14 SEPTEMBER, 2017

Towards digitalization

Digitalization of substation protection and control systems

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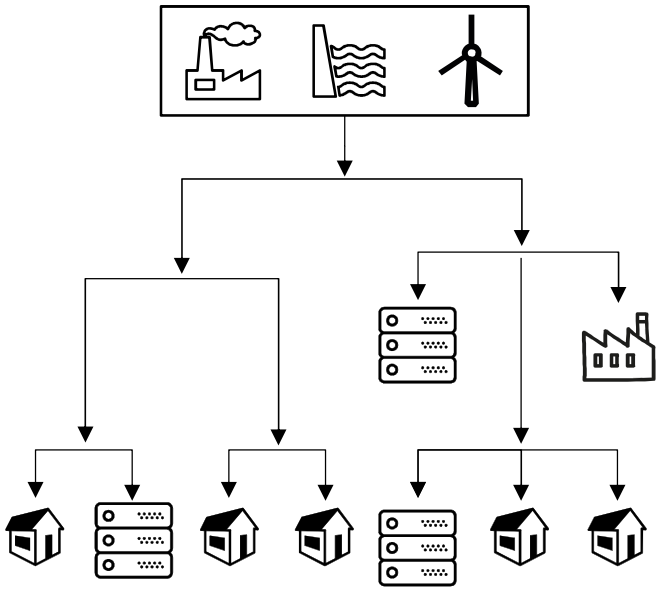
Background

Power systems: before & after

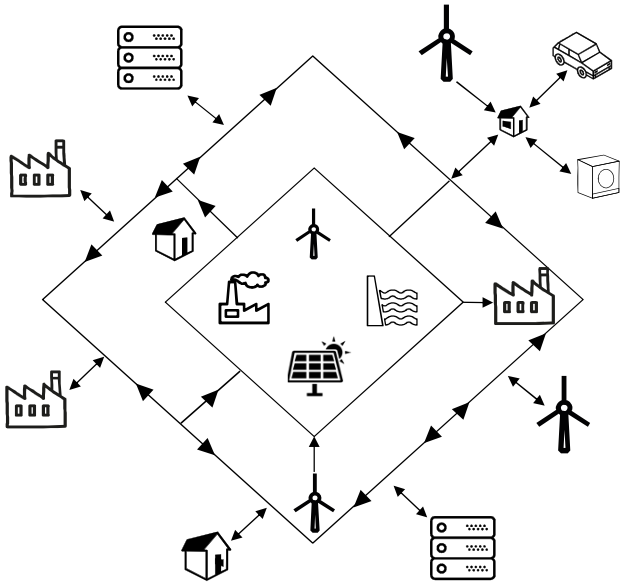
Background (1/2)

Traditional grid



- Centralized power generation
- One-directional power flow
- Generation follows load
- Top-down operations planning
- Operation based on historical experience

