



EASUN REYROLLE

An ISO: 9001-2000 Company

GENERATION

TRANSMISSION

INDUSTRY

AUTOMATION SYSTEMS

IEC 61850

in

Practice

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Dy Manager Technology

Automation Business Process



Evolution of Technology.....

Electro Mechanical Technology → Stand alone Functionality

Static Technology → Stand alone Functionality

Digital Technology → Functionality coupled
with Communication

Communication Technology

↓
Proprietary (Manufacturer specific)

↓
Open Protocols Viz.. IEC 60870-5-101/103/104, Modbus, DNP 3.0

↓
Need for One Standard



Objectives of the Standard

The objectives that were set for making the standard were:

- A single protocol for complete substation considering modeling of different data required for substation.
- Definition of basic services required to transfer data so that the entire mapping to communication protocol can be made future proof.
- Promotion of high interoperability between systems from different vendors.
- A common method/format for storing complete data.
- Define complete testing required for the equipment which conforms to standard

“Result of the Objectives”



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Need of the Hour.....

Substation Automation System with.....



- One World
- One Technology
- One Standard
- One Protocol

“IEC 61850”





IEC 61850 Features

Data Modeling -- Complete functionality of the substation is modeled into different standard logical nodes.

Reporting Schemes -- Buffered Report Control Block & Unbuffered Report Control Block for reporting data from server through a server-client relationship which can be triggered based on pre-defined trigger conditions.

Fast Transfer of events -- Generic Substation Event (*GSE*) are defined for fast transfer of event data for a peer-to-peer communication mode. This is again subdivided into *GOOSE* & *GSSE*

Setting Groups -- The setting group control Blocks (*SGCB*) are defined to handle the setting groups so that user can switch to any active group according to the requirement.

Sampled Data Transfer -- Schemes are also defined to handle transfer of sampled values using Sampled Value Control blocks (*SVCB*)

Commands -- Various command types are also supported by IEC 61850 which include direct & SBO commands with normal and enhanced securities.

Data Storage-- SCL (Substation Configuration Language) is defined for complete storage of configured data of the substation in a specific format.



Key Functionality of IEC 61850

- ☰ **Interoperability** is the ability of two or more IEDs from the same vendor, or different vendors, to exchange information and uses that information for correct co-operation.



“Interchangeability is beyond IEC 61850”





Benefits of IEC 61850.....

- IEC 61850 is unique. IEC 61850 is not a former serial link protocol recast onto TCP/IP-Ethernet.
- IEC 61850 was designed from the ground up to operate over “state of art” networking technologies and deliver an unprecedented amount of functionality that is simply not available from legacy protocols.
- These unique characteristics of IEC 61850 have a direct and positive impact on the cost to design, build, install, commission, and operate power systems.

Benefits of IEC 61850.....

•While legacy protocols on Ethernet enable the substation engineer to do exactly the same thing that was done 10-15 years ago using Ethernet, IEC 61850 enables fundamental improvements in the substation automation process that is simply not possible with a legacy approach, with or without TCP/IP-Ethernet.





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To better understand the specific benefits we will first examine some of the key features and capabilities of IEC 61850

- VLANs and priority flags for GOOSE and SMV
- Use of a Virtualized Model.
- Use of Names for All Data.
- All Object Names are Standardized and Defined in a Power System Context.
- Devices are Self-Describing.
- High-Level Services.
- Standardized Configuration Language.
- A very well Confined Test Procedure for Certification



