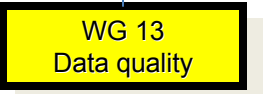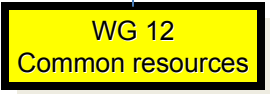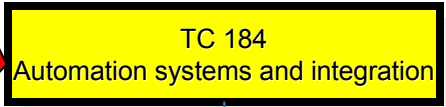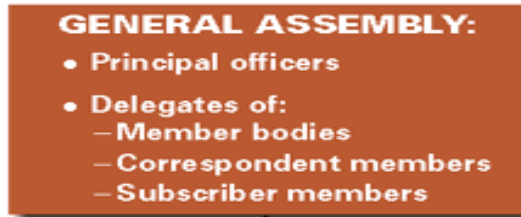# ISO Standards for Product Characterization

Gerald M. Radack, Ph.D.

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Standards

- ISO 8000, *Data quality*
- ISO 29002, *Exchange of characteristic data*
- ISO 22745, *Open technical dictionaries and their application to master data*

ISO STRUCTURE

GENERAL ASSEMBLY:
- Principal officers
- Delegates of:
  - Member bodies
  - Correspondent members
  - Subscriber members

Policy development committees:
- CASCO
- COPOLCO
- DEVCO

Council standing committees:
- Finance
- Strategies

Ad hoc advisory groups

COUNCIL

CENTRAL SECRETARIAT

TECHNICAL MANAGEMENT BOARD

REMCO

Technical advisory groups

Technical committees

TC 184
Automation systems and integration

SC 4
Industrial data

WG 12
Common resources

WG 13
Data quality

ISO TC 184/SC 4 Voting Members

- Australia, SAI; Standards Australia International, Ltd

- Austria, ON; Österreichisches Normungsinstitut

- Brazil, ABNT; Associação Brasileira de Normas Técnicas

- Bulgaria, BDS; State Agency for Standardization and Metrology

- China, SAC; Standardization Administration of China

- Czech Republic, CNI; Czech Standards Institute

- France, AFNOR; Association française de normalisation

- Germany, DIN; Deutsches Institut für Normung

- Italy, UNI; Italian National Standards Body

- Japan, JISC; Japanese Industrial Standards Committee

- Korea, KATS; Korean Agency for Technology and Standards

- Netherlands, NEN; Nederlands Normalisatie-instituut

- Norway, SN; Standards Norway

- Portugal, IPQ; Instituto Português da Qualidade

- Russia, GOST; Federal Agency on Technical Regulating and Metrology

- South Africa, SABS; South African Bureau of Standards

- Spain, AENOR; Asociación Española de Normalización y Certificación

- Sweden, SIS; Swedish Standards Institute

- Switzerland, SNV; Swiss Association for Standardization

- United Kingdom, BSI; British Standards Institution

- United States, ANSI; American National Standards Institute

ISO 8000
Data quality

Parts under development

Part 1: *Overview, principles and general requirements*

Part 2: *Vocabulary*

Part 100: *Master data: Exchange of characteristic data: Overview*

Part 102: *Master data: Exchange of characteristic data: Vocabulary*

Part 110: *Master data: Exchange of characteristic data: Syntax, semantic encoding, and conformance to data specification*

Part 120: *Master data: Exchange of characteristic data: Provenance*

Part 130: *Master data: Exchange of characteristic data: Accuracy*

Part 140: *Master data: Exchange of characteristic data: Completeness*

ISO 8000

- ISO 8000 addresses <u>data</u> <u>quality</u>.

- ISO 8000 is concerned with:

    – the principles of <u>data</u> <u>quality</u>;

    – the characteristics of <u>data</u> that determine its <u>quality</u>;

    – the processes to ensure <u>data</u> <u>quality</u>.

