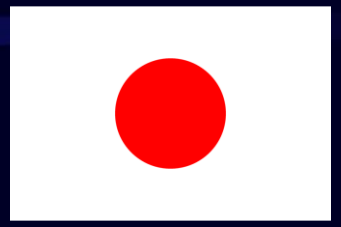
Paris Session 2022



Experience in Studying Implementation of IEC 61850-based PAC System using Analog Power System Analysis Simulator

SC B5 PS2 Q2.05

What are the experiences to improve the practical application and verification of the protection in a real substation project?

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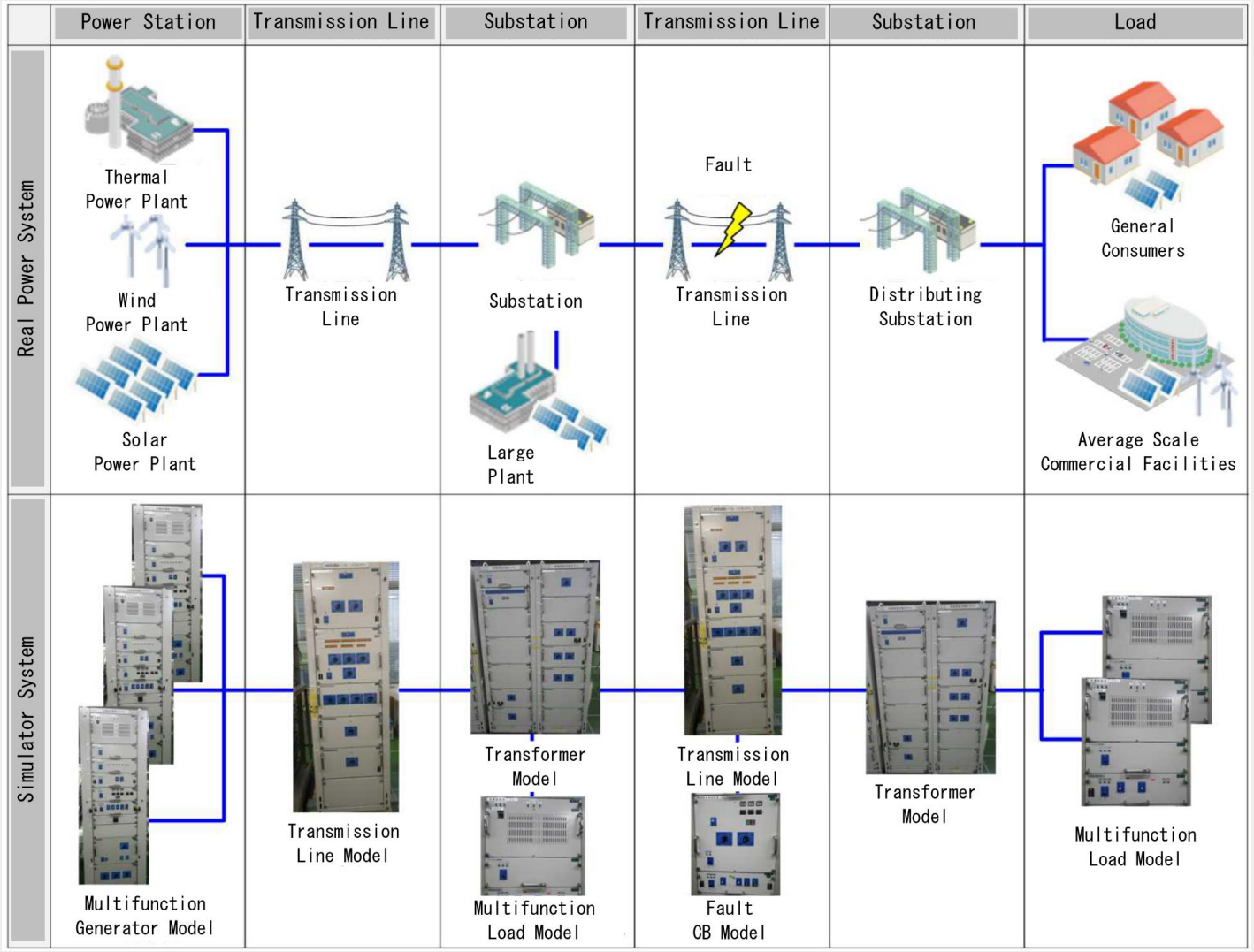
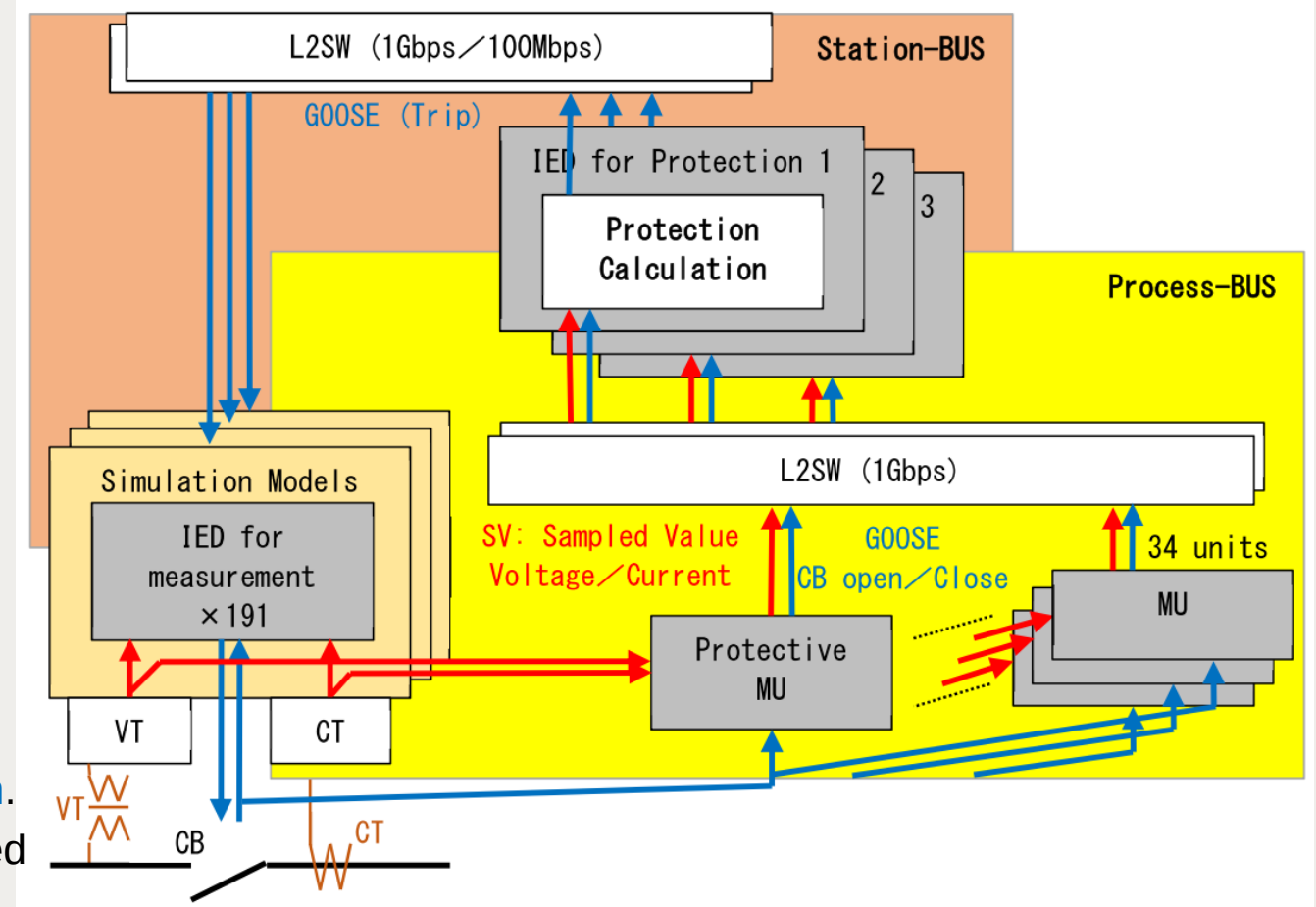
Analog Power System Analysis Simulator

