Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

Digitalisation in the quality infrastructure

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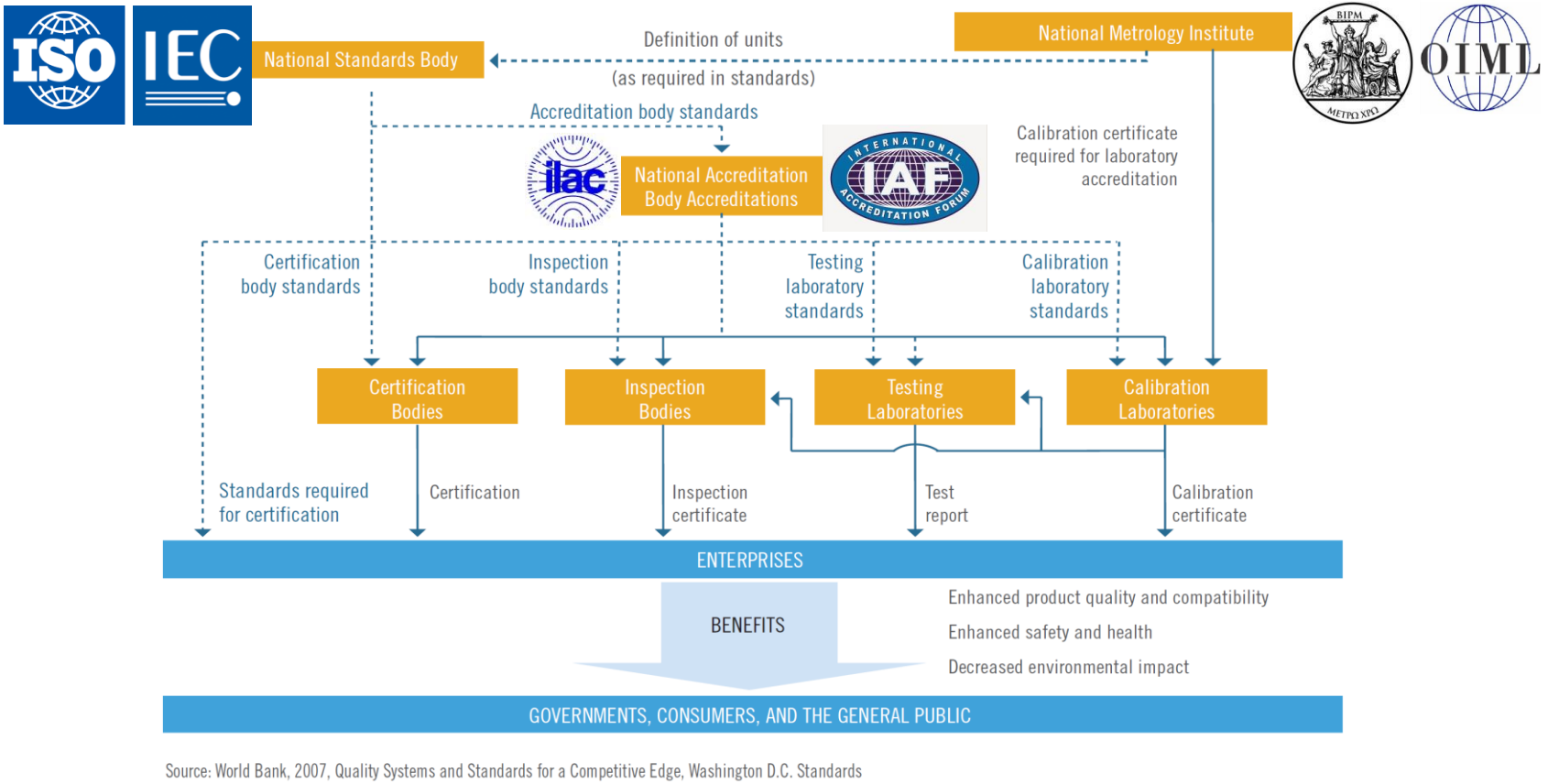
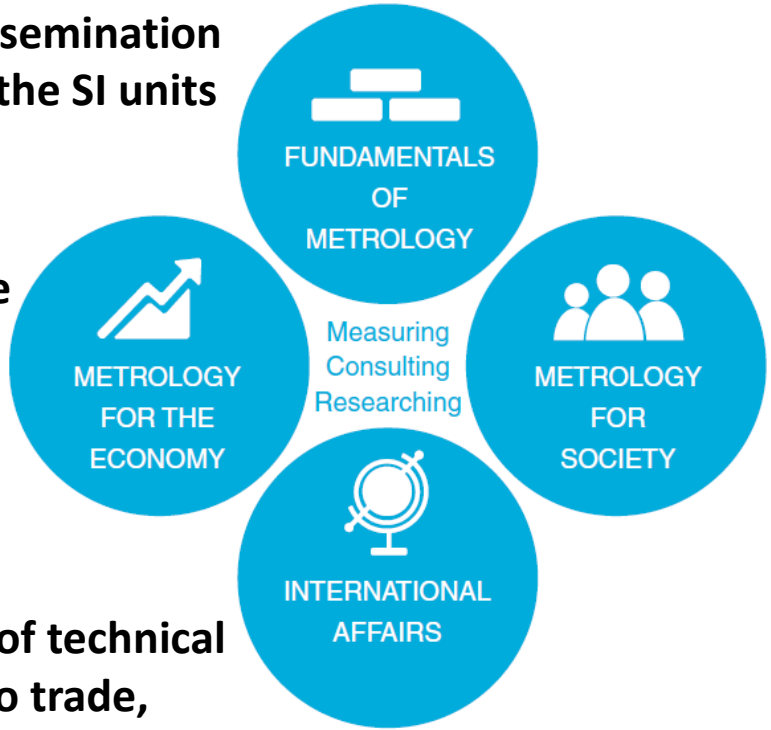
The national quality infrastructure



