EMPIR Call 2017 – Industry, Fundamental, Normative and Research Potential

Selected Research Topic number: **SRT-i27**
Version: 1.0

Title: Communication and validation of smart data in IoT-networks

Abstract

The major obstacle for a reliable and safe communication of data within the Internet of Things (IoT)-networks is the rapidly growing availability and use of networked measurement systems, which are connected via manifold communication interfaces, data formats and security concepts. Cloud storage and services are state-of-the-art, however research into data exchange and data structure addressing the requirements from legal metrology and calibration services has yet to emerge. Therefore in order to meet actual and future demand for the application of IoT-networks, data requirements, data validation, digital calibration certificates and a safe and unambiguous technology and measurement infrastructure are required.

Keywords

Data Security, Internet of Things (IoT), Cloud Services, IoT networks, smart data, digital calibration certificates

Background to the Metrological Challenges

Communication and data exchange are growing rapidly in today's highly interconnected world. In 2016 the global data traffic of mobile devices grew by 63 % and reached 7.2 exabytes per month with 429 million new devices and connections being added, and it is expected that in 2021 the mobile data volume will reach 0.5 zetabytes. Some innovative standard applications of the future are already gathering momentum while others like smart metering in households for the accounting of water and/or gas consumption are already in place. However, the use of manifold interconnections and cross-communication could lead to unintentional loss or misinterpretation of data, insecure/hazardous actions or inaccurate/wrong indications. Therefore a complete metrological chain following the path of the information from sensor to verification is needed. Huge interest in solving these problems addressing aspects of unambiguous, secure and reliable data communication and verification has been shown by NMIs worldwide and industrialised regions outside Europe are planning to develop and provide such systems and structures for their companies within the next few years. Thus European industry needs to catch up and close this emerging gap otherwise it will suffer.

Many countries with significant business within the manufacturing industry have declared IoT as a high-tech strategy, however targeting a commonly agreed concept for communication of networked systems on a global level does not yet exist. In contrast, well-established branches of industry such as the automotive sector, or developers of enterprise application software, have started to define their individual IoT concepts. Therefore the metrology and agreed concepts for the communicating measurement data via the IoT concepts is urgently needed.

Measurement plays an essential role in all fields where sensors are involved, including manufacturing and production control. Therefore, reliable measurement communication via IoT-networks are needed to support data-format validation, provision and testing of digital calibration certificates. Such IoT networks should also reduce the risk and consequences of measurement miscommunication as the new distributed systems and devices should be linked to validation. This would provide customers with reliable information on single devices as well as providing industry with readings of distributed systems, for example in the smart metering of household consumption, in acoustic networks detecting noise pollution in air fields and in cities, or in dimensional metrology networks of measuring devices consisting of components (e. g. various sensors, guides, evaluation software) from different manufacturers. Electronic certification and validation using the IoT will also support and ensure control by legal authorities, device operators or manufacturers, and by adding value gained from online validation and verification simple device output can be transformed by linking it to reliable smart data.

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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 JRP shall focus on the development of metrological capacity for smart measurement data in the Internet of Things (IoT) networks.

The specific objectives are:

1. To define the requirements for a uniform, unambiguous and safe exchange format for measurement data and metrological information in an IoT network. The exchange format shall be based on the definition of SI units and meet central requirements from standards, guidelines and legal metrology.
2. To develop and establish secure digital calibration certificates. This should include exchange formats for administrative information, data transfer, cryptographic requirements, authentication and digital signatures.
3. To develop an online validation for services system for the types of data format as addressed under objectives 1 and 2.
4. To develop a reliable, easy to use, validated and secure online conformity assessment procedure designed for cloud system applications for legal metrology. The online conformity assessment procedure should also be applicable for calibration services and provide compliance with current international and European standards.
5. To build and validate demonstrators involving running applications from industrial stakeholders, to facilitate the take up of the technology and measurement infrastructure developed in the project by the measurement supply chain, standards developing organisations and end users, and to work towards a European platform for metrological calibration services.

Proposers shall give priority to work that meets documented industrial needs and include measures to support transfer into industry by cooperation and by standardisation. An active involvement of industrial stakeholders is expected in order to align the project with their needs – both through project steering boards and participation in the research activities.

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 EMRP project NEW06 TraCIM and how their proposal will build on those.

EURAMET expects the average EU Contribution for the selected JRPs in this TP to be 1.5 M€, and has defined an upper limit of 1.8 M€ for this project.

EURAMET also expects the EU Contribution to the external funded partners to not exceed 30 % of the total EU Contribution to the project.

Any industrial partners that will receive significant benefit from the results of the proposed project are expected to be unfunded 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 JRP 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,
- Transfer knowledge to the computing, communications and security sectors.

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 EMPIR 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

Time-scale

The project should be of up to 3 years duration.