ISO 8000 Definitions

information

knowledge concerning objects, such as facts, events, things, processes, or ideas, including concepts, that within a certain context has a particular meaning [ISO/IEC 2382-1:1993]

meaningful <u>data</u> [ISO 9000:2005]

data

re-interpretable representation of information in a formalized manner suitable for communication, interpretation, or processing [ISO/IEC 2382-1:1993]

quality

degree to which a set of inherent characteristics fulfils requirements [ISO 9000:2005]

characteristic

distinguishing feature [ISO 9000:2005]

requirement

need or expectation that is stated, generally implied or obligatory [ISO 9000:2005]

ISO 8000 Organization

- ISO 8000 is organized into a series of parts, each published separately.
    - General data quality: Parts 0-99
    - **Master data quality: Parts 100-199**
    - Transactional data quality: Parts 200-299
    - Product data quality: Parts 300-399
    - ...
- The initial set of parts will be for the master data quality series.

Data quality and Intellectual Property (IP)

<u>All identifiers are copyright</u>. They belong to the organization that issued them and their use is subject to the terms and conditions imposed by the issuer.

Unless identifiers have been declared available for public use without a licence, they should never be used to retrieve data that was not supplied by the owner of the identifier unless you have specific permission to do so.

In order to protect your data from claims of "joint work" you should not use proprietary identifiers as metadata.

ISO 8000-100

Syntax, semantic encoding, and conformance to data specification

This part of ISO 8000 contains an overview of the ISO 8000-100 to 199 series of parts.

The ISO 8000-100 to 199 series of parts addresses master data quality.

The following are within the scope of the ISO 8000-100 to 199 series of parts:

–master data-specific aspects of quality management system;

–master data quality metrics.

This part of ISO 8000 describes fundamentals of master data quality, defines related terms, and specifies requirements on both data and organizations to enable master data quality.

The following are within the scope of this part of ISO 8000:

–specification of the scope of the ISO 8000-100 to 199 series;

–introduction to master data;

–description of the data architecture;

–overview of the content of the other parts of the ISO 8000-100 to 199 series.
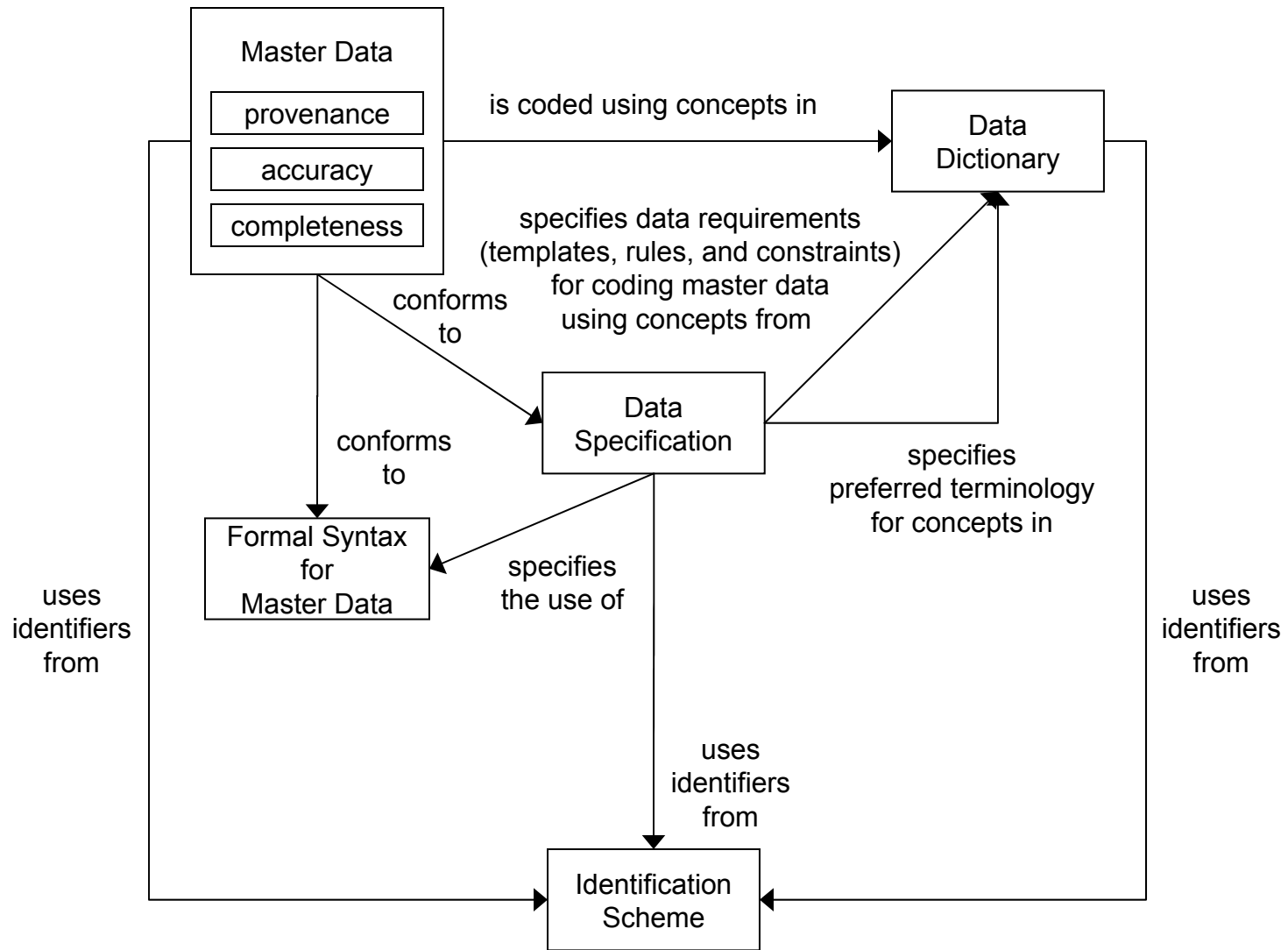
ISO 8000-102
Vocabulary