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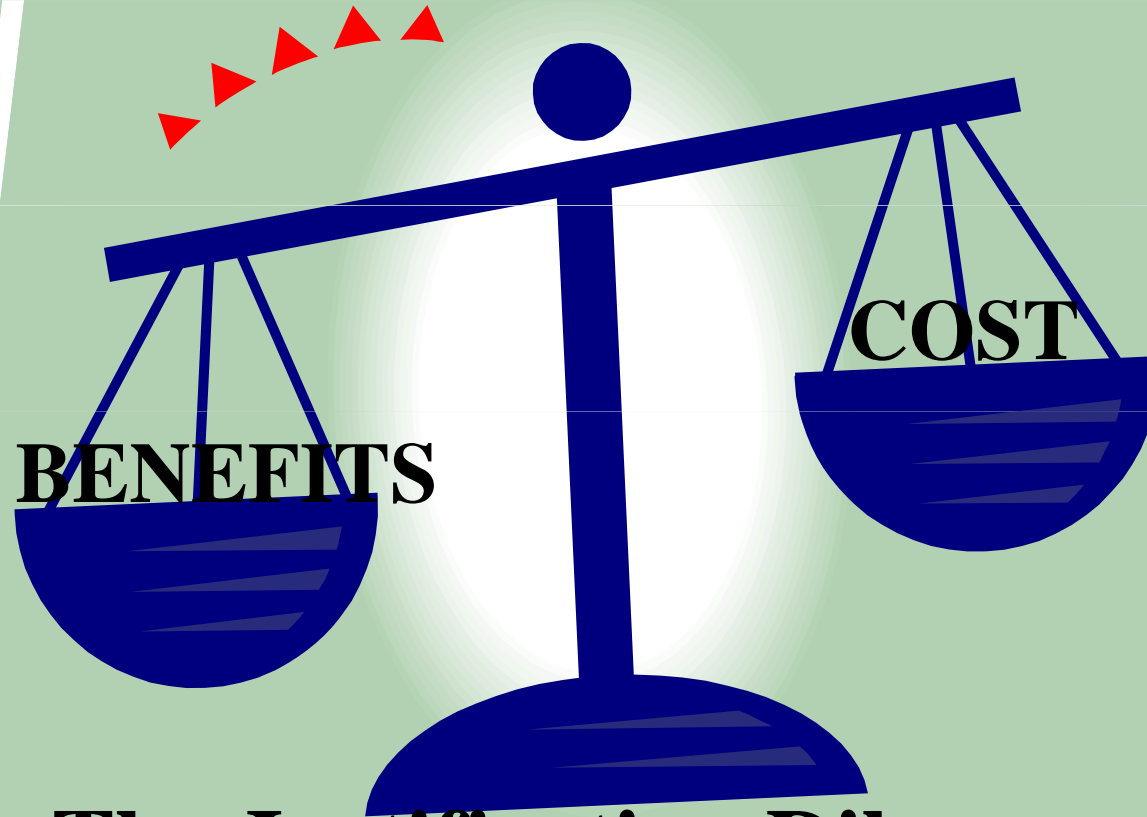
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Engineer's View of Justification