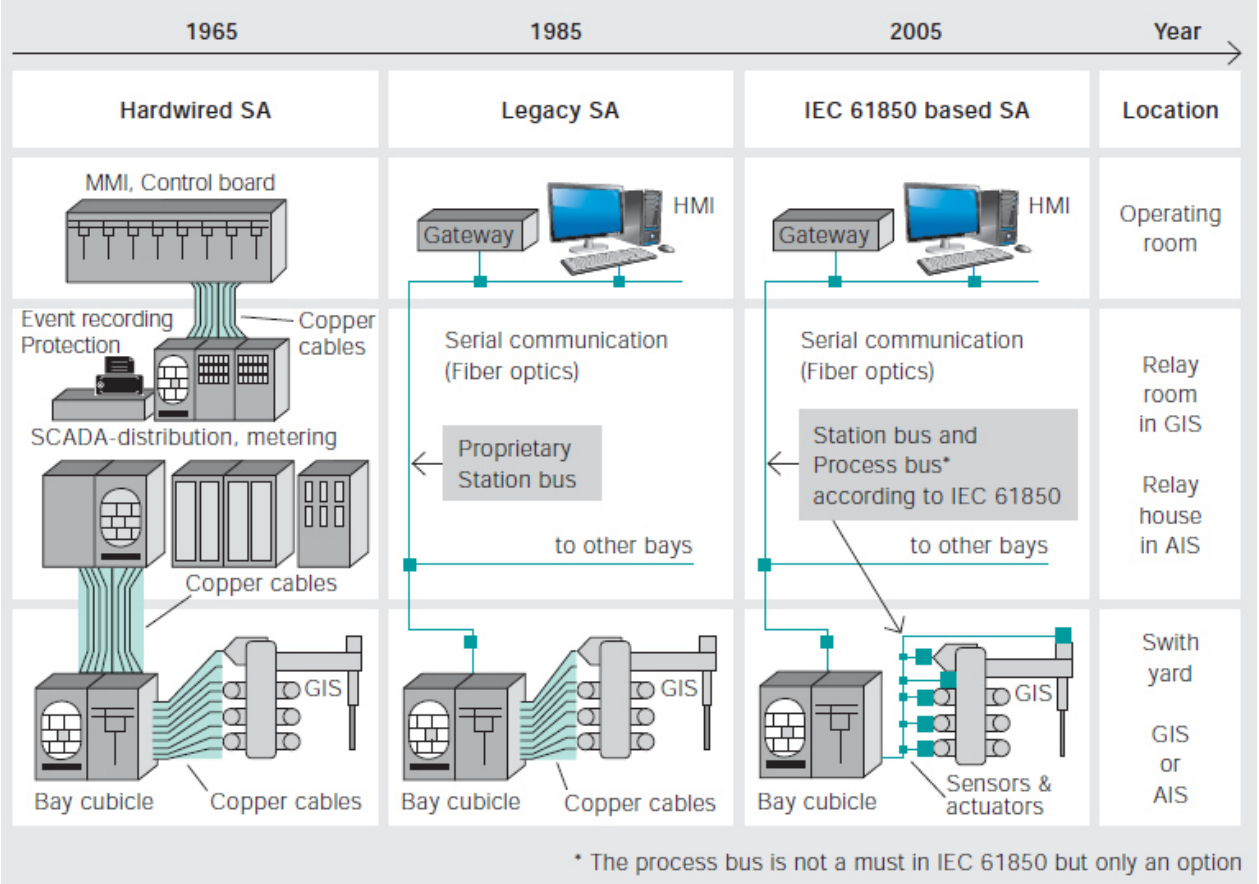
Smart grid



- Centralized and distributed generation
- Multi-directional power flow
- Intermittent renewable generation
- Consumption integrated in system operation
- Operation based on real time data

Power systems: before & after

Background (2/2)



https://library.e.abb.com/public/a56430e1e7c06fdfc12577a00043ab8b/3BSE063756_en_ABB_Review_Special_Report_IEC_61850.pdf

Digitalization

Towards digitalization

Digitalization (1/2)