master data

data held by an organization that describes the entities that are both independent and fundamental for an enterprise, that it needs to reference in order to perform its transactions

Master data describes individuals, organizations, locations, goods, services, rules and regulations.

- Customers
- Suppliers
- Materials
- Services

- Assets
- Locations
- Employees
- MSDS
- ...

ISO 8000-110

This part of ISO 8000 specifies requirements that can be <u>checked by computer</u> for the <u>exchange</u>, between organizations and systems, of <u>master data</u> that consists of <u>characteristic data</u>.

The following are within the scope of this part of ISO 8000:

•requirements regarding conformance to a formal syntax for master data messages;

•semantic encoding requirements for master data messages;

•requirements regarding conformance to data specifications for master data messages;

•requirements regarding the commercial model for the master data exchange.

The following are outside the scope of this part of ISO 8000:

•requirements regarding exchange of data that are not master data, and master data that are not characteristic data;

•requirements regarding data that are not in messages, and messages that are not used to exchange master data between organizations or systems;

•requirements regarding recording the history, accuracy, and completeness of master data;

•requirements regarding the management of master data internally within an organization;

•requirements regarding the quality of data dictionaries;

ISO 8000-110

Syntax

Each master data message shall contain in its header a reference to the formal syntax to which the master data message complies. The reference shall be an unambiguous identifier for the specific version of the formal syntax that was used to encode the master data message.

Semantic encoding

Semantic encoding is the technique of replacing natural language terms in a message with identifiers that reference data dictionary entries…Each reference shall be to a data dictionary entry contained in a data dictionary. The reference shall preserve the integrity of the recipient's data in that the reference to the data dictionary entry may be integrated with the recipient's own data without the creation of a joint work.

Syntax and semantic resolution shall be available at no charge unless the data carries a "fee based encoding" warning label.

Conformance to data specification

Each master data message shall contain in its header a reference to the data specification to which the master data message complies. The reference shall be an unambiguous identifier for the specific version of the data specification that was used to encode the master data message.

ISO 8000-120
Provenance

This part of ISO 8000 describes requirements for representation and exchange of information about provenance of property value pairs and data sets.

The following are within scope of this part of ISO 8000:

•scenarios for data provenance;

•requirements for capture and exchange of data provenance information;

•conceptual data model for data provenance information.

The following are outside the scope of this part of ISO 8000:

•exchange format for data provenance information;

•scheme for registering and resolving organization identifiers and person identifiers;

•provenance of data that are not characteristic data represented as property values;

•configuration management and change control of data;

•syntax of identifiers and resolution of identifiers.

