Progress Report Standardized XML Representation of ISO/IEC 17025 Scope of Accreditation Data

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Where This Started

Let's Stop the Madness!

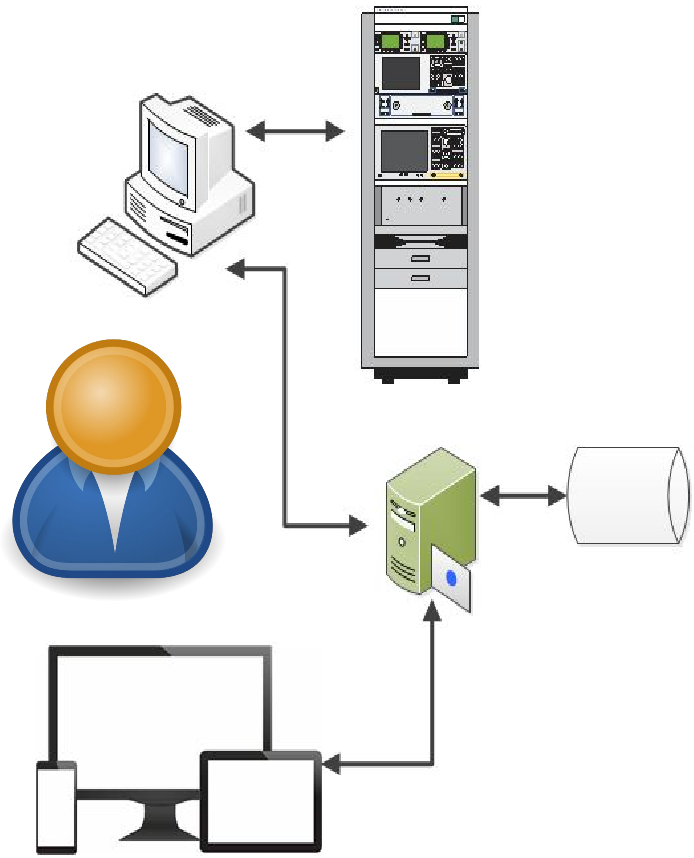
We copy results from Spreadsheet calculations into Word documents we send to the Accreditation body and get back a PDF document.

Accredited Capabilities are 100% disconnected from:

- **our original uncertainty calculations, and**
- **our daily calibration product.**

What is needed is a way to tie all this data together!

Uncertainty Check On Every Test Point



Measure

Report

Archive

Combine
Type A & Type B
Uncertainties

Check Scope of Accreditation

If test point calculated uncertainty is less than the SoA uncertainty, then use SoA uncertainties and store the test point uncertainties for next accreditation, otherwise use test point calculated uncertainty.

* Mark data point as Verified Accredited.

Now Part of a Larger Effort

Measurement Information Infrastructure (MII)

