



IEC 61850 Conformance Testing

Bas Mulder

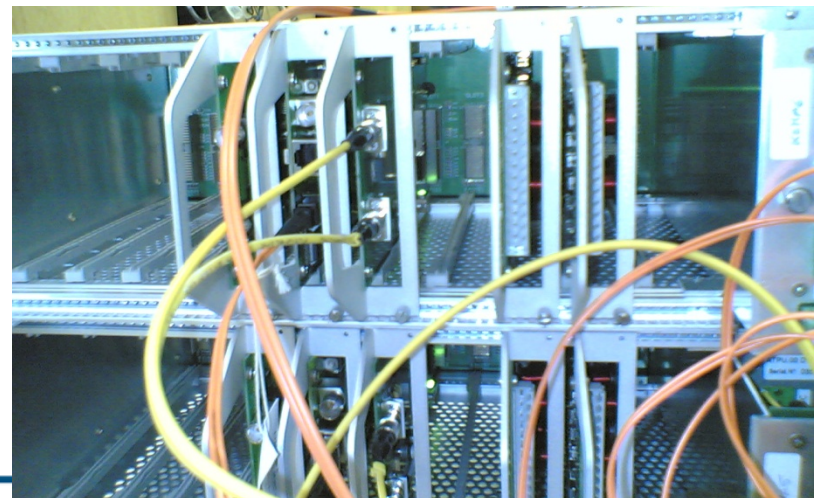
UCAIUG meeting Austin, November 2011

Introduction KEMA