Source: World Bank, 2007, Quality Systems and Standards for a Competitive Edge, Washington D.C. Standards

Business areas of PTB, Germany's NMI

Realization and dissemination of the SI units



- 60 % R&D
- 25 % calibration / services
- 15 % consultation

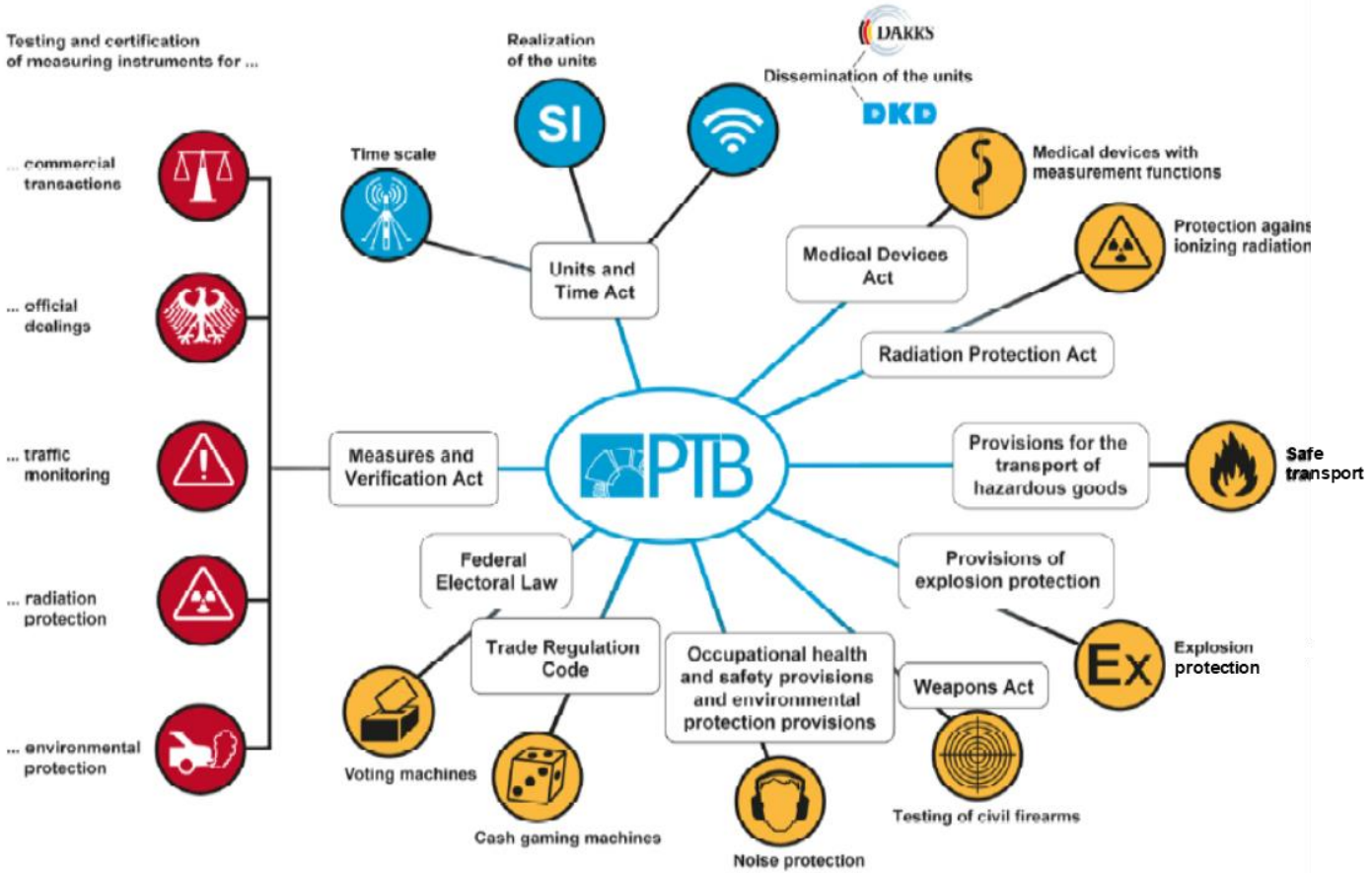
Increasing the efficiency of the economy