Multi-Party Initiative

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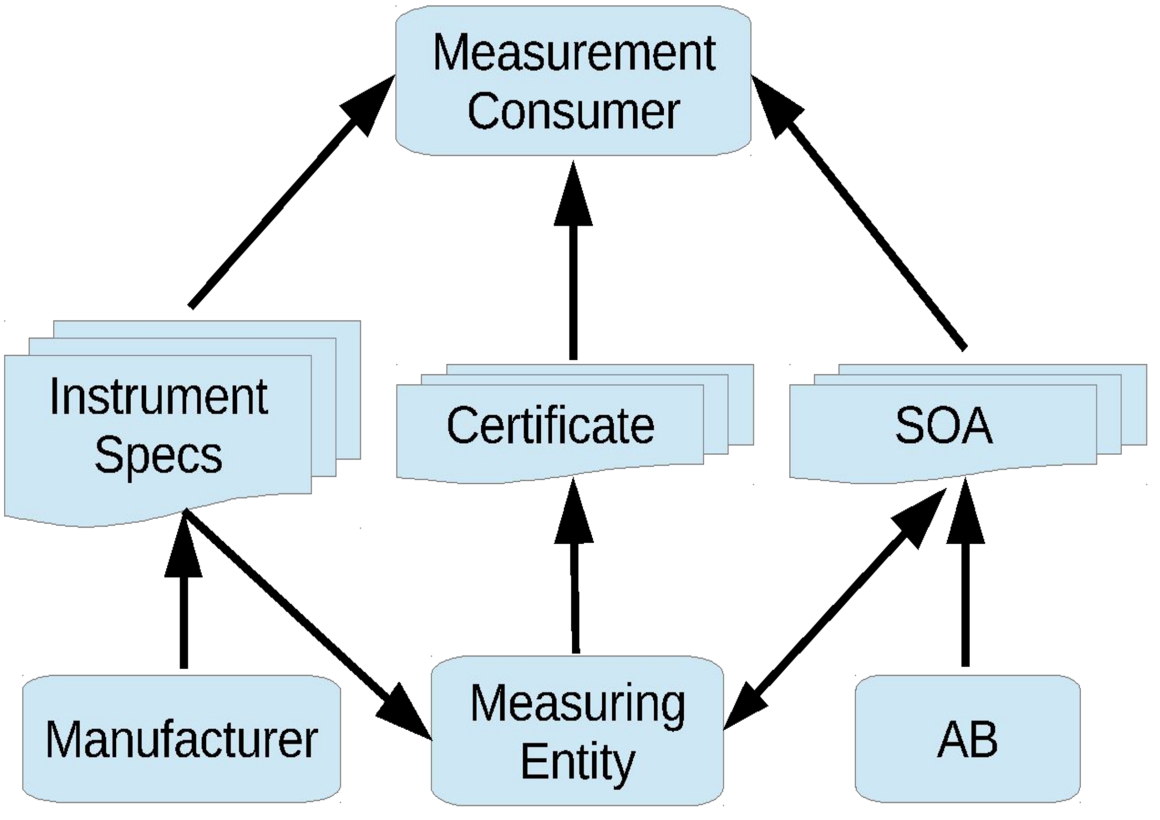