ISO 8000-130
Accuracy

This part of ISO 8000 describes requirements for representation and exchange of information about accuracy of property value pairs, records, and data sets.

The following are within scope of this part of ISO 8000:

•scenarios for master data accuracy;

•requirements for capture and exchange of master data accuracy information;

•conceptual data model for master data accuracy information.

The following are outside the scope of this part of ISO 8000:

•exchange format for data accuracy information;

•scheme for registering and resolving organization identifiers and person identifiers;

•accuracy of data that are not characteristic data represented as property values;

•syntax of identifiers;

•resolution of identifiers.

ISO 8000-140
Completeness

This part of ISO 8000 describes requirements for representation and exchange of information about completeness of property value pairs, records, and data sets.

The following are within scope of this part of ISO 8000:

•scenarios for master data completeness;

•requirements for capture and exchange of master data completeness information;

•conceptual data model for master data completeness information.

The following are outside the scope of this part of ISO 8000:

•exchange format for data completeness information;

•scheme for registering and resolving organization identifiers and person identifiers;

•completeness of data that are not characteristic data represented as property values;

•syntax of identifiers;

•resolution of identifiers.

ISO 29002
Exchange of characteristic data

- Provides common resources for the ISO 13584, *Parts library*, and ISO 22745, *Open technical dictionaries and their application to master data*, standards
- Provides generic formats and functionalities which can be used either:
  - as-is, i.e., without any model-specific restrictions, or
  - according to special adaptations which are defined in the respective standards

ISO 29002
Exchange of characteristic data

- Parts under development
  - Part 5: *Identification scheme*
  - Part 6: *Dictionary reference model*
  - Part 10: *Characteristic data exchange format*
  - Part 20: *Concept dictionary resolution services*
  - Part 31: *Query for characteristic data*

ISO 29002-5, ISO 22745-13
Identification scheme

- ISO 29002-5 pecifies a format for identifiers for elements of a concept dictionary. The format specification is a concrete syntax that meets the general requirements for an international registration data identifier (IRDI) specified in ISO/IEC 11179-5.

- The format will be used by ISO 13584 and ISO 22745 in order to provide a level of interoperability between implementations of these standards, and could have more general applicability.

- ISO 22745-13 is a tailored version of ISO 29002-5 adapted for open technical dictionaries.

registration authority identifier (RAI)

data identifier (DI)

version
identifier (VI)

n = digit
a = alphanumeric
x = safe character
#, - = separator character

optional

omitted only in case of
ISO/IEC 6523 registered organization*

| nnnn | - | xxxx | - | xxxxxx | - | a | - | xxxxxx | | # | | xx | - | xxxxxx | | # | | n |

item code (IC)

code space identifier (CSI)

additional information (AI)

OPI source (OPIS)

organization part identifier (OPI)

organization identifier (OI)