The Justification Dilemma





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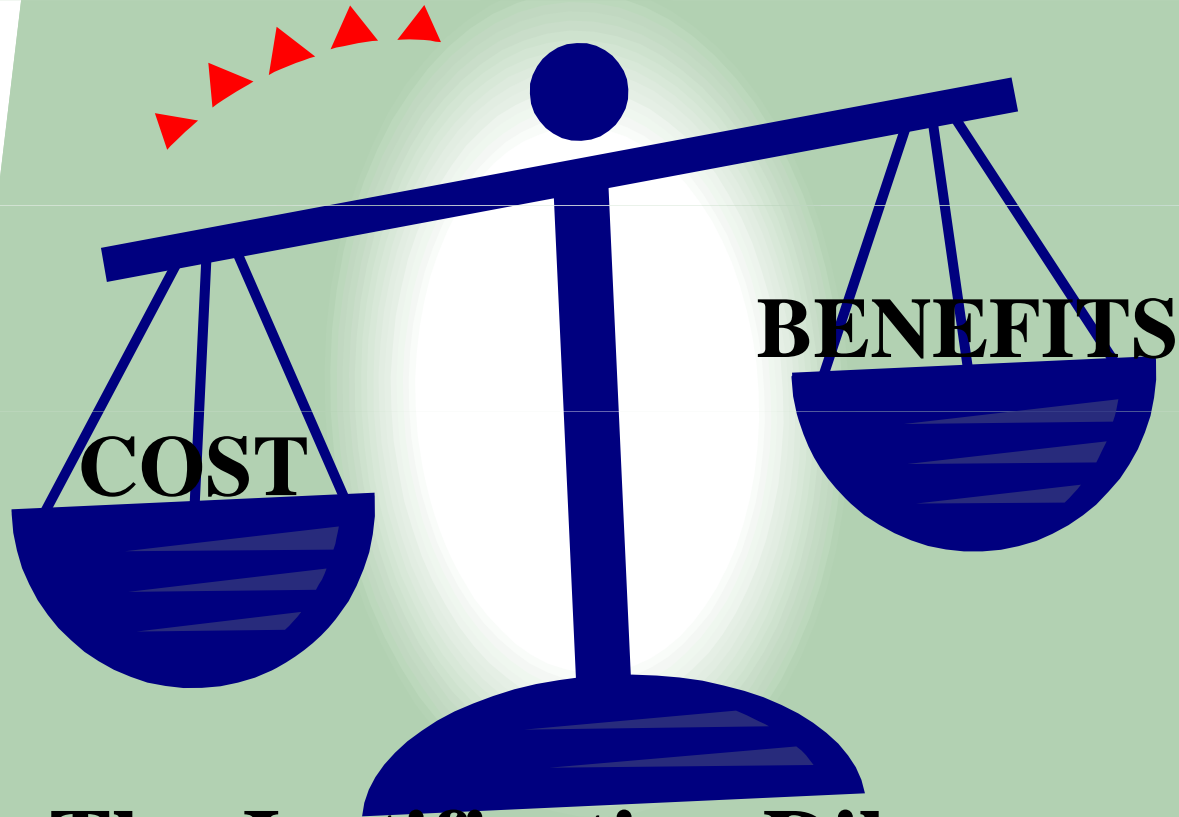
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Accountant's View of Justification



The Justification Dilemma





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The Tragedy of Automation



*There are no benefits
without some cost*



Identifying ALL Costs

- Requires a complete view of cost.

You can't justify a IEC61850 device by examining only the price of the device.

- OR -

The benefit of a IEC61850 device is not in the price of the relay.

Identifying ALL Costs

- Requires a longer time frame.

It is hard to justify any system by examining only the purchase price.

- OR -

Benefits are received as systems are used, not when they are purchased

Keys to Successful Justification

- Identify ALL the costs:
 - Equipment
 - Installation
 - Engineering
 - Commissioning
 - Utilization Costs
 - Impact on External Systems
 - Costs to Change/Migrate in Future
 - Intangibles (new capability)



Justification

Description	Legacy	IEC61850	Impact
Equipment Purchase	\$	\$\$	-
Installation	\$\$	\$	+
Configuration	\$\$	\$	+
Equip/Application Migration	\$\$\$	\$	+
Flexibility & Capability	\$\$\$	\$	+ 

Unlock it

Key to this Analysis



“Imparting Knowledge to Engineers on the Standard, Concepts and Advantages of IEC61850 Based Automation is the Key towards this success”



