TESTING & CERTIFICATION WORKSHOP

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Grid-Interop™

SGIP SMART GRID INTEROPERABILITY PANEL

Agenda

- Why is Testing & Certification Important for the Smart Grid
- SGIP Testing & Certification Committee Overview
- IPRM Version 2 – January 2012 release
- Certification Programs – Actors & Relationships
- Testing & Certification Initiatives for 2013

Why is Testing Important?

- Considerable time/effort goes into standards-making
- Purchasers want “standards compliant” products
- How is “standards compliant” determined?
- Testing provides the facts to support claims of “standards compliant”

Conformance vs. Interoperability

- Compliance or Conformance generally refers to an individual product satisfying the criteria within a specific standard
- Compliance does not assure interoperability (and vice versa)
- Interoperability adds a dimension to testing where multiple products and standards need to be addressed in a test program
- Interoperability is the objective for Smart Grid

Why is Interoperability Testing Important?

- Smart Grid systems can be deployed today via customized product evaluations and extensive integration testing
- Advantage – custom solution tailored to a specific need
- Disadvantages
  - Not always repeatable for other sites/scenarios
  - Limited flexibility in product selections and alternatives
  - Higher costs associated with customized engineering
- Interoperable products lead to greater choice in product selection and design, driving lower cost and faster implementations

Challenge for the Smart Grid

- There are a limited number of industry testing programs available today addressing key Smart Grid standards
- ….and even fewer that address interoperability
- The SGIP is tackling this challenge

SGTCC Overview

- The Smart Grid Testing & Certification Committee (SGTCC) is a standing committee of the Smart Grid Interoperability Panel (SGIP)
  - http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/SmartGridTestingAndCertificationCommittee
- SGTCC has developed a framework to enable industry testing and certification programs for Smart Grid interoperability
- SGTCC members are a diverse, elected group including manufacturers, end users and test labs

CHAIR – Rik Drummond
VICE-CHAIR – Dean Prochaska
SECRETARTY – Ryan Maley
ADMINISTRATOR – Rudi Schubert

SGTCC Structure and Major Activities

- Interoperability Process Reference Manual (IPRM)
  - Version 2 released in 2012
  - https://collaborate.nist.gov/twiki-sggrid/pub/SmartGrid/SmartGridTestingAndCertificationCommittee/IPRM_final_-_011612.pdf
- IPRM Implementation
  - Supporting Interoperability Testing & Certification Authority (ITCA) first adopters to implement the IPRM
  - Collaborating with industry accreditation organizations to support independent assessments of ITCA programs
- Advocacy for Smart Grid Interoperability Testing
  - Outreach to stakeholders
  - Building Demand for Tested/Certified Products
- SGIP Catalog of Standards reviews for testing aspects
- End to End Test Case Development

2012 SGTCC Accomplishments

- Interoperability Process Reference Manual (IPRM) Version 2 released
- The IPRM implementation working group (WG8) has completed an application/review process for Interoperability Testing and Certification Authorities (ITCAs); provides the foundation to assess ITCAs for their IPRM implementation
- The SGTCC Catalog of Standards (CoS) working group has completed development of the review process for standards proposed for inclusion in the SGIP CoS, analyzing the characteristics of the standard related to testing/certification
- Implemented the IPRM/ITCA "implementation for dummies" FAQ
- White paper on Testing and Certification Importance and Value for the Smart Grid
- Completed a 2013 Education and Outreach plan for Smart Grid Testing and Certification advocacy

What is the IPRM?

- The Interoperability Process Reference Manual (IPRM) is the primary document defining the framework for Smart Grid testing and certification
- Key IPRM Topics
  - Best Practices for Interoperability Test Construction
  - Criteria for certification body processes
  - Criteria for test laboratory best practices
  - Best Practices for Cyber Security Test Construction
  - ITCA implementation of the IPRM recommendations

Goals of the IPRM

- Increase the buyer's confidence in the purchase products for their organizations
- Standardize the testing and certification processes, through an initial set of best practices, across multiple standards
- Implement a formal approval process for those organizations following the SGTCC Testing and Certification Framework
- Reduce costs and shorten product implementation cycle time

IPRM Version 2

- Completed and approved by SGTCC voting members in 2012
- Version 2 is operationally focused as compared to the more informational style of Version 1
  - Describes the roles and responsibilities of an Interoperability Testing & Certification Authority (ITCA)
  - Describes the process for an ITCA to implement IPRM recommendations
  - Expanded content on cybersecurity testing considerations

Key Recommendations in IPRM V2

- All certification bodies and test labs operating programs associated with Smart Grid standards shall be accredited in accordance with globally recognized ISO standards
  - Certification Bodies – ISO/IEC Guide 65 accreditation
  - Test Laboratories – ISO/IEC Guide 17025 accreditation
- Nearly 40 additional technical requirements/best practices for the ITCA are specified to assure technical depth and sufficiency for end user needs addressing:
  - Explicit and transparent information on program requirements, processes, metrics, specific test environments
  - Detailed report documentation - procedures, profiles, results, product versions, caveats/limitations
  - Validated and traceable test tools and software
  - Qualitative evidence of interoperability – lack of reported problems or anecdotal information is insufficient

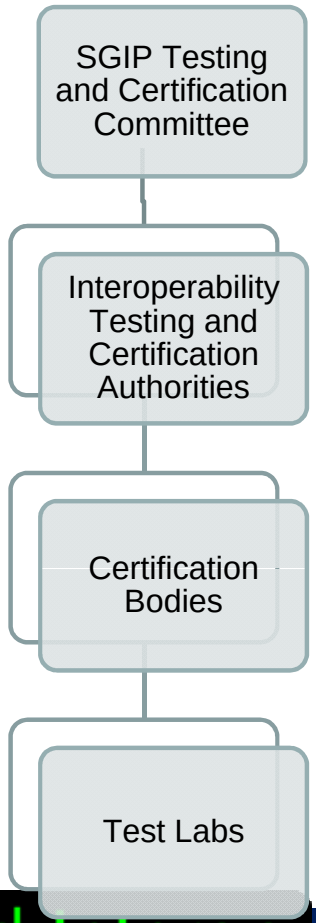
3RD PARTY CERTIFICATION MARKS ARE CRITICAL FOR QUALITY OF TESTING AND CERTIFICATION