Industry 1.0 – 1712
First practical steam engine

Industry 2.0 – 1870
First elevated conveyor belts

Industry 3.0 – 1969
Electronics / software based control

Industry 4.0 – today and tomorrow
Internet of …

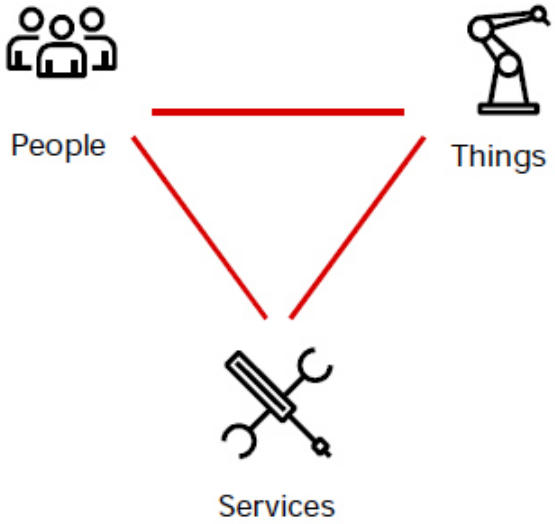
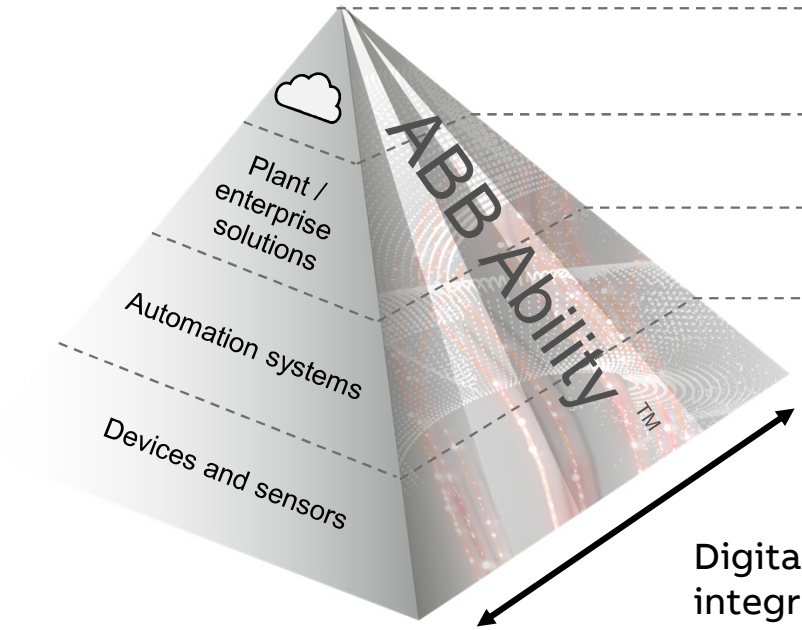


ABB Ability™ platform

Digitalization (2/2)