- Simulator that simulates Real Power System can implement the PAC equipment.
- Rated Analog Main Circuit : 50V-62.5mA
- Primary Voltage and Current Ratings are Different from Real Power System.
- Simulator can Simulate Real Power System Conditions by Properly Interconnecting Each Model.
- PAC equipment (MU, IED) for Real Power Systems can be Implemented in this Simulator by Modifying Voltage / Current converter.



PAC Equipment (MUs and IEDs)

- **Functions of IED for Measurement(191 units)**
  - Analog Main Circuit Measurement.
  - Internal Data Measurement of Generator Model.
  - Open/Close Control of CB Model.
  - Transformer Tap Control.
- **Function of Protective MU (34 units)**
  - Converts Primary-side AC Values to Digital Data with 3,75 Degree Electrical Angle Sampling.
  - Transferred to IED as SV Data.
- **Functions of Protective IED (3 units)**
  - Execution of Various Protective Function Operations using SV Data from Protective MU.
  - Transmission of Trip Commands from Protective IED to CB Model IED via GOOSE Communication.
  - Various Protective Functions: Relay Elements used in Real Power System.



Time Synchronization System

• All 228 units use Time Synchronization Master(GMC) and Time Synchronization (using IEC 61588-PTP)

• Time Synchronization Accuracy is within 1 MicroSecond.

• IED for Measurement and MU for Protection are Sampling Synchronized Starting from Time Synchronization Timing of Every Second.

• All Digital Data in Simulator are All Sampling-Synchronized Data.

• Characteristics of Communication SW adopted for SV Communication between Protective MU and IED.

- Sampling Synchronization Discrepancies
- Missing Data
- Retention Occur

• Problem : Communication Network Configuration or in Distribution of Amount of Communication Data through each SW.

• This experience has shown that Characteristics of SW for SV Data must be determined with Highest Priority.