IPRM Facts & Fiction

- Mandatory vs. voluntary
  - Implementation of the IPRM is a voluntary process
  - SGTCC recommends implementation and supports ITCA efforts
    - ITCA – Interoperability Testing and Certification Authority
  - SGTCC does not accredit ITCAs
  - http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/SGIPITCAProgramList
  - Purchasers and other stakeholders may mandate compliance – individual business decisions
- US vs. International
  - SGTCC views the IPRM as globally applicable and elected to use international ISO standards as a basis for many IPRM recommendations
- High Cost of Implementation
  - ITCAs will have increased upfront costs if they do not currently have a recognized quality management system
  - Compliance costs parallel normal cross-industry lab and certifier practices

Testing and Certification Framework

- Defined in SGIP Interoperability Process Reference Manual (IPRM)

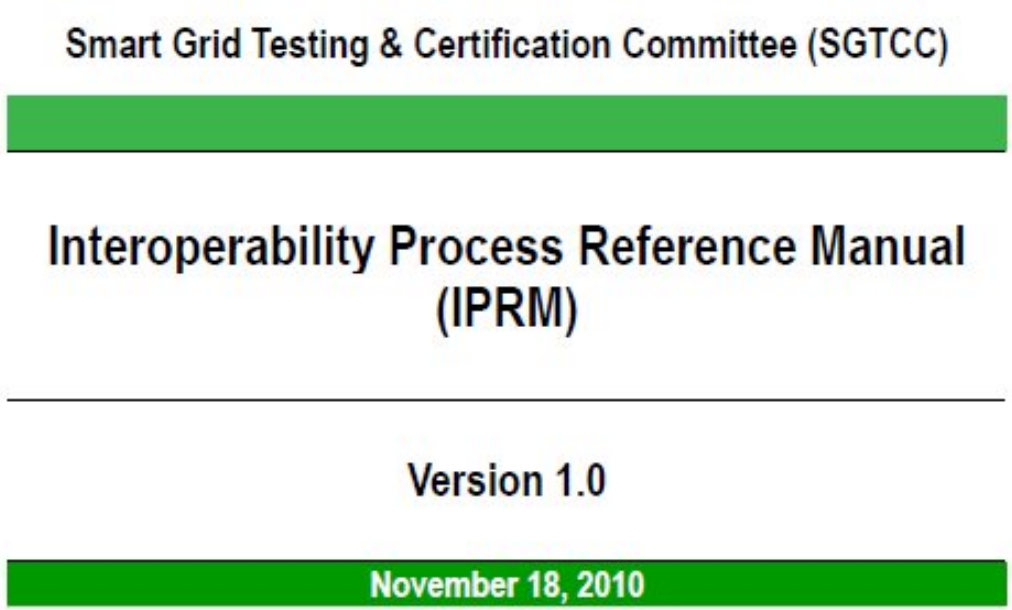


SGIP IPRM documents requirements and best practices for ITCAs, CBs and TLs

ITCAs establish T&C schemes for specific domains/use cases and accredit CBs and TLs
Initially-identified ITCAs: NEMA, UCAIug 61850, OpenADR, and Multispeak

Certify test results

Perform conformance and/or interoperability testing to specified test cases


Smart Grid Testing & Certification Committee (SGTCC)

Interoperability Process Reference Manual (IPRM)

Version 1.0

November 18, 2010

Certification Programs Actors and Relationships

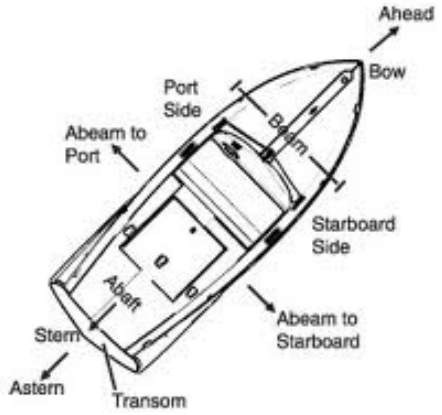
R. Kent Donohue, PE
UL LLC

SGIP December 2012
Irving, TX

Topics

- Language of certification programs
- Actors and their roles
- Functions, requirements and relationships
- Product applicant – logistics of submittal
- Q&A

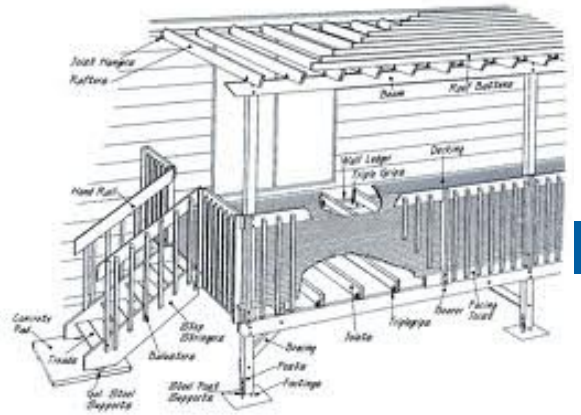
The language



- Accreditation[1]
  - 3rd party attestation related to a conformity assessment body conveying formal demonstration of its competence to carry out specific conformity assessment tasks
- Accreditation Body[1]
  - authoritative body that performs accreditation
- Certification[1]
  - 3rd party attestation related to products, processes, systems or persons

[1] ISO/IEC 17000: Conformity assessment – Vocabulary and general principles

The Language



- Certification System[2]
  - rules, procedures and management for carrying out 3rd party product conformity assessment
- Certification Program[2]
  - product certification system related to specific products to which the same specified requirements, specific rules and procedures apply
- Certification Body[3]
  - body operating a product certification system

[2] ISO/IEC Guide 67: Conformity assessment – Fundamentals of product certification

[3] ISO/IEC Guide 65: General requirements for bodies operating product certification systems

So…

- If a Certification Body operates a Certification System, and
- the Certification System is derived from a Certification Program:
  - who defines the Certification Program, and
  - what makes a Certification Program credible?

