

IEEE PES Powering Toward the Future
Transmission and Distribution
CONFERENCE and EXPOSITION
McCormick Place
CHICAGO *Chicago*
April 21-24, **2008**

**IEC 61850 for Power System
Communication**

Christoph Brunner
Switzerland

UTINNOVATION

K02.03.20060309

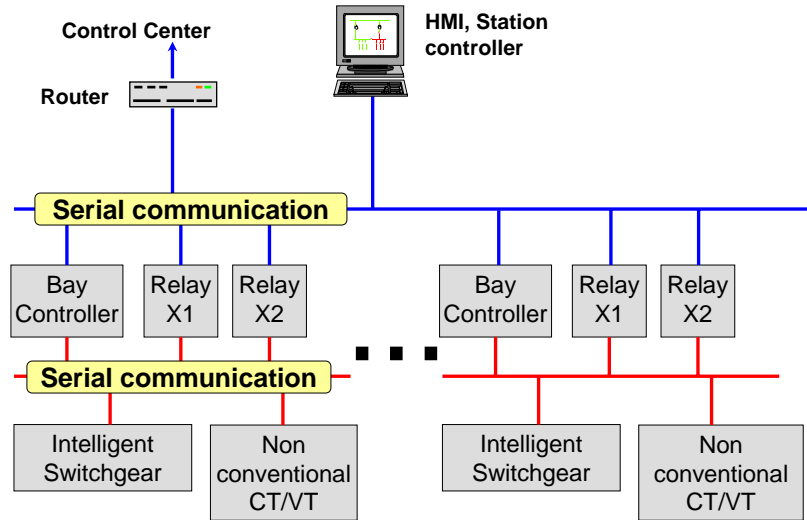
Content **IEEE PES** Powering Toward the Future
Transmission and Distribution
CONFERENCE and EXPOSITION
McCormick Place
CHICAGO *Chicago*
April 21-24, **2008**

- What is IEC 61850?
- Where in the power system can IEC 61850 be used?
- The basic features
- A use case for IEC 61850
- Communication between substations
- Harmonization with CIM

IEEE T&D 2008 Chicago Page: 2

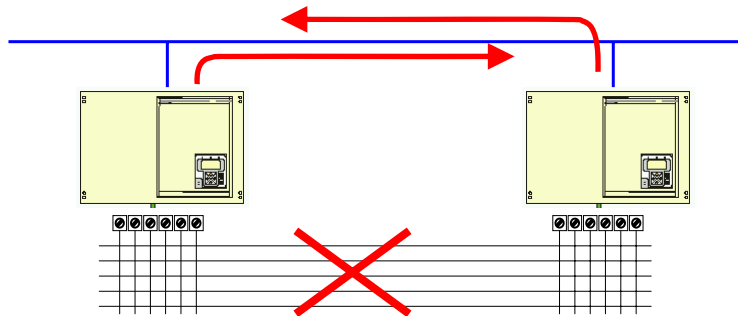
What is it?

... a standard for information exchange



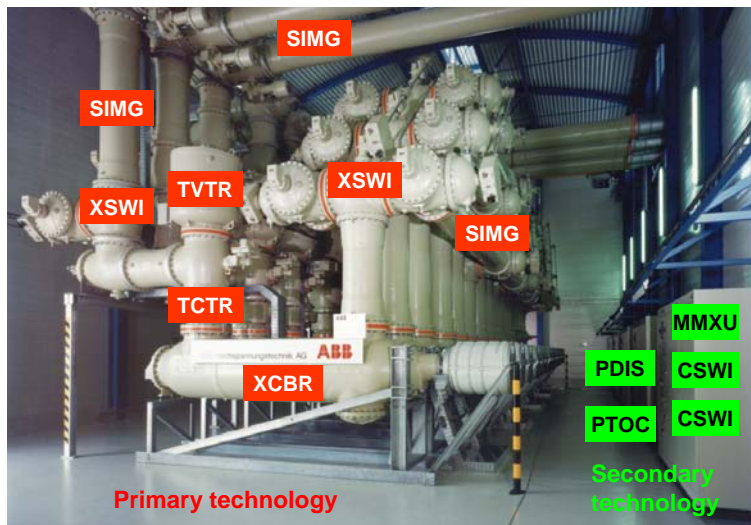
What is it?

