INTEROPERABILIDADE NO BARRAMENTO DE PROCESSOS À LUZ DA IEC 61850/IEC 61869-9 E O SINCRONISMO TEMPORAL

De 15 a 18 de setembro de 2019
Shopping RioMar | Recife PE

Paulo Sergio Pereira Jr.

XIII SIMPASE

CONPROVE ENGENHARIA

Promoção: cigre Brasil

Realização: Chesf

Resumo

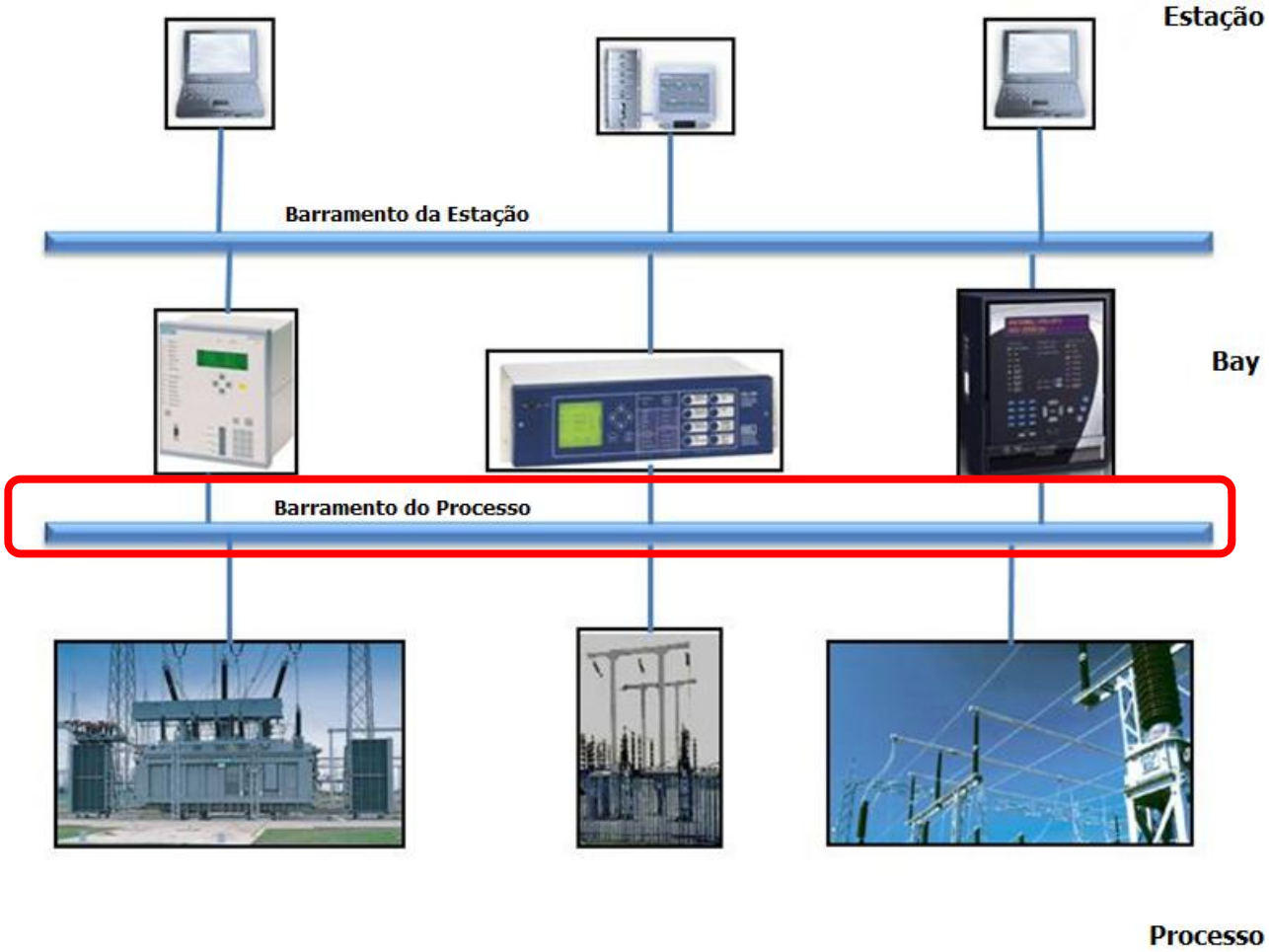
- Este trabalho tem como objetivo, apresentar a **experiência** do Barramento de Processos com **vários fabricantes**. Além de questões relacionadas a **sincronização**;

- Foram realizados **ensaios** com **SAMU´s**, **IED´s** e **equipamentos de testes distintos** operando na mesma rede Ethernet.