Actors and Roles

- ITCA
  - Interoperability Testing & Certification Authority
    - Develops, owns and maintains certification program requirements (CPRs)
- TL
  - Testing Laboratory
    - Performs and documents testing under ITCA CPRs
- CB
  - Certification Body
    - Issues and maintains certifications under ITCA CPRs
- AB
  - Accreditation Body
    - Accredits TLs / CBs to standards supplemented by ITCA CPRs

Interoperability Testing and Certification Authority

- Develops, owns and maintains CPRs
  - Detailed CPRs (IPRM and ISO/IEC Guide 67)
    - TL requirements, e.g.
      - Test suite specifications
    - CB requirements, e.g.
      - Certificate control
      - Surveillance of Certified products
    - Formats for forms, records, reports
    - Etc., etc., etc.
  - Lends expertise
    - Technical resource for AB assessments of TL / CB
    - Consistency between TLs, and between CBs
    - Feedback to Standard Setting Organization (SSO)

Accreditation Body

- Signatory to peer arrangements / agreements
- Subject to periodic peer assessments
- Management system per ISO/IEC 17011
  - General requirements for accreditation bodies accrediting conformity assessment bodies

NACLA

Testing Laboratory

- Management system per ISO/IEC 17025
  - General requirements for the competence of testing and calibration laboratories
- Operates per the ITCA CPRs
- Accredited by AB
  - Assessed to
    - ISO/IEC 17025
    - ITCA CPRs
    - Competence for specific standards / specifications
  - Accreditation scope
    - Standards for assessed testing activities, or
    - Specific ITCA certification program test suite specifications

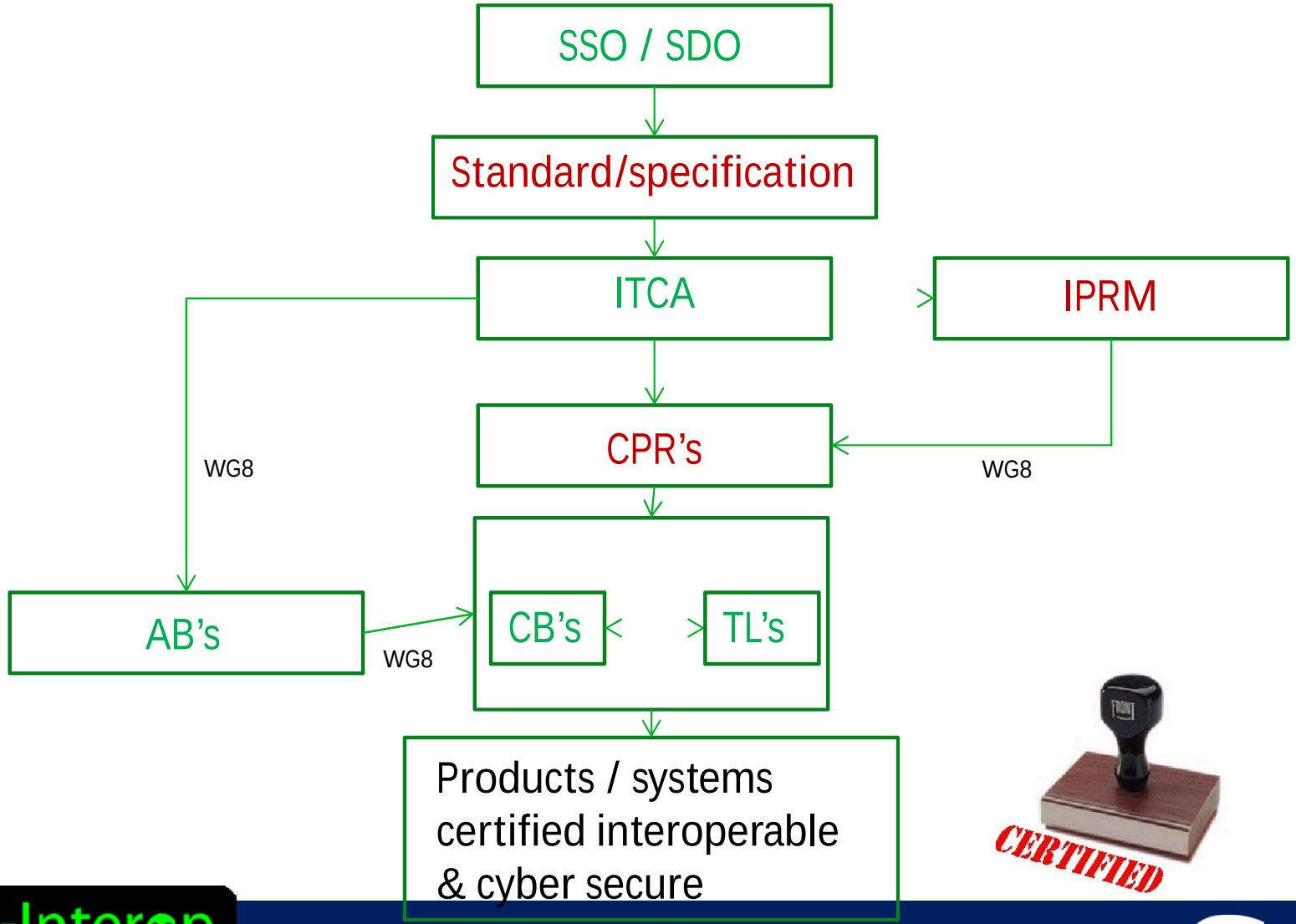
Certification Body

- Management system per ISO/IEC Guide 65
  - General requirements for bodies operating product certification systems
- Operates per ITCA CPRs
- Accredited by AB
  - Assessed to
    - ISO/IEC Guide 65
    - ITCA CPRs
    - Competence for technologies involved
  - Accreditation scope
    - Technology related ICS codes(1), or
    - ITCA Certification Program