... replacing wires between IEDs



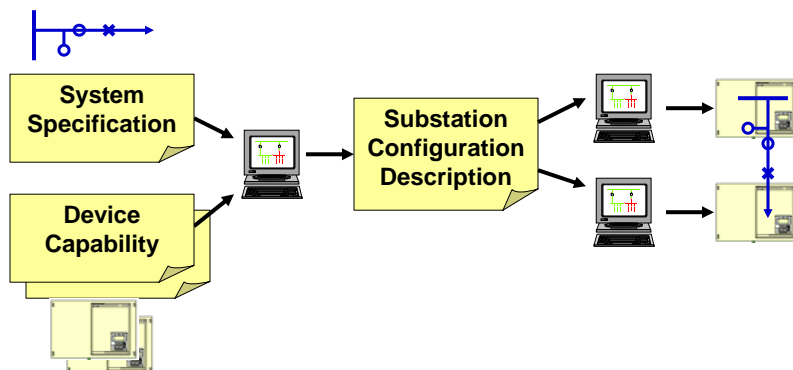
What is it?

... domain specific object models



What is it?

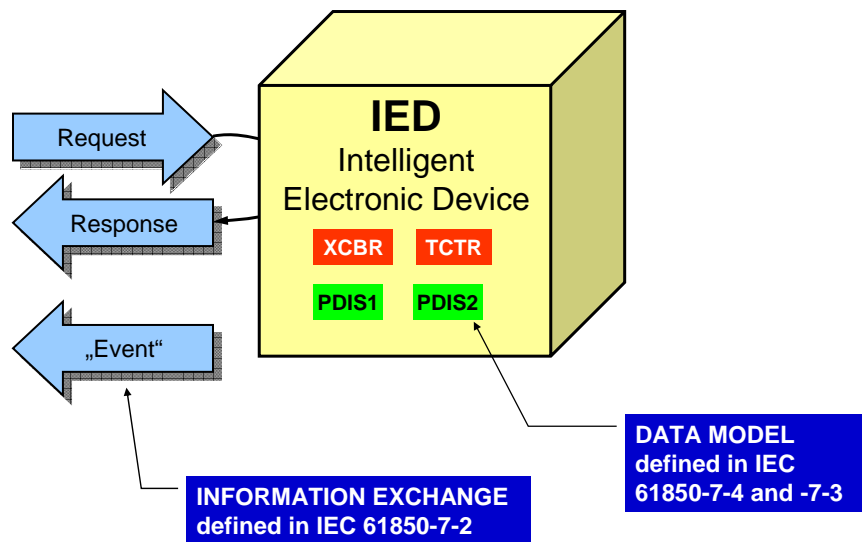
... a set of files with configuration information



Where can it be used?

- **Substation automation and protection**
- **Control of hydro power plants**
- **Control of windpower plants**
- **Interface to distributed energy resources**
- **Communication between substations**
- **Communication between control centers and field devices**