Build on customer trust, domain expertise, deep process knowledge

Open access, intelligent cloud

New end-to-end digital solutions

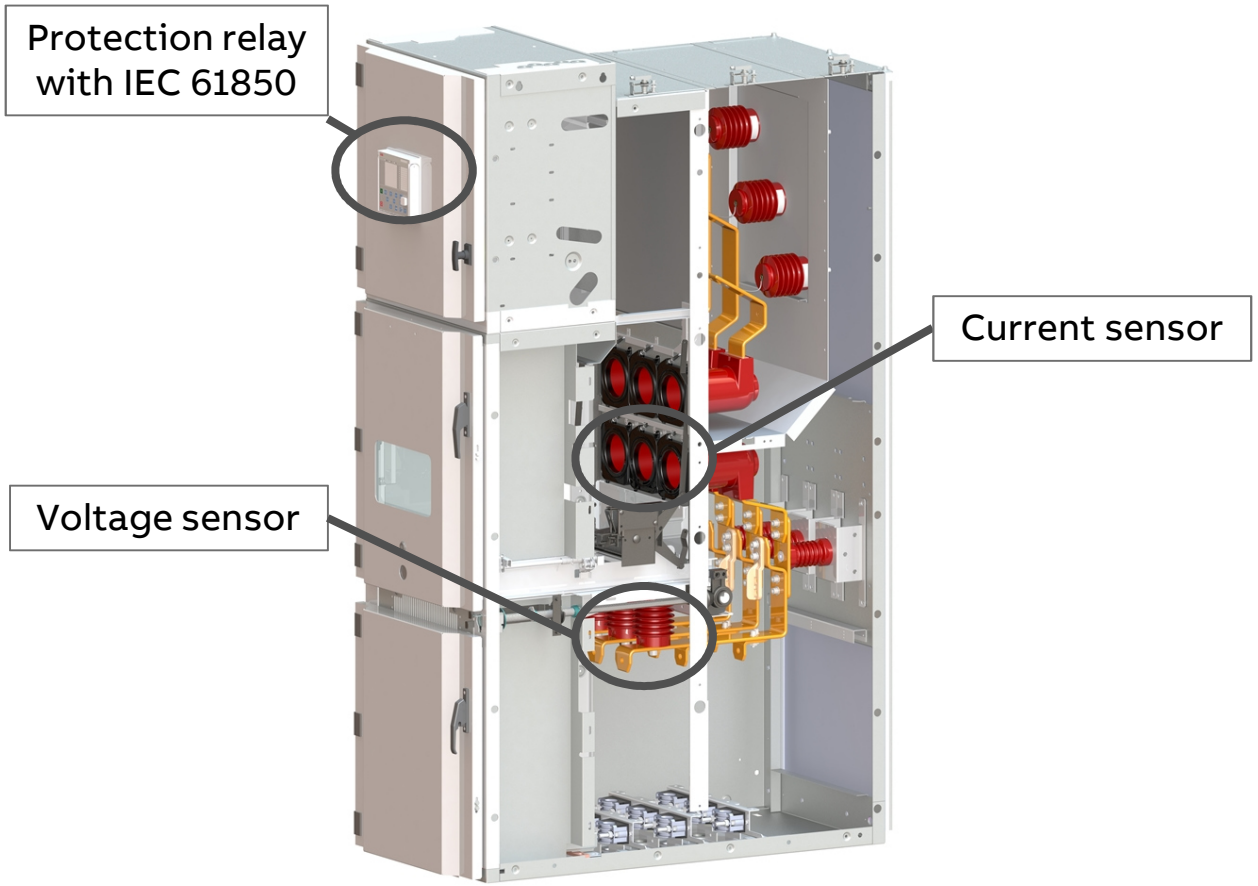
Closing the loop with connected devices

Digital ABB offering across businesses: integrate, penetrate, replicate

UniGear Digital

UniGear Digital

UniGear Digital (1/9)



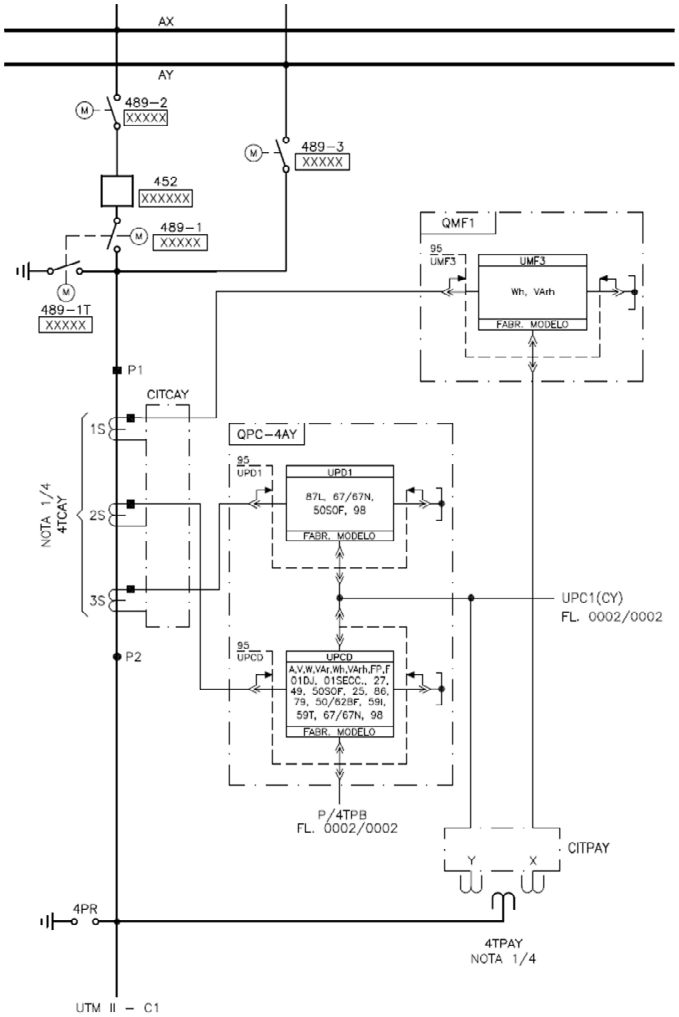
UniGear Digital

UniGear Digital (2/9)

http://new.abb.com/medium-voltage/switchgear/air-insulated/iec-and-other-standards/unigear-digital

Multifunction protection relay

UniGear Digital (3/9)

