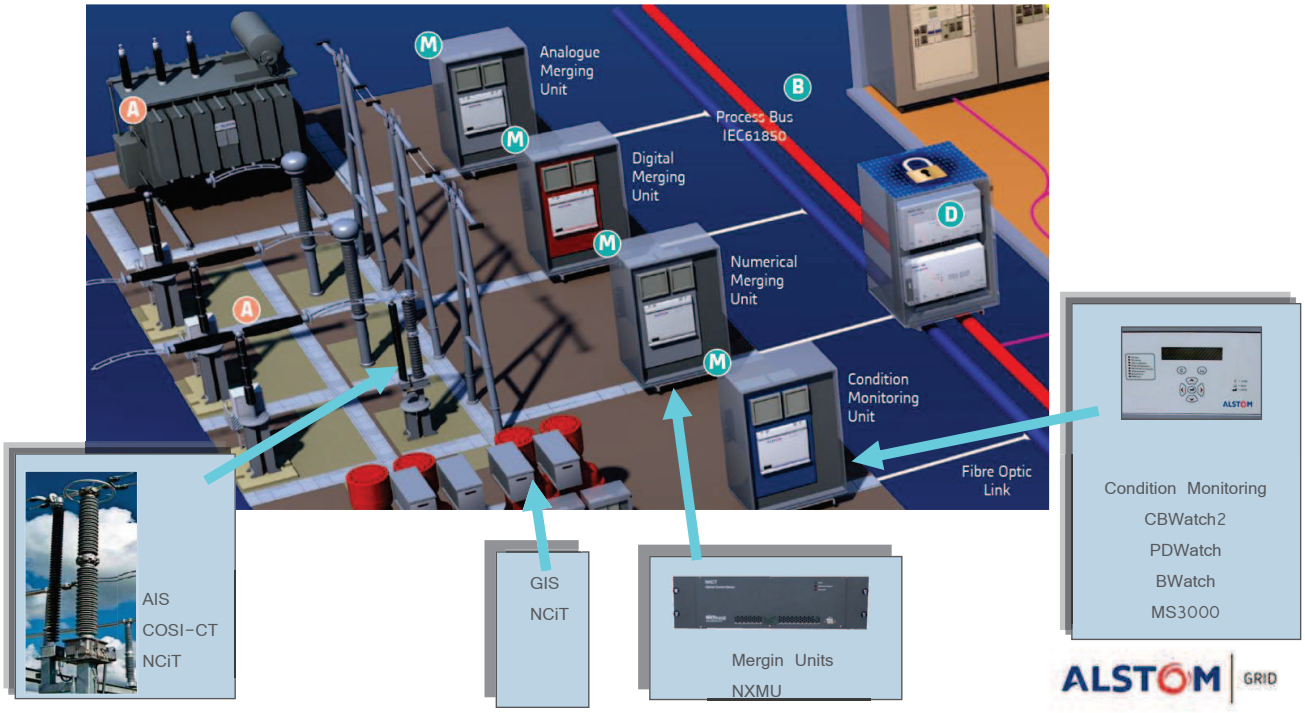
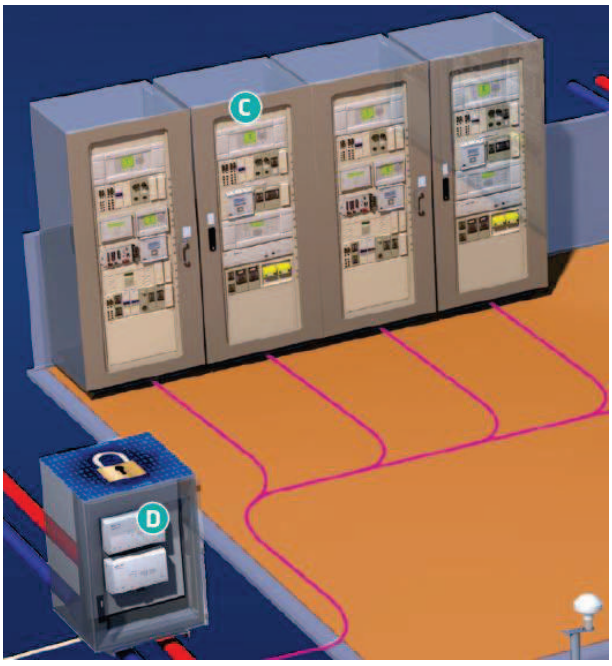
Alstom Grid's Digital Substation: The process bus area