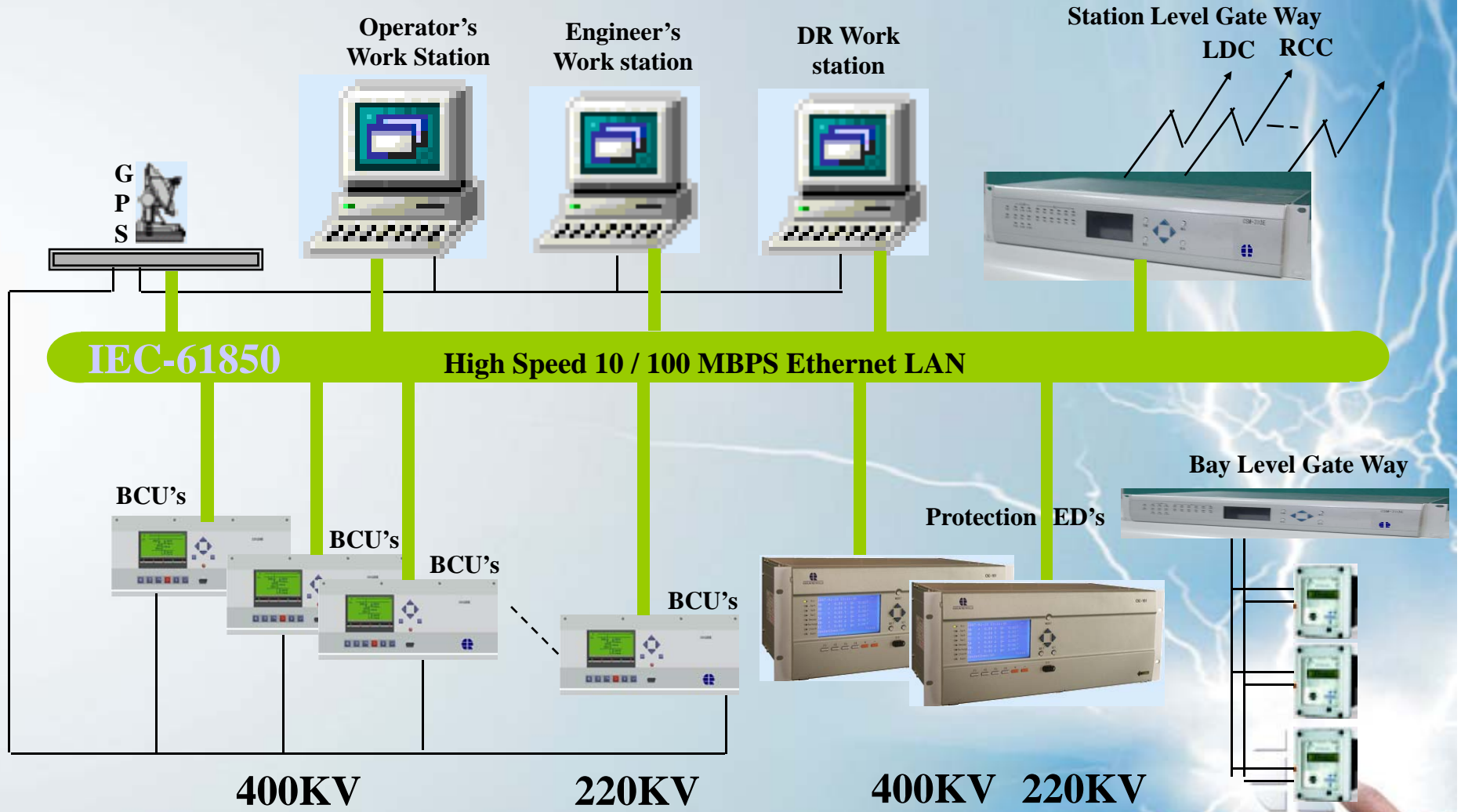
Few Critical Factors for Effective/Reliable IEC61850 SAS.....

- Fast GOOSE Messaging for successful feeder interlocks as per Part -6 (Suitable Industrial grade, Managed Ethernet Switches with VLAN, RSTP etc., features).
- No Interposing equipments used (Viz . CMR for DI Status, Transducer for CT and PT).
- Reliable Communication medium (Viz. FO communications for to counter station EMI).

Few Critical Factors for effective/Reliable IEC61850 SAS.....

- Best Suited Communication Architecture based on the Nature of the Job (Viz. Ring / Star etc.,)
- HMI Redundancy.
- Dedicated Tele-control unit for RCC / RSCC/LDC etc.,
- Dedicated Bay Level Gateway for TVM integration.,
- Higher Device EMC and EMI compatibility.

Typical Architecture





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Thank You

