

IEC 61850 Edition 2.0 and Security Updates

By Sterin T Jose

Introduction

Power Industry is witnessing the IEC 61850 extensions to different domains like Hydro Power Plant, Distributed Energy Resources and Wind Power Plant apart from Substation. Users all over the world contributed to the technical issues in order to improve the protocol definition and make it better in terms of data exchange and configuration mechanisms. Edition 2.0 of IEC 61850 Standard has been released considering valid technical issues and future aspects of protocol usage. This article compares the IEC 61850 Edition 2.0 specification to its predecessor Edition 1.0.

➤ Service tracking and new FCs

- Tracking of Service Requests is one of the major changes in Edition 2.0. Dedicated Information Exchange Model class has been defined in order to provide a diagnosis interface to track services like Control, Configuration and other Control Blocks.
- A new CDC has been introduced for Service Tracking – CST (Common Service Tracking)
- New Functional Constraints have been introduced for the support of enhanced Tracking Request Services:
 - I. SR – Service Response - To represent data from different process objects with same Tracking Object
 - II. OR – Operate Received - To represent result of an Operate Request to a Data Object
 - III. BL – Blocking – To block value updates to a Data Object

Service Tracking can be divided into three types:

- I. Control Block Related Services
- II. Command Related Services
- III. Other Services

Control Block Associated with CST CDC are:

- BTS - Buffered Report Tracking Service

- UTS - Unbuffered Report Tracking Service
- LTS - Log Control Block Tracking Service
- OTS - Log Tracking Service
- GTS - GOOSE Control Block Tracking Service
- MTS - MSVCB Tracking Service
- NTS - USVCB Tracking Service
- STS – SGCB Tracking Service

Simulation parameter has been added to GOOSE and SMV Control Blocks.

Introduction of service tracking will help Client systems to monitor and analyze the cause of failures in Sever while using a Service. All ambiguities related to the processing of a Client request will be resolved by exposing the error information as 61850 data. Trouble shooting is made easier with the introduction of Tracking Objects along with each and every control blocks.

➤ **Other Changes**

LN list has been extended from 92 to 208 based on new requirements. New System logical nodes are introduced to indicate the status of GOOSE and Sampled Value Subscription. Grouping of Logical Node is also extended to include relevant areas.

GSSE is deprecated and moved to Annex of 7 – 2. This will cause older less flexible GSSE based systems move out from IEC 61850 scope. Hence, GOOSE will have added importance in Inter Bay Communication.

IEC 61850 9 – 1 is also deprecated as per conformance Table. Ethernet based Sampled Value transmission (IEC 61850 9 - 2) will take over process bus communication. Now all IEC 61850 Specific Communication Service Mappings are using Ethernet Technology.

New standards are introduced or being introduced for Substation-to-Substation and Substation-to-Control Center Communication. This shows wide acceptance of IEC 61850 beyond Substation network by different Users.

Binding to External Input in SCL is more clear with GOOSE Control Block Reference. This will help implementations to identify the source of data more easily.

➤ **Security Updates**

The key aspects of security are Confidentiality, Integrity, Availability and Accountability. Above requirements are satisfied by IEC62351 standards for IEC 61850.

- IEC62351-3: Profiles including TCP / IP
- IEC62351-4: Profiles including MMS
- IEC62351-6: Profiles including IEC 61850

Security requirements have been realized by Transport Layer Security, Authentication and Encryption Standards.

➤ **Time Synchronization Using IEEE 1588 / IEC 61588**

The accuracy offered through IEEE 1588 will be a boon for Process bus implementations. Hardware-assisted implementation can achieve up to 1 nanosecond accuracy. However, to achieve this range of accuracy, all Ethernet hardware in the network should support IEEE 1588.

Millisecond accuracy can be achieved with Software level implementation of IEEE 1588.