



IEC 61850 IOP 2013 Report



What is the purpose of the IOP

- The IOP is not about passing tests, but rather failing tests. It is through analysis of the failures that the standard, implementations, and industry will be improved.
- Give a neutral technical snapshot of the products and tools to document (by confirming/informing/extending) the interoperability issues mentioned by some end-users (e.g. ENTSO-E)
- Suggest solutions and coordinated responsibilities (e.g. UCA, IEC,...)



Not a trivial effort

- IEC WG10 participants began discussions in May 2012 (Berlin Meeting) regarding UCA IOP based upon vendor experiences.
- Initial Solicitation for participation/witnesses was in February 2013. Development of test plans/strategies began.
- IOP Group “closed” around early April 2013.
- IOP held in October 2013
- Report still be created as of January 2014.

Summary: Hopefully more reuse and more active participation can make preparation/execution less intensive in the future.

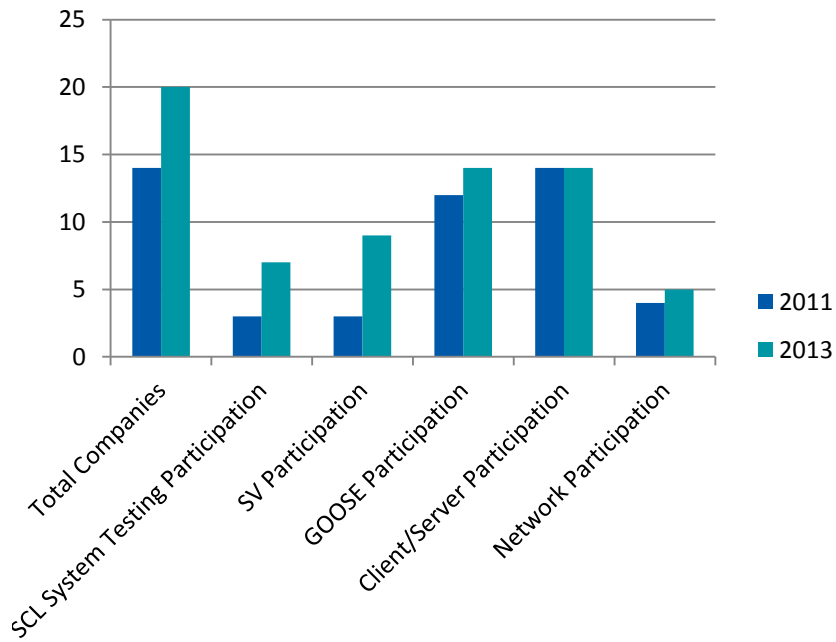


Comparison of 2011 vs 2013

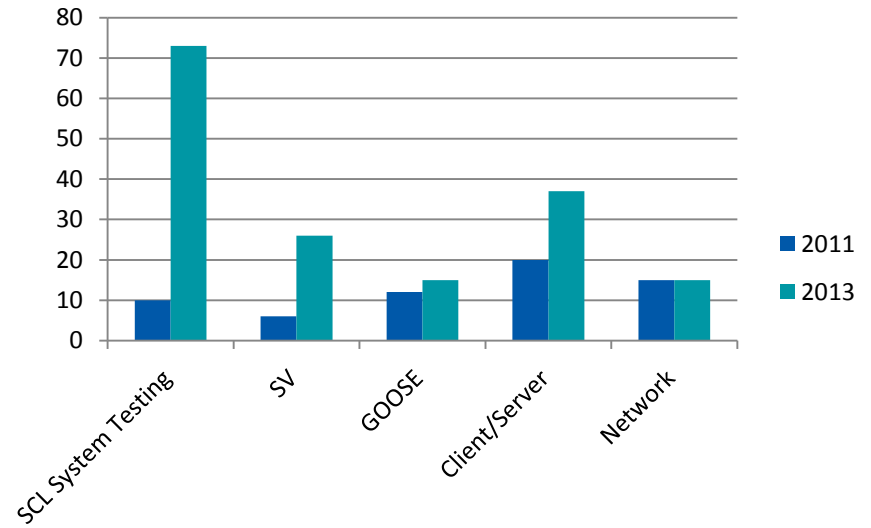
	IOP 2011	IOP 2013	Change
Item			
Participating Companies	19	43	126%
Companies whose products are tested	14	20	35%
Companies providing test witnesses	5	20	380%
People Participating	37	93	150%
People whose products are being tested	30	60	100%
People whose companies are observers	7	33	370%



More Comparisons



Participation



Test Cases



The IOP Group - Day 5



The Witness Protection Program (WPP) – Day 5



Participants



Power and productivity
for a better world™



SIEMENS



ALSTOM



Ingeteam



TOSHIBA



Witnesses





UCA IOP Focussed on:

