DISCUSSION CONTRIBUTION

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PREFERENTIAL SUBJECT: 1

QUESTION N°: 1.6

The IEC 61850 standard imposes changes to PACS environment and consequently tests conditions. The classical method of testing using analog current, voltages and binarys I/O has been changing to IEC 61850 methods with Sampled Values and GOOSE messages.

In the classical method referred in figure 1, the primary analog (An P) signal is converted to the analog secondary signal (An S) by the IT´s and its output goes to the relay, that provides or not, the trip signal using Binary Output signal (BO).

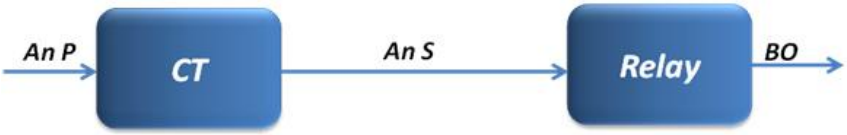

FIGURE 1 - Classical Method with Copper hard wire connections

On the Process Bus method in figure 2, the CT secondary output is connected to the SAMU. The Merging Unit converts the CT secondary signal to sampled values in accordance with IEC 61850-9-2 format. The frame generated by SAMU, goes through Ethernet LAN to the IED, where the decision of trip will comes like a GOOSE message.

FIGURE 2 - Process bus /Sampled Values

At this new concept, evolution of tests involves a test set that have capabilities to deal with IEC 61850 signals and messages (communication and networks now are inside the PACS) and has to have the same requirements of the entire system (other devices).

The test have to check all the exchanged information on the network, if the time required are ok, if the message are in the correct format, and others requirements.

Tests can be divides in two different approaches: One Equivalent to classic system, in other words, injecting situations of fault and nominal values looking for the system response, and other one for new communications conditions and necessities.

Regarding the chain with CT, SAMU and IED, new test´s requirement are necessary, figure 3 divides the process in some parts that allows identifying the test needs and possibilities.

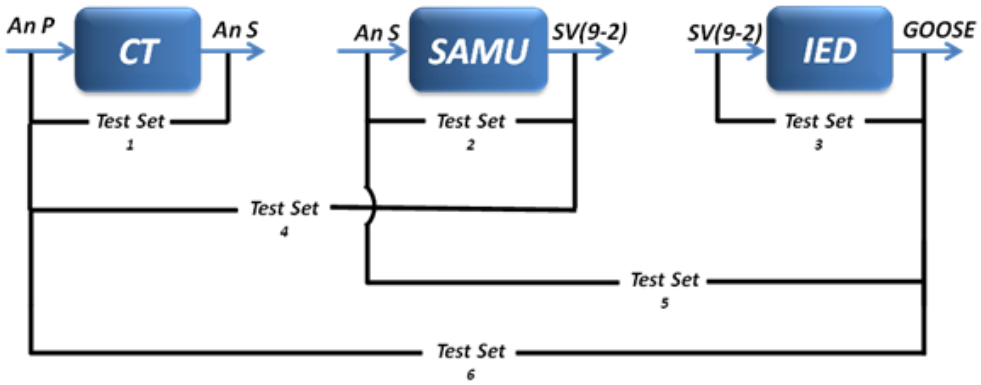

FIGURE 3 – Splitting the Process Bus scheme to display the tests requirements

In each part of the whole scheme, the requirements for input and output have to be analyzed, considering their specific needs.

For the proposed scheme there are six tests options, and for each option one object or group is evaluated. To achieve these requirements the test set instrument got to be capable to generate and measure analog (primary and secondary amplitude), digital (frame / messages) and timer signals.

	Object Under Test	Inject	Measure
1	CT	Primary Current	Secondary Current
2	SAMU	Several secondary currents and voltages	SV (9-2)
3	IED	SV (9-2)	GOOSE
4	CT + SAMU	Primary Current	SV (9-2)
5	SAMU + IED	Several secondary currents and voltages	GOOSE
6	CT+ SAMU + IED	Primary Current	GOOSE

It however has to be mentioned, that depending on the tests objectives, the arrangement can be made including one or more blocks.

The last issue that we have to remember is with these changes, test people have to be prepared to this new condition, with specific training. Human Recourses is one of keys for successes of the IEC 61850 substation.