# FLEXINET

## Deliverable [D8.4]

## [Standardisation Plan]

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|---|---|
| **Workpackage:** | [WP8] – [Dissemination, Exploitation and Standardisation] |
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## FLEXINET Project Profile

**Contract No.:** NMP2-SL-2013-608627

| | |
|---|---|
| **Acronym:** | FLEXINET |
| **Title:** | Intelligent Systems Configuration Services for Flexible Dynamic Global Production Networks |
| **URL:** | http://www.flexinet-fof.eu/ |
| **Start Date:** | 01/07/2013 |
| **Duration:** | 36 months |

## FLEXINET Partners

| | |
|---|---|
| Loughborough University | Loughborough University, UK |
| Coventry University | Coventry University, UK |
| ITI Instituto Tecnológico de Informática | Instituto Tecnologico de Informatica, Spain |
| Fraunhofer IPK Institute Production Systems and Design Technology | Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung E.V., Germany |
| ainia centro tecnológico | Asociacion de Investigacion de la Industria Agroalimentaria, Spain |
| CONTROL 2K total solutions provider | Control 2K Limited, UK |
| University of St.Gallen | Universitaet St. Gallen, Switzerland |
| INDESIT company | Indesit Company S.P.A., Italy |
| KSB | KSB AG, Germany |
| custom drinks container + beverage solutions | Customdrinks SL, Spain |
| HIGHFLEET | Highfleet INC, United States |
| HOLONIX Lifecycle Knowledge Solutions | Holonix S.r.l., Italy |
| technische universität dortmund | Technische Universität Dortmund |

# Document History

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# Executive Summary

This FLEXINET deliverable entitled "Standardisation Plan" presents a full view of the key standardisation opportunities available to FLEXINET, together with an action plan for participation in the relevant standards bodies.

The world of standardisation groups and committees relevant to FLEXINET is described, which includes the Object Management Group; the Open Group; CEN TC 310 concerned with "advanced automation technologies and their application"; ISO/TC 184/SC4 concerned with "Industrial Data" and ISO/TC 184/SC5 concerned with "Interoperability, integration, and architectures for enterprise systems and automation applications". A particular joint working group that works across ISO/TC 184/SC4 and ISO TC184/SC5 is highlighted as being of particular importance to FLEXINET. This is ISO TC 184/SC4 JWG8 concerned with "manufacturing process and management information".

Existing standards and standardisation approaches are also described. Of particular interest to FLEXINET is the "Industrial Data Integrated Ontologies and Models" (IDIOM) approach as this is consistent with the FLEXINET view of the need for standards based on formal ontologies to improve the interoperability of industrial data systems.

The FLEXINET standardisation plan focuses on the product-service production reference ontologies being developed in workpackage 3 as the most significant aspect of the project targeted at standardisation. The key structure of the reference ontology is explained and the process guidelines for developing a new standard are described. This places a significant three year timescale constraint on the standardisation process. A plan that involves a start point of engaging with the ISO TC184 SC4 community in November 2014 is described.

We also anticipate contributing to the Open Group (OG) standardisation activity in Quantum Lifecycle Management. Further standardisation contributions may also be made if they are identified by the project as our work progresses.

# Table of Contents

## List of Figures



## List of Tables

# 1 Introduction

## 1.1 Purpose

The purpose of this report is to present a full view of the key standardisation opportunities available to FLEXINET, together with an action plan for participation in the relevant standards bodies. An important aspect of FLEXINET is its commitment to the belief that the best route to effective systems interoperation should be through the use of standards, as these should provide a shared basis upon which all the parties involved can develop a common understanding. An important aspect of this project is to provide a standard formal reference ontology to support the flexible configuration of global production networks. The main aspect of this document is to lay the foundation for taking the FLEXINET product-service production reference ontology through to standardisation.

## 1.2 Approach for Work Package and Relationship to other Work Packages and Deliverables

This Standardisation Plan is released in the context of FLEXINET WP8 "Dissemination, Exploitation and Standardisation" and emanates from Task T8.4: "Standardisation". This task is concerned with the promotion of the most relevant results of the project for standardisation through inputs to standardisation institutions, particularly at the international level. The intention is to identify the best way to bring the results of the project to standardisation. In particular it was foreseen by FLEXINET that the reference ontology work in WP3 could serve as an industrial validation of the IDIOM approach of ISO TC184 SC4.

Task T8.4 is strongly aligned with WP3 "Product-Service Production Reference Ontologies" for the reasons explained above and will work closely with WP3 to draw on their results and prepare them for standardisation. If other important areas for contributions to standardisation emerge from other project workpackages these will also be taken forward as appropriate, none have been identified to date.

At the end of the project a further standardisation deliverable, D8.9 "Standardisation Report" will be provided which will provide a comprehensive summary of the FLEXINET contribution to standards.

## 1.3 Structure of the Document

Chapter 2 provides a description of the standardisation world that is relevant to FLEXINET. It focuses on standards, standardisation groups and committees as well as other forward-looking activities within standardisation bodies that are of relevance to manufacturing in order to identify the most appropriate path for FLEXINET standardisation activity.

Chapter 3 then goes on to develop the standardisation plan. This describes the key aspect of FLEXINET that we plan to propose for standardisation in section 3.1. It describes the standardisation process with which we need to conform in section 3.2 and then describes the plan in terms of the activities and anticipated timescales towards standardisation in section 3.3.

# 2 The standardisation world relevant to FLEXINET

The aim of this section is not necessarily to be exhaustive, but to keep as close as possible to the expectations of the manufacturing industry in terms of standardisation.

Given the domain of interest of the project, investigations were made both in terms of relevant instances, but also in terms of levels to address (national, European and international). We present in this section the results of our investigations: OMG, Open Group (OG), ISO, ISO/IEC and CEN.

However, it should be noted that ISO, IEC and CEN are *statutory* standardisation bodies (SB) and as such are the only ones able to propose "*de jure*" standards; others, such as OMG and OG can only propose "*de facto*" standards, or specifications prepared before standardisation.

## 2.1 Object Management Group

The Object Management Group (OMG) is an international, open membership, not-for-profit technology standards consortium. OMG Task Forces develop enterprise integration standards for a wide range of technologies, to which their modelling standards include the Unified Modeling Language (UML) and Model Driven Architecture (MDA). Additionally OMG hosts organizations for example, the Cloud Standards Customer Council (CSCC) and Consortium for IT Software Quality (CISQ).

OMG hosts four technical meetings per year, enabling members and non-members to be co-located and work together. Additionally OMG organises conferences and workshops for international members, an example being the Internationalization & Unicode Conference.

Within the manufacturing domain, a Task Force called the 'Manufacturing Technology and Industrial Systems Domain Task Force" (ManTIS DTF) has been created by the OMG. Its mission is to foster the emergence of cost effective, timely, commercially available and interoperable software components for the Manufacturing and Industrial Systems domain through the development of standard interfaces using the OMG process. These currently apply to the manufacturing, industrial processes and control systems industrial sectors.

OMG web site: http://www.omg.org

## 2.2 Open Group

The Open Group is a global consortium that enables the achievement of business objectives through IT standards. With more than 400 member organizations, The Open Group has a diverse membership that spans all sectors of the IT community – customers, systems and solutions suppliers, tool vendors, integrators, and consultants, as well as academics and researchers to:

- Capture, understand, and address current and emerging requirements, and establish policies and share best practices
- Facilitate interoperability, develop consensus, and evolve and integrate specifications and open source technologies
- Offer a comprehensive set of services to enhance the operational efficiency of consortia
- Operate the industry's premier certification service

Further information on The Open Group is available at www.opengroup.org.

The Open Group publishes a wide range of technical documentation, most of which is focused on development of Open Group Standards and Guides, but which also includes white papers, technical studies, certification and testing documentation, and business titles. Full details and a catalogue are available at www.opengroup.org/bookstore.

### 2.2.1 Relevant statutory standardisation bodies and working groups

Different relevant standardisation bodies have been studied, both at the international and at the European level. They are mentioned in the following sections.

### 2.2.1 Standardisation bodies at the international level

Standardisation bodies at the international level mentioned here are: ISO TC 184, ISO TC 154 and ISO/IEC JTC1.

#### *2.2.1.1 ISO TC 184: Automation systems and integration*

**Scope**: ISO TC184 is one of the one various committees managed by the ISO (International Standardisation Organisation). The scope of the ISO TC 184 is "*Standardisation in the field of industrial automation and integration concerning discrete part manufacturing and encompassing the applications of multiple technologies, i.e. information systems, machines and equipments and telecommunications*". This means that the standards developed are applicable to manufacturing and process industries, applicable to all sizes of businesses, to extending exchanges across the globe through e-business. The standards developed by the ISO TC184 and its different sub-committees cover various domains related to industrial automation and integration, among which enterprise modelling, enterprise architecture, communications and processes, integration of industrial data for exchange, access and sharing, life cycle data for process plants, manufacturing management, mechanical interfaces and programming methods, part libraries, physical device control, Process Specification Language (PSL (an ontology based language aimed at representing process concepts)), product data, and robots for manufacturing environment.

**Subcommittees/Working Groups:**

| Subcommittee/ Working Group | Title |
|---|---|
| ISO/TC 184/AG | Advisory group<br>*The convener can be reached through the secretariat* |
| ISO/TC 184/WG 6 | OGI<br>*The convener can be reached through the secretariat* |
| ISO/TC 184/SC 1 | Physical device control |
| ISO/TC 184/SC 2 | Robots and robotic devices |
| ISO/TC 184/SC 4 | Industrial data |
| ISO/TC 184/SC 5 | Interoperability, integration, and architectures for enterprise systems and automation applications |

**Table 2-1: Technical Committee 184 Subcommittees and Working Groups**

The following section describes ISO TC184 Sub-committees 4 and 5 in more depth, since they are the groups targeted by the standardisation effort of the project.

### ISO/TC 184/SC 4 Industrial data and working groups

The activity of the SC4 committee deals with standardisation of the industrial data related to products including, but not limited to geometric design and tolerance data, material and functional specifications, product differentiation and configuration, process design data, production data (including cost), product support and logistics, life cycle data, quality data, disposal planning data (ISO TC 184/SC4 2008). It also includes organisational data provided by relationships between enterprises or between components of a single enterprise for the purposes of supplier identification. It includes personnel data to the extent of identification of approvals, including capacities and capabilities. Specifically excluded is business planning data such as profit projections, cash flow, and any other personnel data or organisational data. The goal of SC4 is the creation and maintenance of standards that enable the capture of information comprising a computerised product model in a neutral form without loss of completeness and integrity throughout the lifecycle of the product.

SC4 comprises several WGs, which are detailed in Table 2-2 below:

| Subcommittee/ Working Group | Title |
|---|---|
| ISO/TC 184/SC 4/PPC | Policy and planning committee<br>*The convener can be reached through the secretariat* |
| ISO/TC 184/SC 4/QC | Quality committee<br>*The convener can be reached through the secretariat* |
| ISO/TC 184/SC 4/ AG 0 | Change management advisory group |
| ISO/TC 184/SC 4 / WG 2 | Product characteristics and libraries<br>*The convener can be reached through the secretariat* |
| ISO/TC 184/SC 4 / WG 3 | Oil, Gas, Process and Power<br>*The convener can be reached through the secretariat* |
| ISO/TC 184/SC 4 / WG 8 | Joint SC 4 - SC 5 WG : Manufacturing process and management information<br>*The convener can be reached through the secretariat* |

| Subcommittee/ Working Group | Title |
|---|---|
| ISO/TC 184/SC 4 / WG 11 | Implementation methods and conformance methods<br>*The convener can be reached through the secretariat* |
| ISO/TC 184/SC 4 / WG 12 | STEP product modelling and resources<br>*The convener can be reached through the secretariat* |
| ISO/TC 184/SC 4 / WG 13 | Industrial Data Quality<br>*The convener can be reached through the secretariat* |
| ISO/TC 184/SC 4 / WG 21 | SMRL Validation Team<br>*The convener can be reached through the secretariat* |
| ISO/TC 184/SC 4 / WG 22 | Reference data validation team<br>*The convener can be reached through the secretariat* |
| ISO/TC 184/SC 4/ WG 23 | Vocabulary validation team<br>*The convener can be reached through the secretariat* |

**Table 2-2: Sub-Committee 4 Working Groups**

ISO/TC 184/SC 5 Interoperability, integration, and architectures for enterprise systems and automation applications

**Scope**: Standardisation in the field of enterprise architecture, communications, and processes to enable manufacturing system integration, interworking, and interoperability. This standardisation will include:

- Process representations; such as exchange/negotiation in manufacturing enterprises
- Requirements for a global programming environment
- Manufacturing profiles likely to be utilized by industry

SC5 has four working groups:

- **WG1** Modeling and Architecture
- **WG2** Communications and Interconnections
- **WG3** Industrial Automation Vocabulary (Terminated)
- **WG4** Manufacturing Programming Environment

- **WG5** Open Systems Applications Frameworks

TC184 SC5 WG1: Modeling and Architecture:

**Scope**: To develop a standard framework that coordinates existing, emerging, and future standards for the modeling of enterprises to facilitate computer-integrated manufacturing.