Introdução

- IEC 61850 -> **Desenvolvimento p/ PAC**;
- **Data M**
- **Cliente**
- **SV -> M**
- Importâ
- Ensaio
- **Familiaridade** c/ a nova tecnologia.

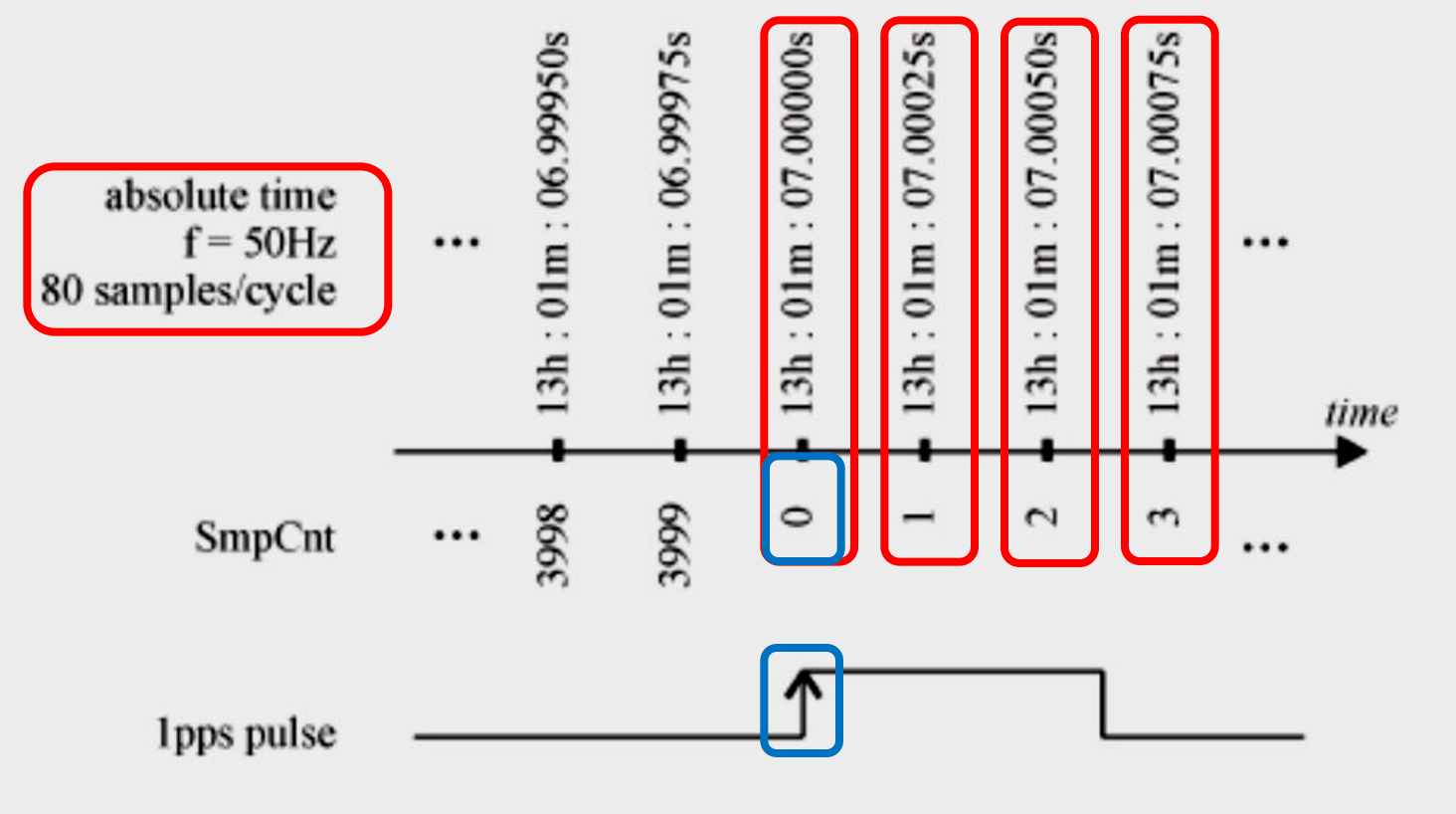
Process Bus


Estação
Barramento da Estação
Bay
Barramento do Processo
Processo

Sincronização

- 61850-9-2 -> **Sincronização das Amostras**;
- Representação do **Momento da Aquisição**;
- **SmpCnt** -> Reconstruir F. Onda;
- **Ângulo de Fase**;
- **Independente Atraso** da Rede Ethernet;
- Chaveamento **Estatístico** / **Caminhos** Distintos.