(1) ISO publication "International Classification for Standardization"
http://www.iso.org/iso/ics6-en.pdf

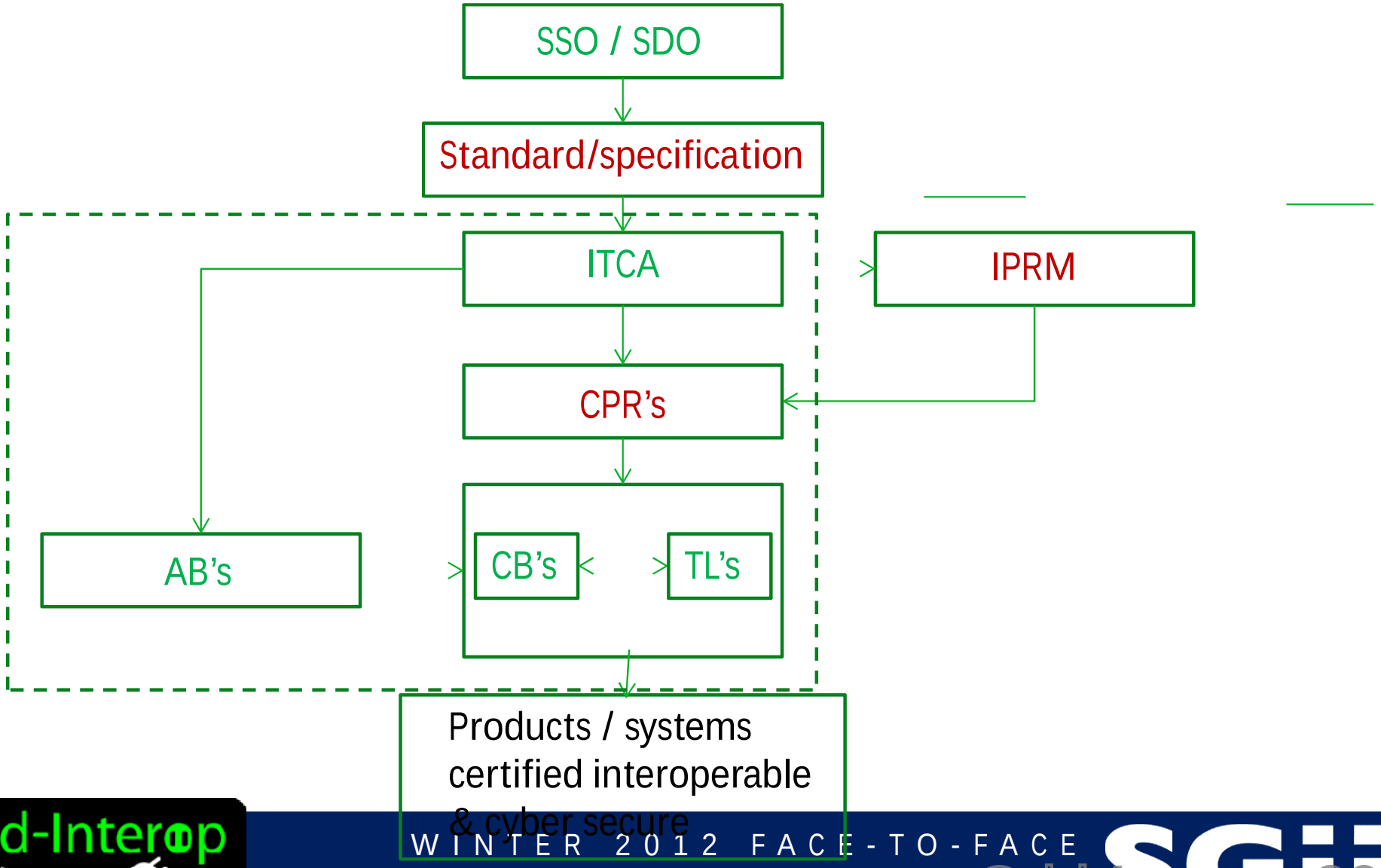
Certification Scheme Framework

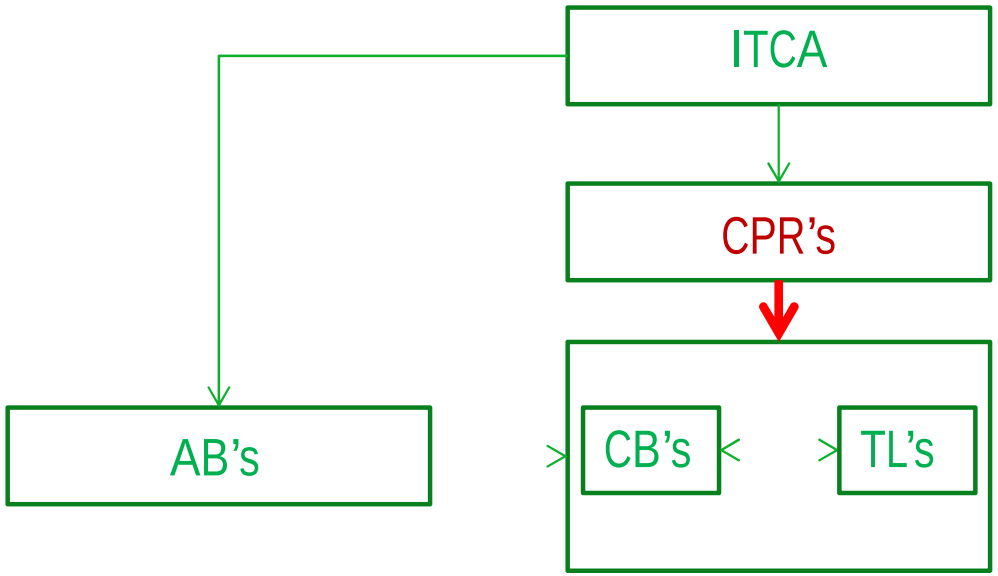
Functions and Requirements



Certification Scheme Framework

Functions and Requirements



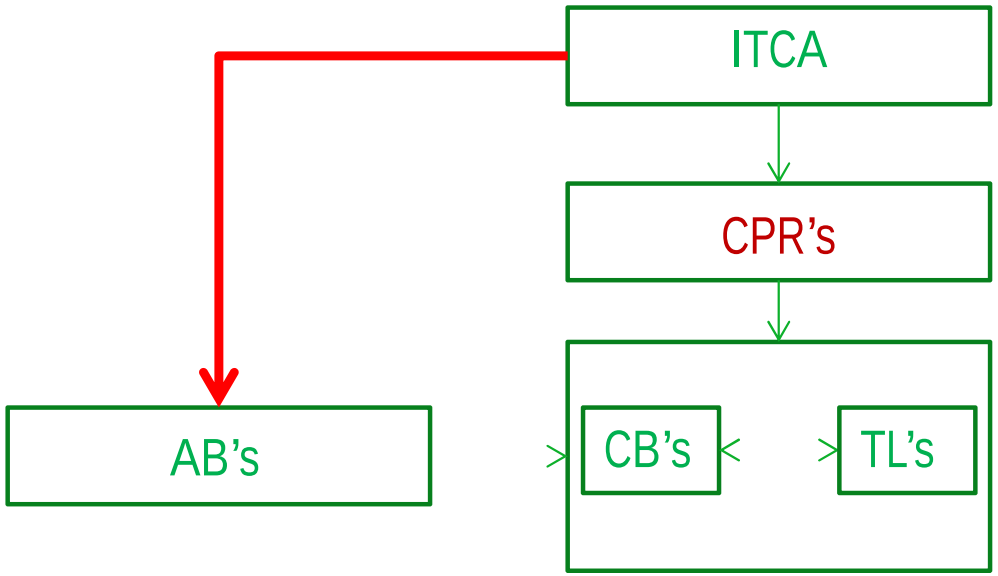