**Current Activity**: WG1 plans to produce standards that relate to information infrastructures, integration frameworks, enterprise models, enterprise reference architectures and methodologies, and manufacturing-process interoperability. ISO 14258, Concepts and rules for enterprise models, has been published as an International Standard (IS). ISO 15704, Requirements for enterprise reference architectures and methodologies, is being balloted as a Final Draft International Standard (FDIS). WG1 is planning a suite of standards to improve manufacturing process interoperability. For more information about WG1 plans for future standardization, see under Resources in this World Wide Web site, TC184 SC5 WG1 New-projects description, Standards for the manufacturing enterprise, Process-interoperability improvements and Enterprise Representation: A Different Paradigm for Designing Process Interoperability Standards

WG1 feels that a standard within its scope should not mandate standard processes or standard enterprises. For more information about WG1 views regarding standardization in this domain, see, under Resources in this World Wide Web site, TC184 SC5 WG1 View on Standardization for Enterprise-Reference Architectures, Enterprise Models, and Process Interoperability.

**Joint working groups under the responsibility of another committee:**

ISO TC 184 SC4-SC5 JWG8 is one of the possible standardisation groups targeted by the FLEXINET project. The convenor for this joint WG is Prof. Anne-Françoise Cutting-Decelle.

Web site: http://isotc.iso.org/livelink/livelink/open/tc184sc4

#### *2.2.1.2 ISO / IEC JTC 1: Information technology*

**Scope**: Standardization in the field of information technology.
**Subcommittees/Working Groups:**

| Subcommittee/ Working Group | Title |
|---|---|
| ISO/IEC JTC 1/SG 1 | Smart Cities<br>*The convener can be reached through the secretariat* |
| ISO/IEC JTC 1/SWG 1 | Accessibility (SWG-A)<br>*The convener can be reached through the secretariat* |
| ISO/IEC JTC 1/SWG 2 | SWG - Directives<br>*The convener can be reached through the secretariat* |
| ISO/IEC JTC 1/SG 2 | Big Data<br>*The convener can be reached through the secretariat* |
| ISO/IEC JTC 1/SWG 3 | Planning<br>*The convener can be reached through the secretariat* |
| ISO/IEC JTC 1/SWG 5 | Internet of Things (IoT)<br>*The convener can be reached through the secretariat* |
| ISO/IEC JTC 1/SWG 6 | Management<br>*The convener can be reached through the secretariat* |
| ISO/IEC JTC 1/WG 7 | Sensor networks<br>*The convener can be reached through the secretariat* |
| ISO/IEC JTC 1/WG 8 | Governance of IT<br>*The convener can be reached through the secretariat* |
| ISO/IEC JTC 1/SC 2 | Coded character sets |
| ISO/IEC JTC 1/SC 6 | Telecommunications and information exchange between systems |
| ISO/IEC JTC 1/SC 7 | Software and systems engineering |
| ISO/IEC JTC 1/SC 17 | Cards and personal identification |
| ISO/IEC JTC 1/SC 22 | Programming languages, their environments and system software interfaces |
| ISO/IEC JTC 1/SC 23 | Digitally Recorded Media for Information Interchange and Storage |
| ISO/IEC JTC 1/SC 24 | Computer graphics, image processing and environmental data representation |
| ISO/IEC JTC 1/SC 25 | Interconnection of information technology equipment |
| ISO/IEC JTC 1/SC 27 | IT Security techniques |
| ISO/IEC JTC 1/SC 28 | Office equipment |

| Subcommittee/ Working Group | Title |
|---|---|
| ISO/IEC JTC 1/SC 29 | Coding of audio, picture, multimedia and hypermedia information |
| ISO/IEC JTC 1/SC 31 | Automatic identification and data capture techniques |
| ISO/IEC JTC 1/SC 32 | Data management and interchange |
| ISO/IEC JTC 1/SC 34 | Document description and processing languages |
| ISO/IEC JTC 1/SC 35 | User interfaces |
| ISO/IEC JTC 1/SC 36 | Information technology for learning, education and training |
| ISO/IEC JTC 1/SC 37 | Biometrics |
| ISO/IEC JTC 1/SC 38 | Distributed application platforms and services (DAPS) |
| ISO/IEC JTC 1/SC 39 | Sustainability for and by Information Technology |
| ISO/IEC JTC 1/SC 40 | IT Service Management and IT Governance |

**Table 2-3: Standardization in the field of information technology**

- ISO/IEC JTC 1 / SC32 business plan may be accessed at the following URL : http://isotc.iso.org/livelink/livelink?func=ll&objId=8913375&objAction=browse&sort=name

**Scope**: Standards for data management within and among local and distributed information systems environments. SC32 provides enabling technologies to promote harmonization data management facilities across sector-specific areas. Specifically, SC32 standards include:

1. reference models and frameworks for the coordination of existing and emerging standards;
2. definition of data domains, data types and data structures, and their associated semantics;
3. languages, services and protocols for persistent storage, concurrent access, concurrent update and interchange of data;
4. methods, languages, services and protocols to structure, organize and register metadata and other information resources associated with sharing and interoperability, including electronic commerce.

- Web site for the SC32 (ISO) : http://isotc.iso.org/livelink/livelink/open/jtc1sc32 and home page : http://jtc1sc32.org/
- Web site for the JTC1 : http://isotc.iso.org/livelink/livelink/open/jtc1

*2.2.1.3 ISO TC 154: Processes, data elements and documents in commerce, industry and administration*

**Scope**: International standardisation and registration of business, and administration processes and supporting data used for information interchange between and within individual organizations and support for standardization activities in the field of industrial data.

Development and maintenance of application specific meta-standards for:

- process specification (in the absence of development by other technical committees);
- data specification with content;
- forms-layout (paper / electronic).

Development and maintenance of standards for:

- process identification (in the absence of development by other technical committees);
- data identification.

Maintenance of the EDIFACT-Syntax.

**Subcommittees/Working Groups**:

| Subcommittee/ Working Group | Title |
|---|---|
| ISO/TC 154/JWG 1 | Joint syntax working group (with UN/ECE)<br>*The convener can be reached through the secretariat* |
| ISO/TC 154/WG 3 | CCTS - Core Component technical Specification<br>*The convener can be reached through the secretariat* |
| ISO/TC 154/WG 4 | eLK (electronic Layout Key)<br>*The convener can be reached through the secretariat* |
| ISO/TC 154/WG 5 | Representation of dates and times<br>*The convener can be reached through the secretariat* |

Web site:
http://www.iso.org/iso/home/standards_development/list_of_iso_technical_committees/iso_technical_committee.htm?commid=53186

### 2.2.2 Standardisation bodies at the European level – CEN TC 310

We will limit here our investigations at the EU level to the CEN TC 310 committee (*Advanced automation technologies and their applications*), since it seems to us, at the European level, to be the standardisation group the most suited to the standardisation outputs of the project.

**Scope:** Standardisation in the field of automation systems and technologies and their application and integration to ensure the availability of the standards required by industry for design, sourcing, manufacturing and delivery, support, maintenance and disposal of products and their associated services. Areas of standardisation may include enterprise modelling and system architecture, information and its supporting systems, robotics for fixed and mobile robots in industrial and specific non-industrial environments, automation and control equipment and software, human and mechanical aspects, integration technologies and system operational aspects. These standards may utilise other standards and technologies beyond the scope of TC310, such as machines, equipment, information technologies, multi-media capabilities, and multi-modal communications networks.

**CEN/TC 310 Subcommittees and Working Groups:**

| Working group | Title |
|---|---|
| CEN/TC 310/WG 1 | Systems architecture |
| CEN/TC 310/WG 2 | STEP |
| CEN/TC 310/WG 3 | Cad lib |

**Table 2-4: CEN/TC 310 Subcommittees and Working Groups**

- **CEN/TC 310/WG 1 scope** : The development of the required framework and standards for the conceptualisation and modelling of manufacturing processes and their resources, to provide business process model based decision support leading to model based monitoring and control; this includes support for increased tool interworking and the needed infrastructural services. Convenor: Mr David Chen
- **CEN/TC 310/WG 2 scope**: To monitor the activities of ISO TC 184 SC4 on Industrial data, to coordinate European input and to identify and execute any developments required specifically within Europe.

- link to the CEN TC 310 business plan: http://standards.cen.eu/BP/6291.pdf
- web site:

http://standards.cen.eu/dyn/www/f?p=204:7:0::::FSP_ORG_ID:6291&cs=1FB8DE3E2415169C5A629164496F80A52

### 2.2.3 Other working groups

Three working groups are presented in this section: the new Memorandum of Understanding (MoU) Management Group (MG) semantic interoperability and harmonization group, the Future Architecture (FA) Task Group and the work around the "Big Picture".

#### *2.2.3.1 MoU MG Semantic interoperability and harmonisation*

A presentation was made during the ISO TC 184 SC4 meeting, held in Philadelphia (US) in May 2014 of a new group: the MoU MG between ISO, IEC, ITU, UN/ECE about : semantic interoperability and harmonization:

MoU/MG/14 N 586
Status: Draft
Date: 1 April 2014
Source: MoU/MG Chairman

**Project Proposal**

**ISO-IEC-ITU-UN/ECE MEMORANDUM OF UNDERSTANDING MANAGEMENT GROUP (MoU/MG) SEMANTIC INTEROPERABILITY AND HARMONIZATION**

**Background:** Key stakeholders in the MoU/MG recognise that semantic harmonisation is a fundamental component for delivering the objective of semantic interoperability across consumers, industry and governments. The customer requirement for information standards demands interoperability at the level of business processes, so that the relevant information can be consumed by different applications without intervention by the end user. Significant components of this information are common across many business processes, so a common definition of such components to which systems can comply or map offers obvious benefits.

Recognising the various ongoing activities that are already providing solution components, it is therefore proposed that a federated MoU/MG project should be set up for the development of a harmonized controlled vocabulary to act as the focus for such harmonization.

**Key requirements:** The project should address a number of key requirements:

- Governance and operation of the vocabulary, in a web-enabled syntax neutral environment

It is clearly recognised that many different stakeholders exist, with a wide range of constituencies that may overlap. The vocabulary must be broadly accessible using non-proprietary tools. It is therefore essential that the vocabulary can be managed in such a federated environment, with open access and tools that are independent of any particular technology.

- The processes for discovering concepts and reusing them to foster interoperability

Effective usage of such a vocabulary is critically dependent on the ease with which developers and standardisers can find whether a suitable concept is already defined and whether it is possible to reuse it to meet their business needs. Careful structuring with an agreed taxonomy will be required.