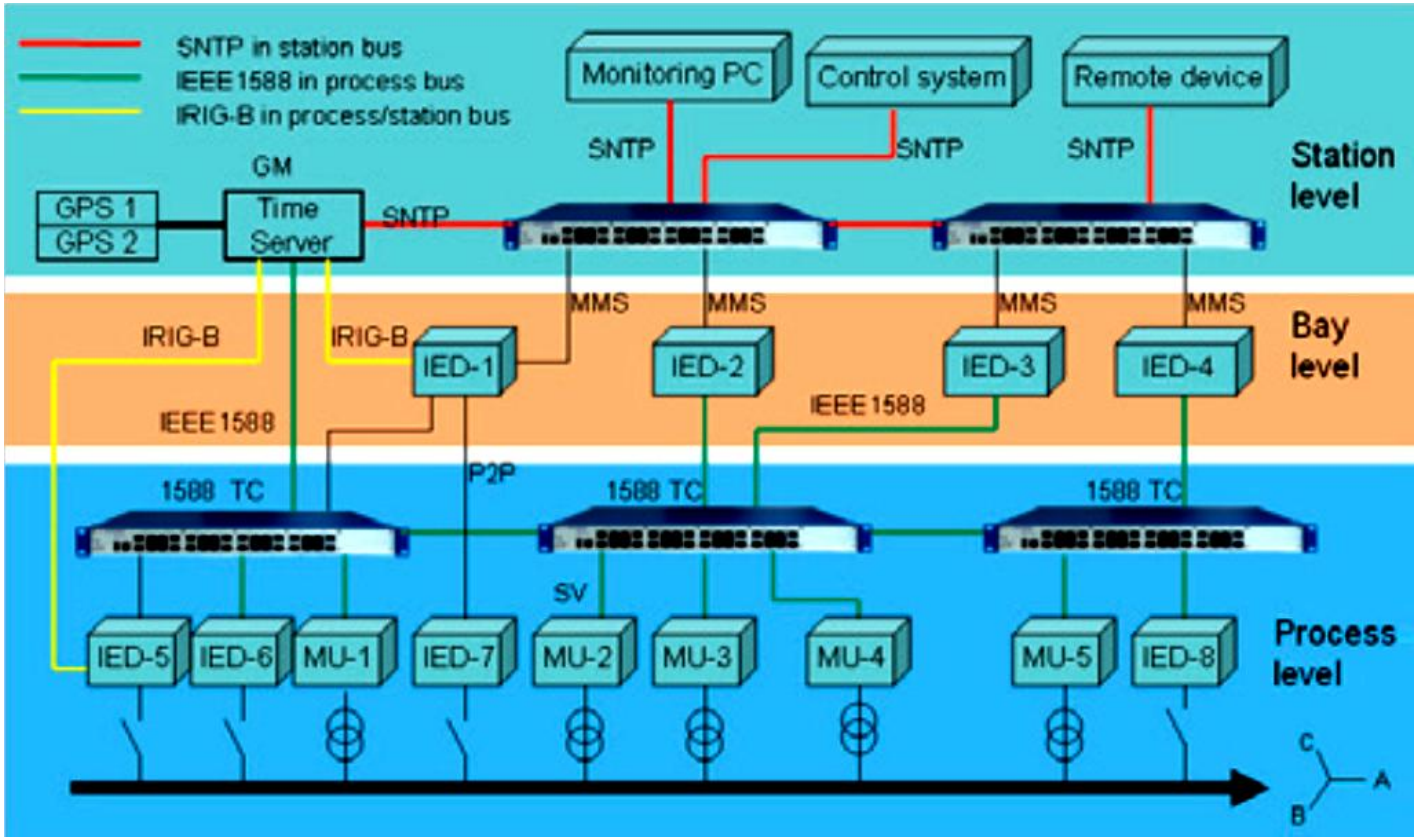
Sincronização



Sincronização

- **1 DJ + ½** e **Prot Dif**;
- Sinais de **mais de uma MU**;
- Não Sync -> SmpCnt **momentos distintos**;
- Dif de Fase -> **Atuação Indevida**;
- **GPS**
  - 1PPS, IRIG-B, SNTP e PTP.

