CALLAB SOLUTIONS
Fusing Software With Metrology

Creating a Standardized Schema for Representing ISO/IEC 17025 Scope of Accreditations in XML Data

Speaker/Author:

David G. Zajac

Cal Lab Solutions

dzajac@callabsolutions.com

This Presentation Will Be:

- Exciting!!! (Not a chance,... it's technical...) NO!
- Informative (Nope. You'll have to read the paper.) NO!
- Tell you **what** is in the subject paper (refer to above) NO!

Tell you **why** you should read and study the subject paper YES!

Be an open invitation to contact the Author/Presentor for follow on discussions, demos, collaboration, etc. YES!

This Presentation is concerned with:

- ✗ Scope of Accreditations
- ✗ Cal Lab Solutions, Inc., Software or Services
- ✗ Certificates of Calibration / Test Reports
- ✗ Database Schemas or XML

Uncertainties on **ISO/IEC 17025 Compliant** Test Reports

Isn't this a bit off topic?

The Machinery Information Management Open System Alliance (MIMOSA)

http://www.mimosa.org/mimosa/

"What is MIMOSA?"

"MIMOSA is a not-for-profit trade association dedicated to developing and encouraging the adoption of open information standards for Operations and Maintenance in manufacturing, fleet, and facility environments. MIMOSA's open standards enable collaborative asset lifecycle management in both commercial and military applications."

Serves as an example of how both competitors and their customers can work together cooperatively to achieve the development of standards enabling the open information interchange of data originating from Test Measurement and Diagnostic Equipment and the benefits that can accrue to all participants as a result.

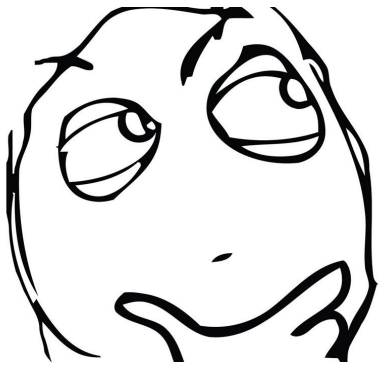
A role model we in metrology can follow.

A lesson learned - Metrology.NET™ - The importance of a Trade Mark.

wrong

The proper formula for an uncertainty on a ISO/IEC 17025 Test Report is a function of Type A and Type B Uncertainties

$$U = f(U_A, U_B)$$



What's Wrong With That ???

The Calibration Measurement Capability (CMC) must be taken into consideration for an ISO/IEC 17025!

$$U_k = f(U_A, U_B); \text{ typically } \sqrt{(U_A)^2 + (U_B)^2}$$

$$U = f(U_k, CMC) = max\{U_k, CMC\}$$

On the last slide the **CMC** from the **Scope of Accreditation** **was not included**!

Got It!

Calculating Uncertainties...
when is it going to get interesting?

A Whole Paper on that? Seriously?

(boring)

Automating Equipment Control and Measurement Collection is **Old Hat**!

(nothing new here)

Automating the Statistical Formulas for Type A and Type B Uncertainty Calculations is **Straightforward**.

The Availability of a Max(value1, value2) Function is **Ubiquitous**!

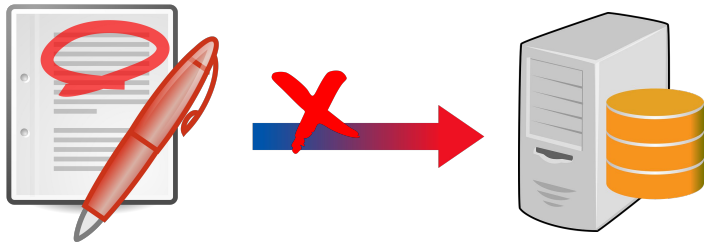
(just fell asleep)

???

But... How can you **readily** get the **CMC** directly **from** the **Scope of Accreditation???**

(Of course that must be a trick question...
That's just not possible!!!)

(Seriously, it is worth a whole paper.)



Problem - Automatically Getting the CMC from a Scope of Accreditation document is a very complex problem.

- **Scope of Accreditation Document is the legal reference source for CMCs**

- **Yet, there is no standard mechanism for synchronizing the CMC statements in a Scope of Accreditation document with a queryable database.**

The Proposed Solution?