Features – data model

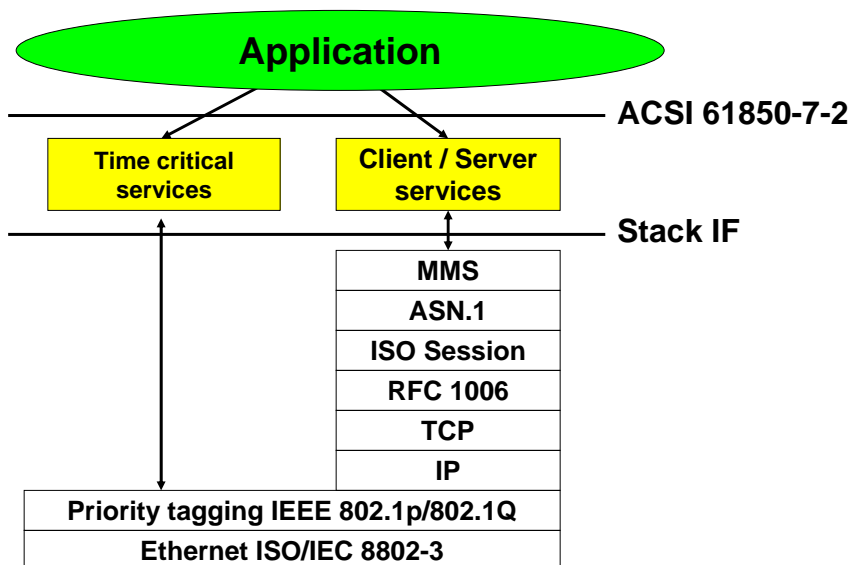


Features – data model

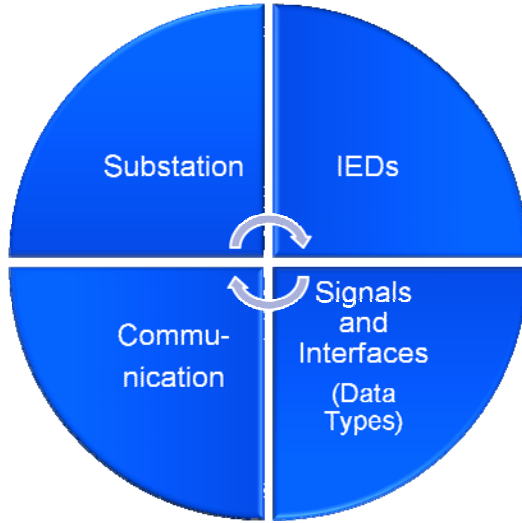
XCBR

Data Name	Type	Explanation
Mode	INC	enable / disable
EEHealth	INS	ok / warning / alarm
EEName	DPL	Name plate
OpCnt	INS	operation counter
Pos	DPC	Position (control / status)
BlkOpn	SPC	Block opening
BlkCls	SPC	Block closing
ChaMotEna	SPC	Charger motor enabled
CBOpCap	INS	op. capability (o-c...)
POWCap	INS	point on wave capability
MaxOpCap	INS	maximal op. capability
TrCoilFail1	SPS	Failure of trip coil 1
TrCoilFail2	SPS	Failure of trip coil 2
HydrLeak	SPS	Leakage of hydraulic