61850 Edition 2

ENTSO-E Punchlist

See: https://www.entsoe.eu/fileadmin/user_upload/_library/news/IEC61850_standard/121018_PunchListTF61850_15102012V4.pdf

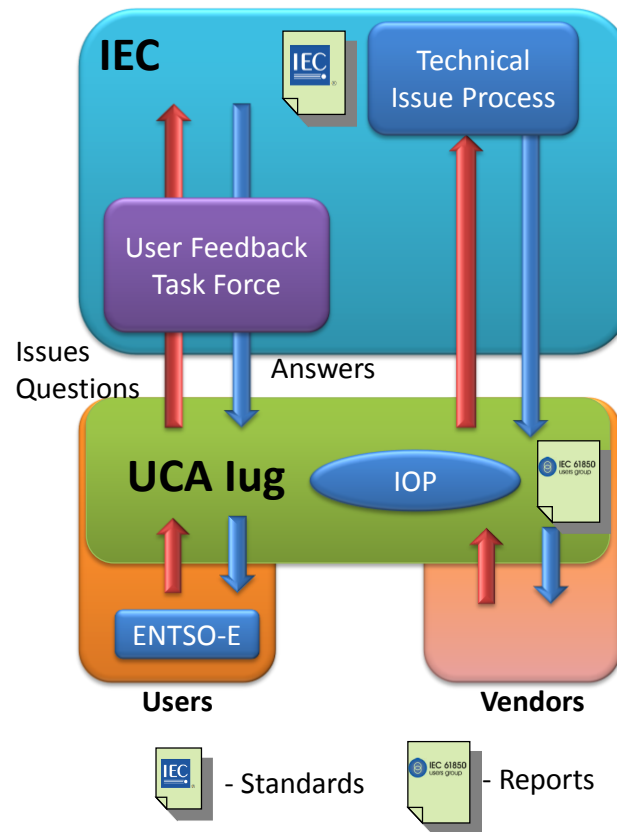
Engineering efforts required to implement the standard in a substation **are huge**:

There is currently no mature third-party tool available on the market. Grid operators are forced to use specific vendor tools that are not optimal in a multi-vendor environment and train staff to use a wide range of tools to configure the system. **A clear move by the market to a top-down approach using standardized third-party tools is needed.**

Transmission system operators want to be able to develop and manage by themselves – and possibly with the help of integrators – the technical knowledge and skills that are required to design and maintain IEC61850 substations. TSOs are unable to cope with this challenge with the **complexity of the tools** currently available. On the contrary, all of this complexity counteracts this objective and erodes the real added value of the standard.