- The process for defining and agreeing extensions to the vocabulary

Where the necessary concepts are not already defined in the vocabulary, robust processes for proposing, reviewing and agreeing changes must be in place, with consultation across multiple stakeholders. This could be addressed through a procedure such as the ISO Annex SK approach, with nominated maintenance and validation teams.

- Support for multiple representations and syntaxes

The common concepts may be represented in multiple ways, using different syntaxes, but must link back unambiguously to the master definition in the vocabulary.

- Support for multiple languages

Once a concept has been identified, it should be possible to attach other language identifiers and descriptions in order to help mapping to application software in multiple languages.

- Implementation support tools, including mapping between native data in applications and the Vocabulary

A key part of the exploitation of the vocabulary will be the ability to facilitate semantic mapping between applications and the vocabulary as a bridge between various applications. In time, it would be feasible for tools to be based on the vocabulary, rather than proprietary representations. This needs to be supported by reference implementations to allow for consistent validation of implementations.

- Use of tools such as SKOS and RDF

It is proposed that open source tools should be used wherever possible for defining the vocabulary in a way in which can be accessed by both humans and machines.

- Deployment of the vocabulary – Publicly Available Free of Charge

The vocabulary needs to be readily available to implementers and users, which dictates public availability on the web, at no cost. There may be a case for establishing direct programmatic access to the vocabulary.

**A.F. Cutting-Decelle**, David Leal and Keith Hunten have been nominated as ISO TC 184 SC4 experts to this group.

#### *2.2.3.2 Future Architecture Task Group*

The underlying objective of this project is to propose a future architecture for SC4 that greatly reduces the barriers to the use of SC4 standards in industry, reduces barriers to the use of SC4 standards in conjunction with standards from other bodies such as the OMG and OASIS and increases the utility of SC4 standards to industry.

The traditional restriction that SC4 use only SC4 technologies and SC4 models in its standards products has been shown to be an impediment to broad acceptance of the work of SC4, and should no longer be a constraint on the architecture. SC4 cannot invent a new architecture; in fact basing the new SC4 architecture on widespread technologies is the key business driver for the project.

In addition to proposing a future SC4 architecture, this project will demonstrate use of the proposed architecture for a particular usage scenario, define a migration path and mitigation strategies for any identified barriers.

The Future Architecture group has created a wiki: http://futurearch.wikispaces.com/

Among the documents here the IDIOM specifications document is relevant for the FLEXINET project. It is the subject of a section of this report.

A.F. Cutting-Decelle is a member of this FA Task Group.

#### *2.2.3.3 "Big Picture"*

The first utilisation of the term of « Big picture » in ISO TC184 has been made by ISO TC184 SC4 IMTF (Integrated Manufacturing Task Force) in a report to SC4 in 2001. This report was limited to the identification of the place and role of the various standards developed within the TC184/SC4 and to their relationship. The main interest of this report was the first attempt for an overall representation of the ISO TC184/SC4 area of work using a graphical representation on which each concerned standard or project of standardization may be placed as well as the methodology to obtain this representation.

Since then the ISO TC184 has set up under the lead of its Advisory Group a task force named "BSAD" which was appointed to list the various area of interest (universe of discourse) for ISO TC184 and its subcommittees. The objectives of this work was again to try to identify, the place of existing standards and possible areas of work in the ISO TC184 "universe of discourse", using a distinction between developments that are in the core of the scope of ISO TC184, areas that are impacted by ISO TC184 work and/or may impact ISO TC184 developments, and finally areas that are just to be monitored according to the fact they are in the "universe of discourse" of ISO TC184 without any other relationship with its work.

This work has been followed by the first attempts to carry the "Big Picture" effort to ISO TC184 SC5 and finally ISO TC184 level. During the March 2009 meeting of this group it was decided to extend the TC184 "Big Picture" to the "universe of discourse" of both ISO TC184 and IEC TC65 committee.

- **Scope**: definition, population and usage of a set of tools to identify the place and role of the developed standards and/or projects of standardisation project in the universe of discourse of both ISO TC184 and IEC TC65.
- **Object of standardisation :** the basic objects of standardisation (or projects of standardisation) in the ISO TC184 and IEC TC65 universe of discourse will be:
  - products;
  - systems;
  - interfaces;
  - models (of these previous objects).

For further information, contact AFNOR: Ghislaine Magnan and Jean-Jacques Michel: http://www.iso.org/iso/standards_development/technical_committees/other_bodies/iso_technical_committee.htm?commid=54110

## 2.3 The IDIOM approach

### 2.3.1 Basis of the approach

Industrial Data Integrated Ontologies and Models (IDIOM) is a framework or architecture for the representation and exchange of industrial data using technologies, methodologies and approaches that are current industry best practice. The IDIOM approach has been developed by experts from standards-making bodies but its use is not restricted to standards.

Since 2004, the US National Institute of Standards and Technology (NIST) has hosted an 'Ontology Summit' as part of their general advocacy designed to bring ontology science and engineering into the mainstream. In 2009 the topic was Toward Ontology-Based Standards and the following quote from the resulting summit provides important background to the effort.

> *"Ontologies represent the best efforts of the technical community to unambiguously capture the definitions and interrelationships of concepts in a variety of domains. Standards – specifically information standards - are intended to provide unambiguous specifications of information, for the purpose of error-free access and exchange. If the standards community is indeed serious about specifying such information unambiguously to the best of its ability, then the use of ontologies as the vehicle for such specifications is the logical choice."*

IDIOM has implemented the recommendation of the Ontology Summit 2009 and has put ontologies specified using logic based languages at the centre of the approach.

### 2.3.2 Components of IDIOM

IDIOM has three parts, which although they are linked can evolve independently, as follows:

1. the IT framework of software technologies and tools;
2. the methodologies, policies and guidelines for the activities of people using the tools;

3. the framework of core concepts.

The initial development work on IDIOM has concentrated on the IT framework, because the other two parts rely upon it.

The IT framework specifies the set of technologies used to support the various components of the approach. The framework is intended to be flexible and to be extended as new technologies become available. A figure showing the various components of the architecture and examples of what might be created and related is shown in Figure 2-1 below:

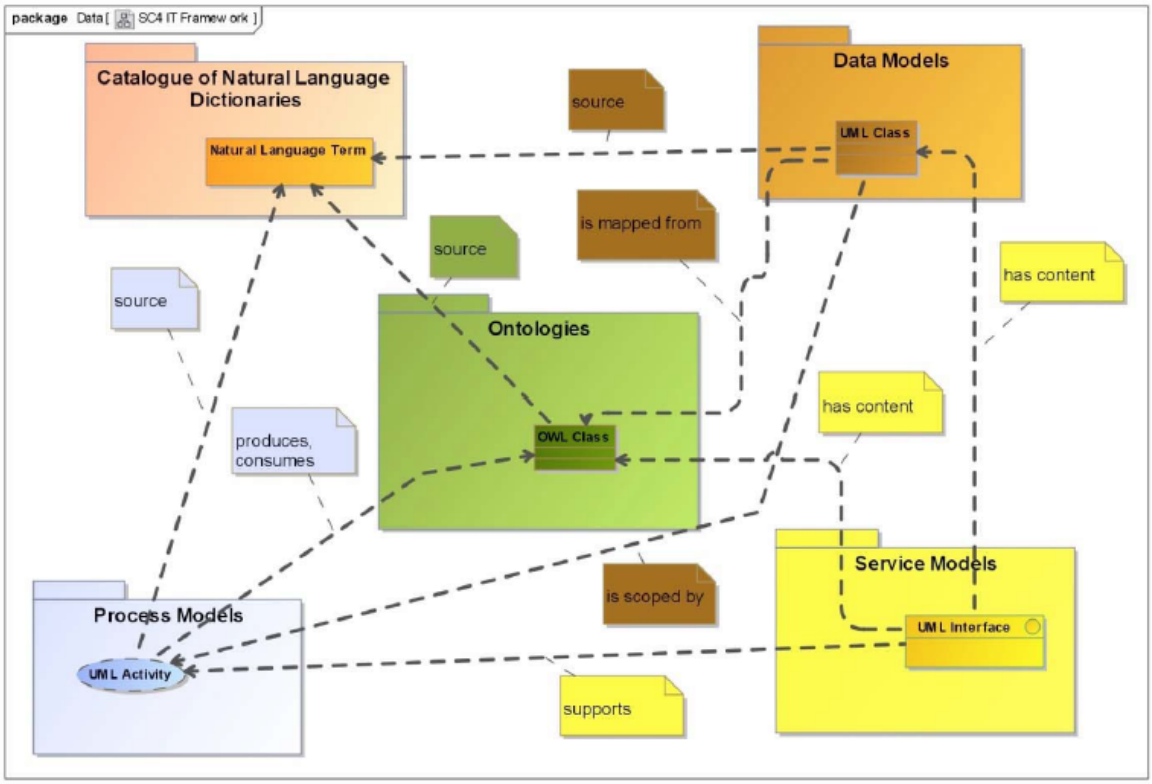



**Figure 2-1: High level IT framework**

Figure 2-1 depicts the high level IT framework diagram, to which the ontologies are a core component upon which the process models, data models and service models depend. The meaning of data within these models is defined by reference to the ontologies.

### 2.3.3 The IDIOM IT framework

Components of the IT framework are: natural language dictionaries; ontologies; process models; data models; service models; mappings and traces. These components are described in detail in separate sections of the full document.

Each component of the IT framework includes models at different levels of abstraction. Figure 2-2 shows some of the levels of abstraction and some of the initial technology recommendations.

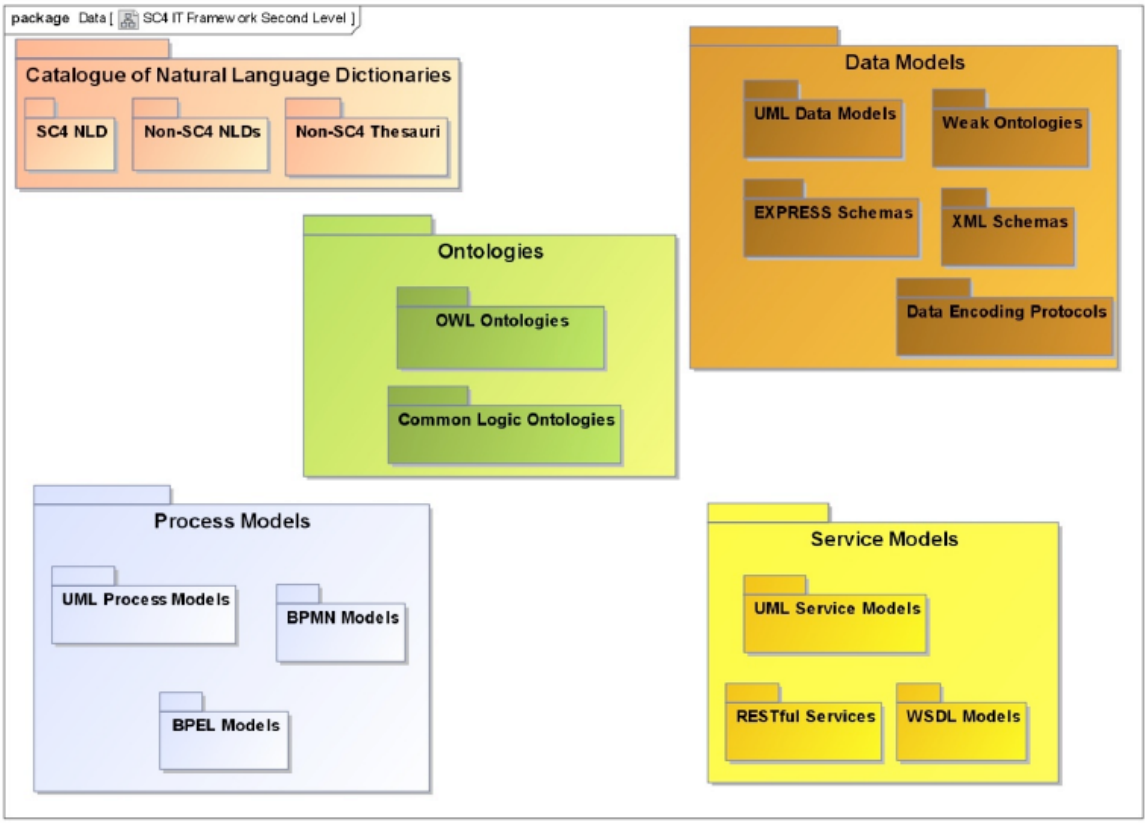



**Figure 2-2: IT framework – second level of detail**

The full document, "*IDIOM Architecture Specification*" can be downloaded at:

http://futurearch.wikispaces.com/file/view/IDIOM_Architecture_Specification_2010-03-18.pdf/135402247/IDIOM_Architecture_Specification_2010-03-18.pdf

## 2.4 The Target Standardisation Group

There are a great many standardisation groups and committees of relevance to manufacturing. For our interests we conclude from this study of the different possibilities standardisation "homes" for our interests that the domains covered by the ISO TC 184 seem to be most relevant to our proposal of standardising manufacturing ontologies. Further that we should target ISO TC 184 SC4 in the first instance and especially ISO TC 184 SC4 JWG8.

