

Christoph Brunner's article regarding IEC 61850 Process Bus in the Autumn 2008 (which would be spring for us "down under") issue is quite topical in the industry. Having had the opportunity to look closely at a few of the different vendors' offerings of Merging Units (MU) that have, or are about to emerge on the market, Christoph's statement is absolutely correct – process bus solutions are available. In fact, there are systems that have been in service for several years, also using non-conventional instrument transformers, giving another dimension to the benefits that IEC 61850 brings to the market. The technology is real - there are projects where large numbers of MUs are being deployed for protection of an entire substation. Time synchronization of the Sampled Values (SV) is certainly something that must be understood. A single relay may need to get the SVs from one MU supplying current from the feeder CTs and another MU supplying the voltage from the bus VTs, or a busbar protection relay needs the SVs to be synchronized across many MUs. Whilst time synchronization is a prerequisite, it is not a stumbling block to deployment of process bus even now. Low impedance bus bar protection systems from several vendors have reliably provided synchronization to the distributed peripheral units and the central processing unit for more than 10 years. We should therefore not confuse the industry, specifically corporate executives and asset owners, that there is yet to be a solution for accurate time synchronisation in order for IEC 61850 process bus solutions to be used. Clearly the solutions exist. The IEC 61850 9-2 LE specification was

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released to provide a means to deploy process bus in advance of IEEE 1588. The LE edition hence allows for the time synchronization to be achieved using a 1 pulse per second (1pps) signal, with the only downside that it requires a separate connection to the MU. IEEE1588 would eliminate this separate time synchronizing network as it uses the same LAN connection as the SVs. However, process bus solutions can already be deployed using 1pps. The issue of industry confidence in the process bus is more fundamental to our typical protection engineering requirements and desire for proven performance, rather than time synchronization solutions. For example, whilst we happily use a multi-core conventional CT from any vendor with any vendors relay, interoperability of a MU from vendor 'A' with a relay from vendor 'B' must be absolute, in as much as we know what are the mutual requirements of a CT knee point voltage and the ability of the relay in regards to saturation and X/R ratios before we are happy to put the system into service. As Christoph points out, process bus also includes understanding the performance of the Ethernet switches in how data and time synchronization is distributed. It simply boils down to making sure we have adequately specified and understood the correct performance requirements of each component. A different solution is perfectly feasible where a 1-to-1 relationship is established between the relay and the MU as a proprietary interface effectively physically separating the analogue input module of the relay into a separate box. This eliminates the synchronization issues of multiple MUs if each MU needs only to supply SVs to one relay providing a useful solution for

such single device non-switched network architecture. At worst, in fifteen or twenty years when the secondary system is up for its next refurbishment, this would mean a re-assessment of the choice of the same proprietary interface. However, even though the MU needs replacing at the same time as the relay, this is likely to be the case with any MU electronics life expectancy, and technology options will no doubt be more common place. At another dimension, the aspect at higher voltages of duplicate, but different vendors' devices to eliminate common mode failures between devices is in some cases a requirement of the national rules. If extended to the MU, this would imply we need two different MU vendors. This may not be a problem from an Ethernet design point of view, but the physical installation of these, needs careful thought. Some vendors have MU that can be bolted to the base of the CT post, whilst others' units need a suitable enclosure. If both MUs use conventional CT/VT inputs, the CT coil is as reliable and well proven as we know today. However, the reliability question may be complicated again by whether two different non-conventional sensors (e.g. one optical and one Rogowski coil) are needed, which then brings into question the physical mounting of the two different sensors from two different vendors, as distinct from a multi-core CT on one CT post. What is clear is that the industry needs to give vendors more direction about the physical nature of the MU and must come to an understanding of how we prove performance and the factors that dictate our confidence in the reliable operation of the protection scheme.

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