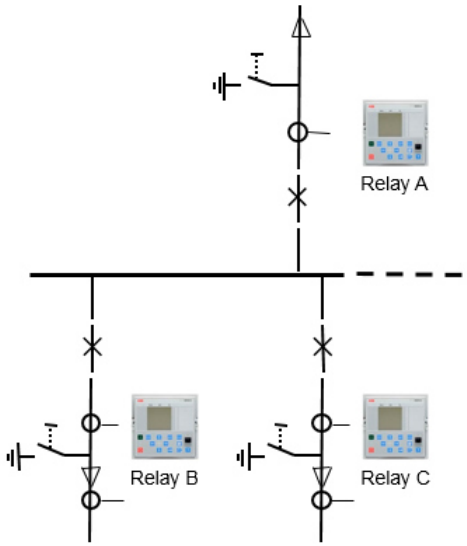


http://new.abb.com/substation-automation/products/protection-control/relion-product-family

Centralized protection and control (CPC) system

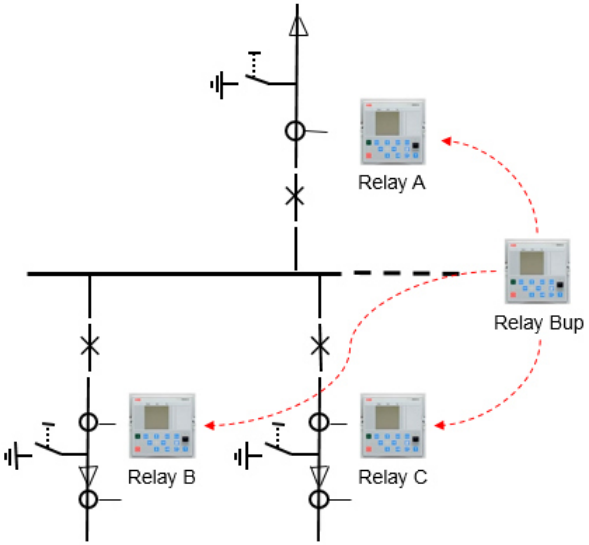
UniGear Digital (4/9)

single



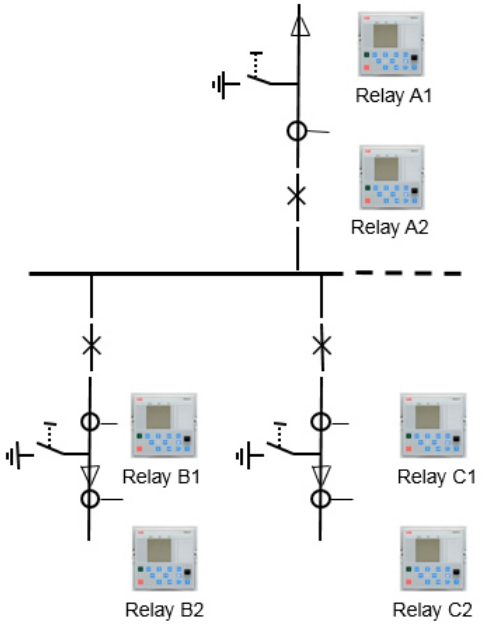
Avail. Cost Simpl.

spare



Avail. Cost Simpl.

main1 + main2

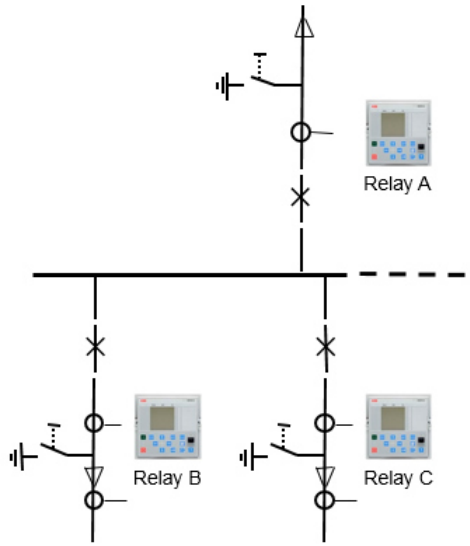


Avail. Cost Simpl.