## 2.5 Existing Standards relevant to FLEXINET

The standards mentioned in this section are organised into four categories: product-service related standards, global production network standards, systems standards and languages standards.

### 2.5.1 Product-Service related standards

The following standards have been developed within the framework of the ISO TC 184 standardisation committee. All of them are relevant to a product and/or service based approach.

#### *2.5.1.1 ISO 10303 STEP (and specific APs)*

ISO 10303 is an International Standard for the computer-interpretable representation of product information and for the exchange of product data.

The objective is to provide a neutral mechanism capable of describing products throughout their life cycle. This mechanism is suitable not only for neutral file exchange, but also as a basis for implementing and sharing product databases, and as a basis for archiving, a brief representation of which is shown in Figure 2-3, Figure 2-4 and Figure 2-5.

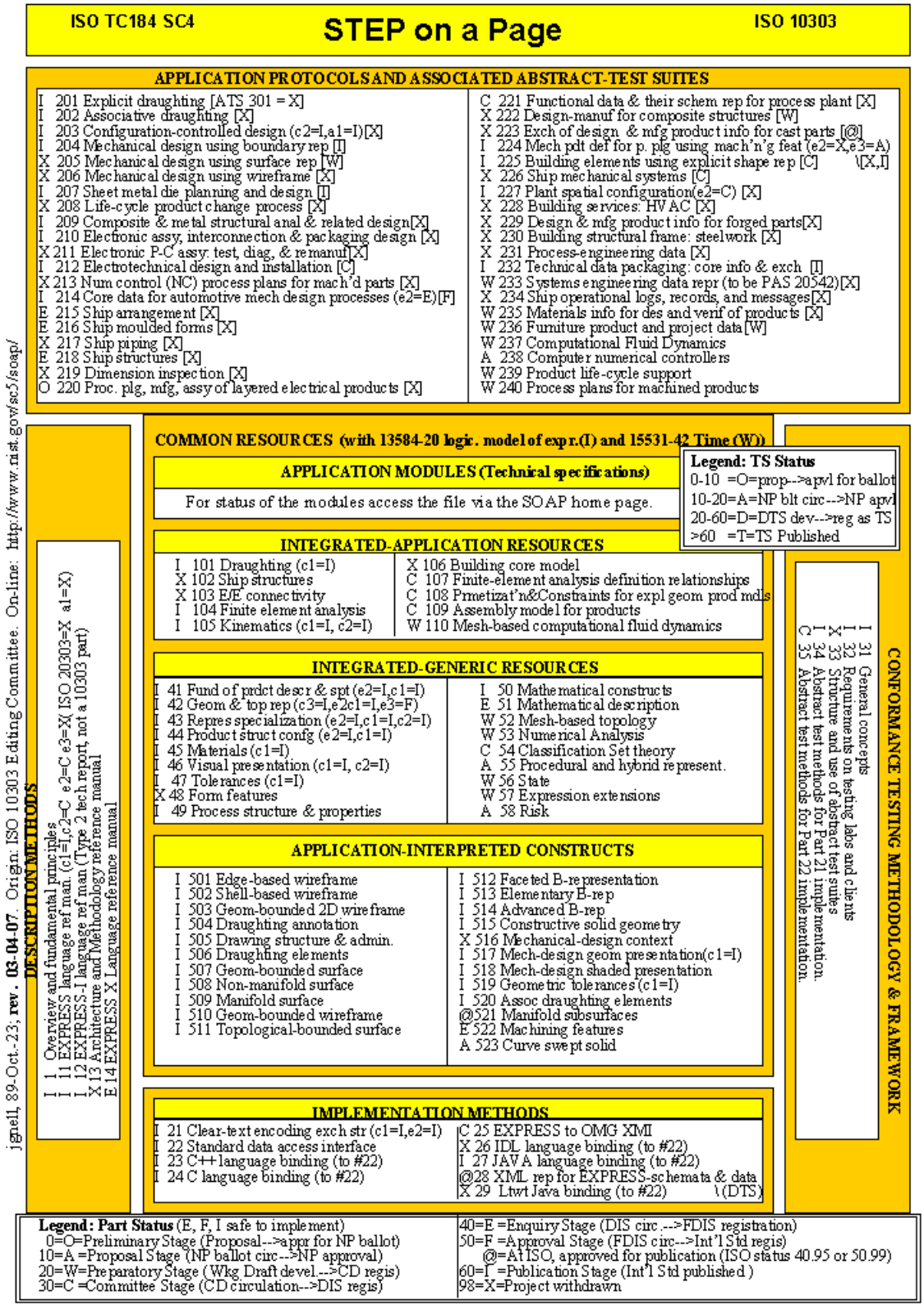



**Figure 2-3: ISO 10303: STEP on a page (part 1)**

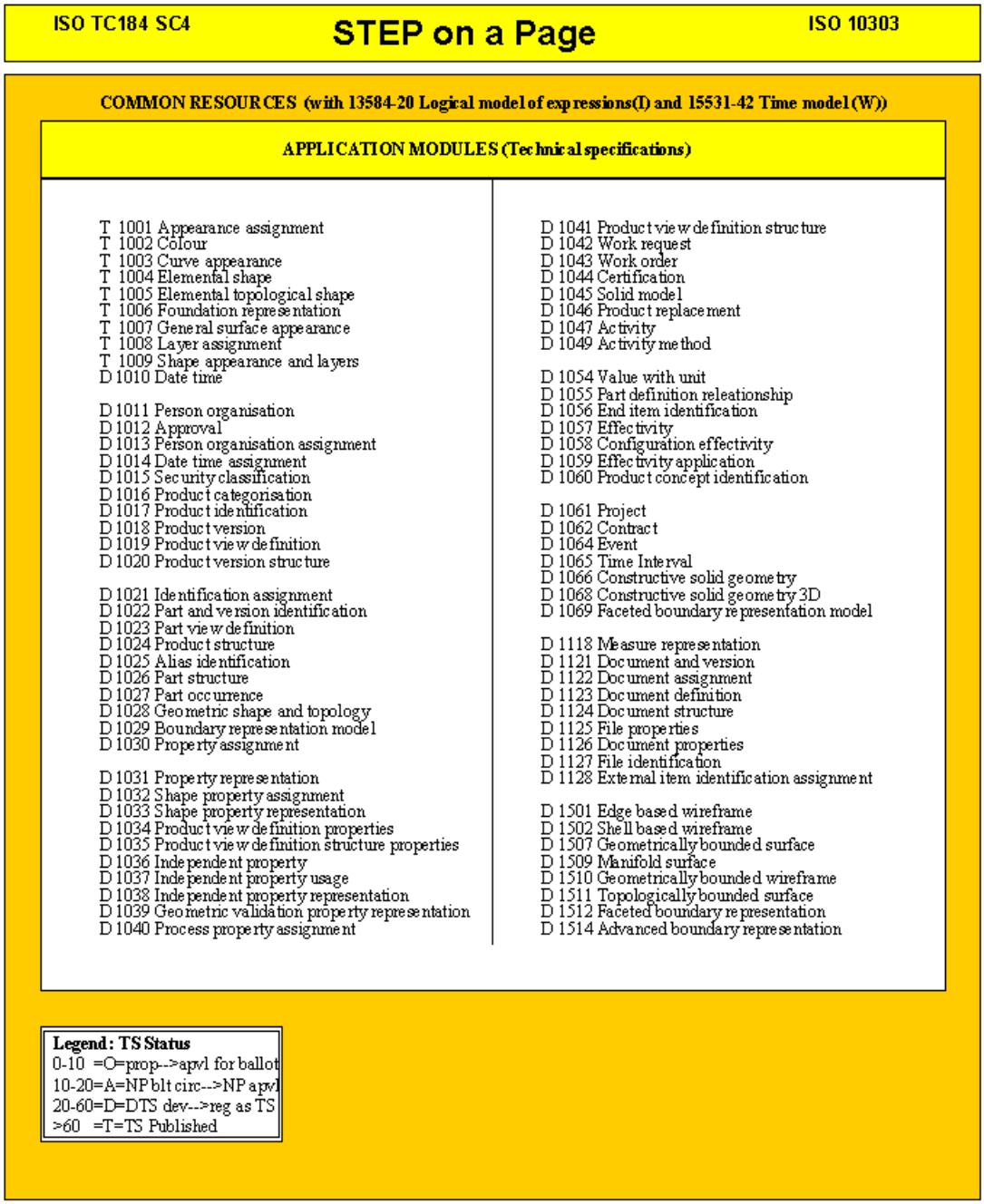
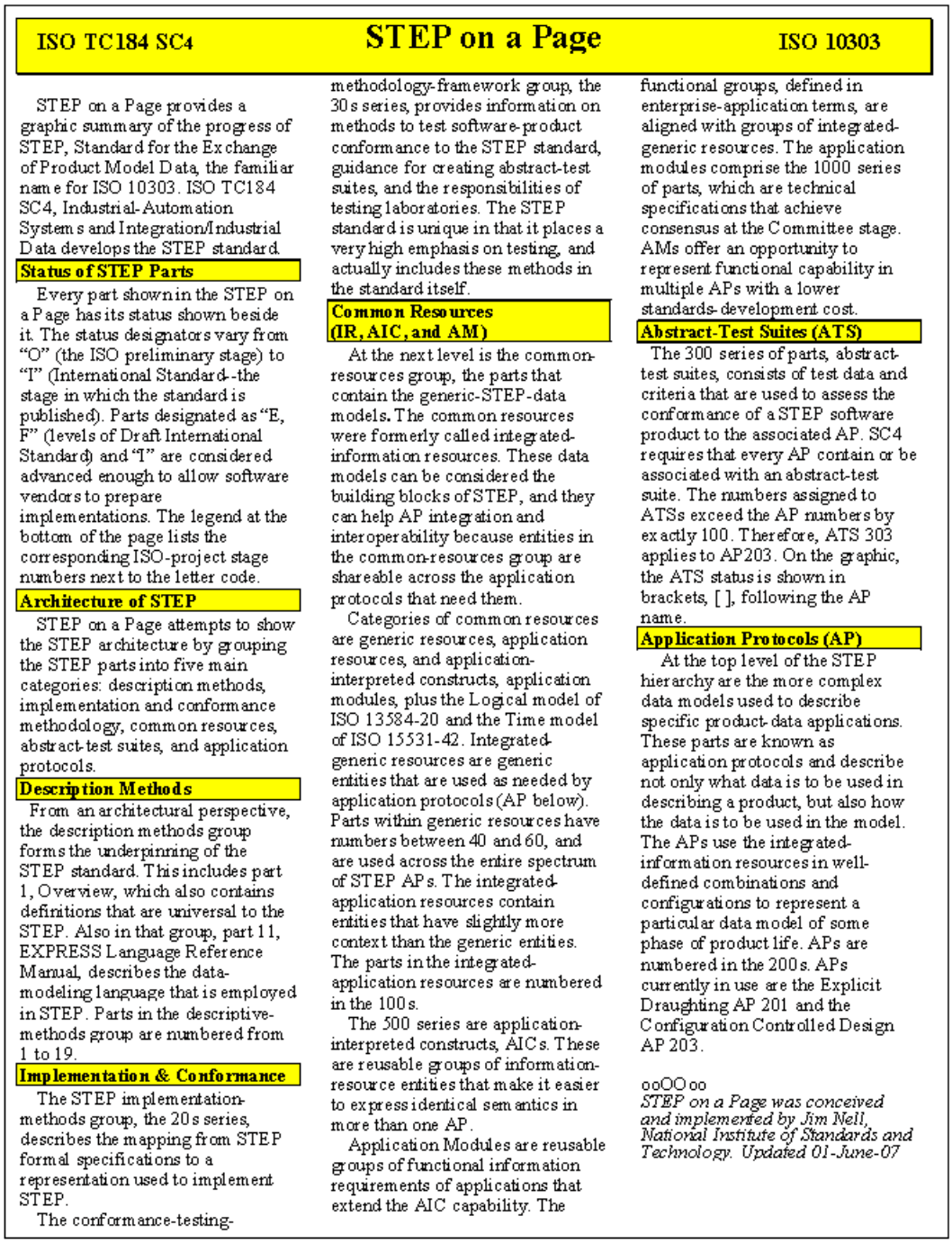