Sincronização



IEC 61869-9 e IEC 61850-9-2

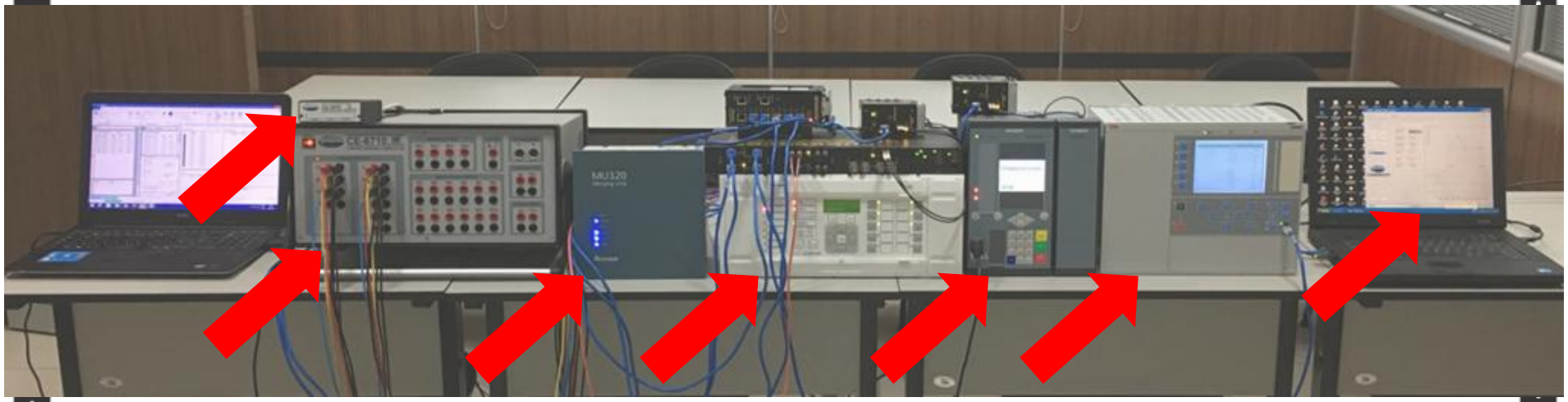
- IEC 61869 **Transf Inst**, **parte 9**, substitui a IEC **60044-8**, embasado **LE**;
- **MU / SAMU**;
- Tempo **Atraso Processamento** < 2ms;
- **Padroniza PTP**, 1PPS alt.;
- **Holdover** Mode / **Free Running**.

IEC 61869-9 e IEC 61850-9-2

Va

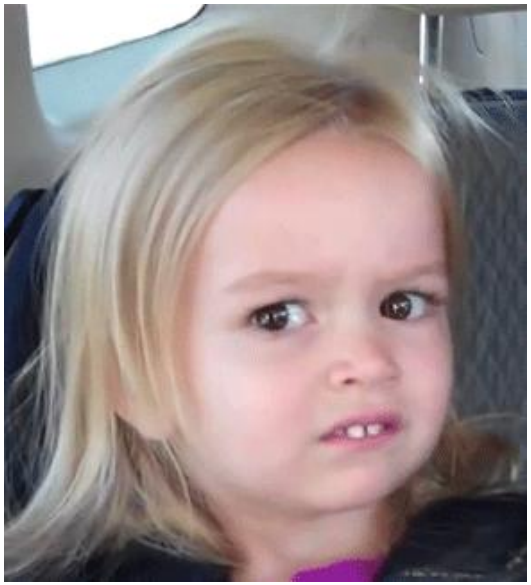
Digital output sample rates Hz	Number of ASDUs per frame	Digital output publishing rate frames/s	Remarks
4 000	1	4 000	For use on 50 Hz systems backward compatible with 9-2LE guideline.
4 800	1	4 800	For use on 60 Hz systems backward compatible with 9-2LE guideline, or 50 Hz systems backward compatible with 96 samples per nominal system frequency cycle.
4 800	2	2 400	Preferred rate for general measuring and protective applications, regardless of the power system frequency.
5 760	1	5 760	For applications on 60 Hz systems backward compatible with 96 samples per nominal system frequency cycle.
12 800	8	1 600	Deprecated, only for use on 50 Hz systems.
14 400	6	2 400	Preferred rate for quality metering applications, regardless of the power system frequency including instrument transformers for time critical low bandwidth d.c. control applications.
15 360	8	1 920	Deprecated, only for use on 60 Hz systems.
96 000	1	96 000	Preferred rate for instrument transformers for high bandwidth d.c. control applications.