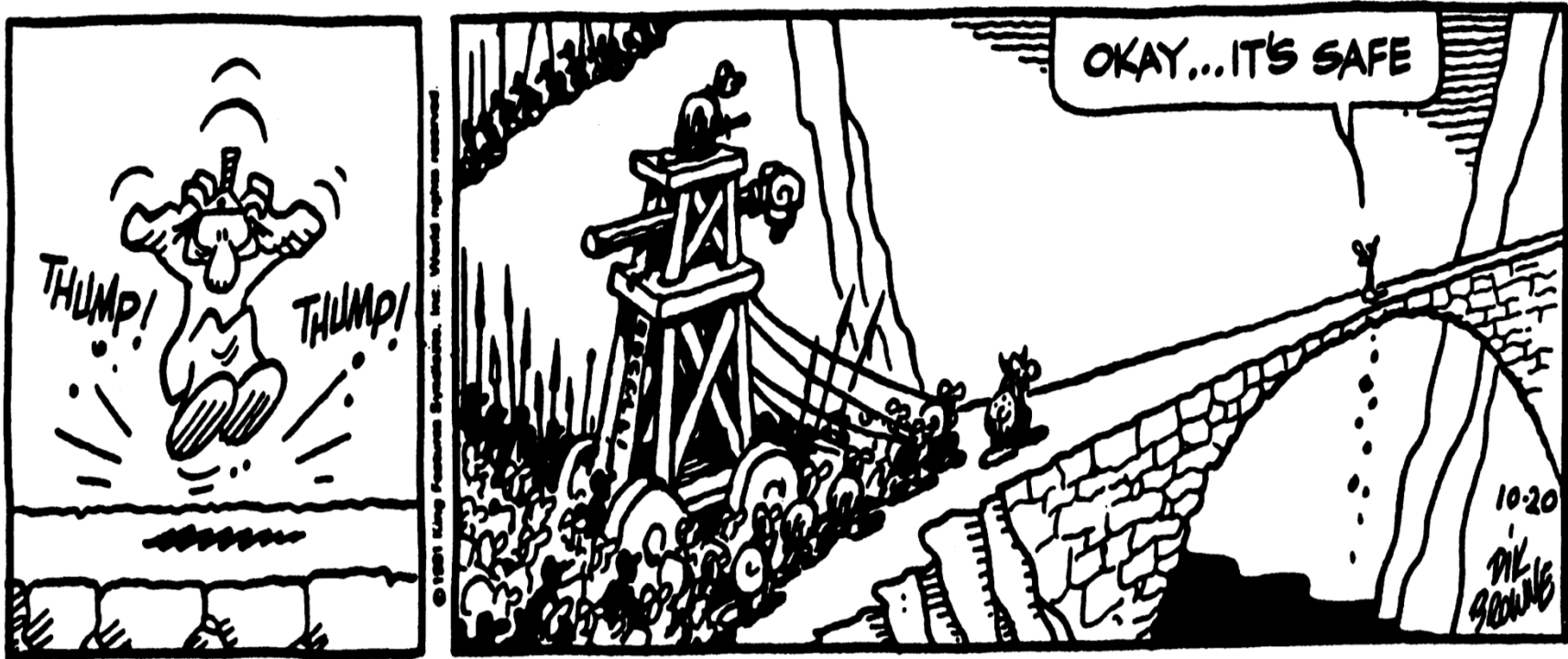


21 November, 2011

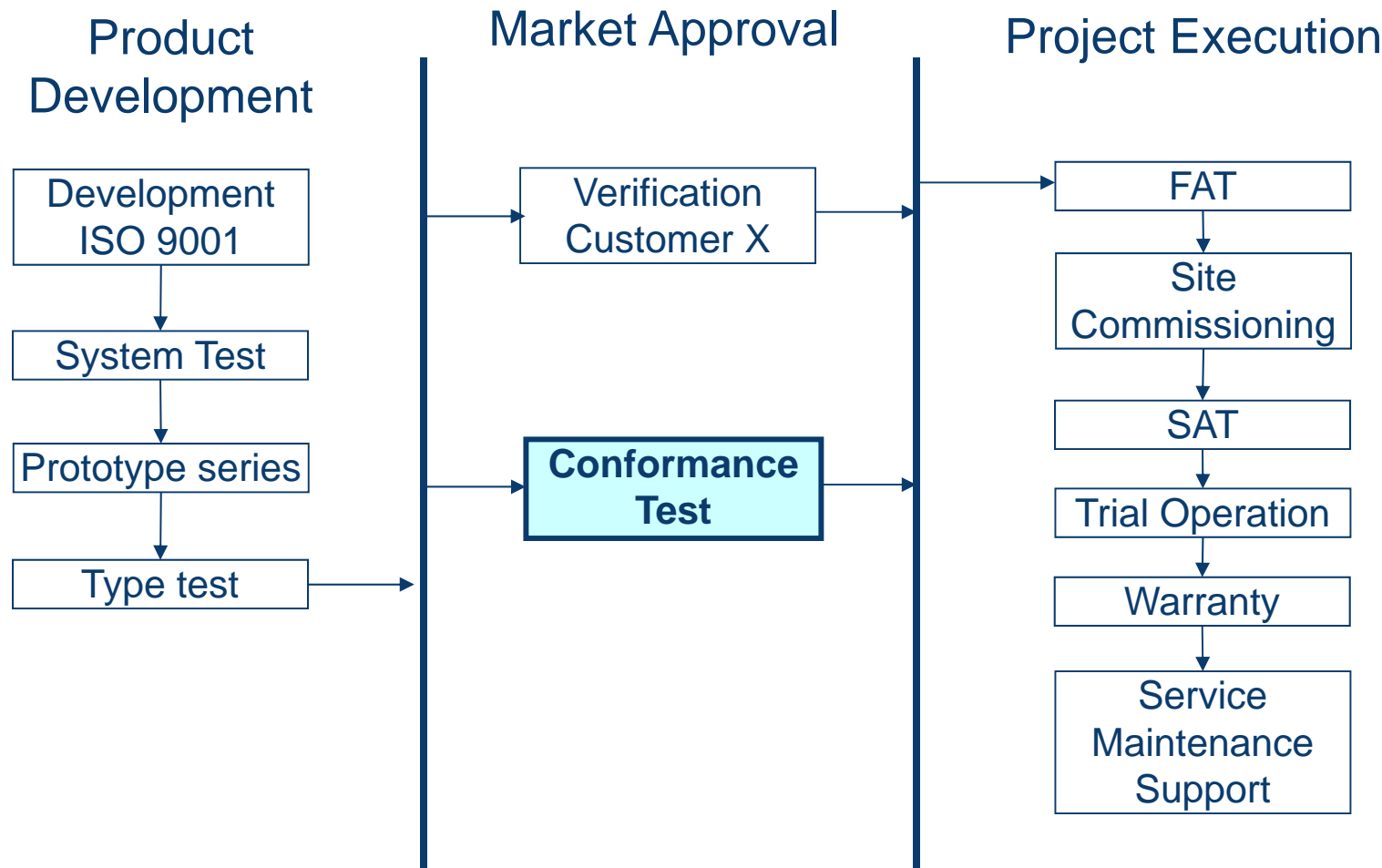
IEC 61850 Testing



Quality Assurance



Quality Assurance Stages (IEC 61850-4)