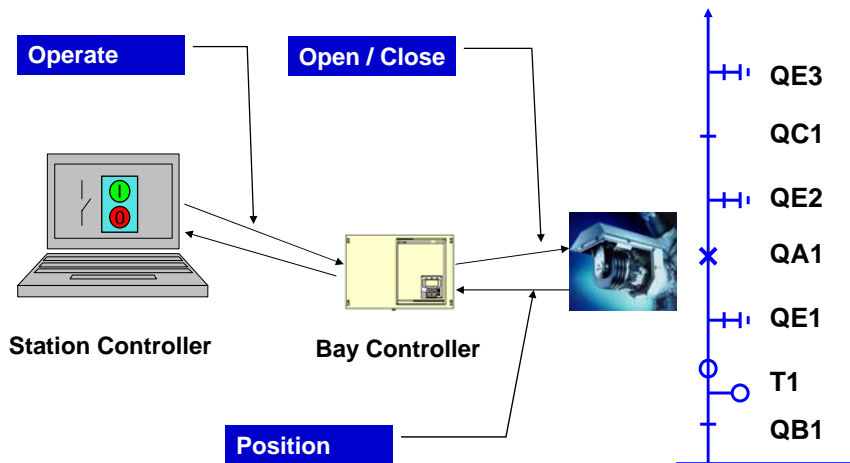
Protocols



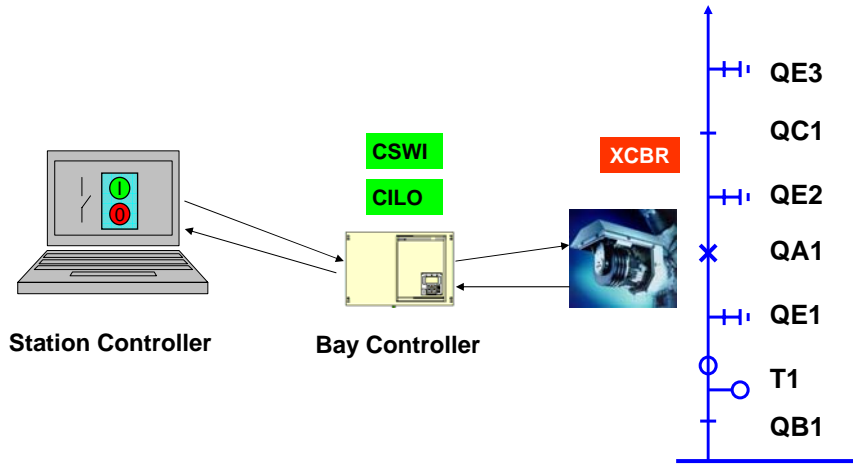
Configuration information



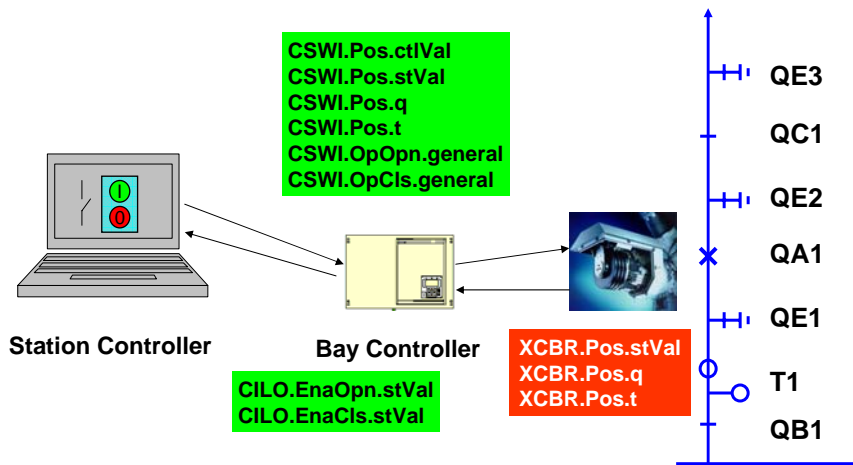
Operate a breaker



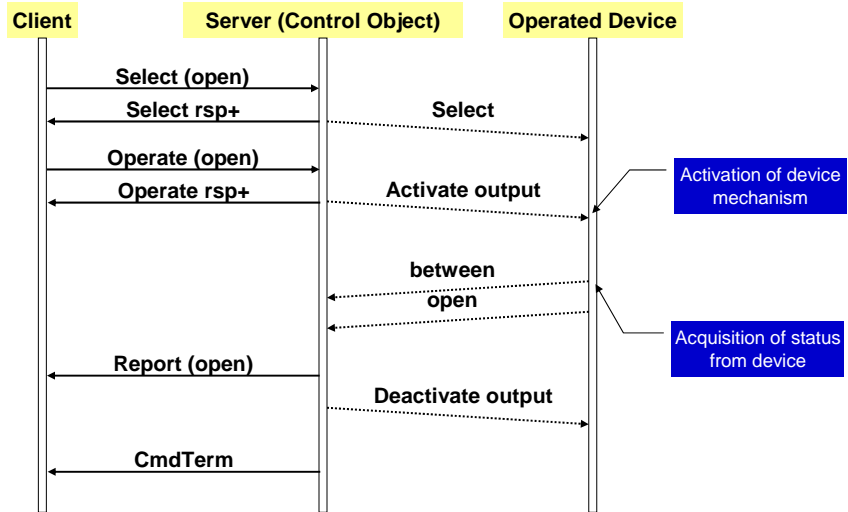
Logical nodes



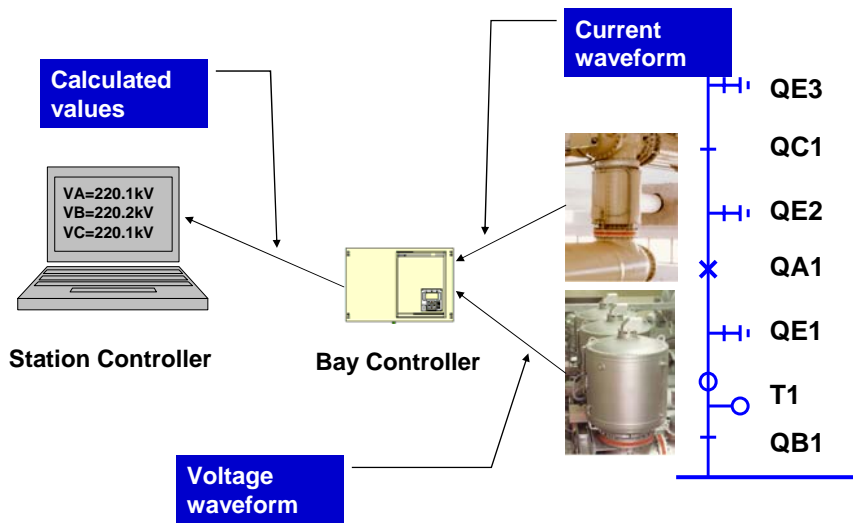
Data and data attributes



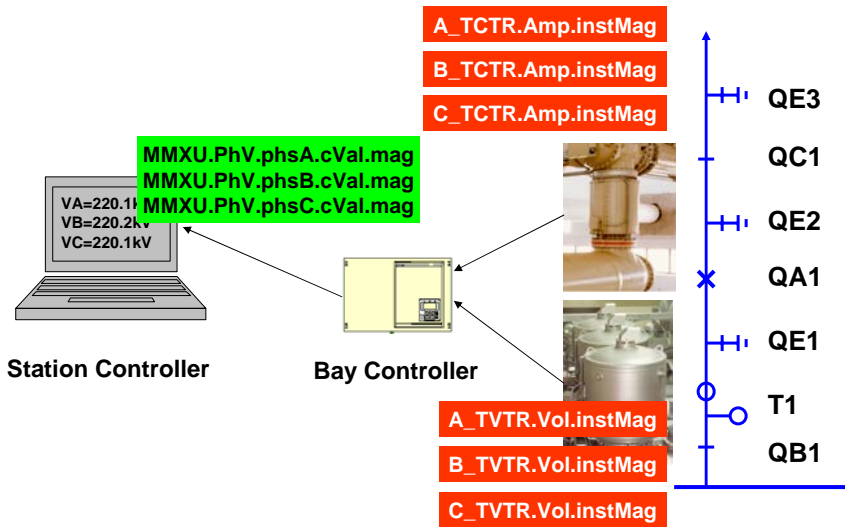
Control model



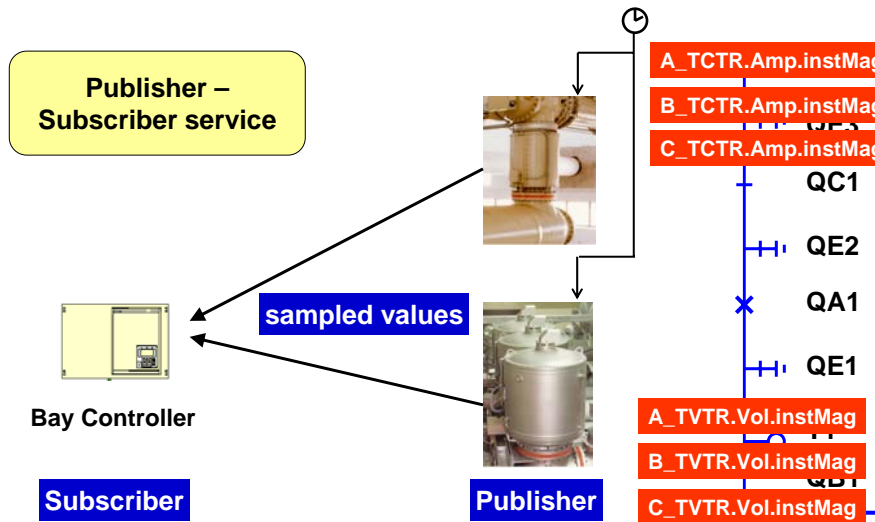
Current and voltage



