Technical Paper Presentation

Implementation of Digital Substation in Brown Field Projects

Speakers :

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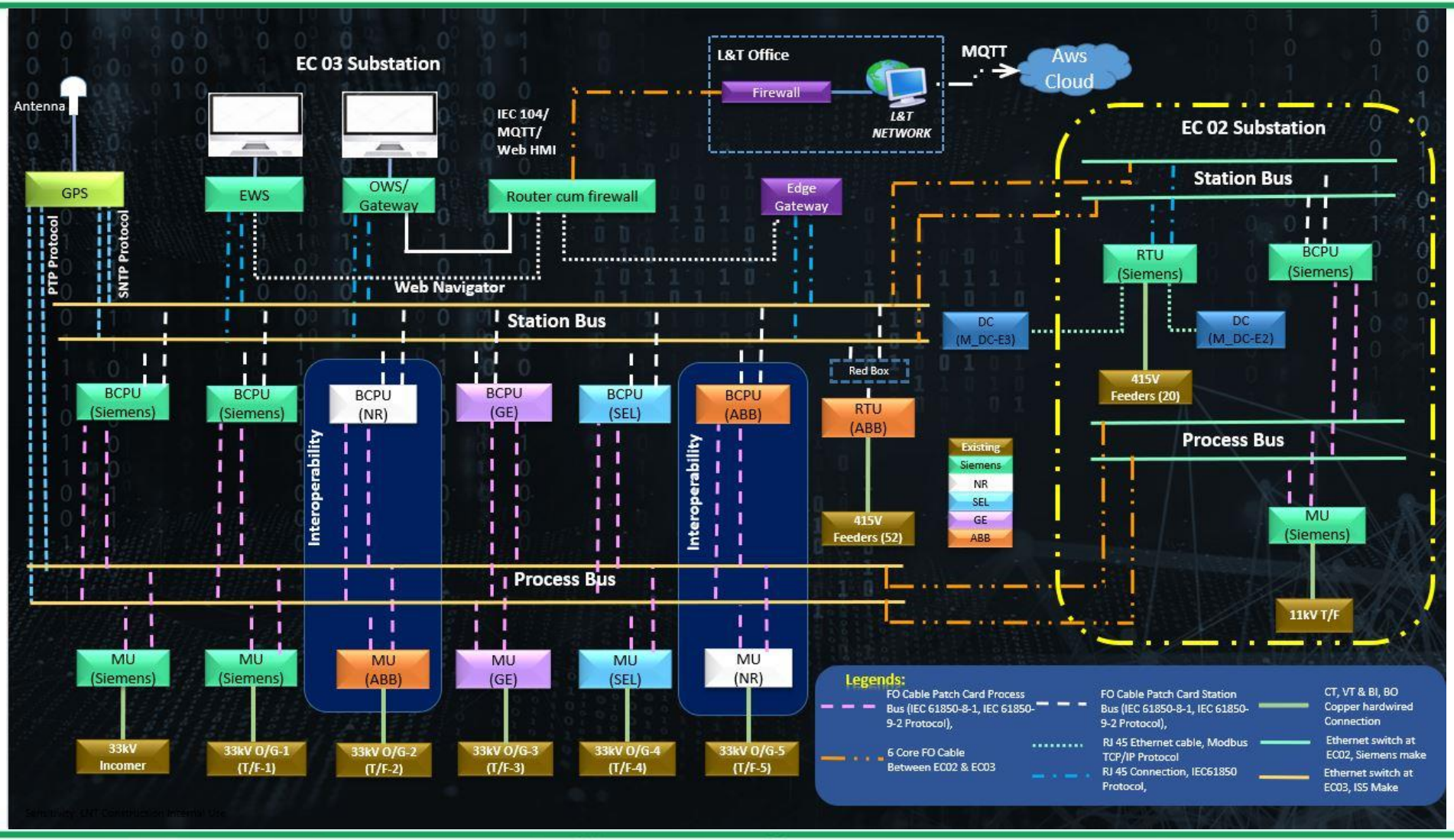
Introduction

