PS2   Question 2.11

a. *How should we structure in a best possible way all tests necessary to secure reliable operation of a complete Digital Substation?*

b. *Which are the most important requirements on modern testing equipment to be used?*

c. *How should we test complex protections, connected to different feeders in Digital Substation like transformer differential protection, busbar protection and maybe line current differential protection?*
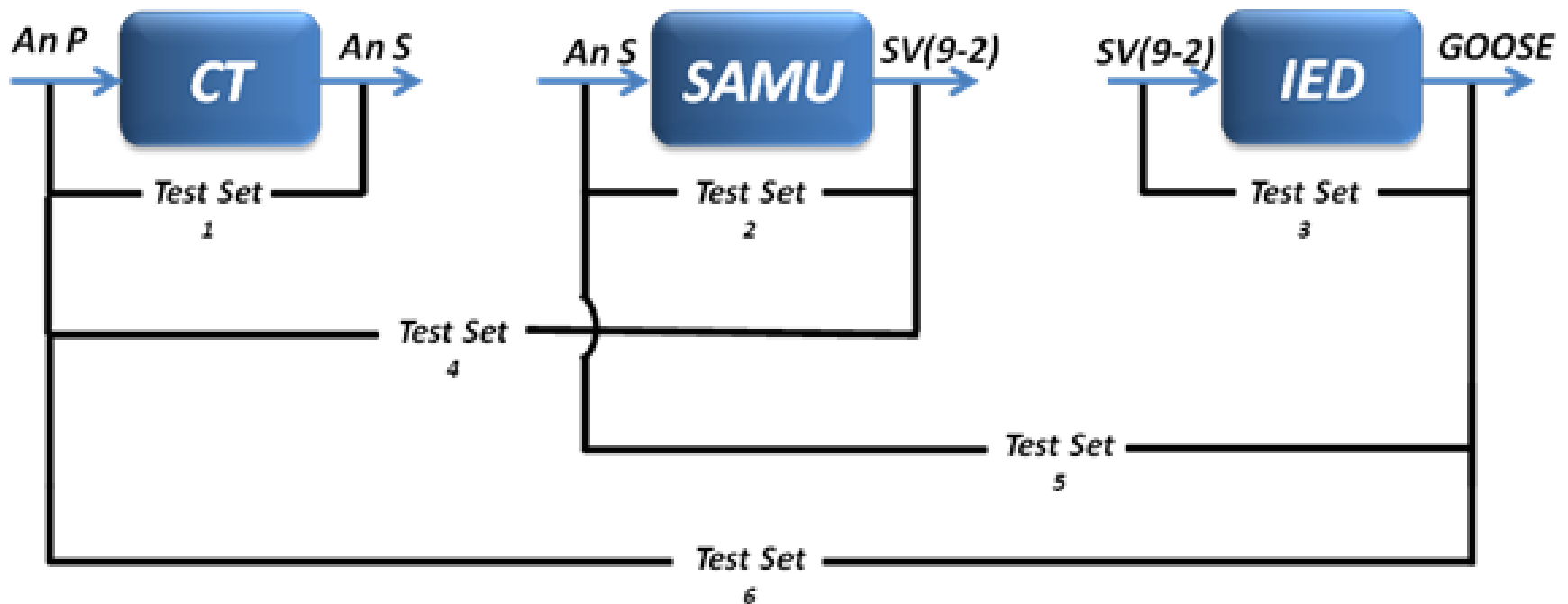
Paulo Junior
Conprove - Brazil

PS2   Question 2.11

a) Test Structure

– **Different tests structures** can be used
– *Bottom-up* can be a good choice: start **separating parts** and come to a test together
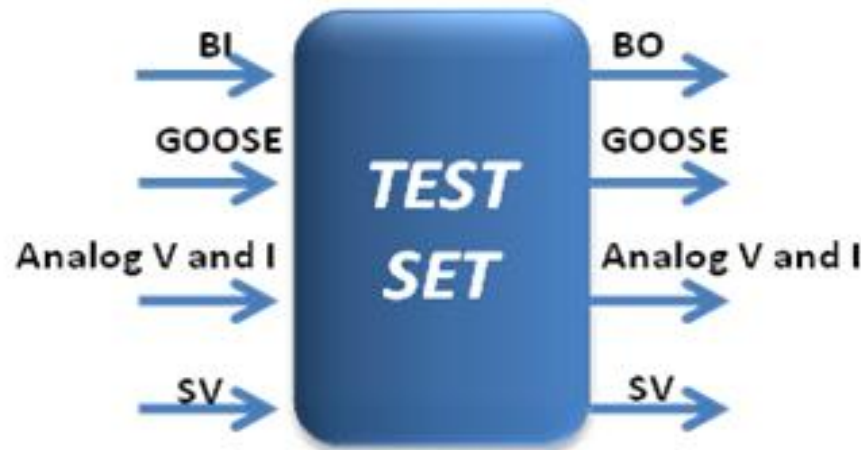
PS2   Question 2.11

b) Equipment requirements

- Must allow **all kind of simulations** that the system can be **submitted**
- Deal with **IEC 61850** substation = **Interact with frames**
- **Bridge: Classic / IEC 61850: An / SV , Binary / GOOSE**

PS2   Question 2.11

c) **Complex Protection Testing**

– Question **core** = Complex Protection with **several NCITs or MUs**

– **Injecting SV** messages

– **2 options:**

  – The testing tool must **simulate more than one feeder**, more than one MU

  – Or: **synchronize two or more testing tools** (+Hard, +$)

Protection / Local	Lab	Field
87 T	One Test set	One Test set
87 B	One Test set	One Test set*
87 L	One Test set	Two Test sets

* Depend on the physical distance, N MUs