European Partnership on Metrology
Call 2024 –Digital Transformation, Green Deal, Normative and Research Potential

Selected Research Topic number: **SRT-d11**
Version: 1.0

Title: Digital workflows, technical frameworks and e-services for digital reports in metrology

Abstract

To meet the needs of their customers, metrology institutes need to adapt to accessible, machine-readable data, necessitating the provision of digital documents or interface requests. Submitted proposals should aim to establish a data processing chain for machine-readable digital reports, laying vital digital infrastructure. The development of tools, frameworks, and digital process management solutions, will facilitate smoother transitions into digital workflows, thereby optimising operational efficiency and enhancing overall service delivery.

Keywords

Digital transformation, digital workflows, technical frameworks, harmonisation approaches, modularisation approaches, FAIR data, machine-readable documents, calibration measurement data, data governance, digital calibration certificates.

Background to the Metrological Challenges

The users of metrology solutions have a pressing need for the development of harmonised terminologies and document structures for smart documents, e.g., digital calibration certificates, to enhance the efficiency, reliability, and accessibility of metrological data and services. Stakeholders, such as calibration laboratories, need to be able to automatically transfer data from their measurement stations to the data processing platform of the actual measurement protocol. The development of dynamically adaptable data acquisition systems that can accommodate evolving data streamlines is urgently needed for a variety of purposes such as certificate generation, key comparison measurements, and long-term performance monitoring. Moreover, there is a growing demand for interoperable systems capable of covering the capabilities and properties of various measurement devices.

Customers with substantial amounts of measurement devices are not supported with automated service request tools and face bigger logistic/administrative efforts. Processes including human operations, e.g., related to the documentation and handling of calibration data, will typically require several inspection and approval procedures to prevent the occurrence of human errors. Documents provided by NMIs, need to be visually analysed by customers to add relevant administrative and measurement data obtained from the certificates into their own systems, if available. NMI customers are asking for customer interfaces to access and retrieve calibration relevant data with respect to their own devices. Without adequate streamline technologies, NMIs face the challenging task of providing large amounts of data to such customer interfaces.

Currently, NMIs lack the necessary frameworks to adapt their backend data systems to meet the demands of internal customer-oriented applications for quality assurance, service, and research purposes.

While some ongoing research projects focus on the layout and content of smart documents, such as digital calibration certificates, there is a notable absence of international initiatives dedicated to developing digital infrastructures. These infrastructures would facilitate the seamless transmission, validation, verification, and processing of measurement data, essential prerequisites before establishing digital certificates. Indeed, before a digital certificate can be generated, it is imperative to ensure that the measurement protocols related to it are interoperable and accessible. This initial step forms the foundation of the entire data workflow, culminating in the creation of a final smart document for the customers.

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Objectives

Proposers should address the objectives stated below, which are based on the PRT submissions. Proposers may identify amendments to the objectives or choose to address a subset of them in order to maximise the overall impact, or address budgetary or scientific / technical constraints, but the reasons for this should be clearly stated in the protocol.

The proposal shall focus on metrology research necessary to support digital transformation in laboratory measurement systems by harmonising and modularizing their data workflow processes and infrastructure.

The specific objectives are:

1. To develop a technical framework within at least two metrology fields, for consistent, uniform, and seamless data transfer across different systems. This will include the establishment of standardised calibration data transfer procedures.
2. To validate and verify Information and Communications Technology (ICT) communication channels, particularly machine-to-machine communication, by implementing rigorous testing methodologies in at least two metrology fields for at least two calibration measurement protocol structures.
3. To establish cross-institutional comparison methods that can scale up for automated calibration data transfer. This will include the development of protocols and tools that enable seamless data exchange and interoperability.
4. To develop and integrate machine learning tools into the digital infrastructure to improve the statistical analysis of devices under test (DUT) trough metrological fields and organisational structures. This will include benchmarking the tools to demonstrate improved reliability of data analysis and increased data transparency.
5. To facilitate the take up and long-term operation of the developed capabilities, technology, and data transfer infrastructure for digital workflows and e-services by the measurement data workflow chain (NMIs, DIs, calibration and testing laboratories) and end-users (industry, instrument manufacturers). The approach should be discussed within the consortium and with other EURAMET NMIs/DIs, e.g. via EURAMET TC-IM and EMNs, and WELMEC/OIML to ensure that a coordinated and optimised approach to the development of traceability in this field is developed for Europe as a whole.

These objectives will require large-scale approaches that are beyond the capabilities of single National Metrology Institutes and Designated Institutes. To enhance the impact of the research, the involvement of the appropriate user community such as industry, standardisation and regulatory bodies, and other European Partnerships is strongly recommended, both prior to and during methodology development.

Proposers should establish the current state of the art and explain how their proposed project goes beyond this. In particular, proposers should outline the achievements of the EMPIR projects 17IND02 SmartCom and 17IND12 Met4Fof and Metrology Partnership project 21SCP01 DCC2GO and how their proposal will build on those.

Proposers should note that the programme funds the activity of researchers to develop the capability, not the required infrastructure and capital equipment, which must be provided from other sources.

EURAMET expects the average EU Contribution for the selected JRPs in this TP to be 1.9 M€ and has defined an upper limit of 2.4 M€ for this proposal.

EURAMET also expects the EU Contribution to the external funded beneficiaries to not exceed 35 % of the total EU Contribution across all selected projects in this TP.

Any industrial beneficiaries that will receive significant benefit from the results of the proposed project are expected to be beneficiaries without receiving funding or associated partners.

Potential Impact

Proposals must demonstrate adequate and appropriate participation/links to the 'end user' community, describing how the project partners will engage with relevant communities during the project to facilitate knowledge transfer and accelerate the uptake of project outputs. Evidence of support from the "end user" community (e.g. letters of support) is also encouraged.

You should detail how your proposal's results are going to:

- Address the SRT objectives and deliver solutions to the documented needs,
- Feed into the development of urgent documentary standards through appropriate standards bodies,

- Facilitate improved industrial capability, or improved quality of life for European citizens in terms of personal health, protection of the environment and the climate, or energy security,
- Transfer knowledge to the metrology community and calibration laboratories.

You should detail other impacts of your proposed JRP as specified in the document “Guide 4: Writing Joint Research Projects (JRPs)”

You should also detail how your approach to realising the objectives will further the aim of the Metrology Partnership to develop a coherent approach at the European level in the field of metrology and include the best available contributions from across the metrology community. Specifically, the opportunities for:

- improvement of the efficiency of use of available resources to better meet metrological needs and to assure the traceability of national standards
- the metrology capacity of EURAMET Member States whose metrology programmes are at an early stage of development to be increased
- organisations other than NMIs and DIs to be involved in the work.

Timescale

The project should be of up to 3 years duration.