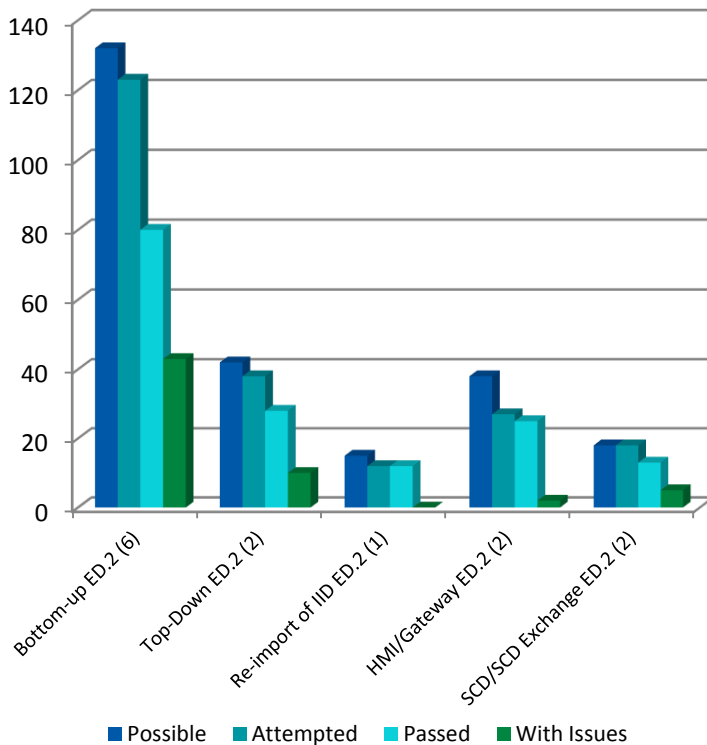
Substation Configuration Language

Moving Forward: Revised Process based upon IOP

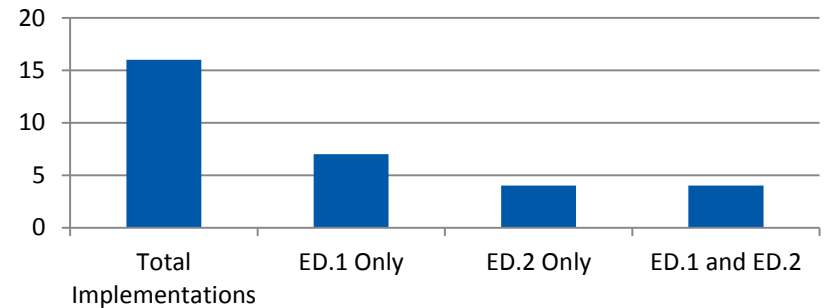


ED.1/ED.2 and Engineering Focus

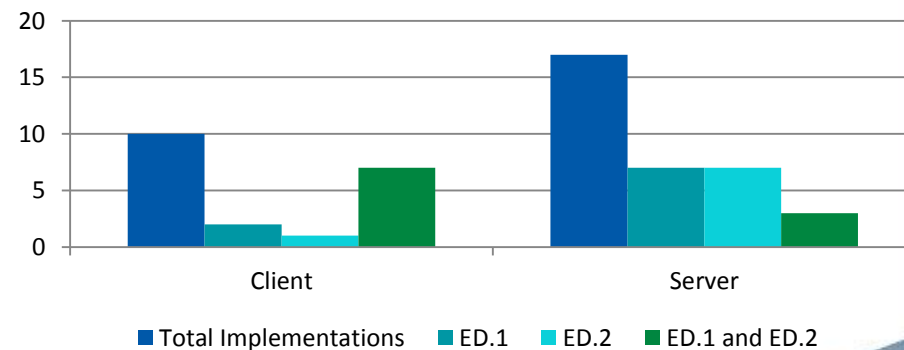
SCL Use Case Testing



GOOSE Implementations vs 61850 Edition



Distribution of Client and Server Implementations



Tested

- SCL*
- GOOSE
- Client/Server
- SV
- Networking*

* - Issues needing IEC resolution found.



Standard Issues found

- SCL
 - ED.1/ED.2 co-existence in a single SCD file*
 - Client reporting subscription*
 - GOOSE subscription*
 - SV subscription*
 - Networking
 - VLAN Tag 0 support in switches
- * - Technical solutions tested during IOP awaiting IEC standard approval.
- * - Several technical proposals available



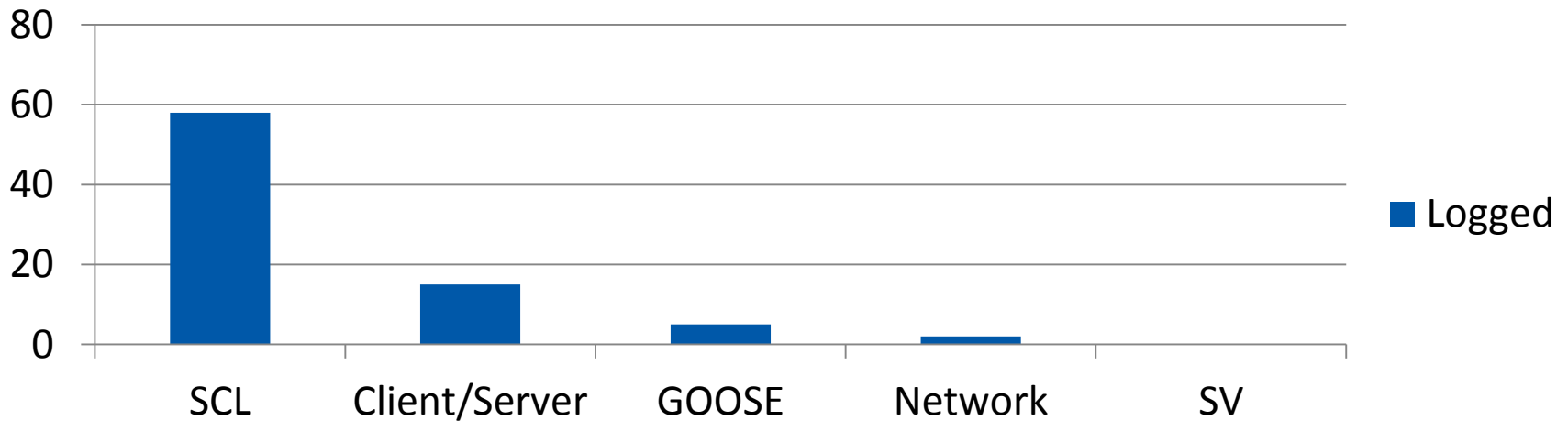
SCL testing

- Engineering Process
 - Bottom-up
 - Top-down
- Ad-hoc (used by Client/Server and GOOSE testing)
 - **Most IOP issues found here.**
- **Many issues had agreed technical solutions or were implementation issues, and did not require feedback into the IEC 61850 Standard.**