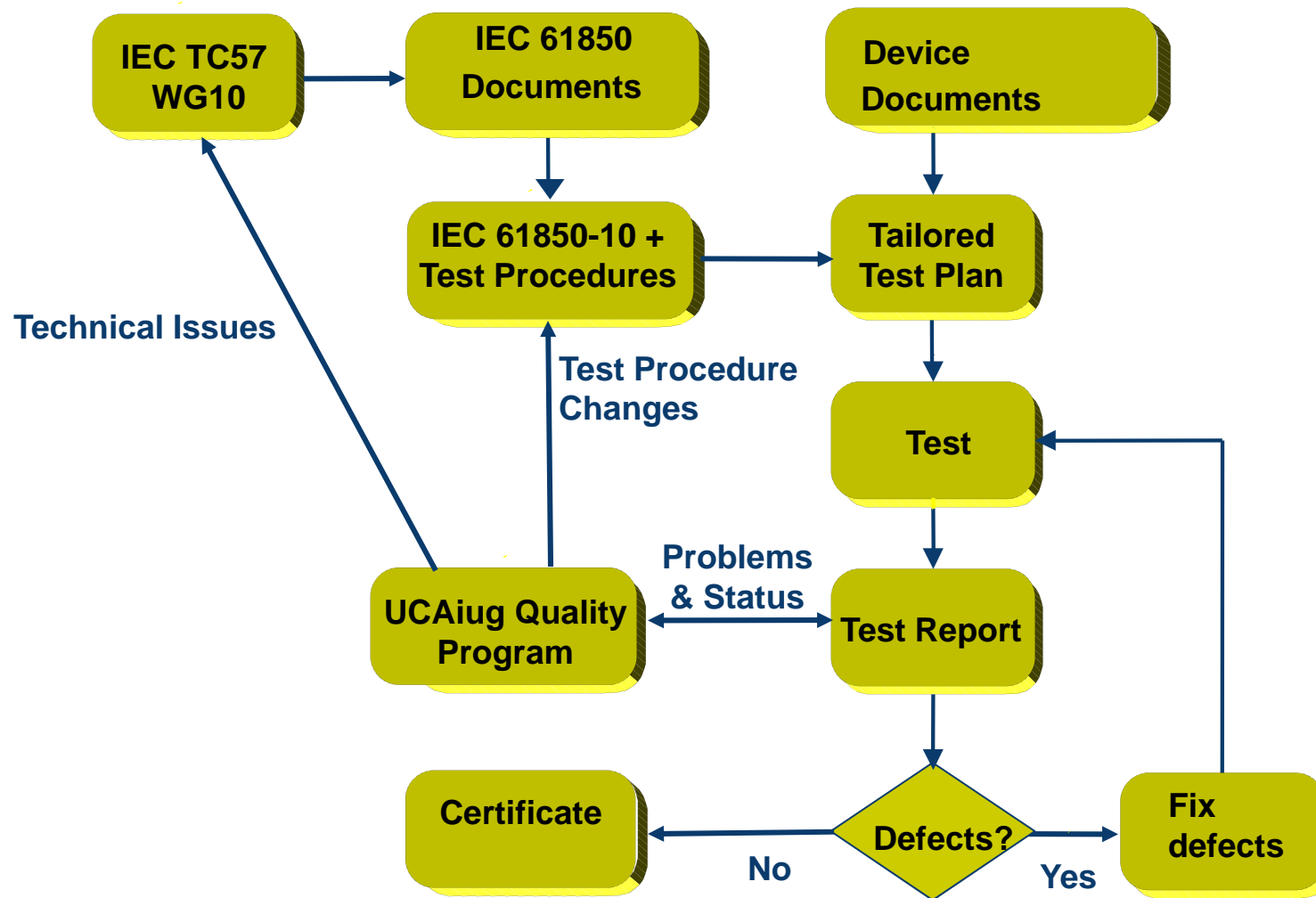
Conformance <> Interoperability

- Need reference system
 - Both positive and negative testing
 - Can test all supported functions
 - Certificate
 - Each system is tested once
 - All errors are detected
- Need 2 systems
 - Limited negative testing
 - Can test matching functions
 - Test report
 - Each combination of systems need to be tested
 - Matching errors are not detected