Experimento



Mala de testes Conprove **CE-6710** com o acessório **CE-GPS** (Time & Frequency Reference System), Merging Unit **MU320** da Reason, IED MiCOM Alstom **P446**, IED Siemens Siprotec 5 **7SL86** e um IED ABB **RES670**, Software Conprove **Multim SV (Ref)**. Switches da Ruggedcom: RSG2288 e RS940G.

Ferramenta de Teste



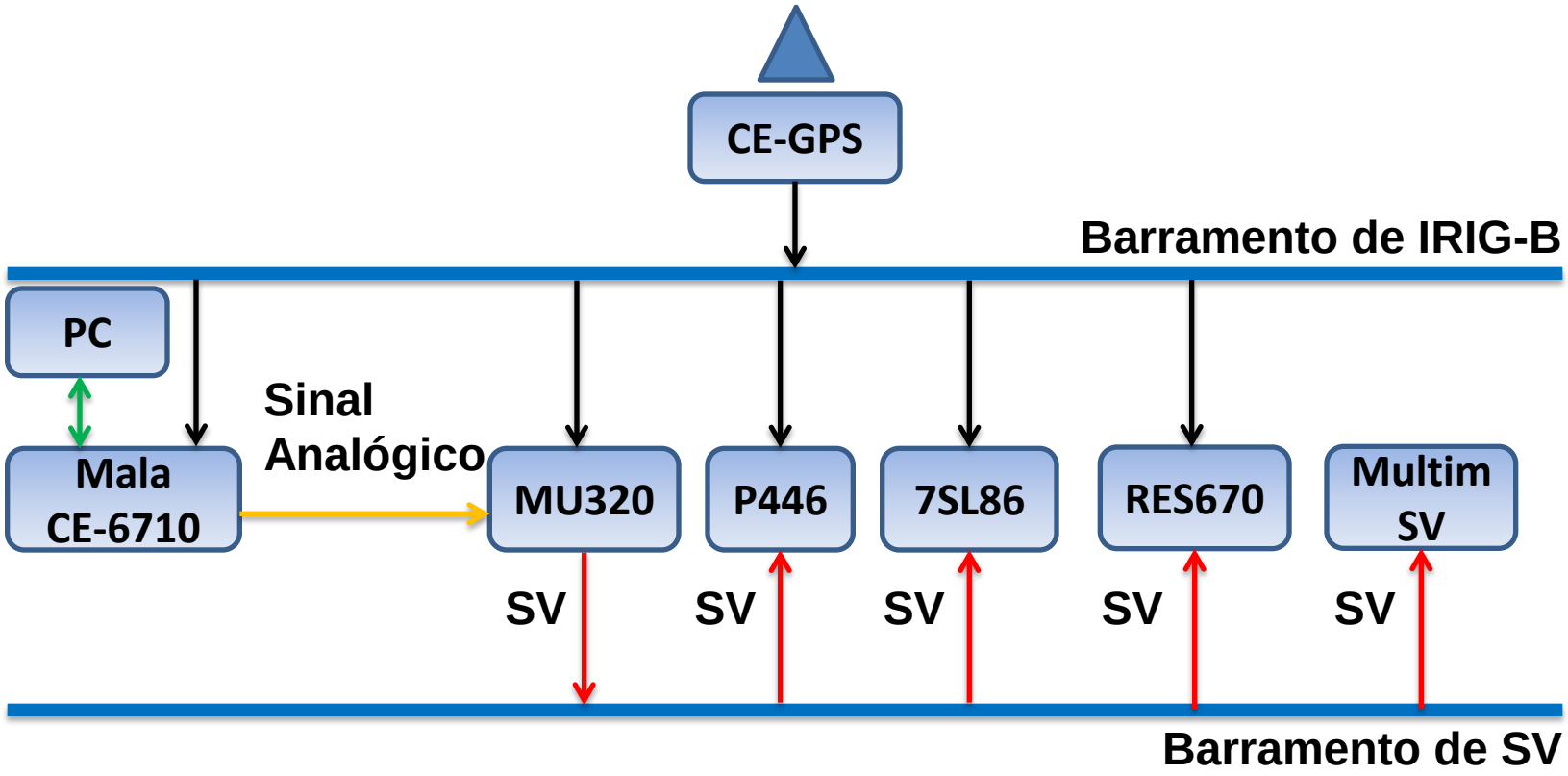
Ferramenta de Teste

- CE-6710:
  - Suporte **total** à IEC 61850;
  - **Receber** SV:
    - **Estatísticas** de tempo: **T. Processamento**, **T. entre frames** e **flag SmpSync**;
  - **Simular**: Sobrecargas, perdas de pacote, atrasos, pacotes duplicados e corrompidos, perda de sincronismo, alterar quality bits e bit de simulação;