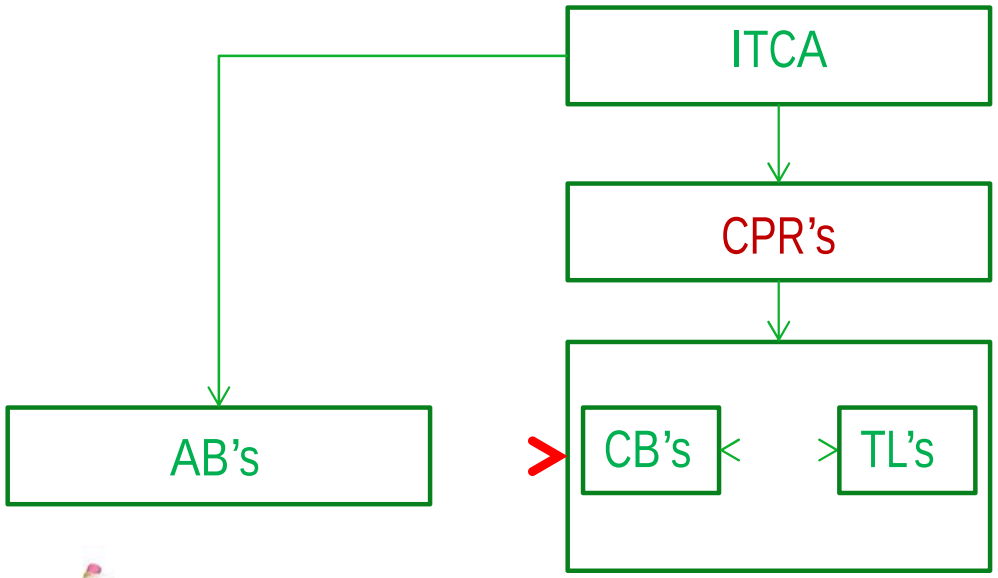
CBs and TLs develop systems to participate in the ITCA Certification Program

- TL layers CPRs into ISO 17025 system
- CB layers CPRs into ISO Guide 65 system

ITCA works with AB

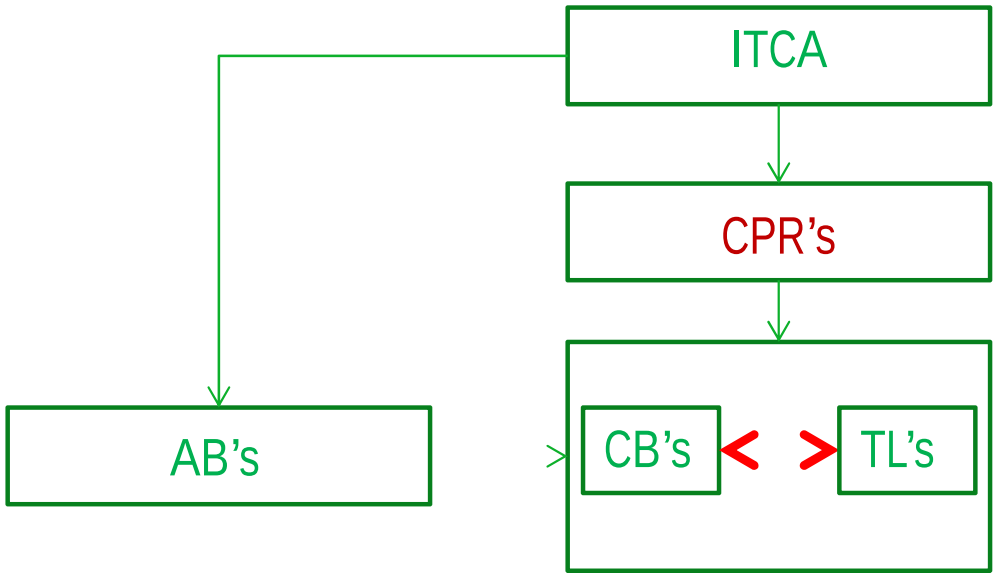
- Identify TL / CB requirements
- Expertise on audit team