DS Agile Switches : interoperable architectures



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Substation Bus

DS Agile Bay Controllers and MiCOM Protection relays

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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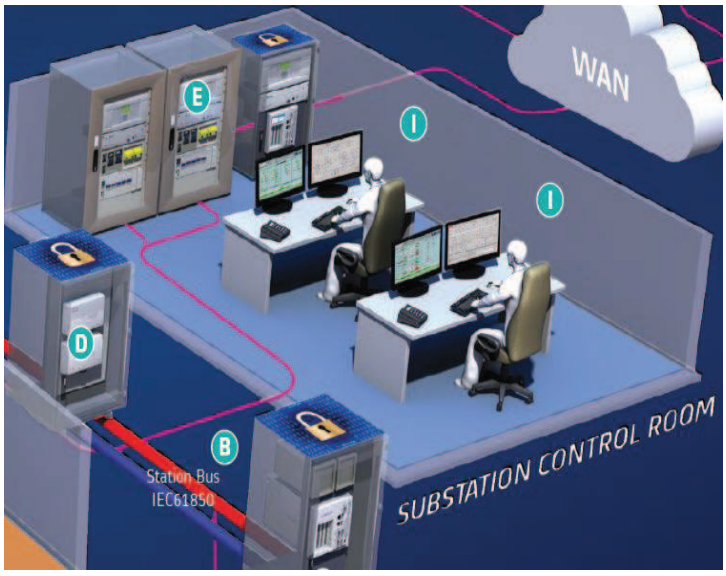
Operator Interface



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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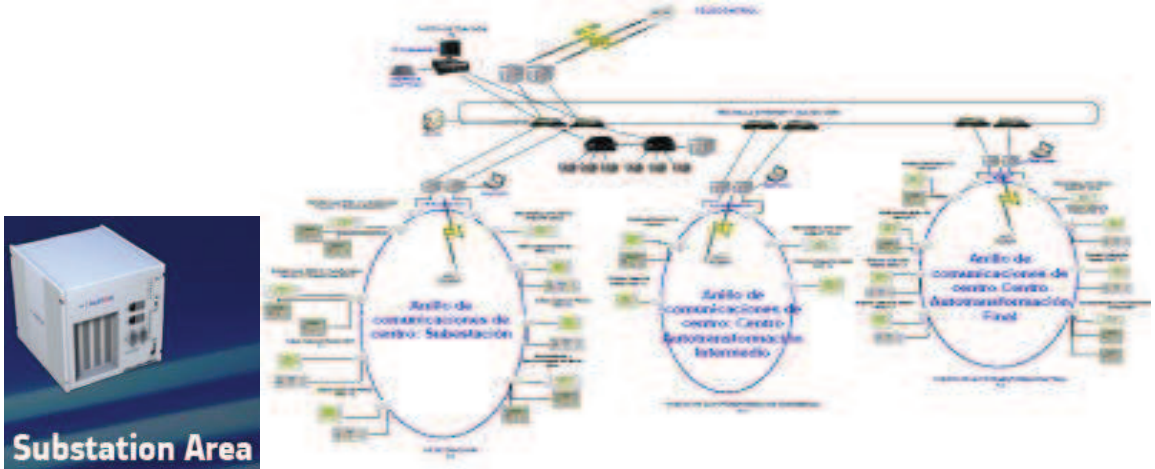
Substation Inter-Controls



Substation Area Wide Area Control Unit (WACU)

- Inter-substation and inter-voltage exchange through IEC61131 automation
- IEC61850 compliant
- Hot stand-by redundancy