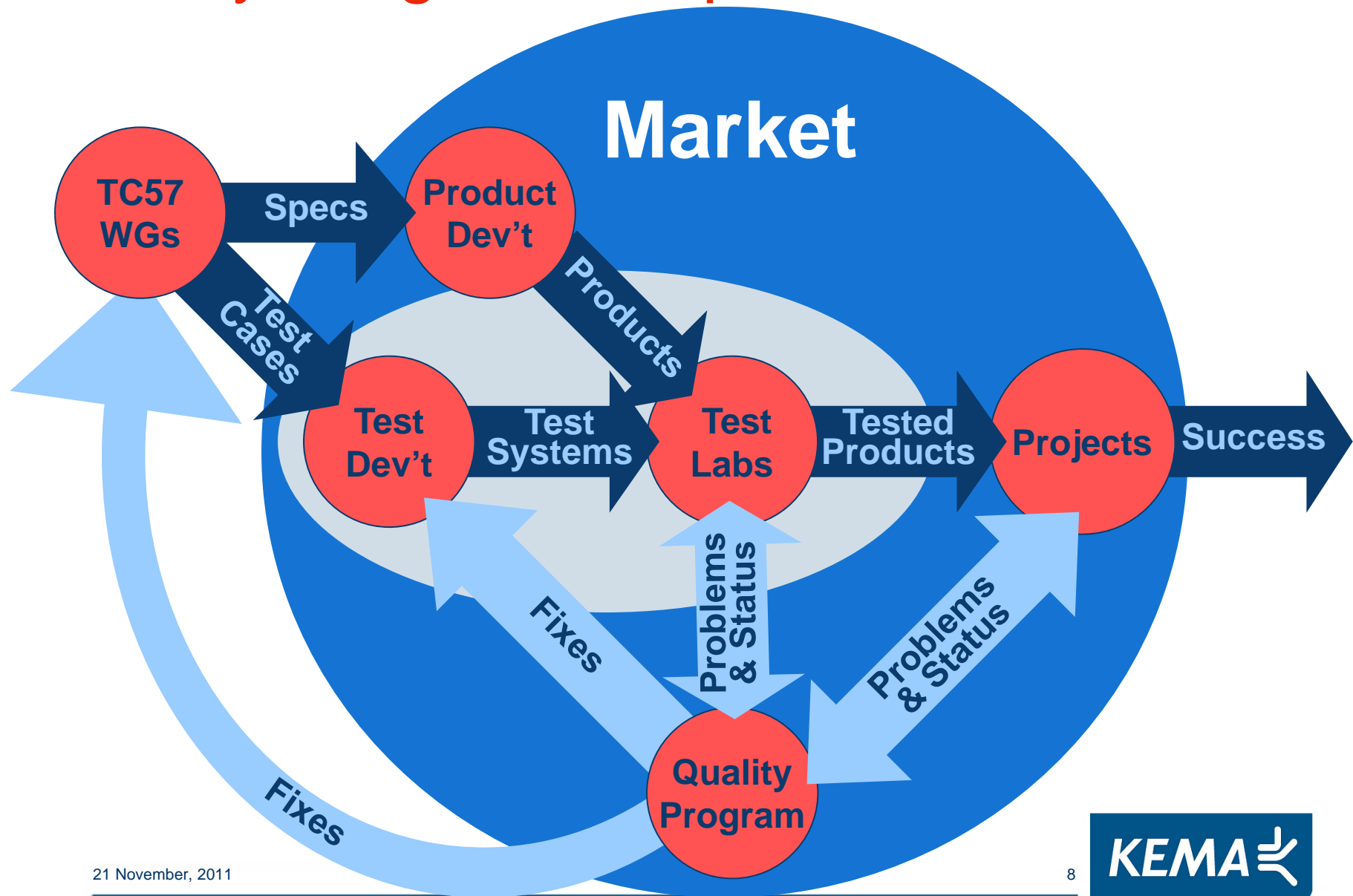
Conformance Testing; Why?

- To reduce inter-operability risks to an acceptable level (before system integration!)
- To provide maximum customer confidence that the device will inter-operate flawlessly with other certified devices now and in the future
- On large number of systems in the market it's more efficient than interoperability testing

Conformance Testing; How?



Quality Program Scope



Quality program managed by UCA international user group -

- Technical committee
- IEC 61850 Testing sub committee
 - Set-up and maintain test procedures
 - Accreditation procedures for test labs
- Sharepoint with documents, minutes of meeting and certificates

UCAIug Testing Quality Assurance Program - Microsoft Internet Explorer provided by KEMA

http://www.ucaiug.org/org/TechnicalO/Testing/UCAIug%20Testing%20Quality%20Assurance%20Program

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Richard Schimmel's Home UCAIug Testing Quality ...