  - **Sync**: PTP, IRIG e 1PPS.

Ensaios

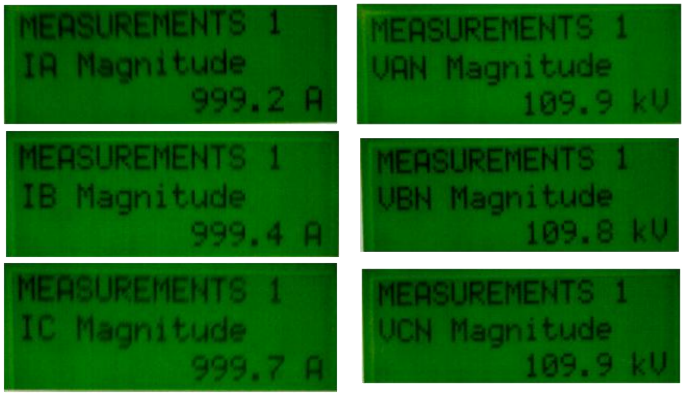
- Inj. SV -> Medição nos **Displays**;
- WG B5.53
  - **Test Strategy** for **PAC** functions in a full digital substation based on IEC 61850 applications;
  - Lista de Testes -> **Individuais** e **FC**;
  - Teste de **formato** do **Frame** (SAMU / MU e IED);
  - Teste de **erro** de **digitalização** (NCIT, MU e SAMU);

Ensaio 1

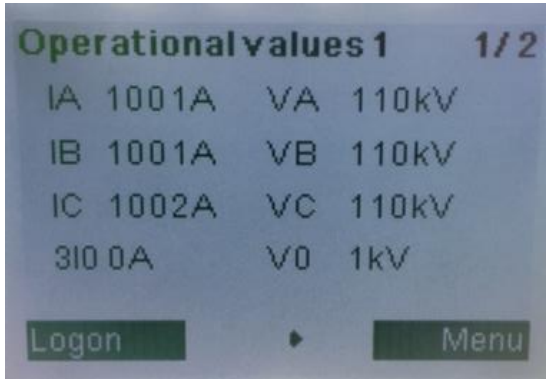

CE-GPS
Barramento de IRIG-B
PC
Sinal
Analógico
Mala
CE-6710
MU320
P446
7SL86
RES670
Multim
SV
SV
SV
SV
SV
SV
Barramento de SV

Ensaio 1

a)



b)