Promotion of consumer protection, safeguarding of living conditions

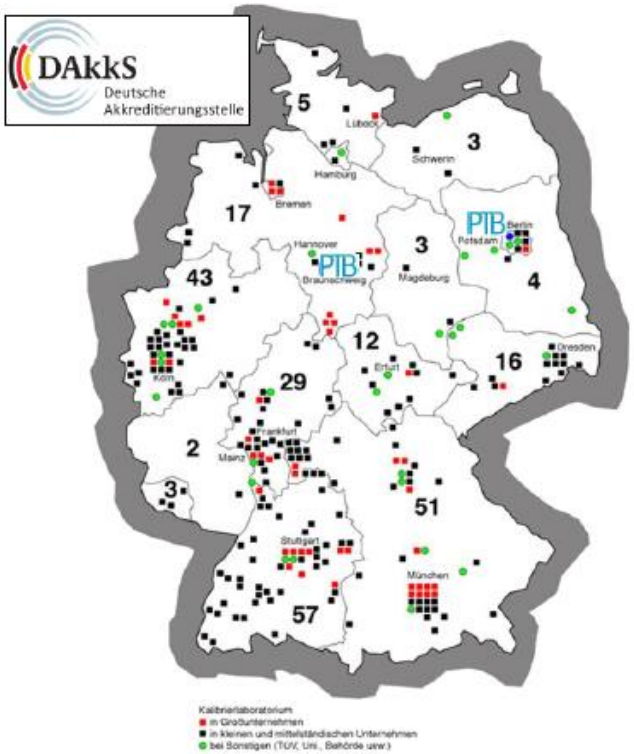
Removal of technical barriers to trade, unification of metrology

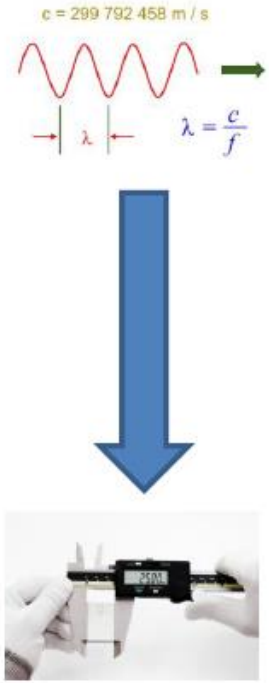
- 2100 members of staff
- Total budget: ~ € 260 Mio.
- Additional third-party research funds : ~ € 24 Mio.