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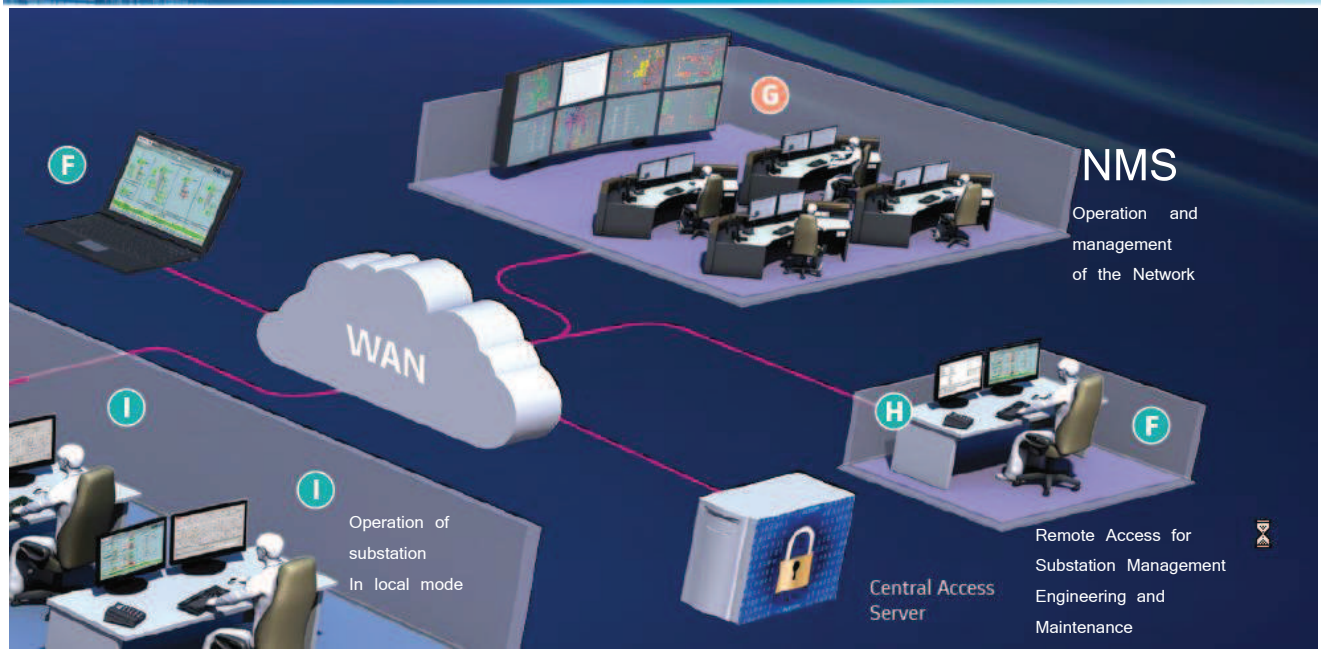
Substation Automation integrated into the Network System



