

**Question 2.02 What are the expected benefits of using digital substation concepts and how to meet these benefits during industrial application?**

The use of process bus in fully digital substations leads to an evolution of the interface between the process level and the Protection, Automation and Control System (PACS). This corresponds to one of the expected benefits of fully digital PACS.

The digital interfacing of the process is a recent development, driven by the wide application of the IEC 61850 standard. This digital interface is the base of the process bus and replaces the hardwiring of HV equipment (instrument transformers, breakers, disconnector switches) to protection and control IEDs.

This development allows the geographical separation of HV equipment and the IEDs hosting the protection and control functions. The absence of any requirement for physical proximity introduces new flexibilities for the architecture of PACS. This development is leading to the creation of a new digital “process” interface implemented between the “traditional” hardwired interface and the fully digital PACS. It is made up of interface IED, including Switchgear Control Units (SCU), Stand Alone Merging Units (SAMU), Binary Input /Output IEDs (BIOI) and Process Interface Units (PIU) (see Figure 1). This also enables more freedom in the allocation of functions in those physical interface IED.

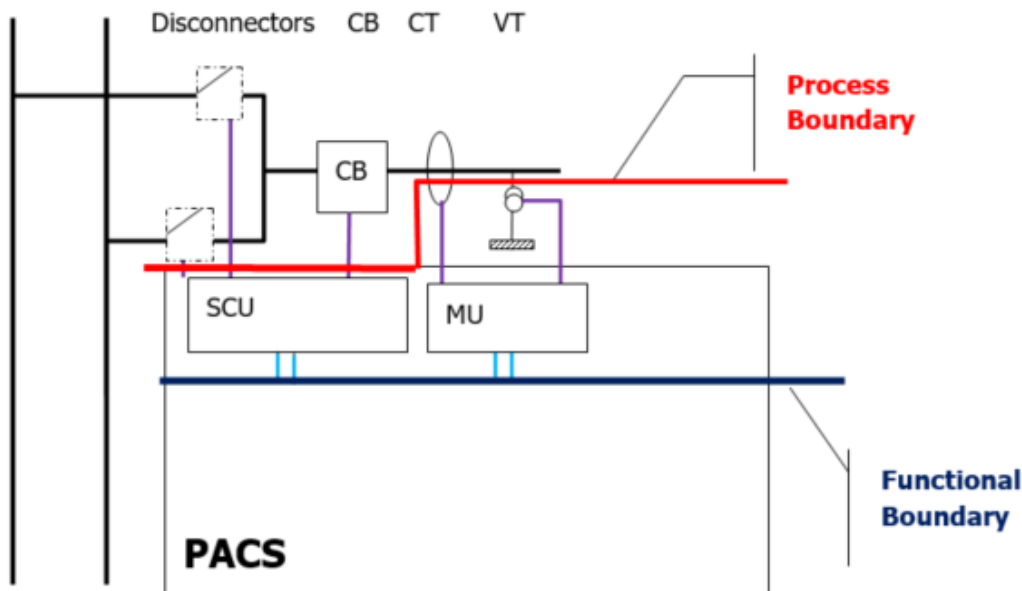


Figure 1 Process Boundary and Functional Boundary for Fully Digital PACS [CIGRE TB 760 – WG B5.53]

It is worth noting that subsequently, thanks to the standardised IEC 61850 process bus, it is possible to modify or replace the digital instrumentation and control system while keeping the installed interface equipment. The latter can also be replaced whatever the type of fully digital PACS.

It therefore becomes possible to separate the purchase and the replacement policies of digital interface equipment from of the PACS, thereby delivering considerable flexibility for the PACS architecture and engineering. Smart primary equipment, e.g. HV equipment with an integrated IEC 61850 interface, such as low-power instrument transformers (LPIT), can also be introduced.

Furthermore, there are potential synergies between a PACS interface of HV equipment and the monitoring of this equipment. These two functions partly rely on the same data and can share the same infrastructure to transmit measurements and data to the substation and beyond.

For this reason, the introduction of a digital “process” interface will alter the boundary between the instrumentation and control system and the process, paving the way for new opportunities and possibilities.