international code designator (ICD)

```
┌─────────────────────┐                          ┌─────────────────────┐
│ Query for           │                          │ Dictionary          │
│ master data         │  is coded using concepts in │ query            │
│ ISO 29002-31        │─────────────────────────→│ ISO 29002-20        │
│ ISO 22745-35        │                          │ ISO 22745-14        │
└─────────────────────┘                          └─────────────────────┘
         │                                                  │
      requests                                         requests
         │                                             information
         ↓                                                from
                                                          │
┌─────────────────────┐                                   ↓
│ Master data         │                          ┌─────────────────────┐      ┌─────────────────────┐
│ (catalogue)         │  is coded using concepts in │ Dictionary       │      │ Identification      │
│                     │─────────────────────────→│ ISO 29002-6         │─────→│ scheme              │
│ ISO 29002-10        │                          │ ISO 22745-10        │      │ ISO 29002-5         │
│ ISO 22745-40        │                          └─────────────────────┘      │ ISO 22745-13        │
└─────────────────────┘                            uses        has concepts   └─────────────────────┘
         ↑                                          concepts    identified by
         │        specifies data requirements       from
         │        (templates and rules)              ↑
         │        for coding                    ┌─────────────────────┐
         └─────────────────────────────────────│ Identification      │
                                               │ Guide               │
                                               │                     │
                                               │ ISO 22745-30        │
                                               └─────────────────────┘
```
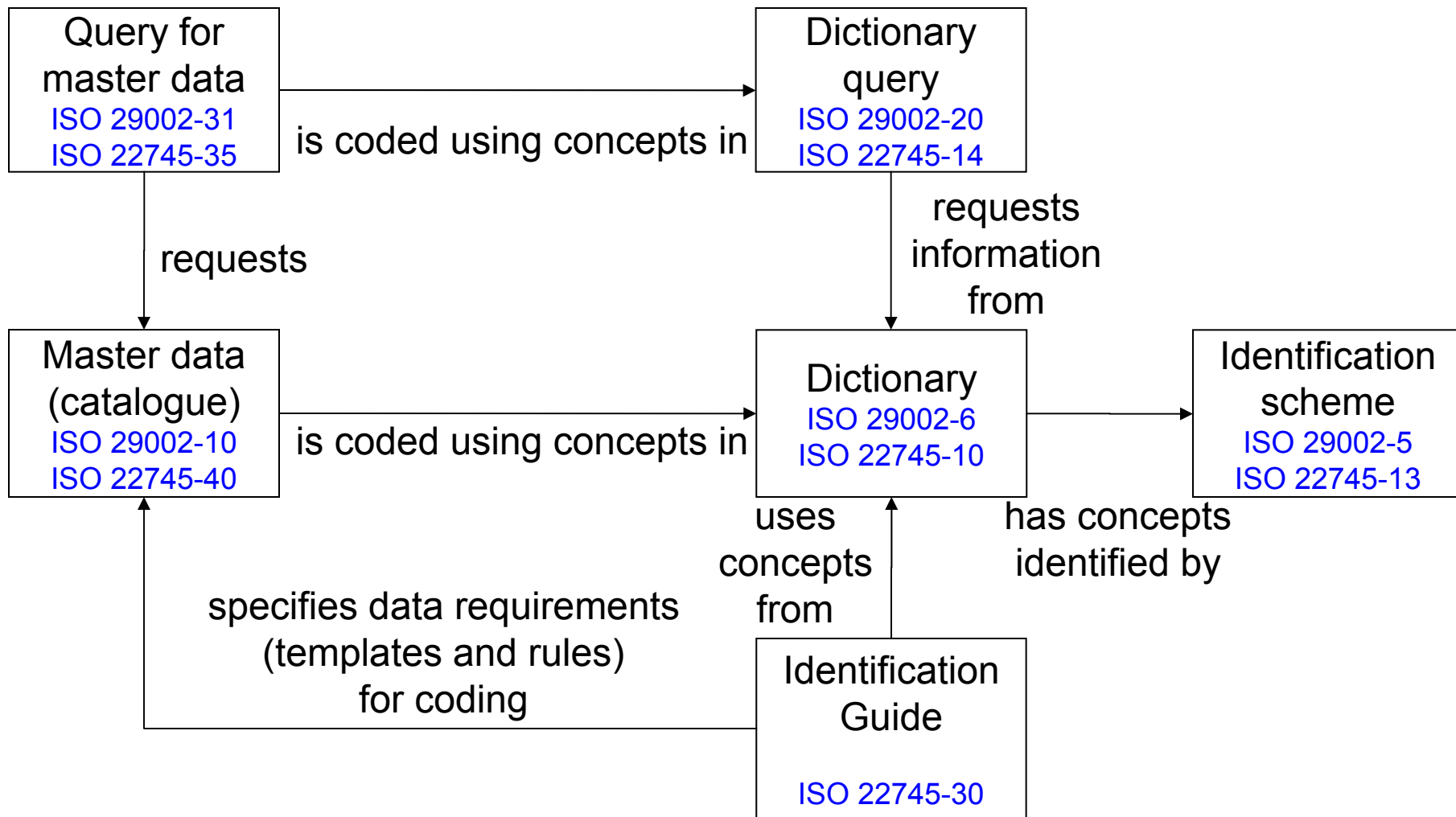
ISO 22745
Open technical dictionaries and their application to master data