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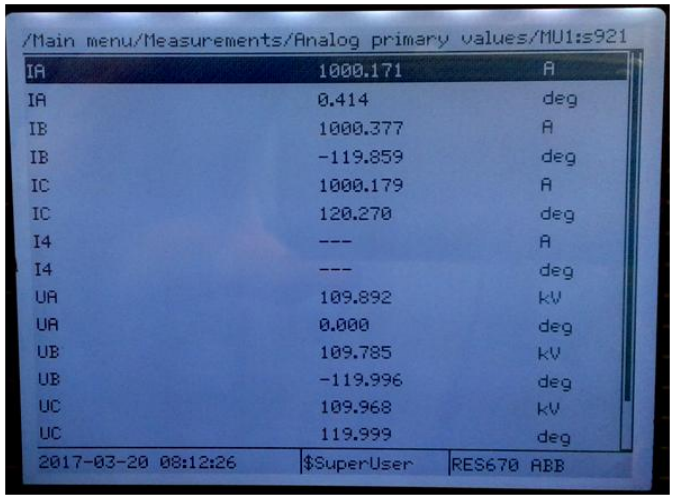
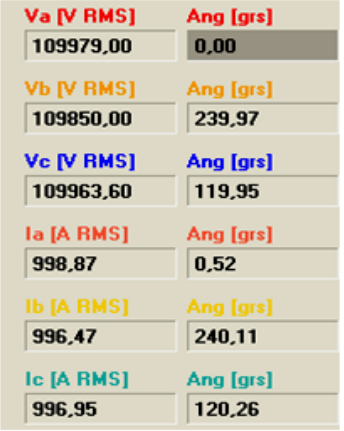
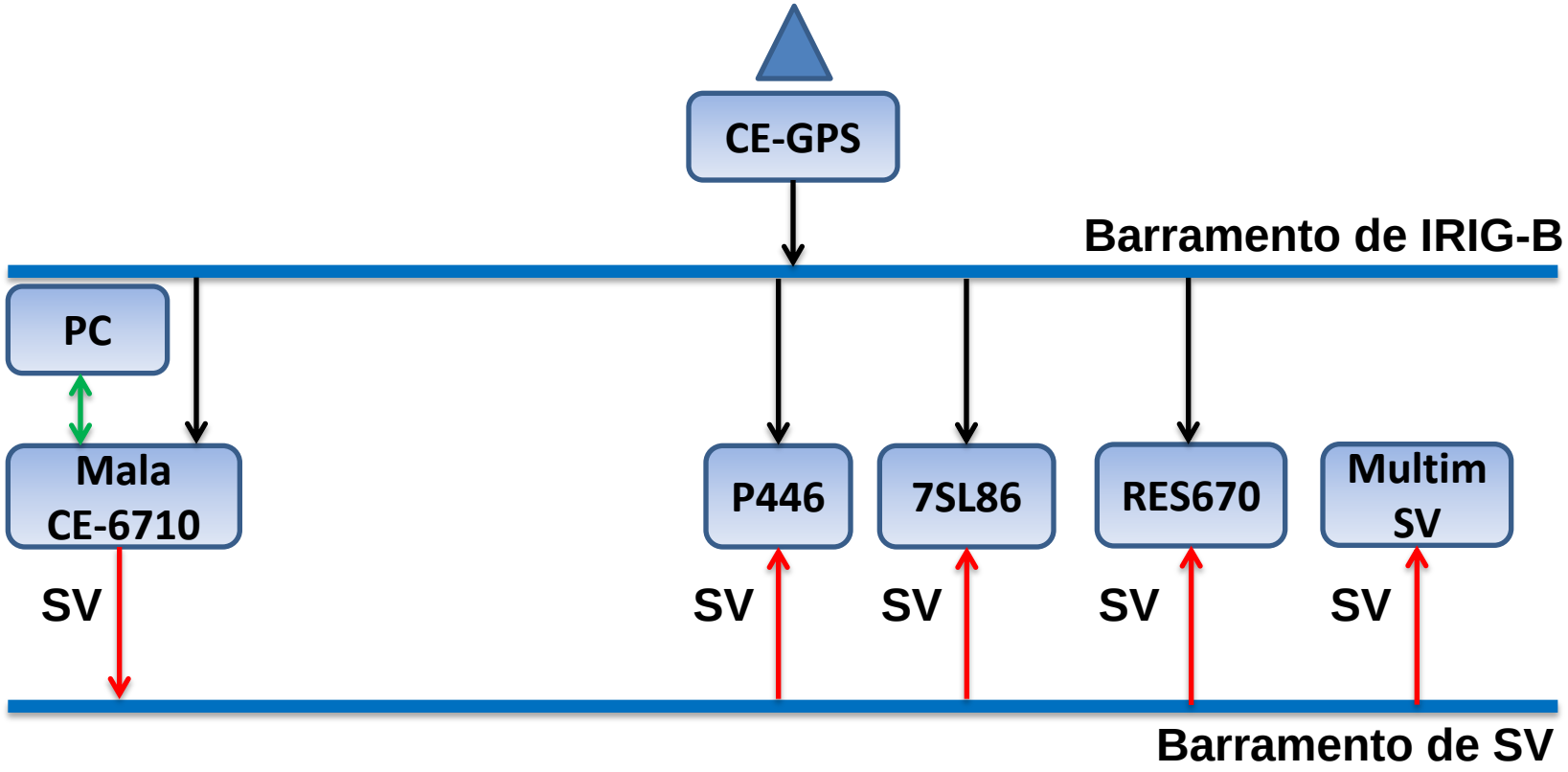


d)