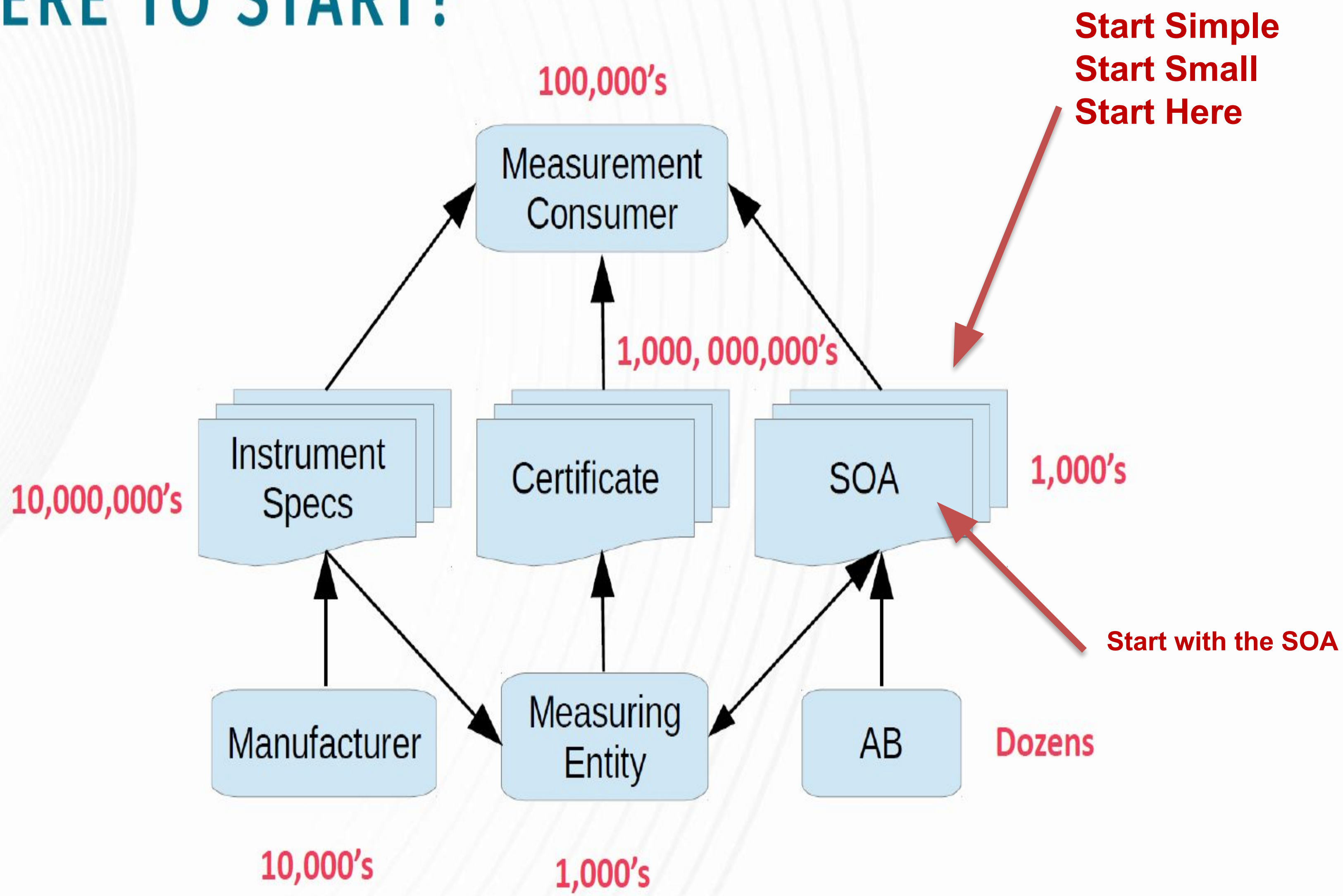
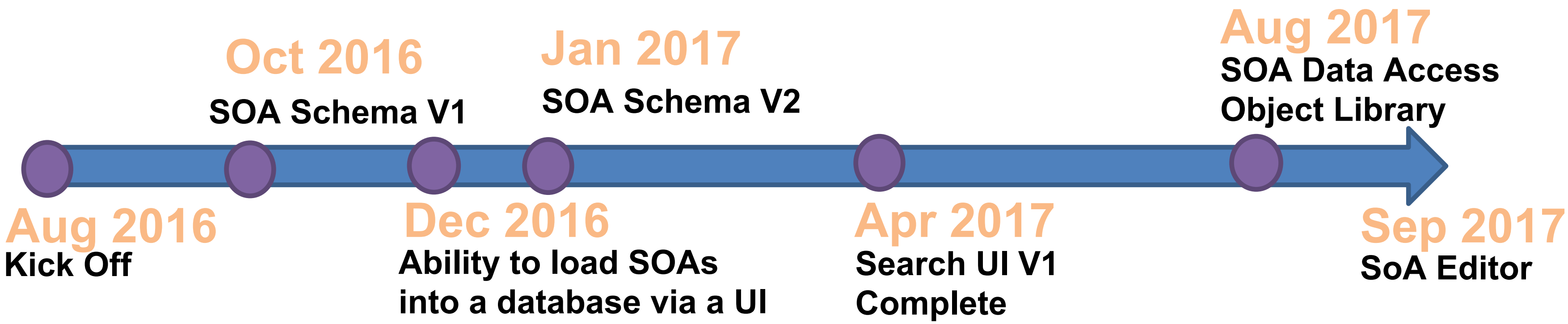
MII Grand Map