Data and data attributes



Sampled values



The message

Abstract

ASN.1 encoded (ISO/IEC 8824-1 / 8825)

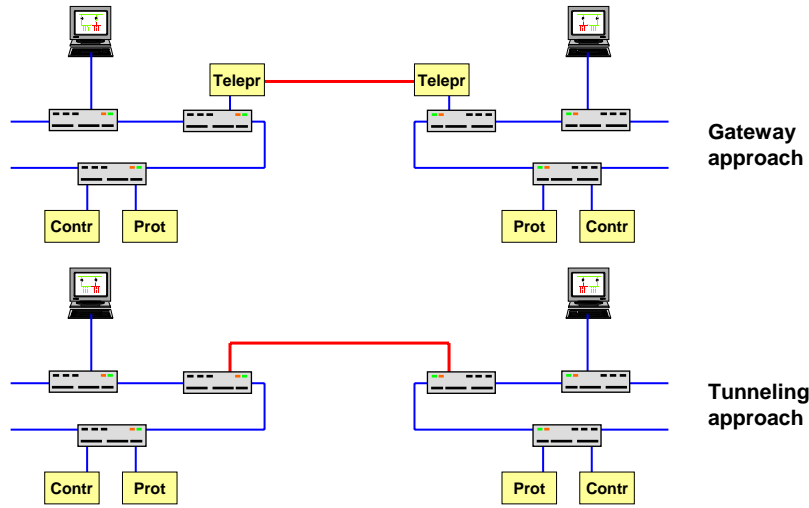
		TAG	Len	Val	
noASDU	savPdu	60	81		
MSVID	noASDU	80	1	2	
SmpCnt	Seq of ASDU	A2	76		
ConfRev	Seq ASDU1	30	36		
SmpSynch	svID	80	7	"MSVCB01"	
Sample	smpCnt	82	2	21	
MSVID	confRev	83	4	2	
SmpCnt	smpSynch	85	1	2	
ConfRev	Seq of data	87	12		
SmpSynch					[A_TCTR.Amp.instMag] 4 Byte