Ensaio 2


CE-GPS
Barramento de IRIG-B
PC
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P446
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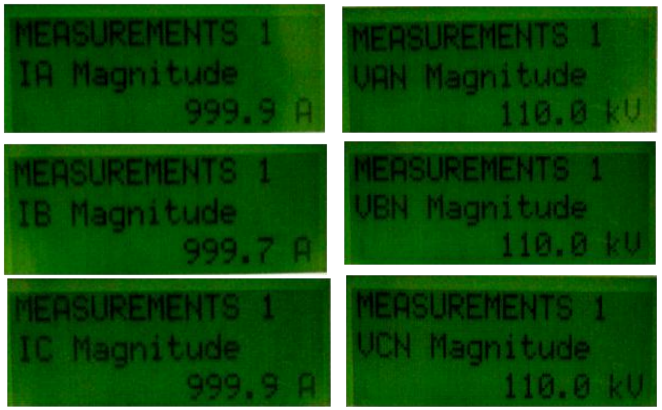
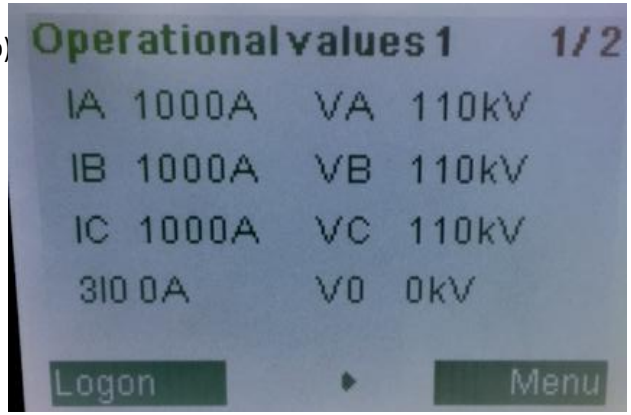
SV
SV
Barramento de SV

Ensaio 2

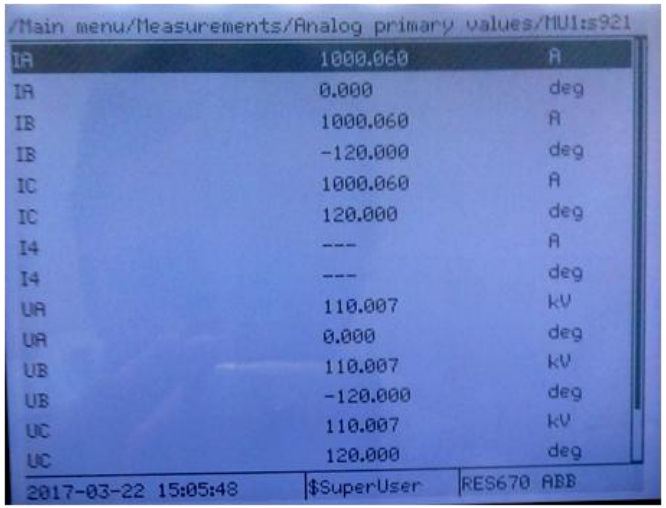
a)



b)



c)



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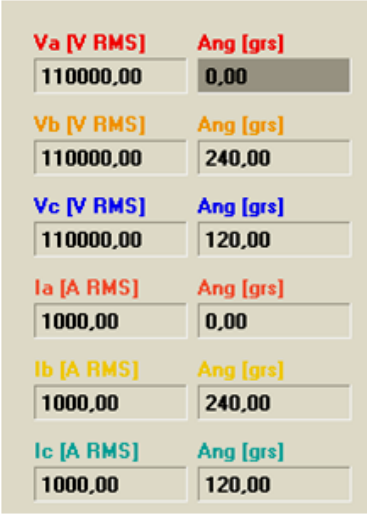

Conclusões

- **Elucidações**: Process Bus, 61850-9-2 e 61869-9;
- Verificada a **Interoperabilidade** (Fontes de SVs);
- WG **B5.53**: - Testes de **Formato** do **Frame**;
  - Teste de **Erro** de **Digitalização**;
- Comportamento dos **Filtros**: SVID, APPID, MAC Dest. e Config Revision;
- Sem sinc não erra ang na mesma MU.

MUITO OBRIGADO!!!

Paulo Junior

(34) 3218-6800

suporte@conprove.com.br

www.conprove.com

Equipe:

Paulo Sergio Pereira Jr.
Rodolfo Cabral Bernardino.
Cristiano Moreira Martins.
Paulo Sergio Pereira.
Gustavo Espinha Lourenço.
Gustavo Silva Salge.