Centralized protection and control (CPC) system

UniGear Digital (5/9)

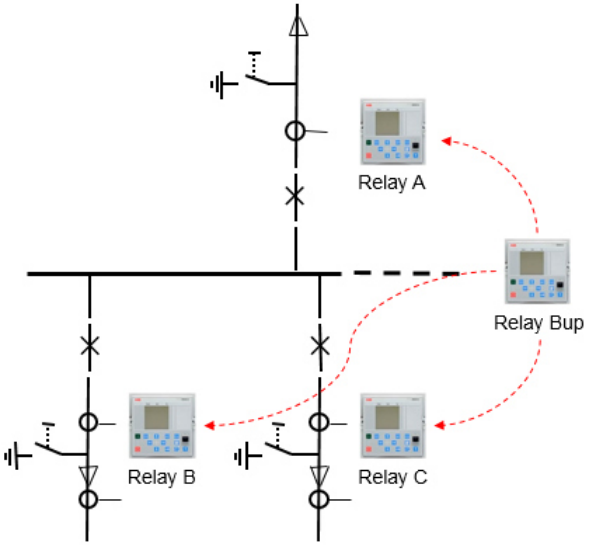
single



low availability

Avail. ↓ Cost ↓ Simpl. ↑

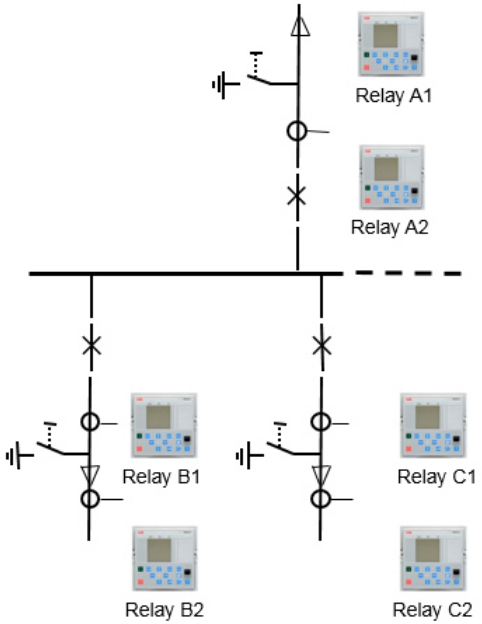
spare



not always simple

