PS2 Question 2.9

It seems that many tests on process bus loading and its influence on operation of relay protection has been performed worldwide. What tests methods have been used for this purpose, what are the results and lessons learned?

Paulo Junior
Conprove - Brazil

PS2 Question 2.9

- **Process Bus** is a **paradigm shift** and can cause **fear**
- **Evaluate** the Process Bus **with load** condition
- **Increase** the number of **MUs** on the network and **analyze** the behaviour of **trip time** (up to **10 MUs**)
- Evaluate the IED so as to promote the relay operation under **different zones**, **different fault types**; for each condition change the **load of the LAN by adding more MU´s** sending messages
- Repeat each test condition many **(20) times**
- **Statistical analysis** (Max, Min, Average, SD)

Results and Lessons Learned

- With **time and experience** sample value technology **reliability increases** and **can substitute** secondary cooper wire
- Paper **209** reports tests involving more than **1000 faults**
- Results up to now were satisfactory: **no relevant relationship** between the number of the MUs and trip time
- **No problems found** related to ethernet load
- **Worst condition** of averages just **1.38 ms** (less than 1/10 of cycle): no relevant delays

PS2 Question 2.9

Limits of 9-2 LE:

- IEC 61850-9-2 left some **definitions open**
- Group of manufacturers established conditions for interoperability: ***UCA Implementation Guide (LE)***
- Protection: 60Hz * 80 Samples = 4800 msg/s -> **208us**
- **Latency Sources**: StoreForward, Processing, Wire, Queue
- **Practical limit** with star connection for **12-14 MUs** on **100Mbps**. With just one switch
- **9-2LE:** limit to **bus bar protection: 14 three-phase** feeders
- **IEC 61869-9** can **change** the LE **frame** and increase these limits