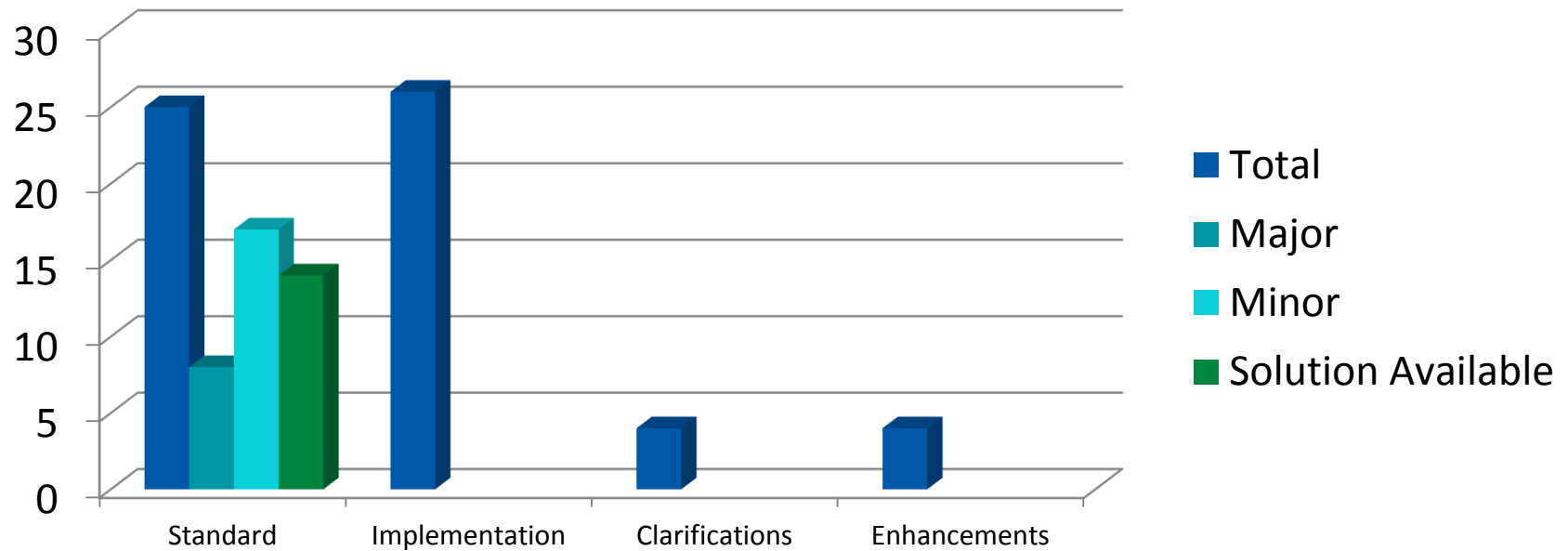


Issues Logged

Logged

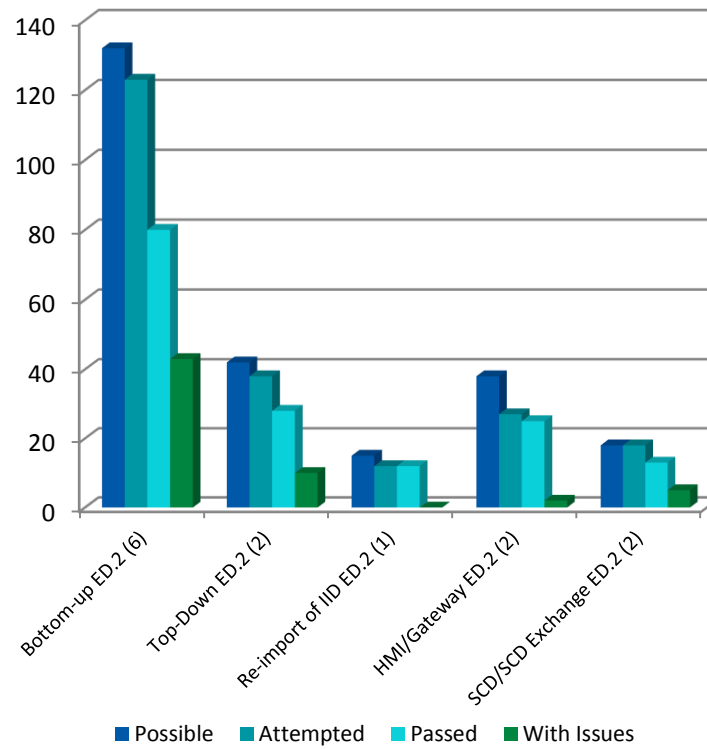


SCL Issues: 58 Logged



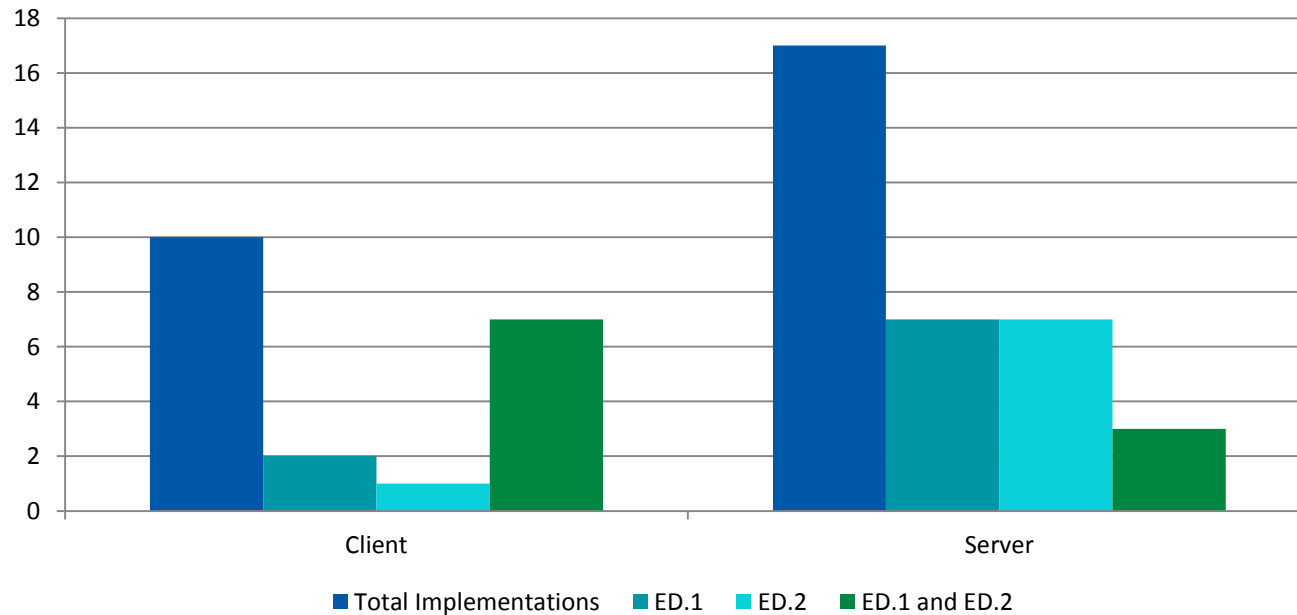
SCL

SCL Use Case Testing



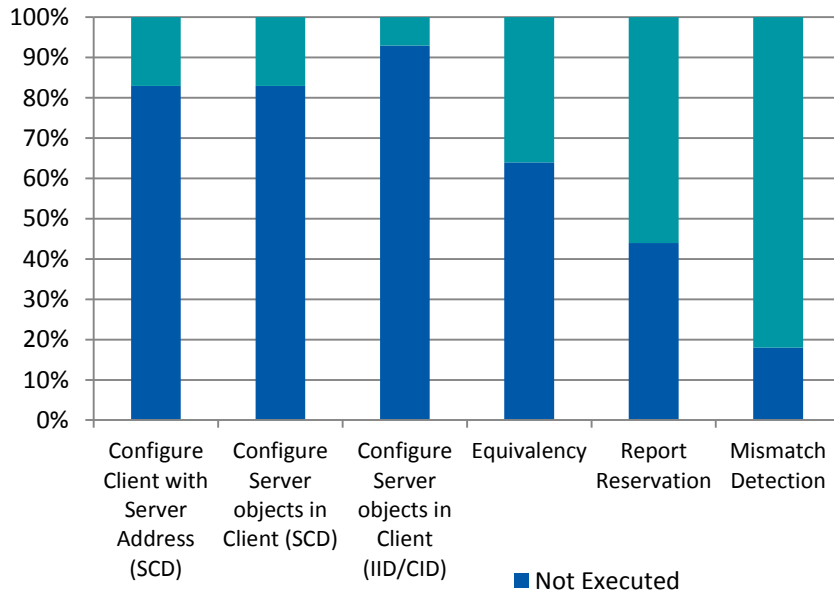