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UCAIug

UCA International Users Group

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UCAIug > Organization > Technical O > Testing > UCAIug Testing Quality Assurance Program > IEC 61850 Server Device Certificates

UCAIug Testing Quality Assurance Program

Actions 1 - 100 View: All Documents

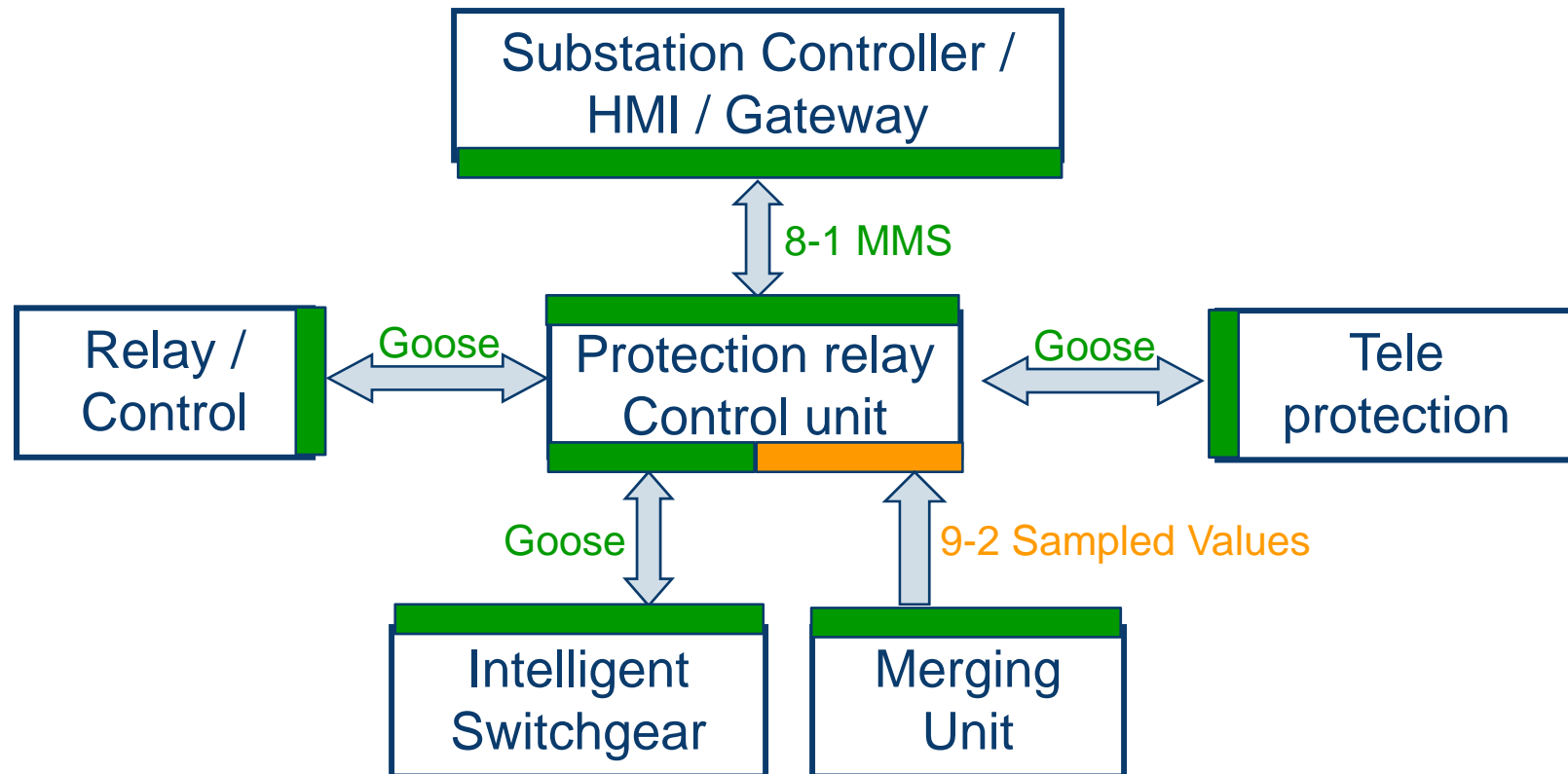
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	0021-2010_CGI	4/14/2011 2:08 PM	Jack .Robinson
	0165-2011_Easun_Reyrolle-TPRO	4/14/2011 2:10 PM	Jack .Robinson
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	07-0420-Areva-P437-Certificate	8/1/2008 4:59 PM	System Account
	07-1306-Toshiba-GRT100 -Certificate	8/1/2008 4:59 PM	System Account
	07-1309-Schneider-SepamServer-Certificate	8/1/2008 4:57 PM	System Account
	07-1357 Siemens 7SD5 Certificate	8/1/2008 5:02 PM	System Account

