



Some clarifications on IEC 61850 process bus

With the worldwide acceptance of IEC 61850 by many utilities, **process bus** has become a hot topic.

WHILE IEC 61850 IS BECOMING the widely accepted solution for communication within substations and while the second edition is in preparation, IEC 61850 process bus has become a hot topic. It was the preferential subject 1 of the CIGRE B5 session in Paris this year – more details can be found in my report on that topic in this issue of PAC world.

What is IEC 61850 process bus? The term "process bus" originates from the beginning of the work on IEC 61850, where we considered the substation automation system consisted of three hierarchical levels – the station, the bay and the process level – with the station bus connecting the station and the bay level and the process bus connecting the bay and the process level. Today, IEC 61850 supports more flexible architectures – in fact, any communication topology is possible. Therefore, we can not really differentiate anymore between a station and a process bus as two different physical sub networks.

Still the term Process Bus has survived to designate a communication based connection from protection relay and bay controllers to the process equipment. The connection of circuit breakers and switches with

either an integrated communication interface or through remote I/O units is one aspect. The other aspect is the connection of current and voltage transformers directly or through a merging unit with a transmission of sampled values.

A merging unit is a device that supplies the signals of the current and voltage measurements of all phases and neutral as synchronized samples. Sometimes, you will however find the term merging unit used for a generic device, not only interfacing to instrument transformers, but also interfacing to the switchgear. Don't get confused about that!

A merging unit has to provide the samples synchronized – if a relay needs samples from multiple merging units, all of the merging units need to be synchronized. This is why recently discussions about time synchronization have become a hype! Of course that synchronization has to be accurate. And reliable – so it should use the same network that we need anyway to get the data. And that is where the IEEE Standard Precision Time Protocol (PTP) IEEE 1588 is of interest. The other concern of the process connection is reliability in general. The process

connection is of vital importance for the protection functionality, and therefore for the substation. And the question is of course, to what level can you trust your industry grade Ethernet switches? The response to these concerns is that architectures are developed that can eliminate the dependencies from Ethernet switches for the most critical functions.

Facing all these issues we should not forget interoperability – the goal of the standard. It is important, that the vendors still bear in mind to develop interoperable products. Solutions that from a technical viewpoint are smart, but if not fully interoperable with products from other vendors, are not useful for the industry.

So what is the status today? Solutions offering some aspects of an IEC 61850 based process connection are available today. Some compromises may exist concerning the flexibility of the architecture; this should not be a critical restriction. Some solutions may be too proprietary – here a decision needs to be made before using them. And I am convinced that sooner or later we will get the products implemented in the spirit of the IEC 61850 process bus.

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