WHERE TO START?



MII Timeline



There is a Measurement Information Infrastructure (MII) Group that has been meeting once a week for the last 9 months.

- Building a FREE SoA Editor for calibration labs and accreditation bodies
- Creating a standard XML Schema for storing and exchanging SoA data
- Demonstrating the power of search tools
- Demonstrating how to verify uncertainties against SoA on every calibration
- Creating a database with tons of SoAs

Open Source Project (GPL-3 License)
https://github.com/CalLabSolutions/Metrology.NET_Public

Joining the Team?

This team is defining, testing, and validating machine readable standard files and tools for storing and communicating with a lab’s CMCs (Calibration Measurement Capabilities).

We already have!

A Great Programming Team

Created a Solid beta version

Created a Search tool

Open Sourced the Technology

Our Door is Open!

People who are motivated

Excited to Define a Standard

Have SOA or Metrology Knowledge

Can Work with the Group

MII - A Challenging Problem Domain

Much has been accomplished.

Much still remains.

A place for everything, everything in its place

Benjamin Franklin

Complex Data - Four Columns

- When data doesn't fit, MII has a Solution.

Parameter/Equipment	Range	CMC[2] (±)	Comments

- Typical SOA column headings

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments

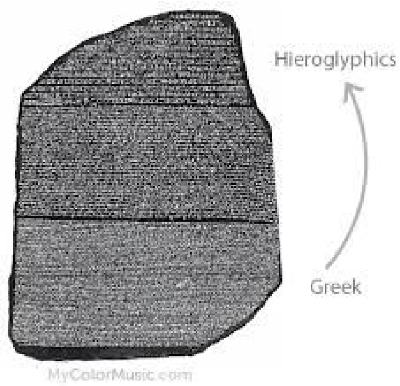
- The data didn't fit - variation required

Parameter/Range	CMC[2] (±) Magnitude	CMC[2] (±) Phase	Comments

- Again the data didn't fit - another variation required

The MII Solution - A Place For Everything

Unit of Measurements
The UOM Database
a Rosetta Stone



- **When UOMs are ambiguous, MII has a Solution.**

What Language do you Speak?

Unit of Measure “fpm” ???

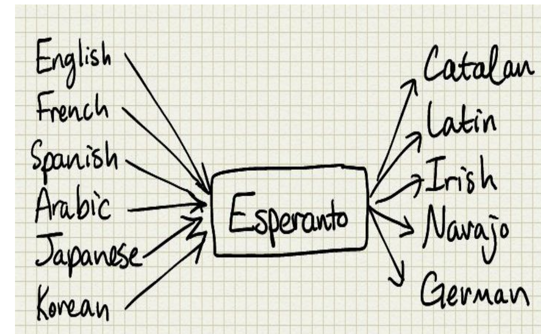
- Speaking Anemometers? - “Feet Per Minute”
- Speaking Tachometers? - “Flashes Per Minute”

Measurement Quantities

The Esperanto of Units of Measurement

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Velocity[3, 7] – Measure	(0 to 300) fpm (0 to 1250) fpm	2.0 % + 5.1 fpm 2.1 % + 4.7 fpm	Alnor 6006AP

Stroboscopes	(1 to 12 500) fpm (20 to 100) kfpm	0.019% rdg + 0.64 fpm 0.058% rdg + 0.5 fpm	Digital Tachometer



Employing the UOM Database - "fpm" is ambiguous - flash rate or speed?

Problem	The UoM Database			
UOM Symbol By Itself	**Unambiguous Quantity**	**Singular Base Unit of Measure**	**Convertable to UoM Alternatives**	**Can be Aliased as Symbol**
"fpm"	**"flash-rate"**	"flashes-per-second"	"flashes-per-minute"	"fpm"
"fpm"	**"speed"**	"meters-per-second"	"feet-per-minute"	"fpm"

The MII Solution - All Values Paired with Quantities

Needing to use deduction

- **When deduction is required, MII has a Solution.**

Liquid Flow Rate [1]	(0.06 to 400) lpm	0.1 % of reading	Coriolis Flow System
	(2 to 48) in lines	1 % of reading	Ultrasonic Flow Meters

- **"in lines":** (Needed to call the laboratory for an explanation.)

Thread Wires	(4 to 80) pitch	8.0 µin	Mechanical comparison
		(5 + 3.8*D*) µin	Laser micrometer

- **"pitch"**: Threads Per Inch? (probably, but…still an assumption!)

Reflection S_{11}/S_{22} – Measure 50 MHz to 500 MHz	(0.00001 to 1.0) lin	(0.0082 to 0.029) lin (1.7 to 180)°	HP 8720C w/ 85052D

- **"lin"**: (obviously, the alternative to "log")

The MII Solution - Embedded Documentation

All the Information is there, yet...

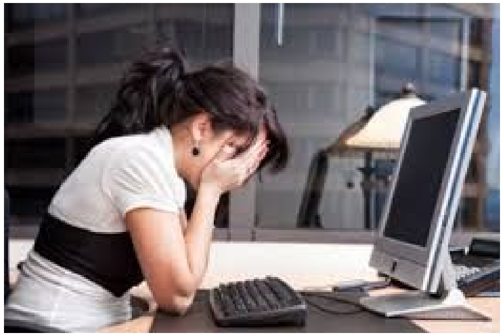
- **When layout makes a difference, MII has a Solution.**

Waveguide Calibration Factors (0.1 to 10) mW			
X band (WR-90)	(8.2 to 12.4) GHz	1.8 % CF	Agilent X486A
Ku band (WR-62)	(12.4 to 18) GHz	1.8 % CF	Agilent P486A
K band (WR-42)	(18 to 26.5) GHz	1.8 % CF	Agilent K486A
Ka band (WR-28)	(26.5 to 40) GHz	1.8 % CF	Agilent R486A
Q band (WR-22) (0.1 to 4.0) mW	(33 to 50) GHz	$(0.15f - 2.8)$ % CF	Agilent 8474E with adapter f = frequency in GHz

- Does (0.1 to 10) mW apply to Q band (WR-22),
- or does (0.1 to 4.0) mW apply to Q band (WR-22)
- In either case, what does this power statement mean?