Client/Server: Edition Support

Distribution of Client and Server Implementations

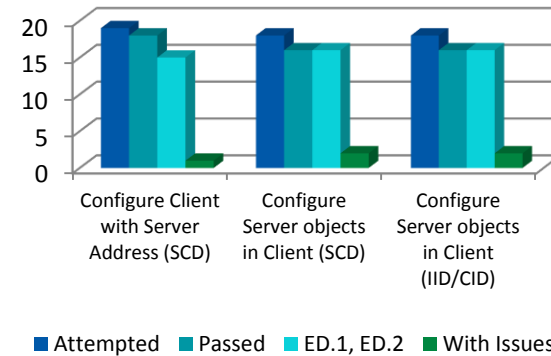


Client/Server: SCL Testing

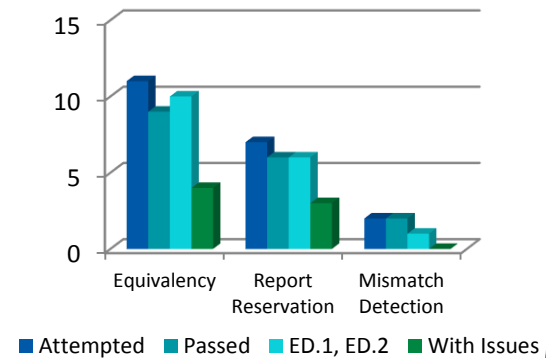
SCL Testing Combinations



SCL Test Results (part 1)