Sample					[B_TCTR.Amp.instMag] 4 Byte
					[C_TCTR.Amp.instMag] 4 Byte
	Seq ASDU2	30	36		
			

IEC 61850-90-1

Communication between Substations

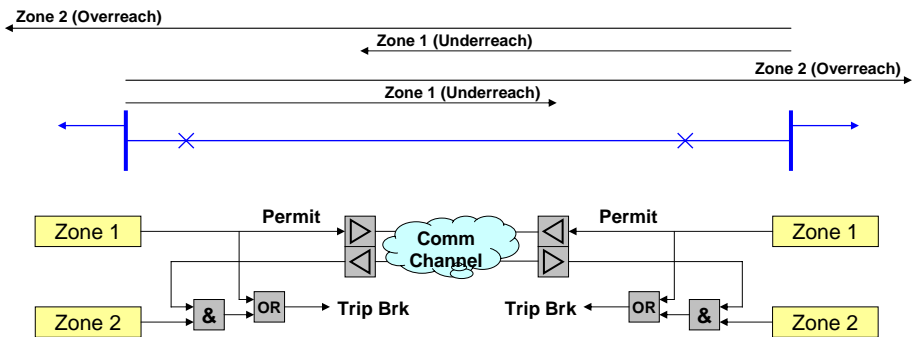
- Protection functions
 - Differential protection
 - Distance protection with permissive and blocking schemes
 - Directional and phase comparison protection
 - Transfer tripping
- Control function
 - Autoreclosing
 - Interlocking
 - Generator and load shedding