**Figure 2-4: ISO 10303: STEP on a page (part 2)**



ISO TC184 SC4

# STEP on a Page

ISO 10303

STEP on a Page provides a graphic summary of the progress of STEP, Standard for the Exchange of Product Model Data, the familiar name for ISO 10303. ISO TC184 SC4, Industrial-Automation Systems and Integration/Industrial Data develops the STEP standard.

**Status of STEP Parts**

Every part shown in the STEP on a Page has its status shown beside it. The status designators vary from "O" (the ISO preliminary stage) to "I" (International Standard--the stage in which the standard is published). Parts designated as "E, F" (levels of Draft International Standard) and "I" are considered advanced enough to allow software vendors to prepare implementations. The legend at the bottom of the page lists the corresponding ISO-project stage numbers next to the letter code.

**Architecture of STEP**

STEP on a Page attempts to show the STEP architecture by grouping the STEP parts into five main categories: description methods, implementation and conformance methodology, common resources, abstract-test suites, and application protocols.

**Description Methods**

From an architectural perspective, the description methods group forms the underpinning of the STEP standard. This includes part 1, Overview, which also contains definitions that are universal to the STEP. Also in that group, part 11, EXPRESS Language Reference Manual, describes the data-modeling language that is employed in STEP. Parts in the descriptive-methods group are numbered from 1 to 19.

**Implementation & Conformance**

The STEP implementation-methods group, the 20s series, describes the mapping from STEP formal specifications to a representation used to implement STEP.

The conformance-testing-methodology-framework group, the 30s series, provides information on methods to test software-product conformance to the STEP standard, guidance for creating abstract-test suites, and the responsibilities of testing laboratories. The STEP standard is unique in that it places a very high emphasis on testing, and actually includes these methods in the standard itself.

**Common Resources (IR, AIC, and AM)**

At the next level is the common-resources group, the parts that contain the generic-STEP-data models. The common resources were formerly called integrated-information resources. These data models can be considered the building blocks of STEP, and they can help AP integration and interoperability because entities in the common-resources group are shareable across the application protocols that need them.

Categories of common resources are generic resources, application resources, and application-interpreted constructs, application modules, plus the Logical model of ISO 13584-20 and the Time model of ISO 15531-42. Integrated-generic resources are generic entities that are used as needed by application protocols (AP below). Parts within generic resources have numbers between 40 and 60, and are used across the entire spectrum of STEP APs. The integrated-application resources contain entities that have slightly more context than the generic entities. The parts in the integrated-application resources are numbered in the 100s.

The 500 series are application-interpreted constructs, AICs. These are reusable groups of information-resource entities that make it easier to express identical semantics in more than one AP.

Application Modules are reusable groups of functional information requirements of applications that extend the AIC capability. The functional groups, defined in enterprise-application terms, are aligned with groups of integrated-generic resources. The application modules comprise the 1000 series of parts, which are technical specifications that achieve consensus at the Committee stage. AMs offer an opportunity to represent functional capability in multiple APs with a lower standards-development cost.

**Abstract-Test Suites (ATS)**

The 300 series of parts, abstract-test suites, consists of test data and criteria that are used to assess the conformance of a STEP software product to the associated AP. SC4 requires that every AP contain or be associated with an abstract-test suite. The numbers assigned to ATSs exceed the AP numbers by exactly 100. Therefore, ATS 303 applies to AP203. On the graphic, the ATS status is shown in brackets, [ ], following the AP name.

**Application Protocols (AP)**

At the top level of the STEP hierarchy are the more complex data models used to describe specific product-data applications. These parts are known as application protocols and describe not only what data is to be used in describing a product, but also how the data is to be used in the model. The APs use the integrated-information resources in well-defined combinations and configurations to represent a particular data model of some phase of product life. APs are numbered in the 200s. APs currently in use are the Explicit Draughting AP 201 and the Configuration Controlled Design AP 203.

ooOOoo

*STEP on a Page was conceived and implemented by Jim Nell, National Institute of Standards and Technology. Updated 01-June-07*

**Figure 2-5: ISO 10303: STEP on a page (part 3)**

For further information: STEP tools web site: http://www.steptools.com/library/standard/

ISO web site:

http://www.iso.org/iso/home/store/catalogue_tc/catalogue_tc_browse.htm?commid=54158&development=on

#### *2.5.1.2 ISO 13584 P-LIB*

ISO 13584 provides a representation of parts library information together with the necessary mechanisms and definitions to enable parts library data to be exchanged, used and updated. The exchange may be between different computer systems and environments associated with the complete life cycle of the products where the library parts may be used, including product design, manufacture, use, maintenance, and disposal. The standard provides a generalized structure for a parts library system and does not define a fully detailed implementable parts library system.

ISO 13584 consists of the following parts under the general title *Industrial automation systems and integration — Parts library:*

- Part 1: Overview and fundamental principles
- Part 10: Conceptual description: Conceptual model of parts library
- Part 20: Logical resource: Logical model of expressions
- Part 24: Logical resource: Logical model of supplier library
- Part 26: Logical resource: Information supplier identification
- Part 31: Implementation resource: Geometric programming interface
- Part 42: Description methodology: Methodology for structuring part families
- Part 101: View exchange protocol: Geometric view exchange protocol by parametric program
- Part 102: View exchange protocol: View exchange protocol by ISO 10303 conforming specification

For further information:

http://www.iso.org/iso/home/store/catalogue_tc/catalogue_tc_browse.htm?commid=54158

#### *2.5.1.3 ISO 15531 MANDATE*

ISO 15531-1:2004 provides a general overview of the whole ISO 15531 standard (MANDATE). It specifies its scope and provides a number of basic definitions on which the whole standard is built in accordance with the "*General system theory*" and the concepts defined in APICS dictionary. Its informative annexes provide a description of the relationships between MANDATE and other standards (especially

ISO/TC 184 standards), as well as a clarification of the concepts of "capability and capacity" as they are used in MANDATE and other standards that refer explicitly or implicitly to the system theory.

MANDATE addresses the modelling of manufacturing management data such as:

- Resources management data (Resource model);
- Time related features (Time model);
- Flow management data in manufacturing (Flow management model).

MANDATE, in association with STEP, PLIB and other SC4 (or non SC4) standards, may be used in any software application that addresses manufacturing management related information such as resources management data, flow management data. As such, the standard is intended to facilitate information exchanges between software applications such as E.R.P., manufacturing management software, maintenance management software, quotation software, etc.

**Manufacturing resources usage management data (3x series):**

- ISO 15531-31: Resource Information Model: Basic Concepts
- ISO 15531-32: Conceptual Model for Resources Usage Management Data

**Manufacturing flow management data (4x series):**

- ISO 15531-42: Time Model
- ISO 15531-43: Data Model for Manufacturing Flow Management
- ISO 15531-44: Manufacturing Management Information Modelling for Shop Floor Data Acquisition

For further information:

http://www.iso.org/iso/home/store/catalogue_tc/catalogue_tc_browse.htm?commid=54158

#### *2.5.1.4 ISO 18629 PSL*

As the use of information technology in manufacturing has matured, the necessity for software applications to inter-operate has become crucial to the conduct of business and operations in organisations. To be competitive and maintain good economic performance, manufacturing organisations need to employ increasingly effective and efficient systems. Such systems should result in the seamless

integration of manufacturing applications and exchange of manufacturing processes between applications. Organisations should also be able to preserve and retrieve on demand the knowledge contained in their business and operational processes, regardless of the applications used to produce and handle these processes.

ISO 18629 provides semantics to the computer-interpretable exchange of information related to manufacturing processes and is probably the standard that is conceptually most aligned with FLEXINET. ISO 18629 provides a language for describing a manufacturing process throughout the entire production process within the same industrial company or across several industrial sectors or companies, independently from any particular representation model. The nature of this language makes it suitable for sharing process information related to manufacturing during all the stages of a production process.

The parts of ISO 18629 are independent of any specific process representation or model used in a given application. Collectively, they provide a structural framework for interoperability. Current parts of the ISO 18629 standard are:

- Part 1: Process specification language : overview and basic principles
- Part 11: Process specification language : PSL core
- Part 12: Process specification language : Outer core
- Part 13: Process specification language : Duration and ordering theories
- Part 41: Process specification language : Definitional extension : activity extension
- Part 42: Process specification language : Definitional extension : Temporal and state extension
- Part 43: Process specification language : Definitional extension : Activity ordering and duration extension

NIST web site about PSL: http://www.mel.nist.gov/psl/

For further information:

http://www.iso.org/iso/home/store/catalogue_tc/catalogue_tc_browse.htm?commid=54158

#### *2.5.1.5 ISO 15926 Oil & Gas: Integration of life-cycle data for process plants including oil and gas production facilities*

Information concerning engineering, construction and operation of production facilities is created, used and modified by many different organizations throughout a facility's lifetime. The purpose of ISO 15926 is to facilitate integration of data to support the life-cycle activities and processes of production facilities.

The data model and the initial reference data are suitable for shared databases or data warehouse computer systems in development project and in operation and maintenance. Furthermore, as well as, for defining the terms used in product catalogues in e-commerce. Another use of the standard is as a reference classification for shared databases and product catalogues not based on ISO 15926.

- Part 1 Overview and fundamental principles: *ISO 15926-1:2003 specifies a representation of information associated with engineering, construction and operation of process plants. This representation supports the information requirements of the process industries in all phases of a plant's life-cycle and the sharing and integration of information amongst all parties involved in the plant's life cycle.* (ISO)
- Part 2 Data model: *ISO 15926-2:2003 is a part of ISO 15926, an International Standard for the representation of process plant life-cycle information. This representation is specified by a generic, conceptual data model designed to be used in conjunction with reference data: standard instances that represent information common to a number of users, process plants, or both. The use and definition of reference data for process plants is the subject of Parts 4, 5 and 6 of ISO 15926.* (ISO)

The model can support all disciplines and life-cycle stages, and it can support information about functional requirements, physical solutions, types of objects and individual objects as well as activities.