Done Internet 95%

Testing related documents

- IS 9646; OSI protocol conformance testing
- IEC 61850-10 Conformance testing
- Quality Assurance Program for IEC Product Testing and Test System Accreditation and Recognition
- QAP - Addendum for IEC 61850 Specific Product Testing
- Test Center Accreditation and Recognition Procedure for IEC 61850 Device Testing
- IEC 61850 Conformance test procedures
- Certificates and test reports (issued by test labs)

Available conformance test procedures



IEC 61850-10 (First Edition)

COMMUNICATION NETWORKS AND SYSTEMS IN SUBSTATIONS –

Part 10: Conformance testing

1 Scope

This part of IEC 61850 specifies standard techniques for testing of conformance of implementations, as well as specific measurement techniques to be applied when declaring performance parameters. The use of these techniques will enhance the ability of the system integrator to integrate IEDs easily, operate IEDs correctly, and support the applications as intended.

NOTE 1 The role of the test facilities for conformance testing and certifying the results are beyond the scope of this part of IEC 61850.

IEC 61850-10 Test case

– 22 –

61850-10 © IEC:2005(E)

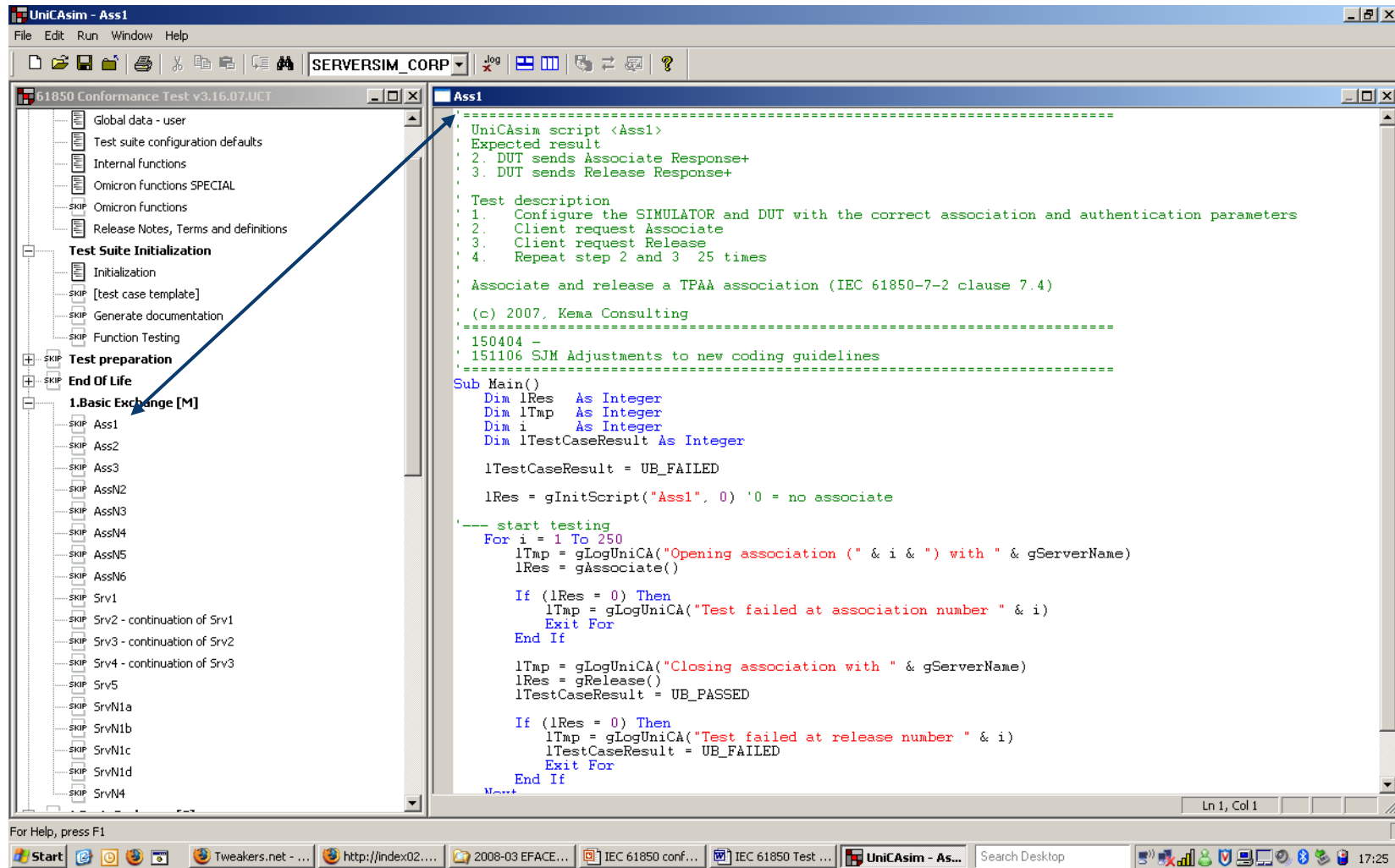
Table 1 – Positive test cases

Test case	Test case description
Ass1	Associate and release a TPAA association (IEC 61850-7-2 Subclause 7.4)
Ass2	Associate and client-abort TPAA association (IEC 61850-7-2 Subclause 7.4)
Ass3	Associate with maximum number of clients simultaneously (PIXIT)

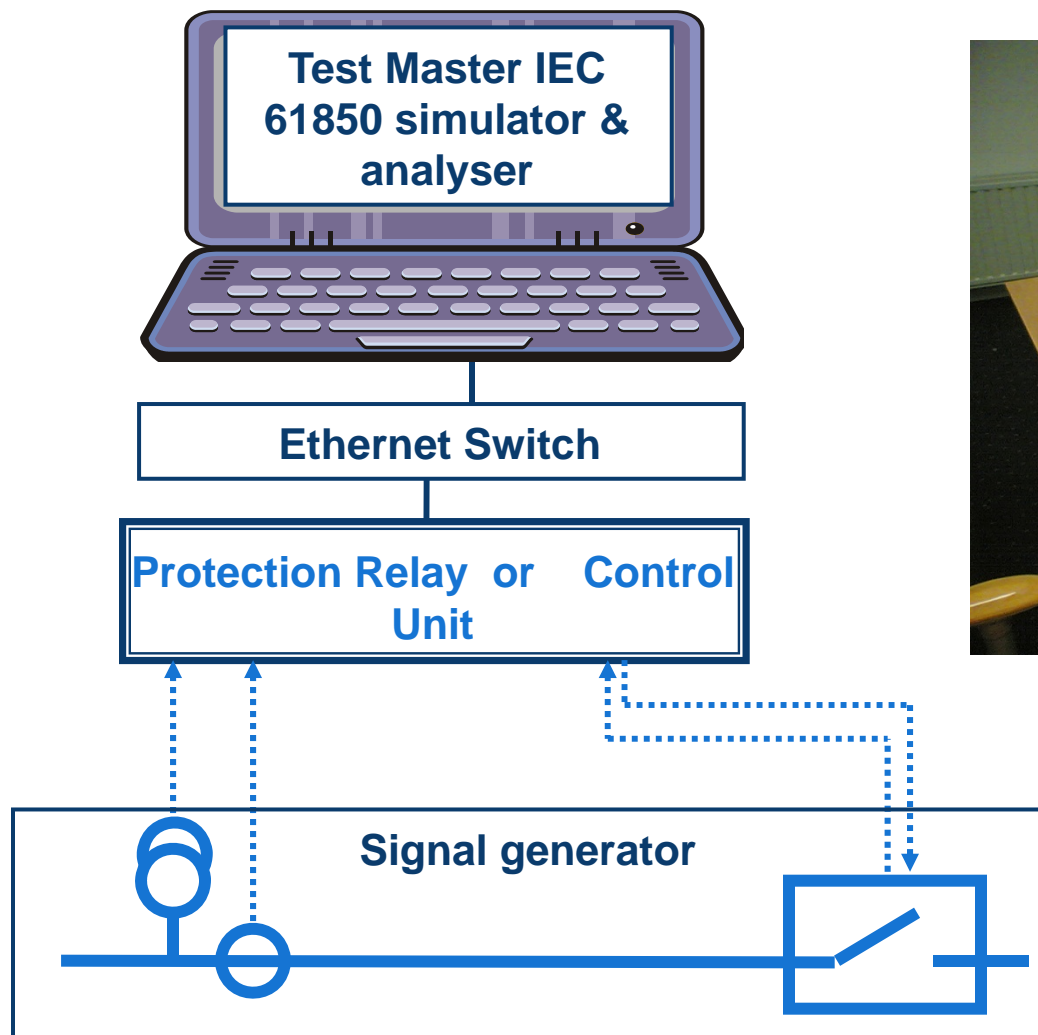
IEC 61850 conformance test procedure

Ass1	Associate and release a TPAA association	PASSED
IEC 61850-7-2 clause 7.4 IEC 61850-8-1 clause 10.2		
<u>Expected result</u> 2. DUT sends Associate Response+ 3. DUT sends Release Response+		
<u>Test description</u> 1. Configure the SIMULATOR and DUT with the correct association and authentication parameters 2. Client request Associate 3. Client request Release 4. Repeat step 2 and 3 250 times		
<u>Comment</u>		