Communication aspects

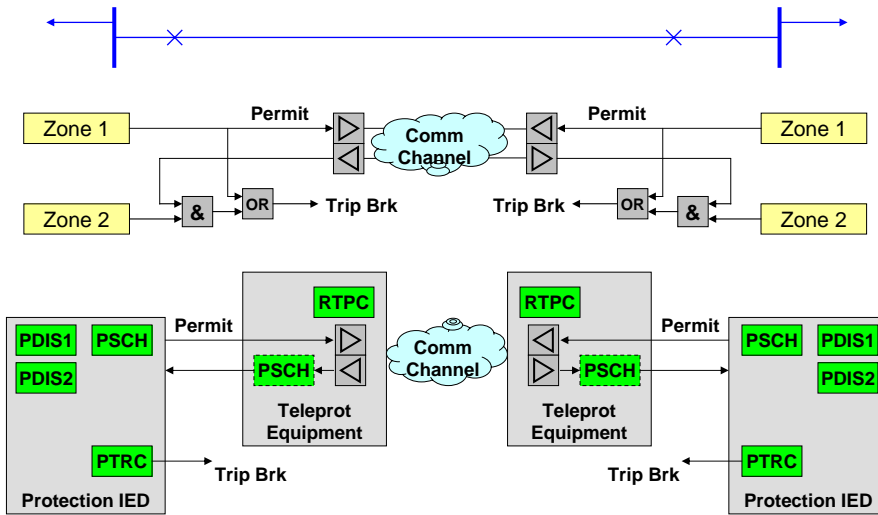


Application example

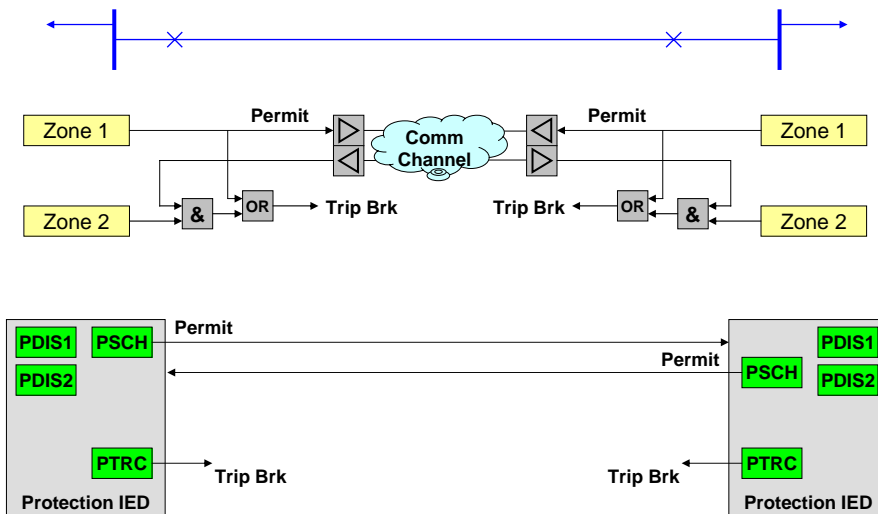
Permissive underreach with transfer trip