Resources:

- Online version of ISO 15926-2
- POSC Caesar's OWL serialization of ISO 15926-2. See also ISO 15926 in OWL for more information on how ISO 15926 may be represented in OWL (Web Ontology language)
- EXPRESS listing of ISO 15926-2

- Part 3 Reference data for geometry and topology: ISO 15926–3 will make the concepts defined by ISO 10303-42 and ISO 10303-104, including concepts in Earth models and the GIS standards ISO 19107 and ISO 1911, available within the ISO 15926 environment. The ontology defined by ISO 15926-3 will be equally valid for CAD, GIS and Earth models.

Resources:

- ISO TS 15926-3 (2007) REFERENCE DATA CLASS. This is the reference data item classifying all reference data items defined in ISO 15926-3 as represented in the POSC Caesar Reference Data Library of Feb. 2008

- Part 4 Initial reference data: *ISO/TS 15926-4:2007 defines the initial set of reference data for use with the ISO 15926 and ISO 10303-221 industrial data standards.* (ISO)

Resources:

- Reference data sets as Excel spreadsheets. The reference data items defined in ISO 15926-4 are published on the Internet at this address
- Web "browsable" version of the ISO 15926-4:2007 reference data items

- Part 6 Methodology for the development and validation of reference data: A combined NWI proposal and CD/TS proposal has been prepared for ISO 15926 Part 6.

- Part 7 Implementation methods for the integration of distributed system -- Template: methodology

ISO 15926-7 is defining and testing implementation methodologies. Through the IDS project a short cut implementation strategy for using Part 4 reference data as a dictionary of standard terms has been developed.

Web site: https://www.posccaesar.org/wiki/ISO15926

#### *2.5.1.6 ISO 8000 Data quality*

The purpose of ISO 8000 is to make it easier to contract for quality data and to identify companies and software applications that can deliver quality data. ISO 8000 quality data is "portable data that meets stated requirements." Portable data is data

that can be separated from a software application. This is important because if the data can only be used or read using a specific licensed software application then the data is also subject to the terms of the license – basically what you think of as "your data" may not in reality belong to you and what you can do with the data may be restricted by the terms of the software license. You can still buy and sell ISO 8000 quality data but it will not be linked to a software application. Separating data from software is also very important when it comes to the long term preservation of data. Data that meets stated requirements is a reference to the fact that you measure the quality of data by comparing data to a "stated" data requirement. ISO 22745-30 is the preferred standard for stating data requirements in XML as well as for exchanging portable data. ISO 22745 creates portable data by labelling the data using an ISO 22745 compliant Open Technical Dictionary such as the ECCMA Open Technical Dictionary (eOTD).

The following parts have already been published:

- ISO/TS 8000-1:2011, *Data quality — Part 1: Overview*
- ISO 8000-2:2012, *Data quality — Part 2: Vocabulary*
- ISO/TS 8000-100:2009, *Data quality — Part 100: Master data: Exchange of characteristic data: Overview*
- ISO 8000-102:2009, *Data quality — Part 102: Master data: Exchange of characteristic data: Vocabulary*
- ISO 8000-110:2009, *Data quality — Part 110: Master data: Exchange of characteristic data: Syntax, semantic encoding, and conformance to data specification*
- ISO/TS 8000-120:2009, *Data quality — Part 120: Master data: Exchange of characteristic data: Provenance*
- ISO/TS 8000-130:2009, *Data quality — Part 130: Master data: Exchange of characteristic data: Accuracy*
- ISO/TS 8000-140:2009, *Data quality — Part 140: Master data: Exchange of characteristic data: Completeness*
- ISO/TS 8000-150:2011, *Data quality — Part 150: Master data: Quality management framework*

Web site: http://www.eccma.org/iso8000/iso8000home.php

### 2.5.2 Global production network standards

We provide here a list of standards or models applicable to global production networks and systems.

#### *2.5.2.1 Enterprise Architecture, Engineering & Integration Standards (ISO and EN)*

The available standards are:

- *preEN/ISO 19439 : Enterprise Integration - Framework for Enterprise Modelling,* ISO TC 184/SC5/WG1 - CEN TC 310/WG1, 2003
- *preEN/ISO 19440*: *Enterprise Integration - Constructs for Enterprise Modelling,* ISO TC 184/SC5/WG1 - CEN TC 310/WG1, 2003
- *ISA 95.00.01: Enterprise-Control System Integration ,* IEC/ISO JWG15, 2002
- *ENV 13550 : Advanced Manufacturing Technology - Systems Architecture - Enterprise Model Execution and Integration Services, ,* CEN/TC310, 1999
- *IS 15704: Requirements for Enterprise Reference Architecture and Methodologies,* ISO TC 184/SC5/WG1, 1998
- *IS 14258 : Industrial Automation Systems - Concepts and Rules for Enterprise Models,* ISO TC 184/SC5/WG1, 1998
- *ENV 12204 : Advanced Manufacturing Technology - Systems Architecture - Constructs for Enterprise Modelling,* CEN TC 310/WG1, 1996
- *ENV 40003 : Computer Integrated Manufacturing - Systems Architecture - Framework for Enterprise Modelling,* CEN/CENELEC, 1991

For further information: http://www.enterprise-architecture.info/EA_Standards.htm

#### *2.5.2.2 ISO 10303-239 PLCS*

ISO 10303-239 (PLCS) is an international standard developed within the framework of the ISO 10303 STEP standard, it specifies an information model that defines what information can be exchanged and represented to support a product through life. The basic data structures that are exchanged are defined by EXPRESS Entities. The high level IDEF0 model for PLCS is shown in Figure 2-6.

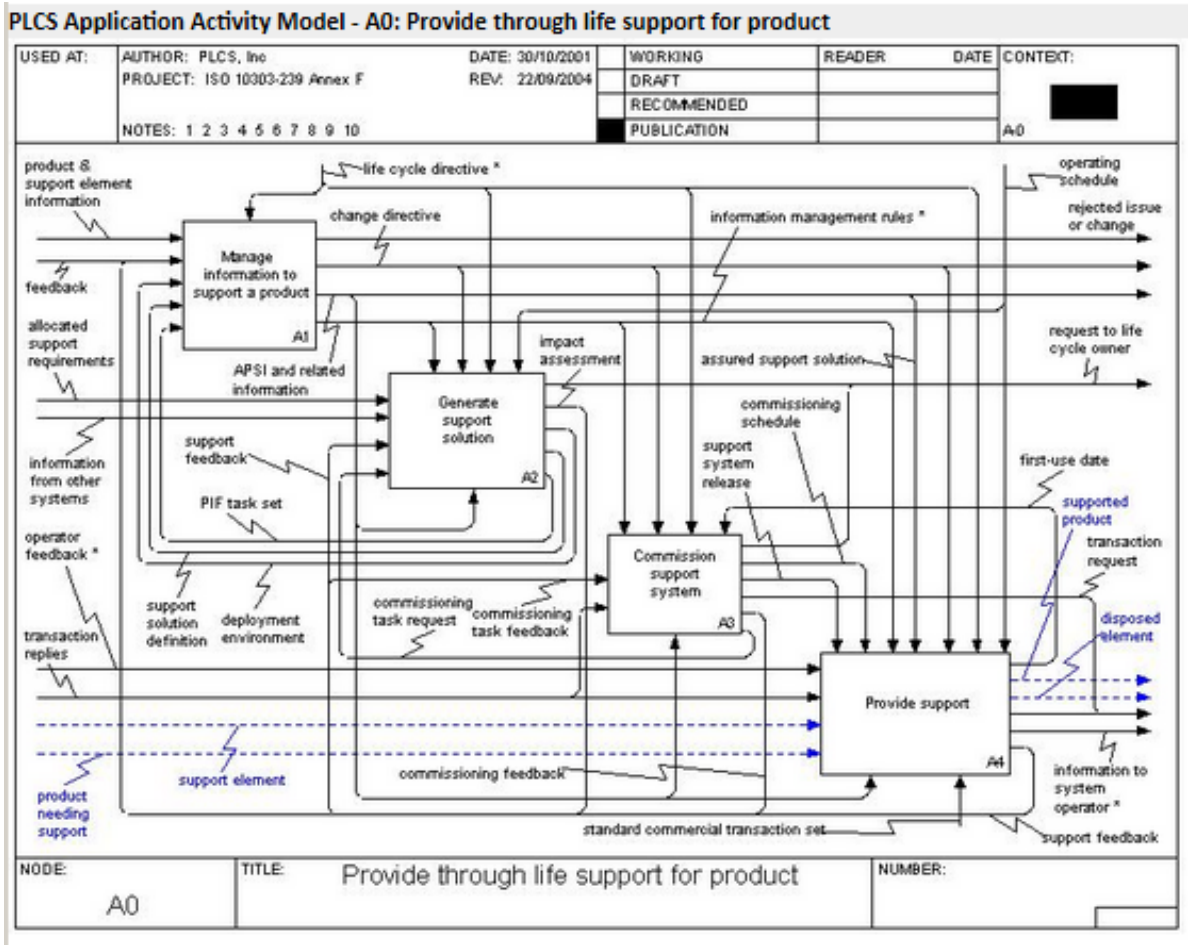



**Figure 2-6: PLCS AAM – A0 diagram**

For further information:

http://www.plcs.org/ and http://www.plcs-resources.org/ap239/

For further details about the model:

http://www.plcs.org/plcslib/plcslib/data/PLCS/ap239e2_model/model_base.html

and

http://www.steptools.com/support/stdev_docs/express/ap239/index.html

### 2.5.3 Systems standards

#### *2.5.3.1 RM-ODP*

The Reference Model of Open Distributed Processing: ITU-T Rec. X.901 | ISO/IEC 10746-1 to ITU-T Rec. X.904 | ISO/IEC 10746-4, commonly referred to as *RM-ODP*, provides a framework to support the development of standards that will support distributed processing in heterogeneous environments.

RM-ODP uses an object modelling approach to describe distributed systems. Two structuring approaches are used to simplify the problems of design in large complex systems: five "viewpoints" provide different ways of describing the system; and eight "transparencies" identify specific problems unique to distributed systems which distributed system standards may wish to address. Each viewpoint is associated with a language that can be used to describe systems from that viewpoint.

The five viewpoints described by RM-ODP are:

1. The **enterprise** viewpoint, which examines the system and its environment in the context of the business requirements on the system, its purpose, scope and policies. It deals with aspects of the enterprise such as its organizational structure, which affect the system.

2. The **information** viewpoint, which focuses on the information in the system. How the information is structured, how it changes, information flows, and the logical divisions between independent functions within the system are all dealt with in the information viewpoint.

3. The **computational** viewpoint, which focuses on functional decomposition of the system into objects that interact at interfaces.

4. The **engineering** viewpoint, which focuses on how distributed interaction between system objects is supported.

5. The **technology** viewpoint, which concentrates on the individual hardware and software components which make up the system.

For further information:

http://www.enterprise-architecture.info/Images/Documents/RM-ODP.pdf

and

http://www.rm-odp.net/

#### *2.5.3.2 ISO 10303-233 Industrial automation systems and integration -- Product data representation and exchange -- Part 233: Application protocol: Systems engineering*

The development of the Systems Engineering (SE) Conceptual Model is a joint effort between the INCOSE, the ISO AP-233 project, and the SE DSIG. The SE Conceptual Model captures the essential concepts of systems engineering (e.g. function, system, and requirement) in the form of an information model which is expressed as a UML

class diagram. The SE DSIG uses this model as an input to the requirements for UML for Systems Engineering. The AP-233 project uses this model as a high level design from which it derives the detailed requirements for the data interchange standard that supports tool interoperability. Illustrations of the implementation areas and system architecture are shown in Figure 2-7 and Figure 2-8 respectively.