UniCA conformance test set



Test Configuration Example



Extract from IEC 61850 part 5

6.6 Conformance test requirements

Interoperability depends both on the device properties and the system design and engineering. Conformance tests shall be performed to verify that the communication behavior of a device as system component is compliant with the interoperability specification of IEC 61850. These tests specify what shall be applied on a device to check that the communication function is correctly performed with a complementary device. Also the pass criteria have to be well defined. Conformance tests may involve the use of various simulators to represent the context of the substation and of the communication network.

Definitions of the conformance tests will be given in IEC 61850-10.4

Certificate



IEC 61850 Certificate Level A¹

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Issued to:
EFACEC
Rua Eng. Frederico Ulrich, Guardedeiras
4470-605 MAIA
Portugal

No. 30820032-Consulting 08-1095

For the product:
UAC 420 Automation and Control Unit
Version UAC 420-Ed1-S-v6.4

Issued by:



The product has not shown to be non-conforming to:
IEC 61850-6, 7-1, 7-2, 7-3, 7-4 and 8-1
Communication networks and systems in substations

The conformance test has been performed according to IEC 61850-10 with product's protocol, model and technical issue implementation conformance statements: "X420 - Indicação de Conformidade com IEC 61850 (PICS) UK (1.1)", "UAC420 - Model Implementation Conformance Statement (MICS) UK (1.0)", "X420 - 61850 Tissues Conformance Statement (TICS) UK (1.1)" and product's extra information for testing: "X420 - Protocol Implementation extra Information for Testing (PXIT) UK (1.1)".

The following IEC 61850 conformance blocks have been tested with a positive result (number of relevant and executed test cases / total number of test cases as defined in the UCA International Users Group Device Test procedures v1.1):

1 Basic Exchange (19/23)	9a GOOSE Publish (7/11)
2 Data Sets (2/5)	9b GOOSE Subscribe (9/9)
5 Unbuffered Reporting (11/13)	12a Direct Control (5/11)
6 Buffered Reporting (13/15)	12b SBO Control (6/15)
	13 Time Synchronization (3/4)

This Certificate includes a summary of the test results as carried out at EFACEC in Lisbon, Portugal with UniCasim 61850 version 3.17.01 with test suite 3.16.07 and UniCA 61850 analyzer 4.17.01. The test is based on the UCA International Users Group Device Test Procedures version 1.1. This document has been issued for information purposes only, and the original paper copy of the KEMA report: No. 30820032-Consulting 08-1094 will prevail.

The test has been carried out on one single specimen of the products as referred above and submitted to KEMA by EFACEC. The manufacturer's production process has not been assessed. This Certificate does not imply that KEMA has certified or approved any product other than the specimen tested.

Amhem, 14-05-2008

W. Strabbing
Manager Intelligent Networks and Communication

S.J.T. Muder
Senior Testengineer

21 November, 2011

IEC

KEMA testing experience

- Executed over 190(!) IEC 61850 conformance tests
- Each test resulted in issues to be fixed
- Raised many technical issues (TISSUES)
- Resulted in almost no interoperability issues!
(considering the huge scale of use)



IEC 61850 Certificate Level A¹

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Issued to:
Siemens A.G., PTD EA
Protection and Substation Control Systems
Wernerwerkdamm 5
D-13623 Berlin
Germany

No. 30720460-Consulting 08-0117

For the product:
Siprotec V4
7VK6 Breaker Management Relay
Firmware V04.60
EN100 V04.00

Issued by:



The product has not shown to be non-conforming to:

IEC 61850-6, 7-1, 7-2, 7-3, 7-4 and 8-1

Communication networks and systems in substations



IEC 61850 Second Edition

- Update IEC 61850-**10** Second Edition
 - Update UCAIUG conformance test procedures
 - Update conformance test reference systems
 - Update test lab accreditation
 - Manufacturers update 61850 in their systems
 - Test labs execute Ed2 conformance tests and issue Ed2 certificates
-
- All in progress in parallel
 - First certified device expected Q4 of 2012



Thank you

Bas.Mulder@kema.com

www.kema.com/pctc