Reverse the Problem

1. Create the CMCs in a database
2. Automatically generate the Scope of Accreditation document from that database

(Duh… What's so hard about that?)

The Devil is in the Details!

The Details are in the Subject Paper!

Yes, you have to read and study the subject paper. There is simply too much detail to fit in a briefing.

Data Analysis: What is a CMC? SOA?

Metrologist - A CMC is an uncertainty figure.

Data Analyst - A CMC is a mathematical formula. It is comprised of functions, operators, and operands. It reduces to a fixed value only after all values of variables have been assigned and the function has been evaluated producing a resultant value.

Metrologist - A Scope of Accreditation (SOA) is a legal document specifying the best uncertainties to which a calibration laboratory has been accredited by an external accrediting body.

Data Analyst - A SOA is a database containing CMCs and criteria (keys) by which a particular CMC may be uniquely selected.

MII - All key to the creation of a MII (Metrology Information Infrastructure) & Metrology.NET® Standardized data format

Metrology.NET™ Schema and Compliant Databases

Rigorous yet generic structure of all data contained in SOA:

- All data organized for algorithmic rather than human processing
- All data locatable and retrievable without ambiguity or transcription error.
- All mathematical results, variables and the sources of values defined and documented. Active Measurement Quantity and Unit of Measurement validation for all formula values and results.
- All technical terms linked to definitions or encyclopedic-like articles
- Expandable repeating and hierarchical structures - Not fixed filing system.
- Intelligent data validation / helpful error diagnostic messages
- Flexible data value entry in presentation format

Spin Offs

- The solution to this problem required the development of a better (unambiguous) method for data structures holding Measurement Quantities and Units of Measurement, their conversion, and printed presentation.

- The same underlying technology used to generate a Scope of Accreditation document from its database, may be applied to the creation of many metrology related paper-based products (i.e., Test Reports, Calibration Labels, or Certificates of Calibration of arbitrary complexity), without the requirement of any proprietary software.

- The data structures employed to fully represent a Scope of Accreditation are highly re-usable and should be a super-set which may be pared down to solve other high complexity metrology related data structure problems such as the representation of equipment capabilities, or self-documenting uncertainty calculators.

- This project has the potential to foster further collaborative development of non-proprietary, open-source software and open metrology standards.

The Beginning of a Journey

- The information technologies and concepts employed in the proposed solution are very advanced and highly complex. It can not be assumed that they can be grasped without either serious study or substantial pre-existing computer science knowledge. It should therefore be expected that although the proposed solution is in the domain of metrology, relatively few metrologists will be capable of mastering their details.

- The layout of a Scope of Accreditation document can not be arbitrarily re-designed by Cal Lab Solutions, Inc. The body of accrediting agencies must be involved and be in concurrence with any such re-design.

- The somewhat radical approach taken in the proposed solution, which resulted in the definition of entirely new computer domain specific systems for non-ambiguous Measurement Quantities and related Units of Measurement, are significant enough on their own merit that it is recommended that they should be presented for separate review by the greater metrology community.

Summary

- Every Uncertainty on a ISO/IEC 17025 compliant Test Report must be greater than or equal to the corresponding CMC contained in the laboratory's Scope of Accreditation.

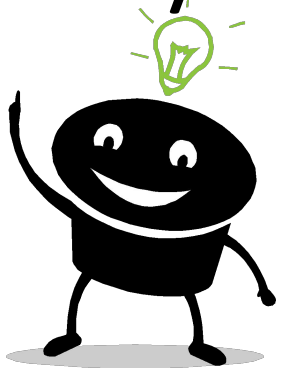
- A method has been proposed in the subject paper to enable a standard mechanism for creating automated solutions to the above problem.

- The proposed solution is complex, but the complexity is unavoidable given the complexity of the underlying problem.

- The proposed solution is not a finished product. Its completion will require the cooperation and collaboration of many participants that exist within the greater metrology community external to Cal Lab Solutions, Inc. Cal Lab Solutions, Inc., has undertaken this effort without external sponsorship, and taken this effort as far as it can on its own.

CALLAB SOLUTIONS
Fusing Software With Metrology

Questions? / Comments



David G. Zajac
Cal Lab Solutions
dzajac@callabsolutions.com