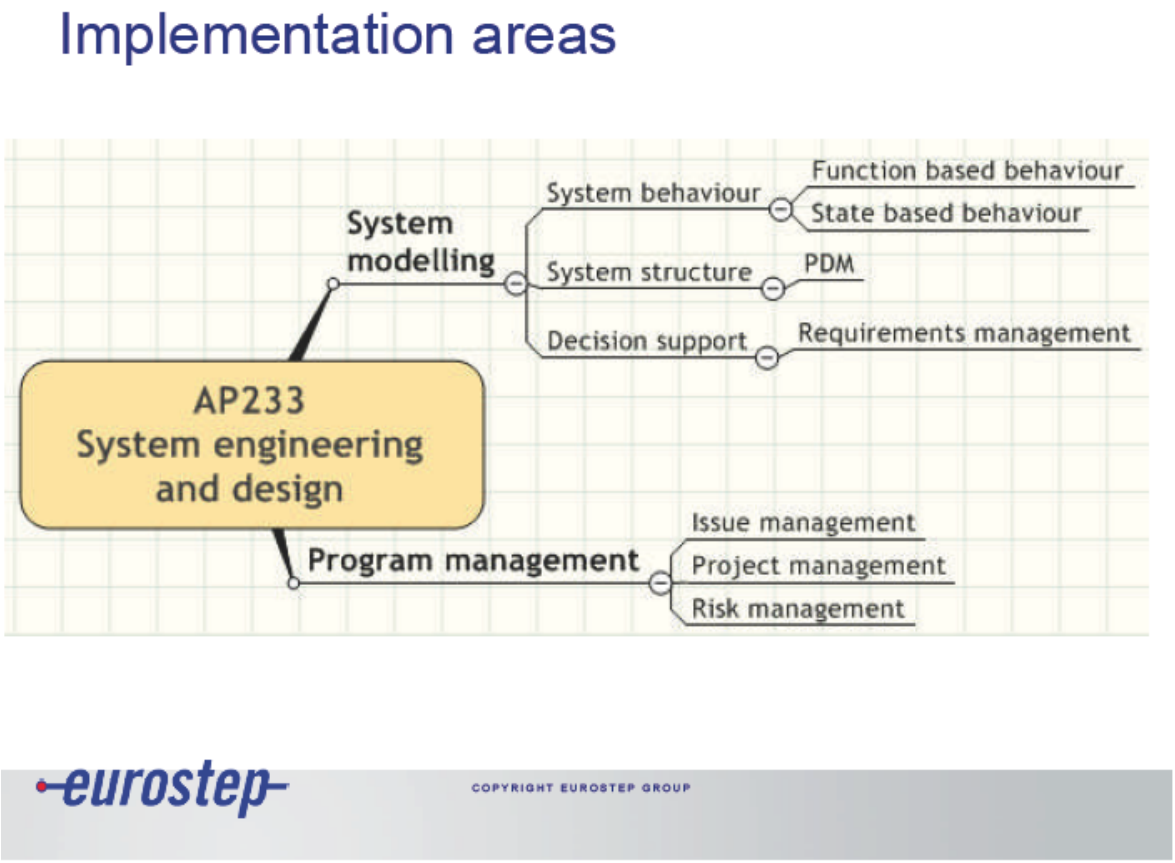



**Figure 2-7: Implementation areas [Phil Spyby, Eurostep, 2014]**

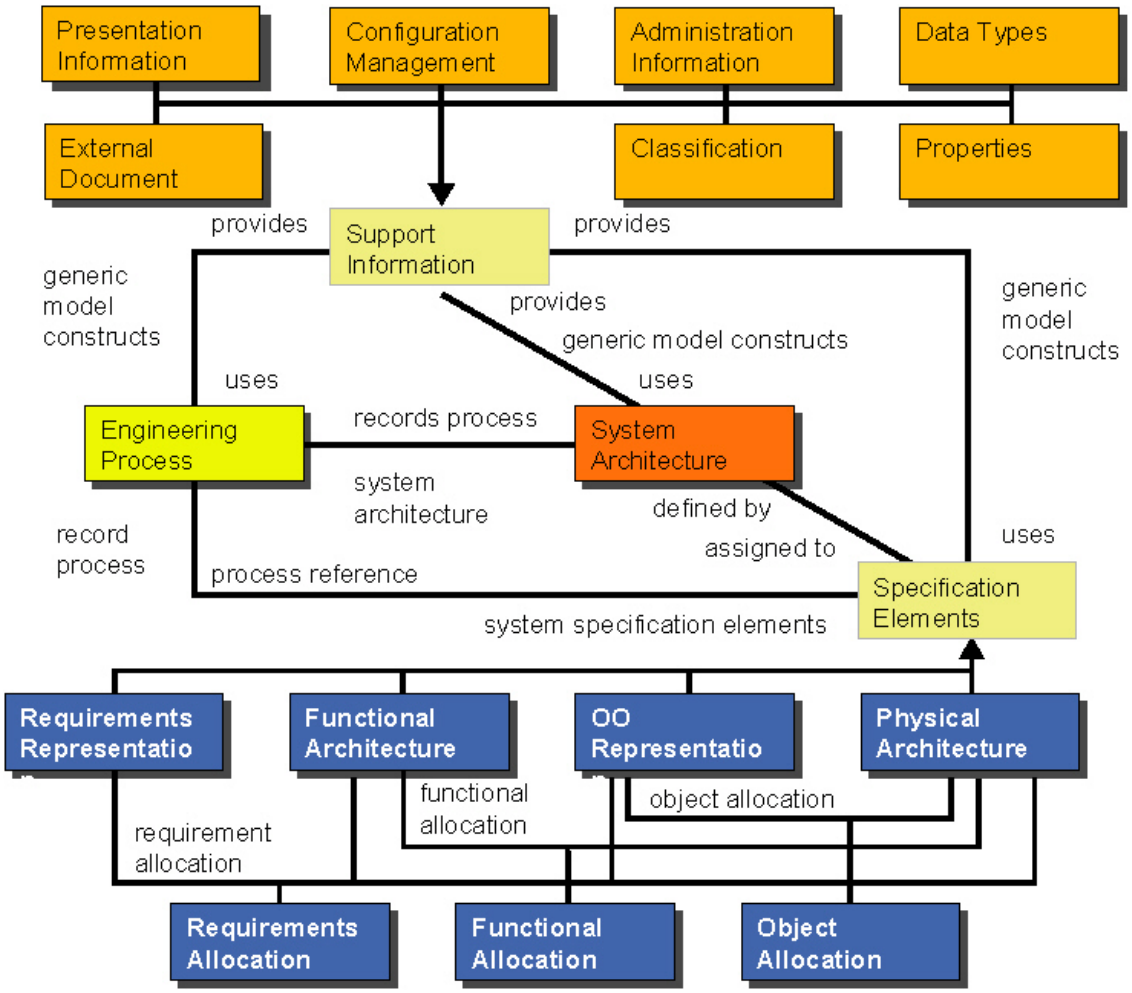



**Figure 2-8: System architecture**

For further information:

http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=55257

and

http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-ap233:mapping_between_sysml_and_ap233

### 2.5.4 Language standards

#### *2.5.4.1 ISO/IEC CD 24707*

ISO/IEC CD 24707 standard: Information technology -- Common Logic (CL): a framework for a family of logic-based languages.

This International Standard specifies a family of logic languages designed for use in the representation and interchange of information and data among disparate computer systems. The following features are essential to the design of this International Standard:

- Languages in the family have declarative semantics. It is possible to understand the meaning of expressions in these languages without appeal to an interpreter for manipulating those expressions.
- Languages in the family are logically comprehensive — at its most general, they provide for the expression of arbitrary first-order logical sentences.
- Interchange of information among heterogeneous computer systems.

This International Standard describes Common Logic's syntax and semantics. It defines an abstract syntax and an associated model-theoretic semantics for a specific extension of first-order logic. The intent is that the content of any system using first-order logic can be represented using this International Standard. The purpose is to facilitate interchange of first-order logic-based information between systems.

This standard reached IS status in 2007 and a second edition is now under development and is planned to reach Draft International Status at the end of 2014.

**Related documents**

- WG2 N1786 Overview of Common Logic.
- WG2 N1767 Proposed Revision to ISO/IEC 24707 Common Logic (2nd Edition).
- WG2 N1766 Proof support for Common Logic.
- WG2 N1703 ( doc , pdf ) ISO/IEC 24707 Common Logic Defects Report.
- WG2 N1702 ( doc , pdf ) ISO/IEC 24707 Common Logic Proposal for Second Edition.

### *2.5.4.2 QLM standard for Product/Service Lifecycle Management*

The Quantum Lifecycle Management (QLM) standards are a family of standards that have been developed by the QLM Working Group, of which Holonix is vice-chair, within the Open Group organization, to fulfill an interoperability gap identified in the context of the Internet of Things (IoT),

These standards aim at providing formats for the identification and retrieval of information related to ”instances” of objects, created and maintained by different entities along the whole lifecycle of each instance.

Using the QLM approach, trusted entities can subscribe to specific information and receive them at the desired interval of time or upon variations.

Quantum Lifecycle Management (QLM) is a major leap beyond Product Lifecycle Management (PLM), and the name has been chosen to highlight a clear differentiation between the two.

Probably the most significant obstacle to effective, whole-of-life lifecycle management is that valuable information is all too often locked into vertical applications, sometimes called “silos”. This information is not readily shared with other interested parties across the Beginning-of-Life (BOL), Middle-of-Life (MOL), and End-of-Life (EOL) lifecycle phases.

In contrast, QLM extends PLM to include detailed information not only about each individual product instance – i.e., physical products – but also their usage in the Middle-of-Life (MOL) and End-of-Life (EOL) lifecycle phases.

Furthermore, QLM standards and infrastructure may also be applied to other kinds of lifecycles such as supply chain, food and beverage, human, services, etc., thus allowing the aggregation of information about

QLM will allow information from any single lifecycle phase to affect processes and decision-making in the other phases. For example information about the condition of products at end-of-life may be fed back and used to affect the maintenance of similar products during middle-of-life or to improve the design and production of future product series at the beginning-of-life. Closed loops ensure that valuable information is available to all lifecycle phases.

Currently, the QLM family consists of two different standards:

- QLM Messaging interface
- QLM (generic) Data Format

The QLM Messaging Interface is a flexible interface for making and responding to requests for instance-specific questions, adopting a peer-to-peer communication approach.

The QLM Data Format describes the payload of the XML-coded messages including information on (generic) object instances

Both QLM Messaging Interface and QLM Data format are undergoing the official approval process within the Open Group, that will be completed in early July 2014.

In order to accommodate peculiarities related to different "kinds" of objects, several extension of the Data Format can be provided.

Specifically relevant for FLEXINET is the "Physical Object Data" extension, describing the information related to Physical Objects (or object instances) that extends the generic data format with the possibility of describing the following categories of information:

- Product type: the type of a product instance
- Lot-related data: information about the production lot of the physical instance
- Lifecycle phase: the specific phase of the product instance lifecycle the exchanged information belong to
- Activities: performed over the object instance (such as assembling, maintenance, repairing, recycling, etc…)

The QLM Physical Object Data extension is currently under development and will be hopefully finalized by Autumn 2014.

A further evolution of this extension is expected, in order to allow the management of Product-Service information exchange, thus enriching the present set of QLM standards to enable dealing with service-related information, again referring them to the Lifecycle of the Product-Service.

The FLEXINET project is expected to provide a valuable contribution to the QLM standards creation process, mostly through Holonix which is vice-chair of the QLM working Group within the Open Group, in particular as for the extension of the standards to manage Product-Service (and not only product) related information.

# 3 The FLEXINET standardisation plan

This section describes the FLEXINET view on its likely contribution to standardisation, the way in which we plan to make that contribution and the timescales against which we expect to work. This section focuses on our plans related to reference ontologies. Where other opportunities to contribute to standardisation have been identified, as in the case of QLM, these will also be pursued as the understanding in the project develops.

## 3.1 Standardisation of the product-service production reference ontologies

Note: this section is the result of the ontology work of FLEXINET workpackage 3. It is especially important to note that, while this section is illustrated using UML class diagrams, the ontologies under discussion will be developed in formal logic, based on the use of Common Logic (ISO 24707).