- L&T upgraded conventional 33 & 11 kV Indoor substations located in its HQ campus chennai with state of art process bus based intelligent electronic devices to implement digital substation concept.
- In this paper presentation we will cover
  - Overview of L&T's digital substation
  - Uniqueness of L&T's digital substation
  - Challenges faced during implementation
  - Key Features

Background of the topic

- L&T was very keen to understand the challenges in implementing with multiple vendor interface in digital substation business, be ready for future market and focus on inhouse skill development.
- To acquire the knowledge on digital substation, L&T selected conventional substations in the Chennai HQ campus location for upgrading the same to digital substation

Overview of L&T's Digital substation



Uniqueness of L&T's Digital substation

- Five makes of IEDs integrated (Siemens, ABB, GE, SEL & NARI) with single substation automation system

- Multiple makes RTU and Ethernet switches in same network
- Integration of data with cloud

Other Key Features of L&T's Digital substation

- Interoperability

  Multiple make MUs and BCPUs are interconnected tested successfully

- Load Shedding

  Frequency and Power based load shedding implemented

- Network Management System

  Port status, switch temperature, CPU usage, no of packets exchanged at each ports

- Cybersecurity

  RBAC, hardening, whitelisting, blacklisting are the few features implemented

Challenges Faced during implementation

- IEDs PRP function limitation in process bus.
- Sample Value failure error.
- IEDs PTP time synch limitation.
- Non availability of dual master communication (MODBS TCP/IP) in existing meter data concentrator.
- Retrofit of HT bays.

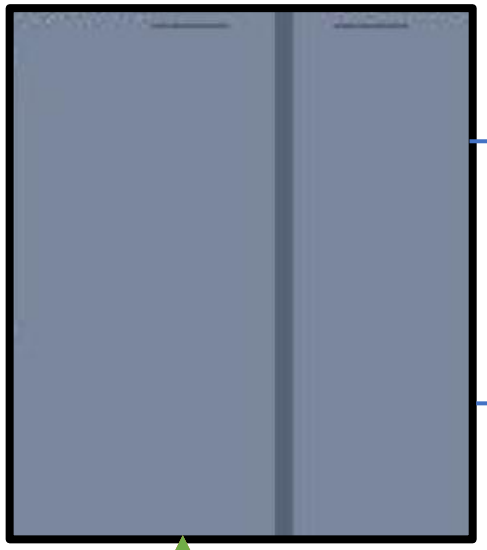
Sample Value failure error

PTP Signal Not Available

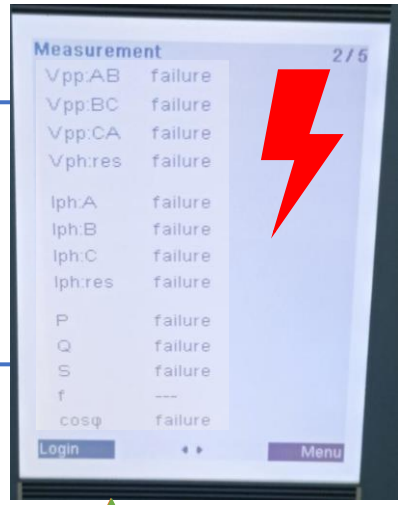
PTP Time Pulse Lost

Merging Unit

Bay Control Protection Unit



Process Bus



Power Supply Restored

Key Takeaways/ Recommendations

- Simulation based IED testing works out faster than conventional VI injection-based testing
- Interoperability between multiple make MU with BCPU is possible
- Failure of time synchroniser could create issues in process bus communication
- Retrofit of existing equipments can be carried out without affecting the productivity with proper planning
- IED level OEMs dependency is restricted only upto integration
- Implementation of all features confirmed by OEMs may be a challenge.
- Different make equipments can be integrated in a single automation system

Key Takeaways/ Recommendations

- Interoperability is a challenge between multiple makes of Optical CT and MU
- Challenges in connecting MU for bus VTs and bushing CTs
- Limited choice of availability in getting multiple makes of Control Switching Device
- Limited choice of availability in getting multiple makes of Tap control device
- Complexity in core optimization for main and busbar protection

Thank You

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