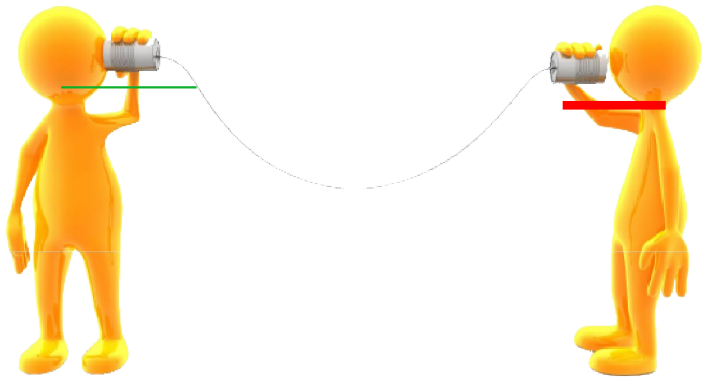




CBs and TLs seek AB accreditation

- AB assesses to ISO Standard + CPRs
- AB maintains accreditation





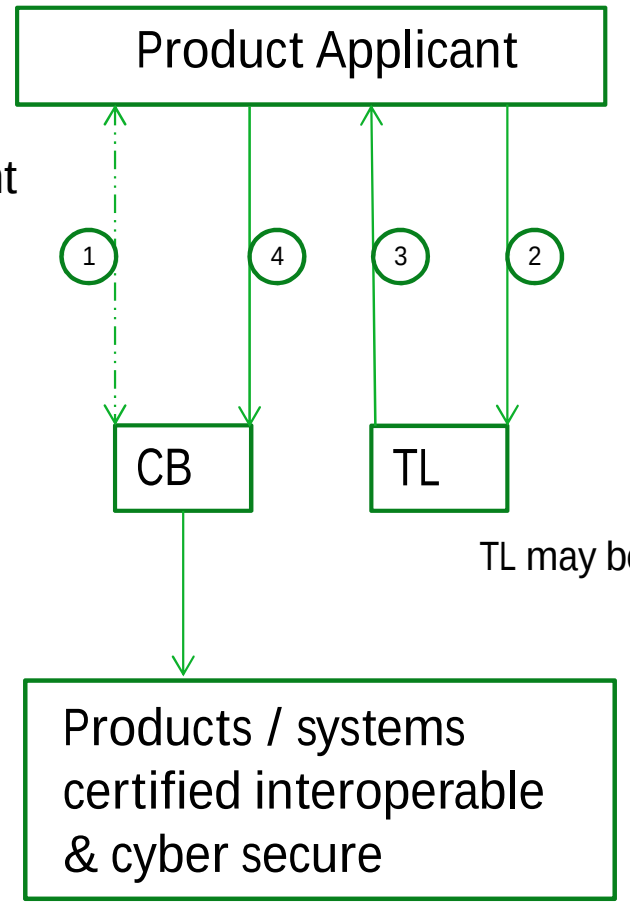
CBs and TLs MAY interact

- CB must review TL test data
- CPRs must identify required interactions

Product Applicant

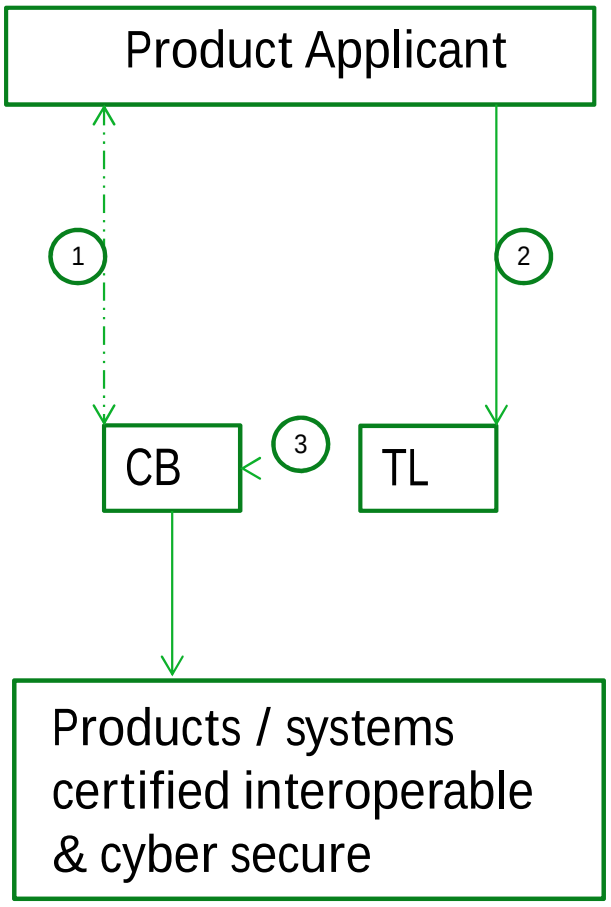
Logistics of product submittal

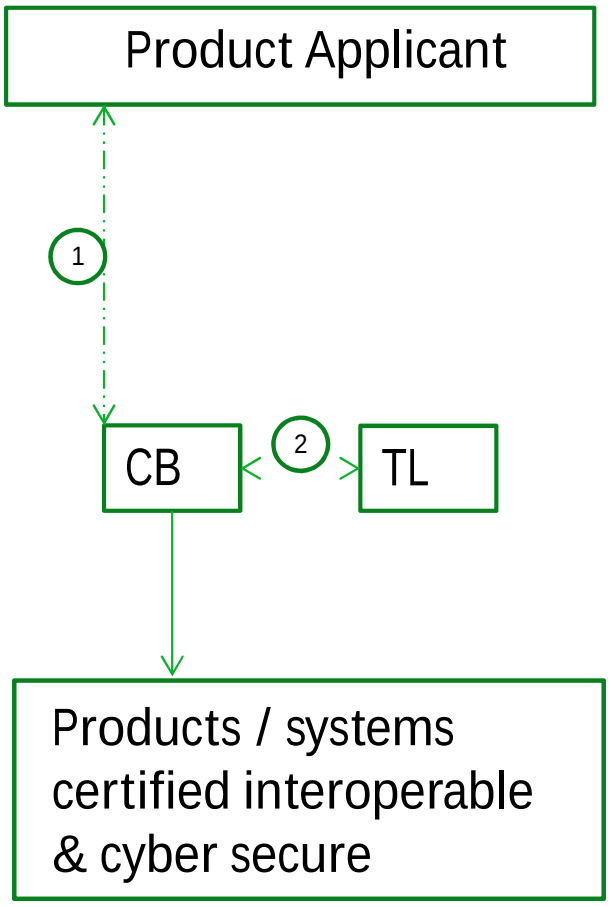
1 – Long term arrangement
- Certificate control
- Product changes
- Surveillance