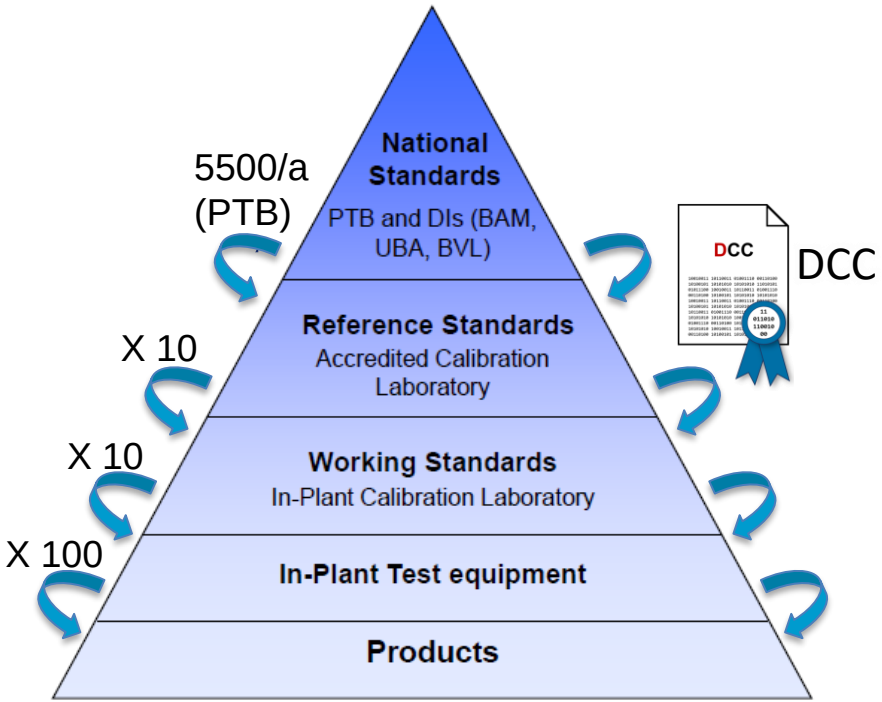
Legal Tasks of PTB (Selection)