- Planned parts
    - *Part 1: Overview and fundamental principles*
    - *Part 2: Vocabulary*
    - *Part 10: Dictionary representation[+]*
    - *Part 11: Guidelines for the formulation of terminology*
    - *Part 13: Identification of concepts and terminology[+]*
    - *Part 14: Dictionary query interface [+]*
    - *Part 20: Procedures for the maintenance of an open technical dictionary*
    - *Part 30: Identification guide representation*
    - *Part 35: Query for characteristic data[+]*
    - *Part 40: Master data representation[+]*
    - *Part 45: Rendering guide representation[*]*
    - *Part 50: Structure and operation of the registration authority*
    - *Part 200: Implementation guide for incorporating master data into ISO 10303 product data*
    - *Part 300 series: Master data guides*

* future part
+ customization of ISO 29002 part

ISO 29002-6, ISO 22745-10
Dictionary

- Contains
  - Concepts with identifiers
  - Terminology to specify meaning of concepts

- Does not contain
  - Relationships between concepts
  - Constraints on property values
  - Data types
  - Reply instructions

These are all contained in identification guides.

ISO 22745
Open Technical Dictionary

- An open technical dictionary (OTD) is a dictionary of concepts (metadata) for describing items that:
  - Meets the "free encoding" requirements of ISO 8000-110
  - Uses the identifiers specified in ISO 22745-13 (a subset of ISO 29002-5)
  - Provides a query interface for resolving identifiers to their meaning, and searching for concepts

Examples of Concepts

- **Class**
  - machine bolt
  - self-aligning plain bearing
- **Property**
  - thread series designator
  - thread diameter
- **Feature**
  - flange
  - inner liner
  - outer ring
  - second hole
- **Representation**
  - string
  - decimal measure
  - rational measure

- **Unit of Measure**
  - degree
  - radian
  - kilogram
  - newton per square millimeter
- **Qualifier of Measure**
  - nominal
  - minimum
  - maximum
- **Controlled Property Value**
  - Monday
  - Tuesday
  - iron
- **Currency**
  - US Dollar
  - Euro

ISO 29002-20, ISO 22745-14
Dictionary query interface

- Three service levels:
  - Level 1: Resolve identifier to a service provider
  - Level 2: Resolve identifier to underlying dictionary entry, search for dictionary entries using query expression
  - Level 3: Resolve identifier to ontological description

- Based on Web Services, an architecture for machine-to-machine interaction over a network

- Includes:
  - Abstract specification of services
  - Concrete binding that all implementations are required to support
    - Based on World Wide Web Consortium recommendations: Web Services Description Language (WSDL) and Simple Object Access Protocol (SOAP)

ISO 29002-10, ISO 22745-40
Catalogue—master data representation

- Collection of items described by:
  - Membership in a class
    - Class identifier is pointer to concept in a dictionary
    - In the case of ISO 22745-40, the dictionary must be an open technical dictionary
  - Property values (characteristic data)
    - Identifiers for properties, units of measure, qualifiers of measure, controlled values are pointers to concepts in a dictionary
    - In the case of ISO 22745-40, the dictionary must be an open technical dictionary

ISO 22745-30
Identification guide representation

- Constrains the use of concepts in the dictionary in catalogue data

- Specification of a recipient's data requirements

- Developed and maintained by data consumers

- Can be registered with and validated by DMO

ISO 22745-20
Procedures for maintenance of an OTD

- The following are within scope of this part of ISO 22745:
  - structure of the dictionary maintenance organization (DMO);
  - rules concerning releases of an OTD;
  - procedure for adding a concept to an OTD;
  - procedure for changing concept documentation within an OTD.

ISO 22745-20
Procedures for maintenance of an OTD

- The following are outside the scope of this part of ISO 22745:

  - procedure for standardization of terminology in a concept dictionary;

    NOTE 1 This is covered in several existing documents. See, for example, ISO 10241 and ISO/IEC Directives: Supplement — Procedures specific to IEC [17], Annex J.

  - procedure for harmonization of concepts and terminology;

    NOTE 2 Harmonization of concepts and terms is within scope of ISO 860.

  - rules and syntax for identifiers;

    NOTE 3 Rules and syntax for identifiers are given in ISO/TS 22745-13.