Avail. ↑ Cost ↓ Simpl. ↓

main1 + main2

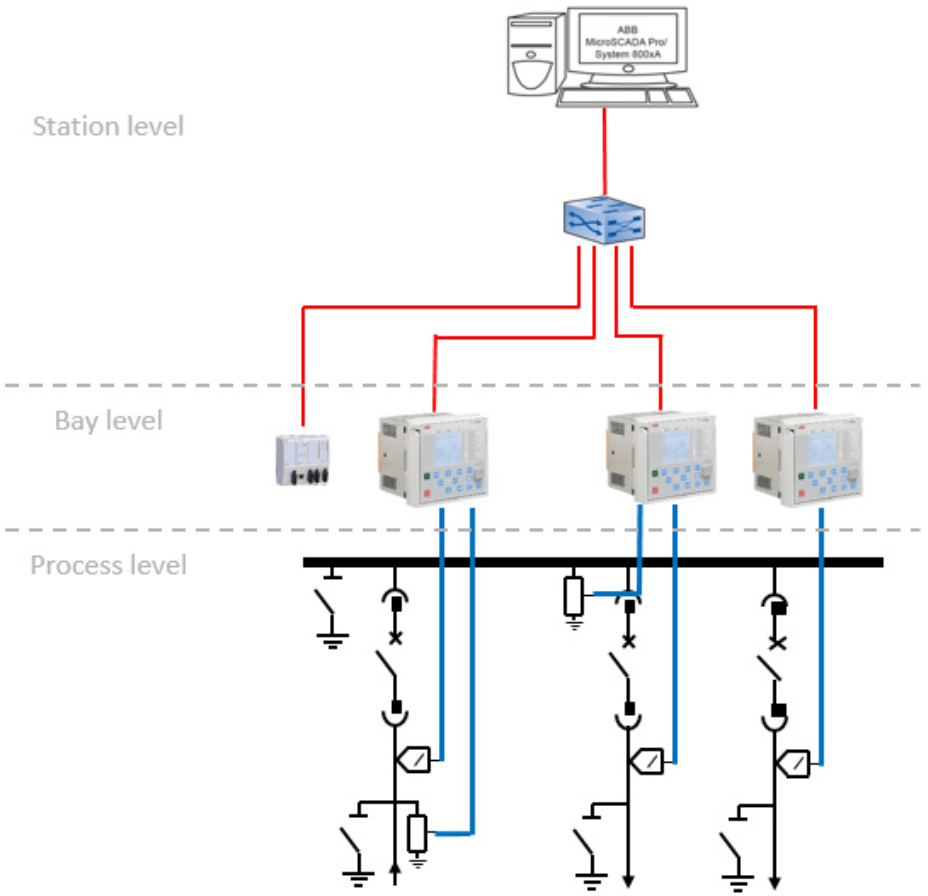


too expensive

Avail. ↑ Cost ↑ Simpl. ↑

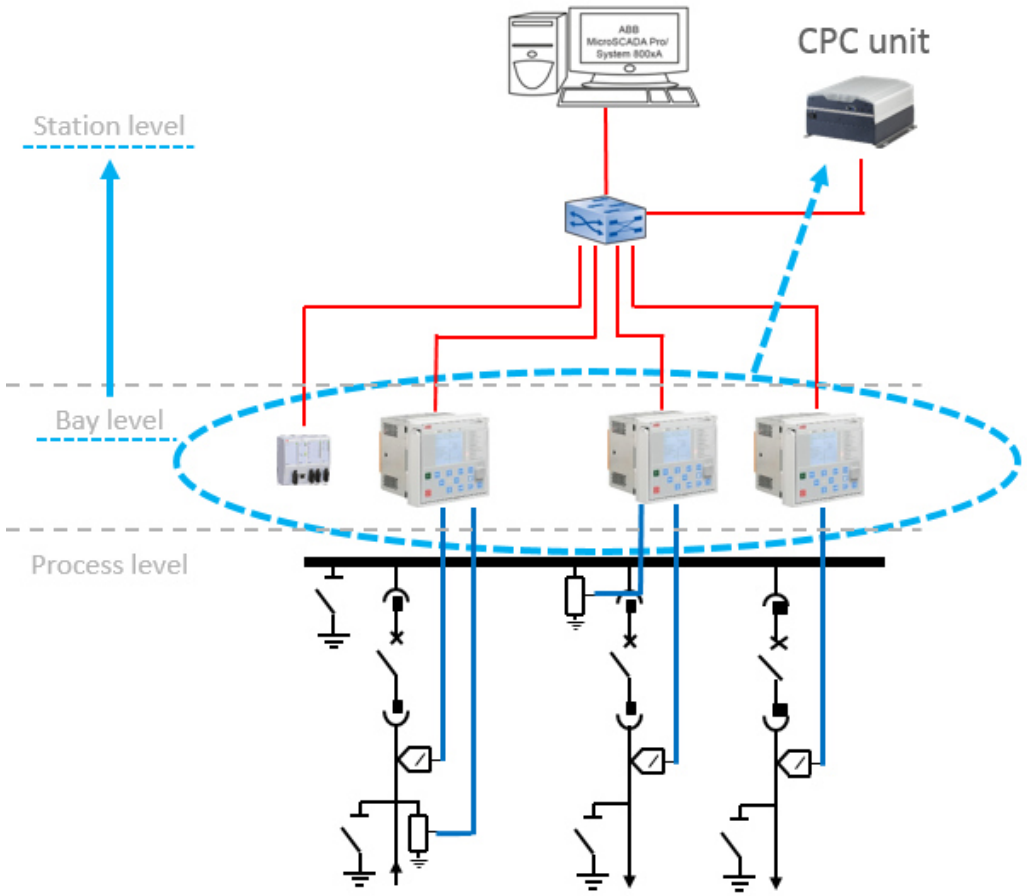
Centralized protection and control (CPC) system

UniGear Digital (6/9)