Dissemination of units and traceability

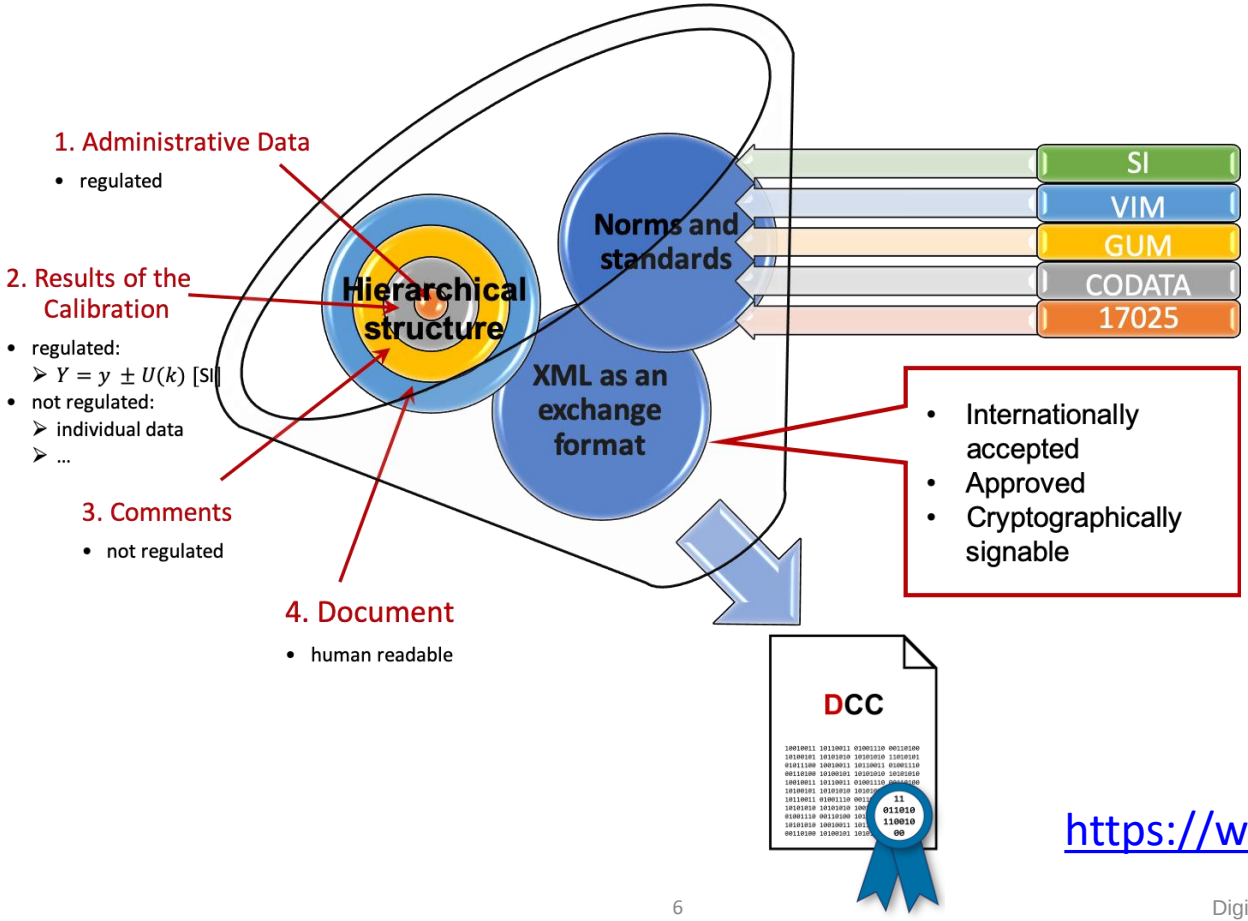






Calibration certificates transport calibration information along the traceability chain

DCC – a digital calibration certificate



https://www.ptb.de/dcc/

DCC – a digital calibration certificate

History

- Development started in 2017
- Developed in close collaboration with international partners
- Designed to the needs of industry and calibration laboratories
- First publicly available version 3.0.0 released in summer 2021, will be long-term available