Substation Local Protection ← Cyber Security → Remote Access Protection

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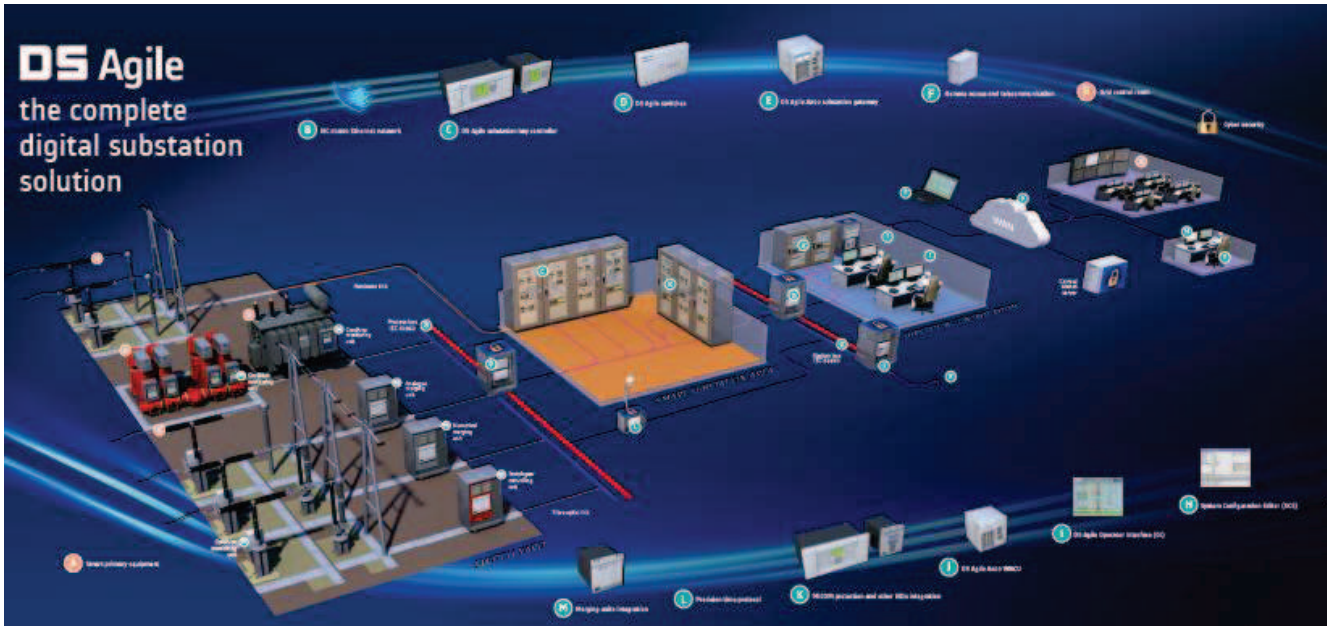
DS Agile Integration into Digital Substation



Alstom's Agile digital substation offers unprecedented performance through intelligent primary systems and tailored automation solutions

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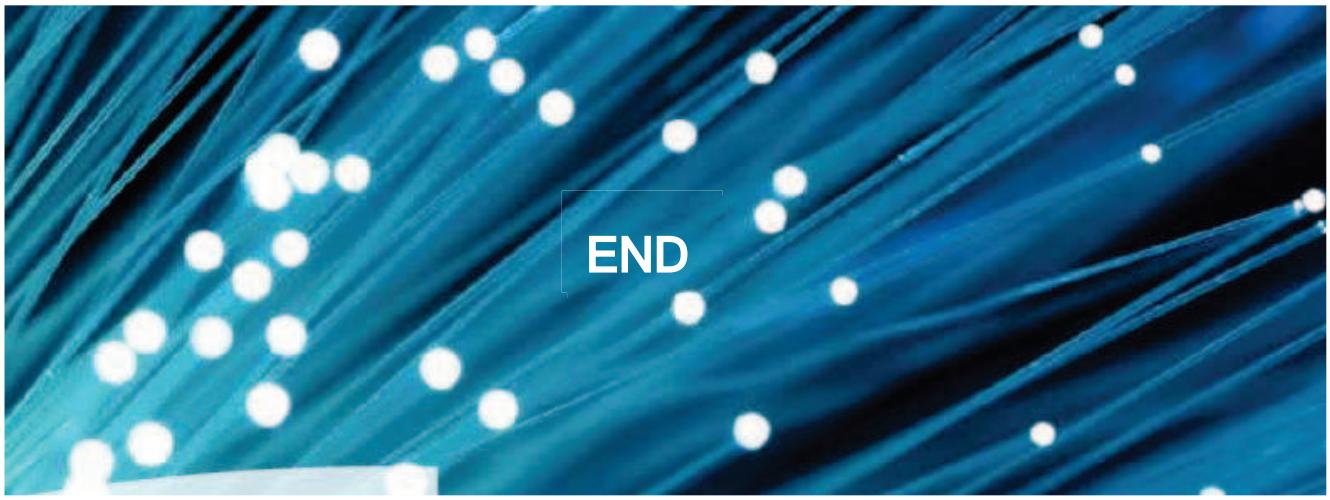

Alstom's Agile digital substation solutions are ready.