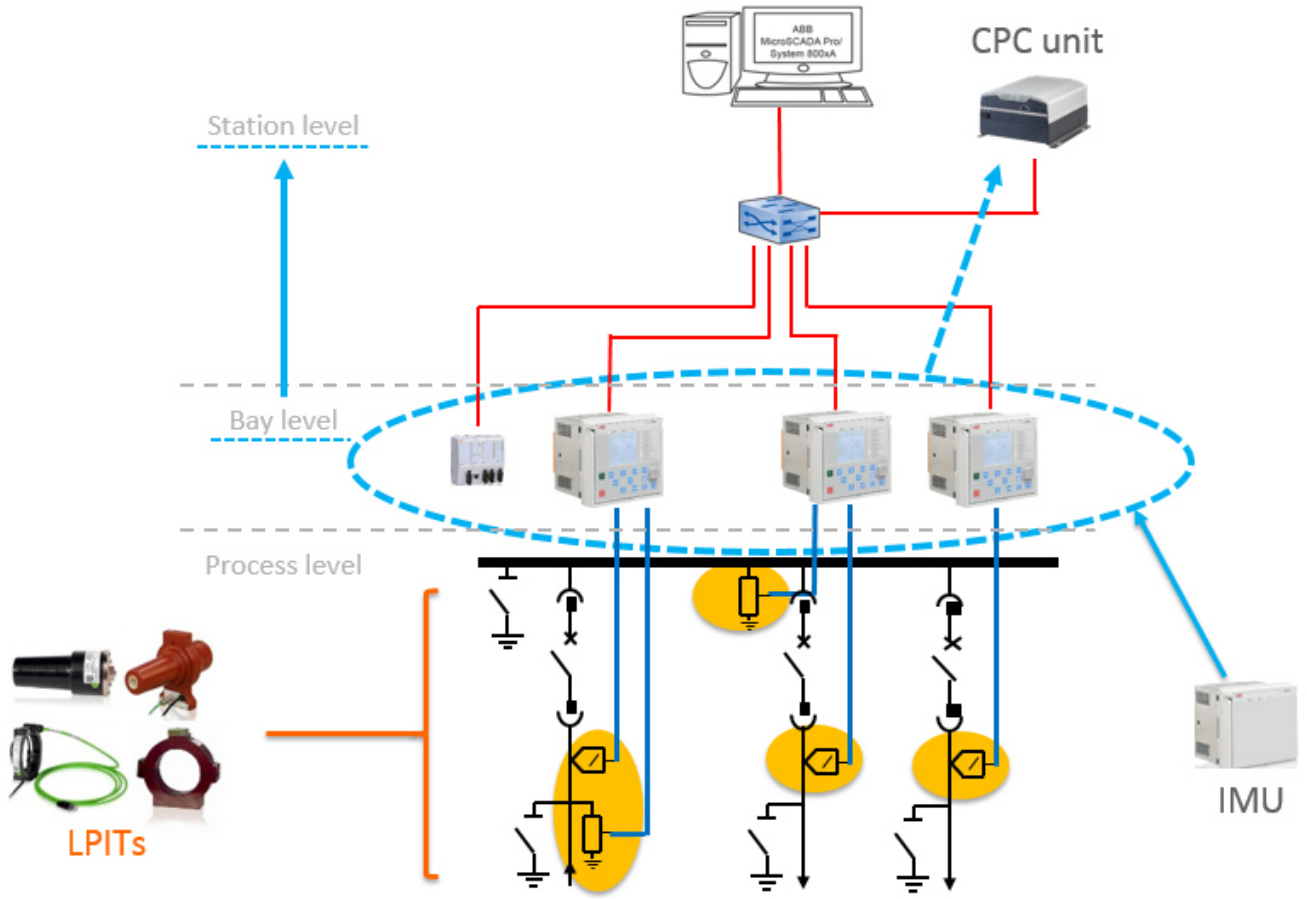
Centralized protection and control (CPC) system

UniGear Digital (7/9)



Centralized protection and control (CPC) system

UniGear Digital (8/9)



Low-power instrument transformers (LPIT)

UniGear Digital (9/9)

- Smaller in size and weight
- Highly linear (less saturation)
- Absence of ferromagnetic core
- Low input signal level
- Current and voltage measurements
- Principles:
  - •Rogowski coil (current)
  - •Capacitive divider (voltage)

Current sensor

Voltage sensor

Combi sensor

http://new.abb.com/medium-voltage/apparatus/instrument-transformers-and-sensors-id

Conclusion

Conclusion

More compact

More economical

More interconnected

More use of data

Higher availability

New possibilities

New functionalities