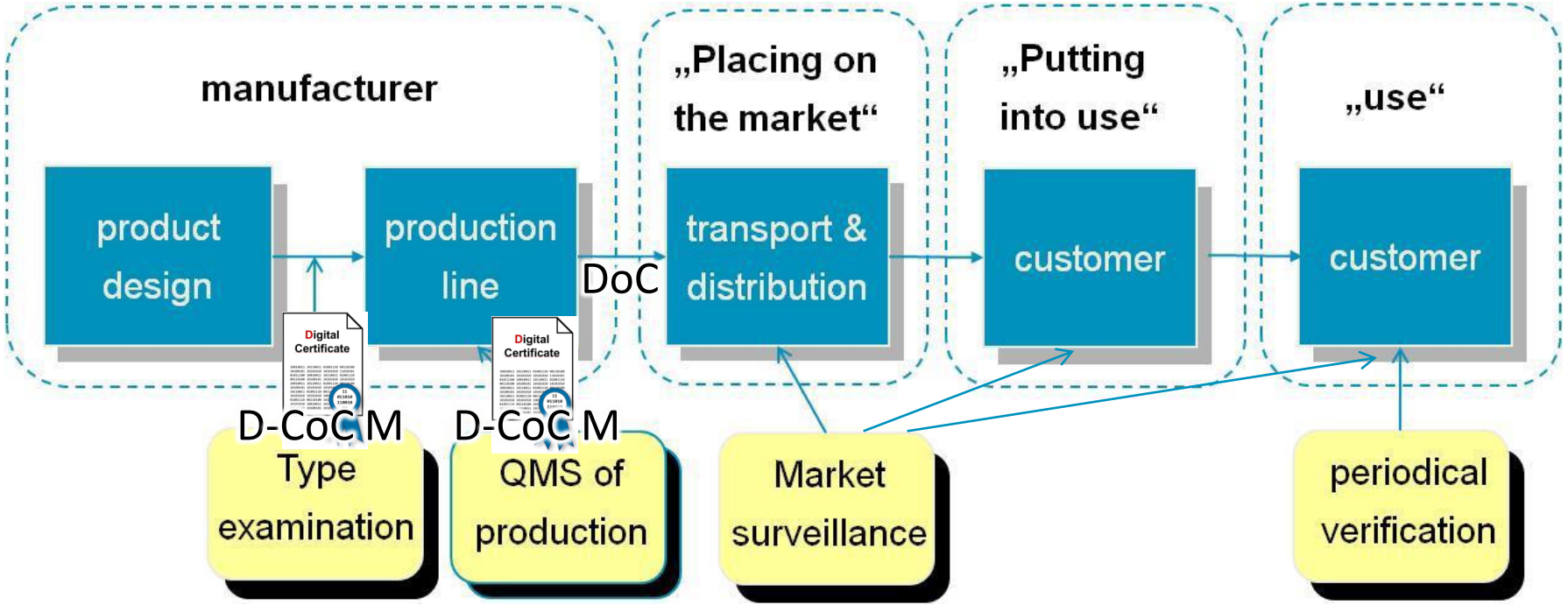
Work in progress

- Good practice examples for measurement quantities serve as means to agree on community specific standards
- Open-source software to handle DCCs

Lessons learned

- Software developers need a stable, standardized schema before integrating the DCC into their products
- Reservations towards the DCC due to the expectation that trainings are required and costs are high

Product life cycle

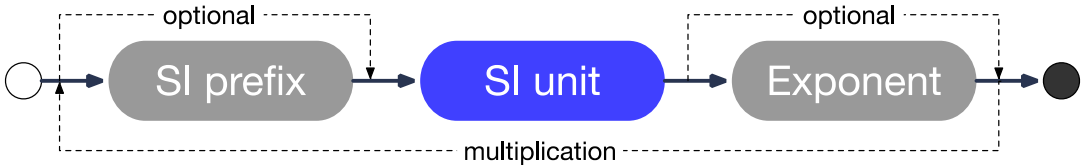


Product: Measurement instrument in legal metrology
Conformity assessment body issues the certificate of conformity
Manufacturer declares the conformity with all relevant requirements

D-CoC M – a digital certificate of conformity in metrology

- Development started 2020, currently V0.3 of xml schema
- First developed for European market, will later be introduced to OIML-CS
- Coordination of which content information is required or optional via project group within the European platform of **No**tified **Bo**dies working in legal **Met**rology (NoBoMet)
- Engagement of manufacturers
- Development of D-CoC creation tool
- Open question: How to exchange information about withdrawn, refused certificates?

D-SI – digital SI for metrological data



real *quantity type extended*	components (of the real quantity type)					
	label	value	unit	dateTime	expandedUnc (S)	coverageInterval (S)
Basic real with expanded measurement uncertainty						
Basic real with coverage interval (probabilistic-symmetric)						

(S) sub type — mandatory — optional

Metadata-format for safe, harmonised and unambiguous digital transfer of metrological information, also outside of metrology certificates

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Coordination in the international QI

Joint Statement of Intent on the digital transformation in the international scientific and quality infrastructure

[…]
We the undersigned undertake to support in a way appropriate to each organisation the development, implementation, and promotion of the SI Digital Framework as part of a wider digital transformation of the international scientific and quality infrastructure.
[…]