The MII Solution - Formal Data Structures

Typos, Special Cases, Overlapping Ranges



- **When data is questionable, MII has a Solution.**

DC Voltage – Generate	(0 to 220) mV (220 to 2.2) V (2.2 to 11) V (11 to 22) V	4.2 µV/V + 0.4 µV 2.3 µV/V + 0.7 µV 1.1 µV/V + 2.5 µV 1.1 µV/V + 4 µV	Fluke 5720

1. **Did they really mean 220V to 2.2V?** **(Range Start > Range End)!**
2. **220mV * 4.2µV/V + 0.4µV = 1.32µV**
3. **220mV * 2.3µV/V + 0.7µV = 1.21µV**

Same point, Different Uncertainties!

Risetime	(10 to 90) % (20 to 80) %	2.8 ps 2.1 ps	High-bandwidth digital sampling system; substitution method with NIST calibrated

Overlapping Ranges? Risetime - These are not Ranges! are different Tests!

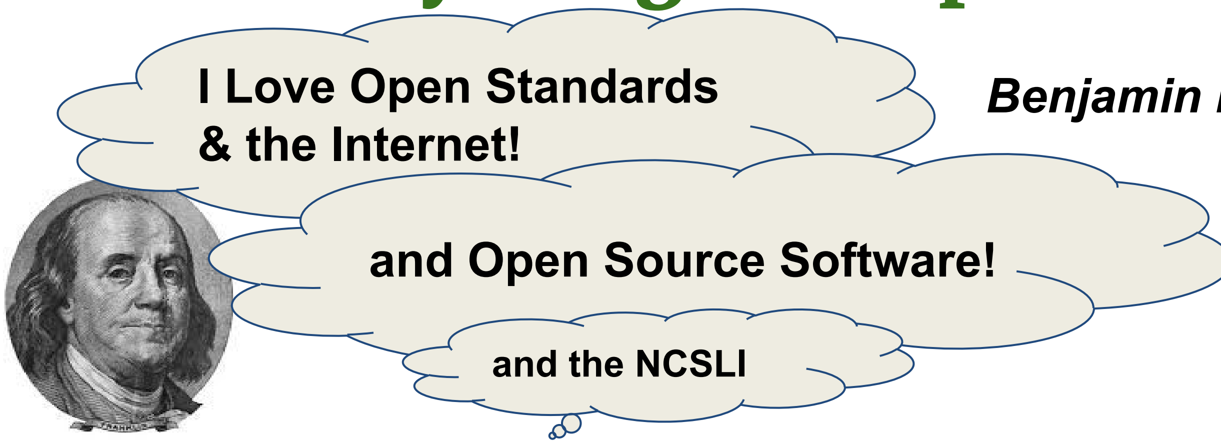
Frequency - Source[3]	0.01 Hz to 2 MHz 10 MHz	2 µHz/Hz + 8 µHz 1 part in 10^{-11} Hz	Fluke 5520A SC1100 Spectracom 8194

1 part in 1 hundred billionth of a Hertz? (I don't think they meant that!) **Bad UoM!**

The MII Solution - Metrology Data - Not just Office Text

The MII Solution Set

A place for everything, everything in its place



Benjamin Franklin

1. http://schema.metrology.net/SOA_Master_Datafile.xsd
2. http://schema.metrology.net/Uncertainty.xsd
3. http://schema.metrology.net/MetrologyTaxonomyCatalog.xsd
4. http://schema.metrology.net/Uom_Database.xsd
5. http://testsite2.callabsolutions.com/UnitsOfMeasure/UOM_Database.xml
6. https://github.com/CalLabSolutions/Metrology.NET_Public

More to come - New NCSLI Committee - Keeping You Abreast

Join the Team

Do you have what it takes to create a Metrology Standard?

- Editor Tool Release - Q3 2017
- Search Tools Release - Q4 2017
- Education & Training Begins in 2018

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Questions? / Comments

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