  - procedures for managing relationships between concepts;

    NOTE 4 Certain relationships between concepts (e.g., that items belonging to a given class must be described by certain properties, or that a given property must be specified with certain units of measure) can be specified within an identification guide.

 - procedures for managing identification guides.

ISO 29002-31, ISO 22745-35
Query for characteristic data

- Basic scenarios:

  1. Know: characteristic data
     Want to know: item reference number(s)

     a) Variation 1: search on exact characteristics

     b) Variation 2: parametric search

  2. Know: item reference number
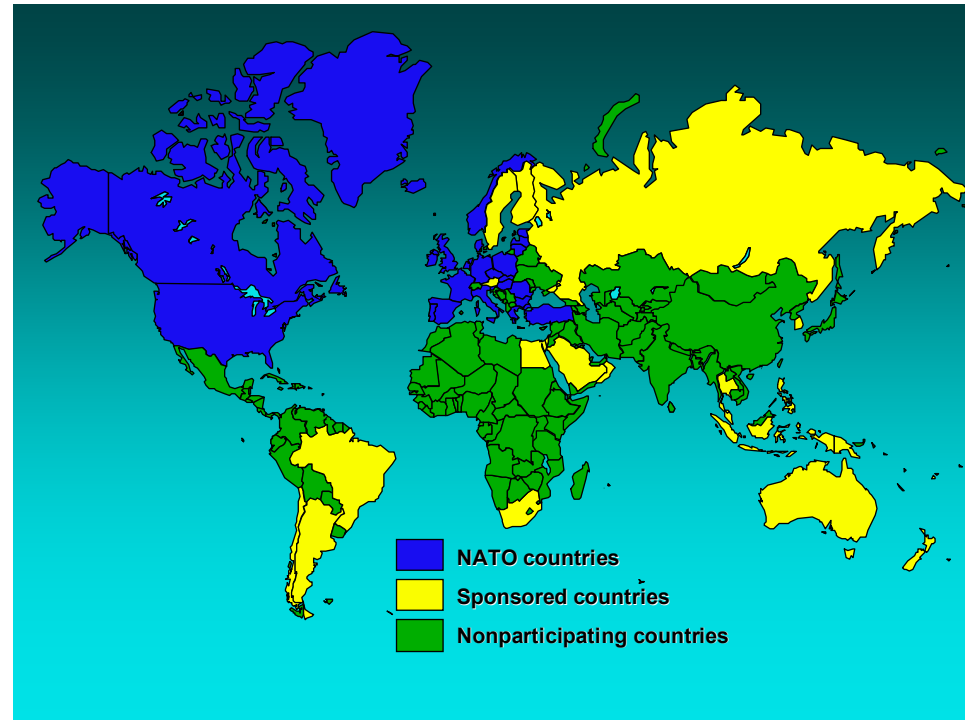   Want to know: characteristic data

ISO 8000-100 series, ISO 29002 and ISO 22745 are about automating the data supply chain
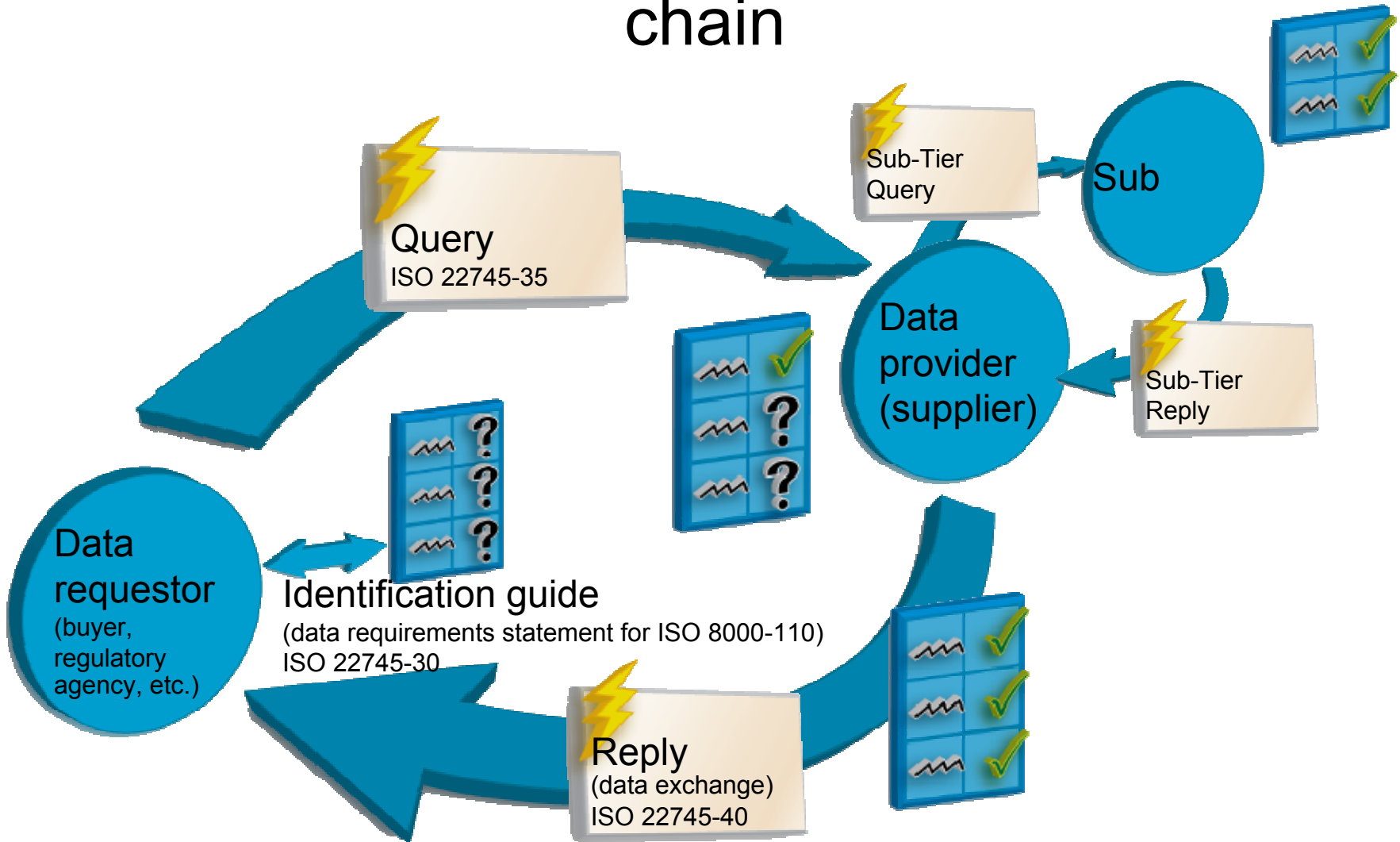
The NATO Codification System (NCS)

- A common supply language throuhout all logistic operations
  - To enable interoperability
  - To optimize resource management by minimizing duplication in inventories
- A flexible system that can be tailored to national requirements
- An important cornerstone to logistics interoperability
  - 15+ million NATO Stock Numbers have been assigned
  - 7 million by the U.S. and 8 million by the other NATO countries
  - 31 million reference numbers have been registered on these NSNs
  - These NSNs contain more than 22 million user registrations
  - 1.5 million manufacturers and other organizations are registered

NATO countries

Sponsored countries

Nonparticipating countries

50ème ANNIVERSAIRE - 50th ANNIVERSARY

NATO 1949 - 1999 OTAN

The ECCMA Open Technical Dictionary

- The ECCMA Open Technical Dictionary (eOTD) is an open technical dictionary of cataloging concepts used to create unambiguous language independent encoded descriptions of *individuals, organizations, locations, goods and services*
- The ECCMA Open Technical Dictionary (eOTD) is based on the NATO Codification System (NCS) with a more modern database architecture oriented toward the commercial world

Aims and Objectives

- NATO AC/135 undertook the partnership with ECCMA and involvement with ISO for the following reasons:
  - To automate the codification process
  - To improve the quality and availability of data
  - To help align the NCS with international standards
  - T   cooperation with industry

Summary

- ISO 8000, ISO 22745 and ISO 29002 is an integrated collection of standards that specify a system of descriptive technology and data exchange for master data, enabling data quality and protecting the value of the data

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