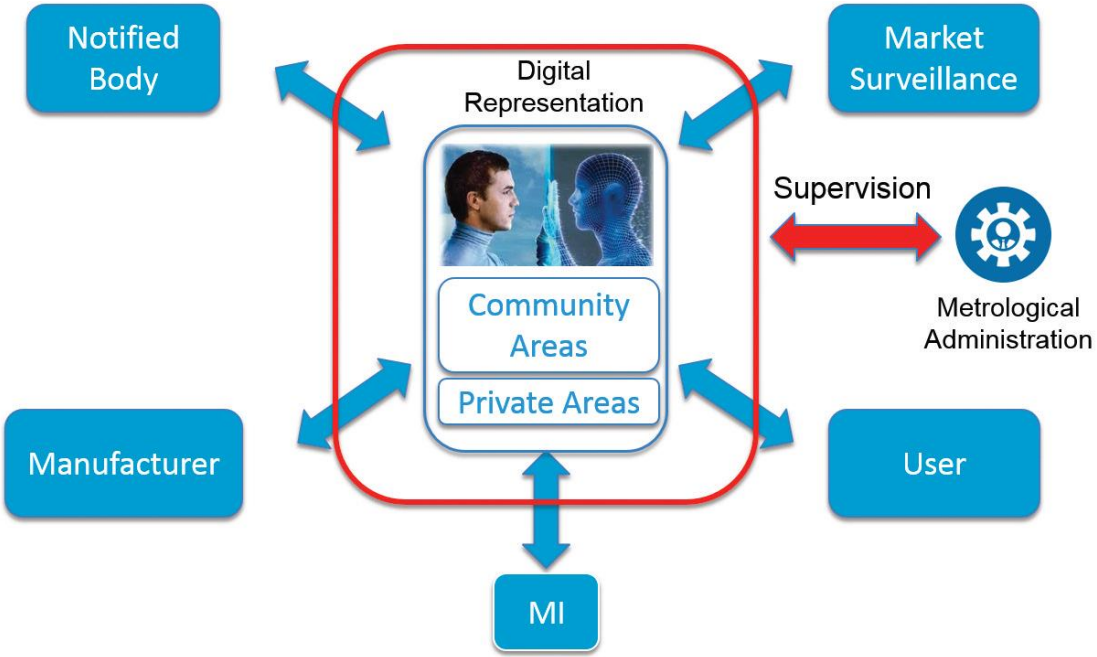
Some relevant task groups (TG)

- CIPM TG on the Digital SI
- CODATA Digital Representation of Units of Measurement (DRUM) TG
- OIML Digitalisation TG

The BIPM is a signatory of the joint statement with the following organizations:

CIE	INTERNATIONAL COMMISSION ON ILLUMINATION
CODATA	COMMITTEE ON DATA OF THE ISC
IEC	INTERNATIONAL ELECTROTECHNICAL COMMISSION
ILAC	INTERNATIONAL LABORATORY ACCREDITATION COOPERATION
IMEKO	INTERNATIONAL MEASUREMENT CONFEDERATION
ISC	INTERNATIONAL SCIENCE COUNCIL
ISO	INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
OIML	INTERNATIONAL ORGANIZATION OF LEGAL METROLOGY

European Metrology Cloud



- Digital representation – twin / product passport – of the measurement instrument
- The central communication and administrative element throughout the product life cycle

www.digital.ptb.de/MetrologyCloud

European Metrology Cloud

- Development started 2018
- First demonstrator for software update of measuring instrument and re-verification
- Developed first for legal metrology, now being enhanced to address additional QI processes
- Challenge: Different degree of digitalisation of the stakeholders

Further important elements / outlook

- Unique IDs for products and for context information of contained components
- Interoperability with other data spaces for data-reuse
- Accreditation information for trust in data sources
- Standardisation as means to involve as many stakeholders as possible and adapt regulations to new developments

www.digital.ptb.de/en

www.qi-digital.de/en/

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