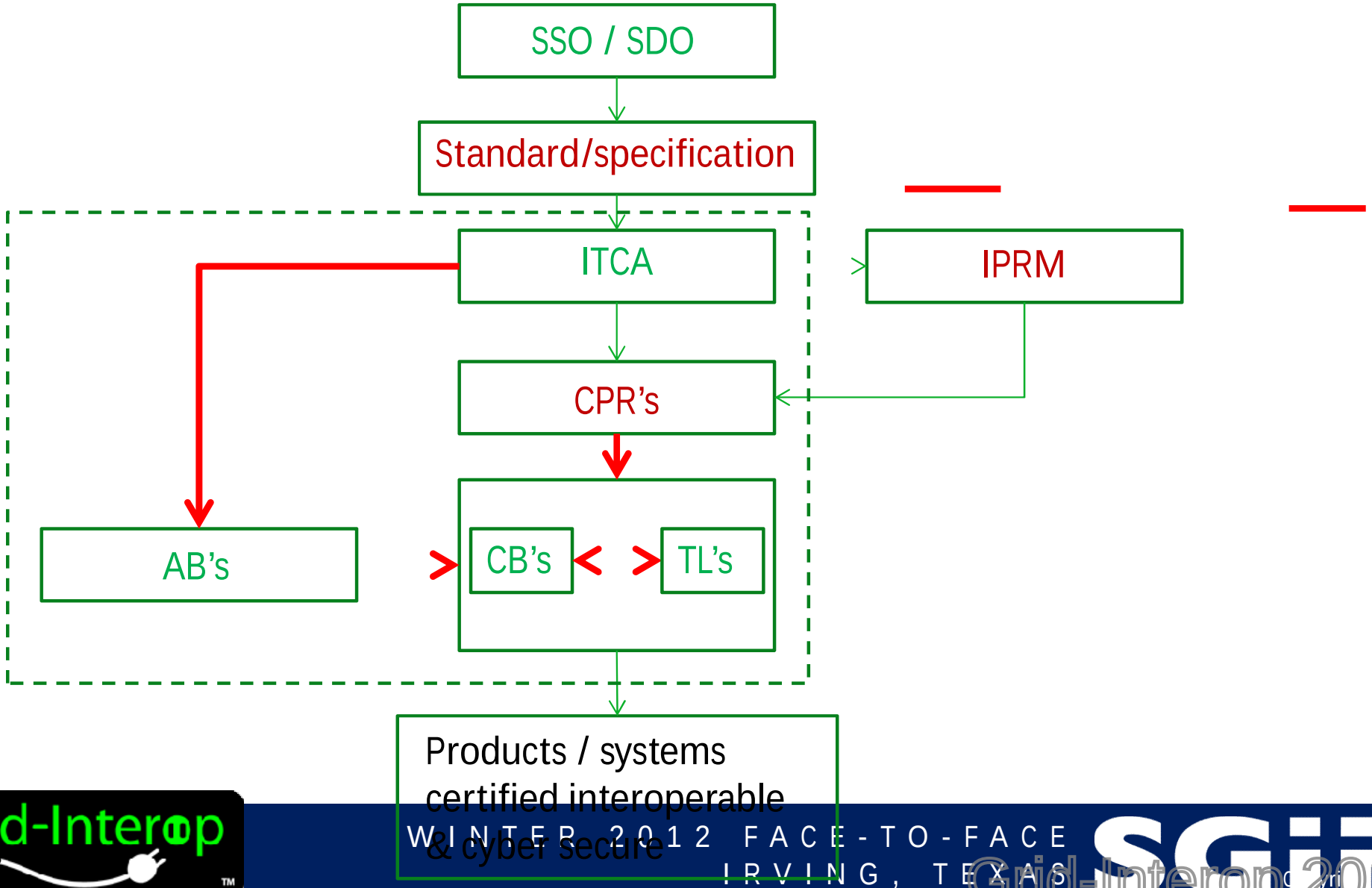


2 thru 4 – Product under evaluation
- Testing
- Test documentation

TL may be 1st, 2nd or 3rd party



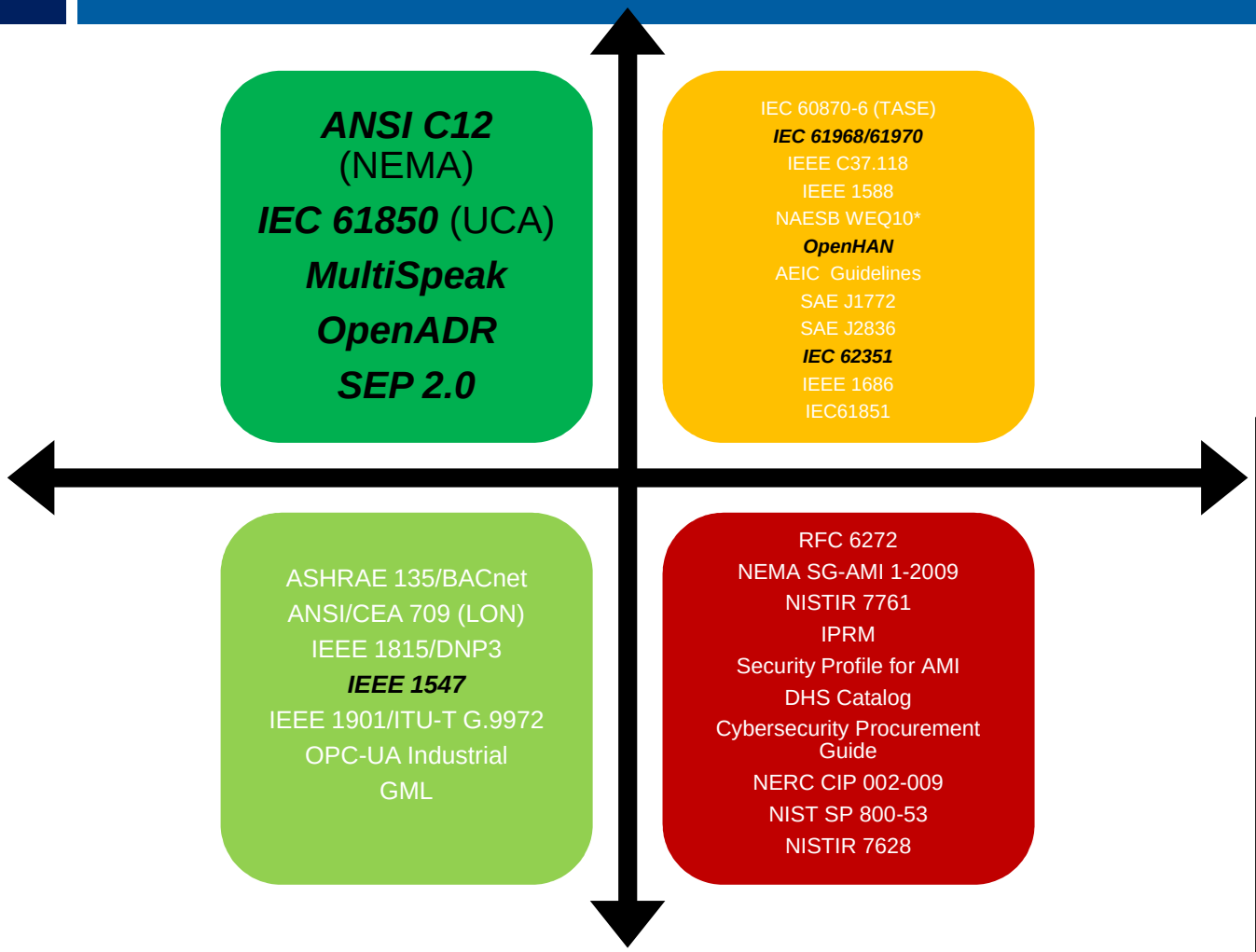




Framework 2.0 Priority Standards

- Thirty-Four Smart Grid standards shown in Table 4-1
  - Five standards associated with ITCA program that have declared IPRM implementation (one additional is formative)
    - One additional standard has formative activities occurring
  - Seven standards have known programs of various styles where program operators have not engaged with SGIP on the IPRM
  - Twelve have either miscellaneous industry test services (periodic test events, some lab services, or no known programs
    - This category suggests formalized programs may be applicable, but does not assess whether or not programs are financially viable (i.e. is there sufficient demand relative to program operations costs)
  - Ten do not appear to be applicable to ITCA/IPRM programs
    - These are mostly process guideline documents, not product specific

FW 2.0 Standards – State of Industry Test Programs



- **ITCAs In Development**
- **Industry Test Programs**
- **No Standardized Testing**
- **Not Applicable for ITCA programs**

Additional FW2 Standards

ANSI C12.22-24
Packet Cable SMA
GPS Signal Specification
IEC 61400-25
ITU G.9960/9961 (G.hn)*
IEEE P1901*
1901.2/G.hnem
ISO/IEC 8824
ISO/IEC 12139
IEEE 802
TIA TR-45/3GPP
3GPP Stds. Family
ETSI GMR-1 3G
ISA SP100
NMS Stds.
ASHRAE 201P
NIST SP 500-267
Z-wave
IEEE 2030
IEC 60929
IEC/TR61000 (EMC)
IEC 62056
IEC PAS 62559
IEC 60870
IEC 60255-22
IEC CISPR 22/24
IEEE C62.022
IEC 61326x
IEEE 1560
IEEE 1613
IEEE P1642

IEEE 473
IEEE P1775
IEEE C63.16
IEEE C37.90
IEEE C37.2
IEEE C37.111
IEEE C37.232
IEEE 1159.3
IEEE 1379
ISO/IEC 15045
ISO/IEC 15067-3