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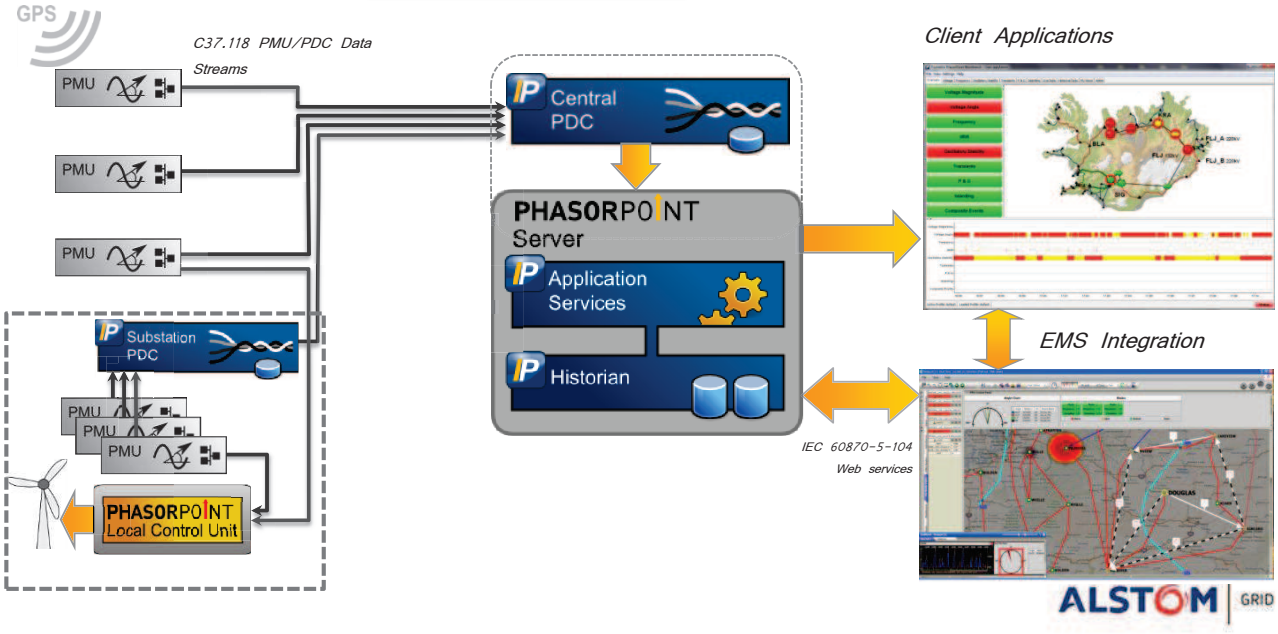
Wide Area Monitoring, Protection and Control Solutions

Synchrophasors: –

- Improve security
- Increase transfer
- System analysis
- Manage renewables



Online Condition Monitoring

Device	Principal applications
PTWatch MS3000	Power transformer condition monitoring: expert system for data management along the life cycle of the power transfomer, with scalable range of sensors and modules for on-line continuous monitoring of all major components of the transformer (active parts, bushings, tap changer and cooling system)
BWatch	GIS bay condition monitoring: interactive diagnostics, acquisition of pressure and temperature, threshold management, leakage, density and liquefaction calculation, internal arc location, enclosure overheating detection
PDWatch	Partial discharge condition monitoring for GIS
GISWatch	Integrated bay & partial discharge condition monitoring for GIS
CBWatch	Circuit breaker condition monitoring: moving part timings and travelling curves, main contact wear, drive energy and auxiliary parts are continuously monitored
DWatch	Disconnector condition monitoring

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Preliminary cost evaluation （400 kV AIS）
Full digital VS conventional

	Cost variation
LV Cables (material)	--
LV Cables (labour/installation)	--
Civil works	-
Landscaping	-
Earth works (earthing grid)	-
Busbars and connectors	--
Marshalling kiosks	--
Batteries & charger	+++
Protection	+
DCS (inc. switches)	+
Engineering (man hours)	-
Commissioning	--
Transport costs	-
Erection	-

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