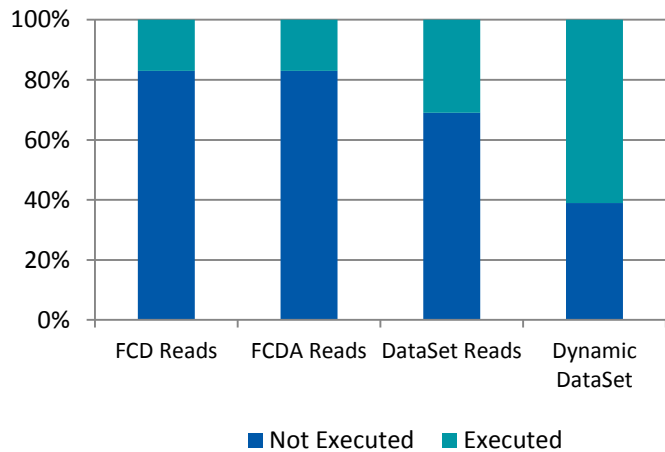


SCL Test Results (part 2)

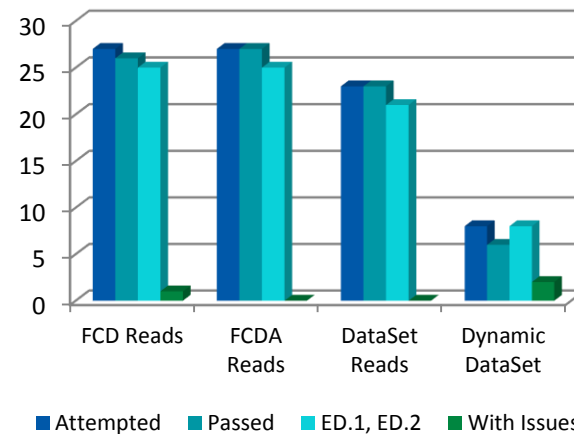


Client/Server: Read and DataSets

Read and DataSet Testing Combinations

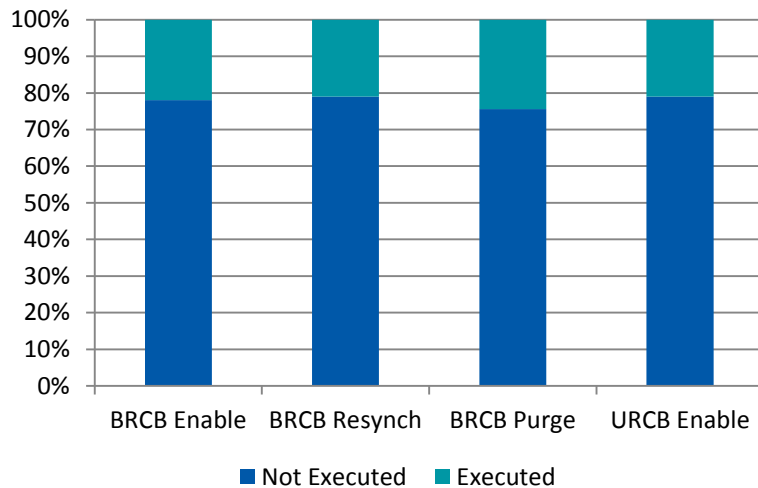


Read and DataSet Test Results

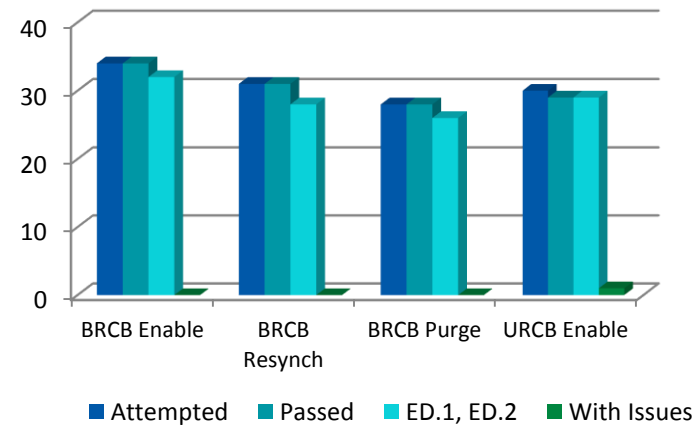


Client/Server: Reporting

Reporting Testing Combinations

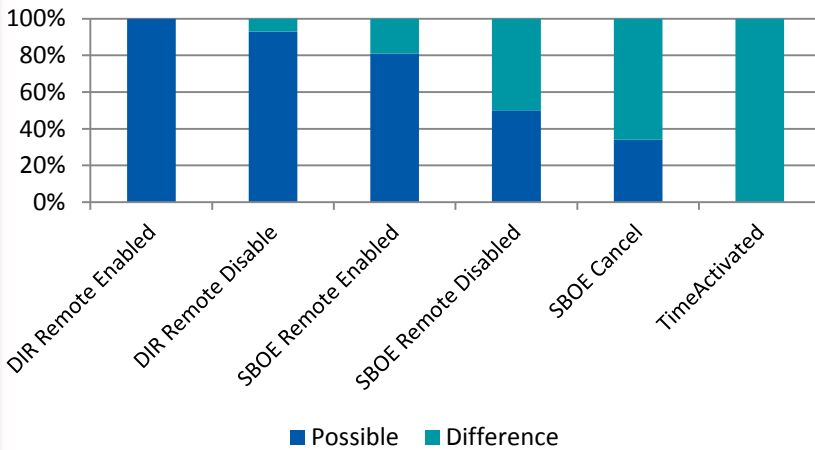


Reporting Test Results

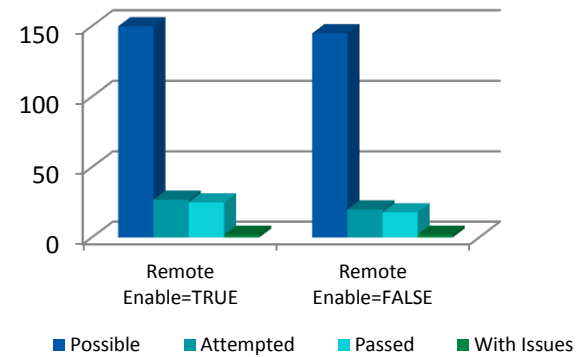


Client/Server: Control

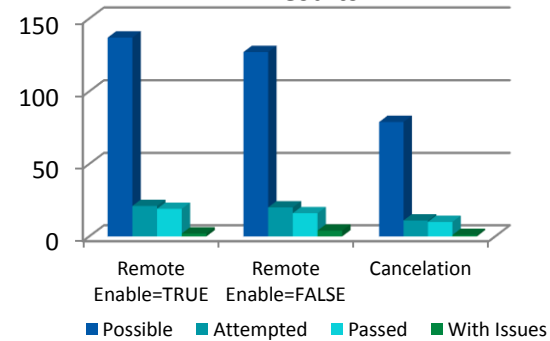
Control Test Combinations



Direct Control Test Results

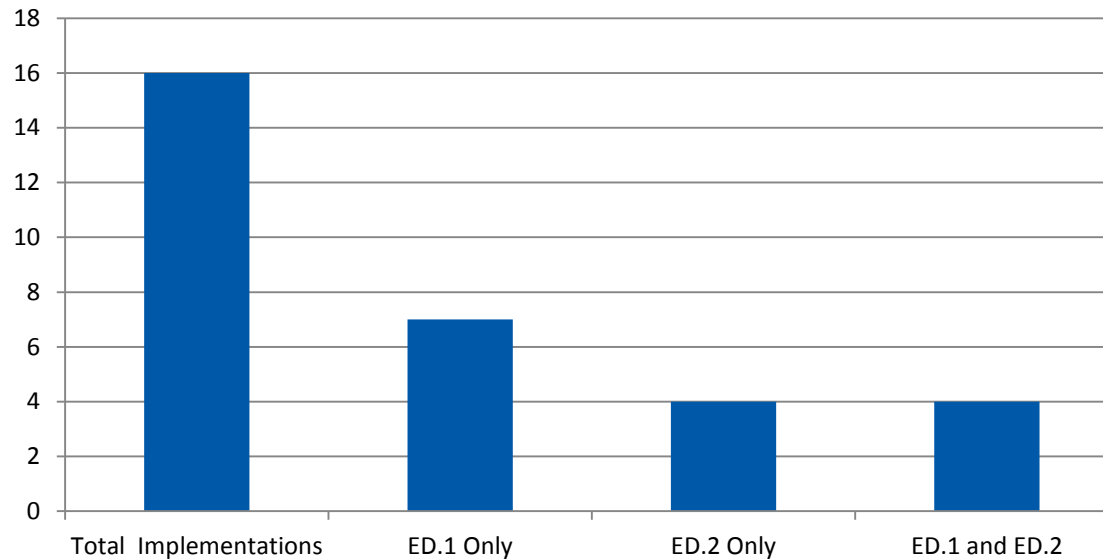