ISO/IEC 18012
NAESB OASIS
NAESB WEQ015
OASIS EI
FIXML
OASIS oBIX
SAE J2847/2-3
WC3 SOAP
W3C WSDL
W3C XML
W3C XSD
W3C EXI
DOT NTCIP 1213
OpenADE
UL-1741
ISA SP99
ISO27000
NIST FIPS 140-2
OASIS WS-Security

Note: The above analysis is a preliminary update to the initial landscape review, full detail review is in progress

Roadmap for ITCA Program Acceleration

- SGTCC collaboration and support for programs in formation
- Develop value proposition to move non-participating test services towards the IPRM model
  - Challenges include implementation costs and financial benefit (some don't see ROI) – smaller revenue programs in particular
- Need to develop a demand driver – until end customers require, there is little motivation for ITCAs and vendors to be aggressive in enhancing T&C activities
- Prioritize the standards currently without programs and develop associated action plans

SGTCC Path Forward and Challenges

- Building utility demand for certified products via ITCAs that comply with IPRM recommendations
  - Demand driver needs to be strengthened via utility purchasing requirements; will drive urgency amongst ITCAs, labs, etc. for aggressive implementation; accreditor service availability also gated by demand by labs/certifiers
- Gaps in standards/interoperability test plans
  - Standards without associated testing practices
  - Sufficiency of ITCA test programs to satisfy utility/end user needs
  - Cross-standard and End to End interop testing practices
  - CoS entries – are they testable?
  - Efficiencies in cross-utility acceptance of test results
- Resource limitations to address testing needs
  - Significant volunteer resources needed to address the many needed programs
  - Most standards provide minimal guidance on how to test and demonstrate conformance