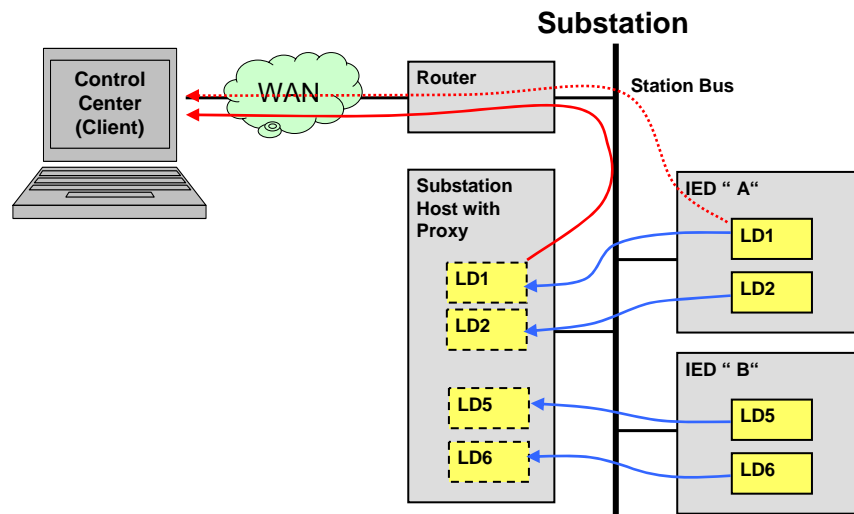
Gateway approach



Tunneling approach



Access to Substation



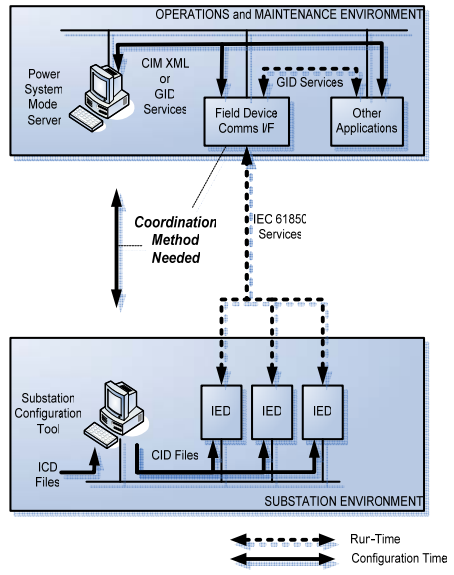
IEEE T&D 2008 Chicago Page: 25

Harmonization with CIM

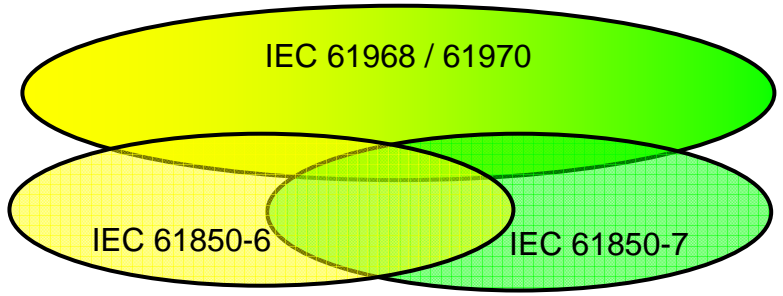
- Eliminate duplicate entry of configuration information
- Seamless data access of CIM and 61850 data at run time
- Establish the link between
 - The attribute of a data in the IEC 61850 model
 - The corresponding information in the CIM
 - No specific configuration shall be required to create that link; i.e. all shall be based on the models defined in the two standards
 - This shall include a unambiguous mapping of different data types where required

IEEE T&D 2008 Chicago Page: 26

Harmonization



Information models



Configuration

Run Time

Harmonization strategies

- What needs to be achieved?
 - Exchange **configuration** information for both the **substation automation system** as well as the **O&M environment** between these two environments – no duplicate manual entry of the same information
 - Exchange of **run time** information – automatic mapping of the information between the models
- ➔ **Relation between CIM and IEC 61850 needs to be described unambiguously and machine readable**

Conclusions

- IEC 61850 is well accepted by the power industry as communication standard within the **substations**
- Standards based on IEC 61850 are in preparation for several areas of **power generation**
- IEC 61850 will be the future standard for communication in the power system between field devices and from field devices to control centers