SBO with Enhanced Security Test Results



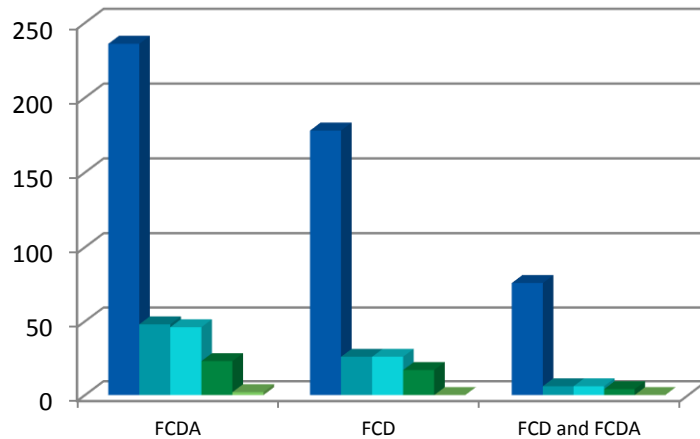
GOOSE: Edition Support

GOOSE Implementations vs 61850 Edition



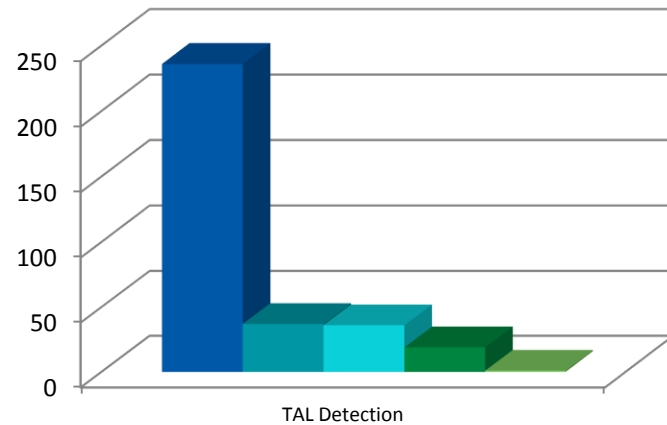
GOOSE: Test Results

FCDA , FCD , and FCD/FCDA DataSet Exchange



■ Possible ■ Attempted ■ Passed ■ ED1 and ED2 IOP Pass ■ With Issues

Time Allowed to Live Detection

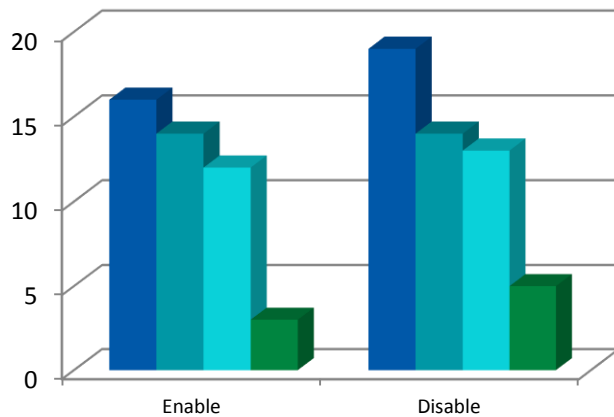


■ Possible ■ Attempted ■ Passed ■ ED1 and ED2 IOP Pass ■ With Issues



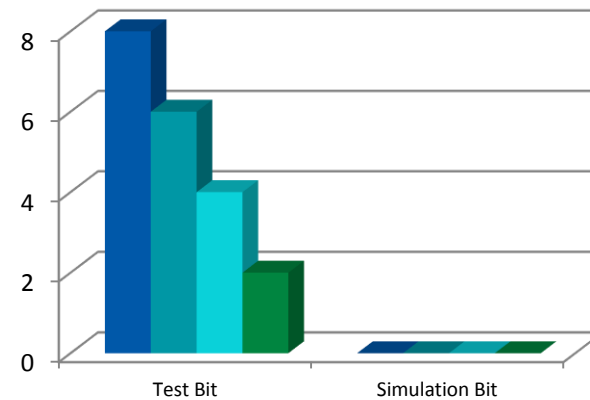
GOOSE: Test Results

GOOSE Control Block Enable/Disable



■ Attempted ■ Passed ■ ED1 and ED2 IOP Pass ■ With Issues

Test and Simulation Bit Test Summary



■ Attempted ■ Passed ■ ED1 and ED2 IOP Pass ■ With Issues



Conclusions

- Both participants and witnesses benefitted
- Although participation increased, still needed more participant and witness resources. Witnesses, especially utilities need to have more involvement with the test case development.
- Process for user feedback is being improved



Future/Discussion

- An IOP is being scheduled for 2015, location will be in Europe.
- There had been discussion regarding doing something in 2014 in North America?
 - Probably too soon for a full IOP?
 - Maybe a 61850 University/Application hands on?
 - Other ideas?