### 3.1.1 Generalisation and the FLEXINET reference ontologies

The FLEXINET premise is that for ease of construction, effective interoperability and flexible re-use enterprise ontologies must be built from a common base that utilises a common reference ontology wherever possible. To enable the management of complexity within the ontology and to facilitate re-use across domains the FLEXINET reference ontology is organised into five levels, as illustrated in Figure 3-1, the most generically applicable being Level 0. Each level inherits concepts from and provides additional concepts to the level above, the ontology becoming more domain specific with each level. Five levels are needed to specialise the concepts from the foundation to the enterprise specific product-service production domain. Figure 3-1 shows example domains at each level, the scope of FLEXINET being indicated in white.

The Level 0 Core consists of foundation concepts applicable to all domains, having nothing to do directly with Product-Service Lifecycle Systems. The foundation concepts include time, events, aggregation and lists and are derived from the Highfleet Upper Level Ontology (ULO) (Highfleet, 2014). Level 1 contains the few key concepts necessary to model any system. A system transforms inputs into outputs and is defined as "a combination of interacting elements organized to achieve one or more stated purposes" (ISO 15288:2008). Level 2 uses Banathy's

(1992) classification to specialise systems into "Natural Systems" and "Designed Systems". Natural systems are living systems of all kinds, including the solar system and the Universe as examples. Designed systems, within which FLEXINET sits, are man-made creations, including fabricated physical systems, conceptual knowledge and purposeful creations. As FLEXINET provides decision support that requires human input (i.e. input from a living system), the scope of FLEXINET also overlaps to a limited extent into natural systems.

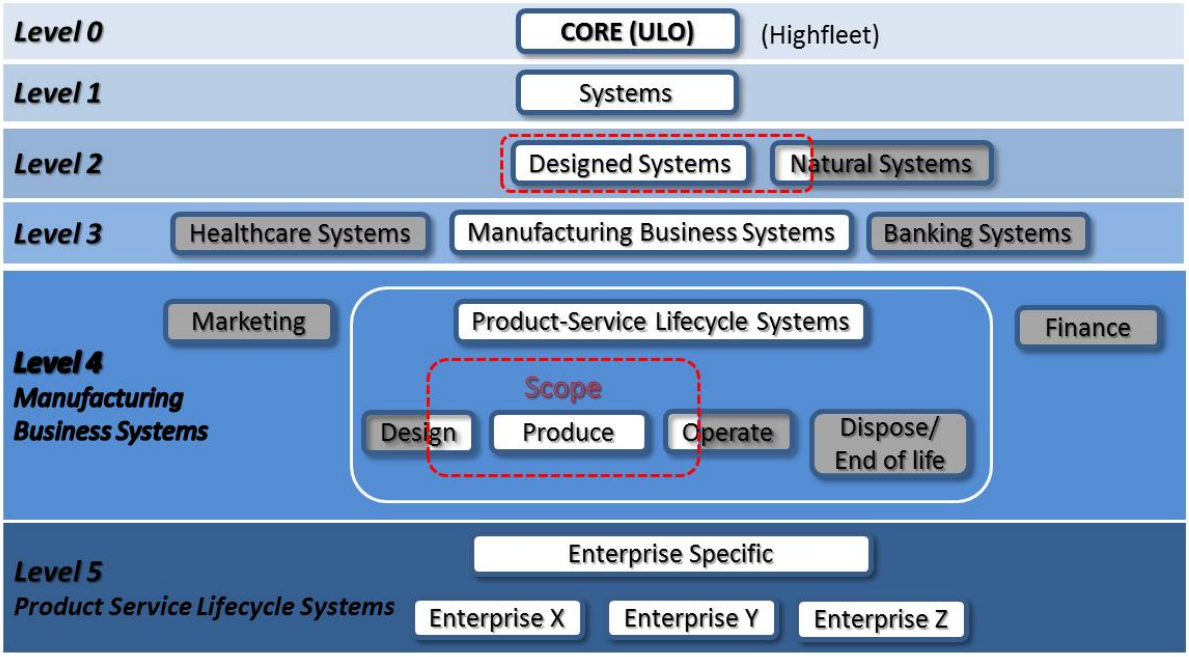



**Figure 3-1: The FLEXINET ontology levels**

Level 3 further differentiates designed systems into applicable areas. Example areas are shown in Figure 3-1. The natural systems area could also be differentiated at Level 3 but this is not shown as it is outside the scope of FLEXINET. FLEXINET is concerned with the area of Manufacturing Business Systems which provides services to define, design and analyse the Manufacturing Business domain. Manufacturing Business Systems is then further specialised within Level 4 (see Figure 3-1 for example areas). Level 3 areas such as Healthcare Systems and Banking Systems would also possess areas providing relevant specialisations at Level 4 and some of these areas might be similar to those within the Manufacturing Business Systems domain (e.g. finance would also apply to Healthcare Systems), however the concepts contained would be specialised to the parent area (i.e. the Healthcare Systems Finance area would contain concepts related to healthcare). FLEXINET

Level 4 contains concepts specifically relating to the Manufacturing Business Systems domain.

The area FLEXINET considers at Level 4 is Product-Service Lifecycle Systems, implemented as Global Production Networks. The lifecycle phases are denoted as design, produce, operate and end of life (including disposal, recycling and remanufacturing). The focus of FLEXINET is how to design a Global Production Network (GPN) to produce and operate a product-service. The main area FLEXINET considers within the Product-Service Lifecycle is therefore "Produce" (producing the product-service) but the scope also overlaps into "Design" (of the network) and "Operate" as the operation of the product and the service needs to be considered in design.

One of the objectives of FLEXINET is to provide formal reference ontologies for product-service lifecycle systems and to evaluate this through three industrial case studies. Each case study considers a different type of GPN implementation. FLEXINET levels, 0-4, provide the reference ontologies which are specialised at Level 5 to suit specific business requirements for the case studies within the domain of Product-Service Lifecycle Systems. Level 5 provides separate domain areas for the enterprise specific requirements of each case study as shown in Figure 3-1.

Five levels were found to be necessary to specialise FLEXINET concepts. Level 5 provides enterprise specific concepts for the product-service production domain for each of the three enterprises; above this Level 4 provides concepts that would apply to any enterprise in the Product-Service Lifecycle Systems domain. The area generalising Product-Service Lifecycle Systems, covering more areas within an enterprise or network, was considered to be Manufacturing Business Systems (Level 3). The super domain for Level 3, encompassing all engineering and enterprise systems, was rationalized as Designed Systems. The domain above Designed Systems (at Level 2) is clearly Systems. Level 0 was required to capture core foundation ontological concepts. The FLEXINET project is limited to three case studies each within a different business area. For a more complete ontology further case studies would be needed to derive concepts from businesses within similar domains. This would enable an extra level providing sector specific concepts to be created which would be located between Levels 4 and 5. Possible sector areas this level could contain for example are "white goods industry", "food and drink industry" and "agricultural machinery industry".

Figure 3-2 sets out the Level 1 ontology detailing the concepts and relations necessary to specify a system. This ontology level utilises the concept TimeSpan

(inherited from Level 0) and contains two parent concepts: Basic and Role. A TimeSpan includes the first and last instants of a date and all the instances in between (Highfleet, 2014). A Basic concept (Mizoguchi *et al.*, 2014) is independent of the system or context, its definition does not depend on another concept and an instance of a Basic always retains its identity as such. Basics occurring at Level 1 can be classified as System, Information, Material or Energy. It is anticipated there will be other categories, a potential one being Feature. The ontology will be extended to include these further categories when necessary.

A Basic can be comprised of Basics, e.g. "bottled water" is comprised of the materials "bottle", "cap" and "mineral water". A System is a subtype of Basic and provides a context for the Roles it contains (shown via the "depends on" relation and the composition filled diamond in the figure). The definition of a Role depends on a context and an instance of a Role cannot exist without a context, for example a person Joe has a Role as a lecturer (context "university"); "bottled water" has a role as a product (context "beverage company"). It can be seen that (for example) a lecturer Role cannot exist without the university context. If the university closes the lecturer role ceases to exist whereas the person Joe (an instance of a Basic) will still be present.

Roles may be comprised of Roles (e.g. a lecturer Role may be comprised of administration, teaching and staff Roles).

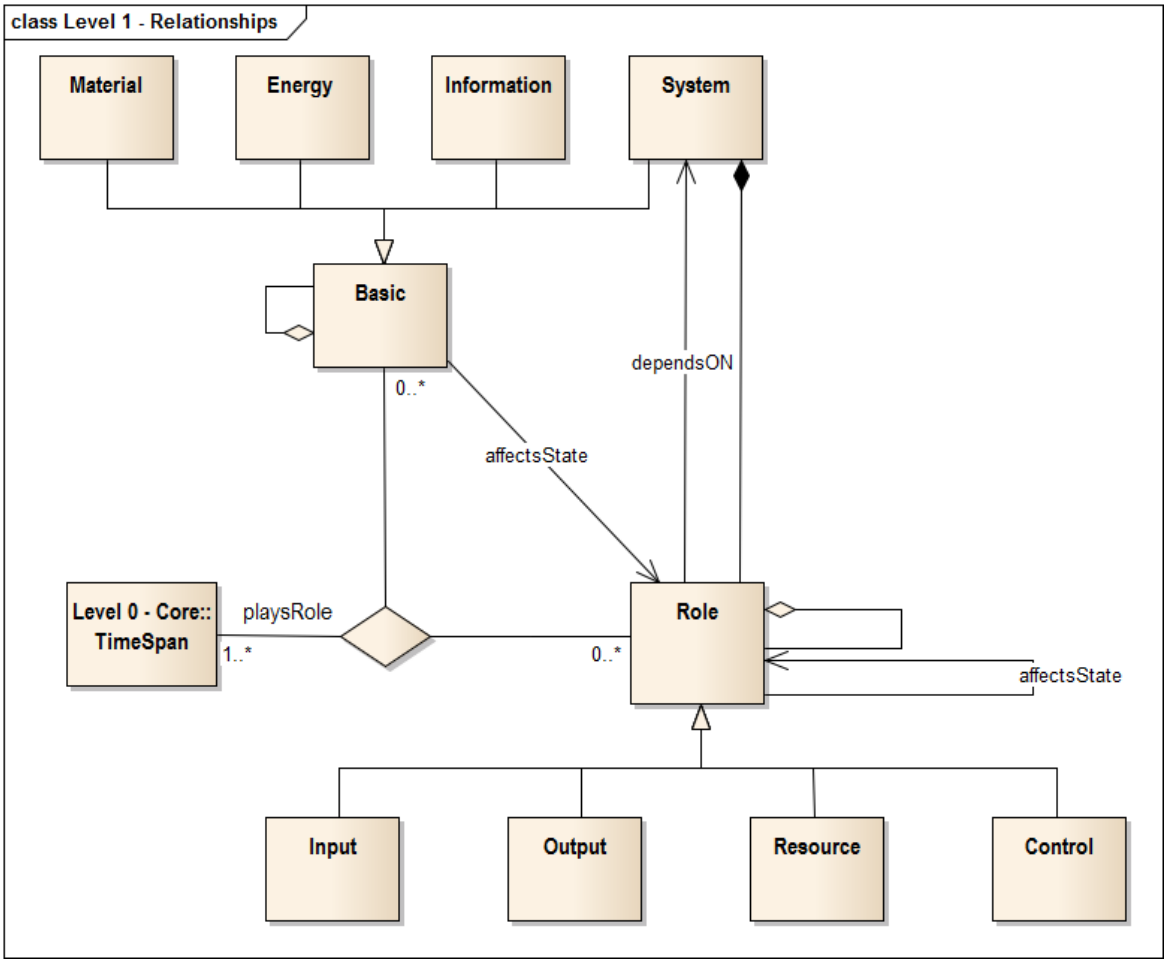



**Figure 3-2: FLEXINET Level 1 Systems Ontology**

The "playsRole" relation is transient, i.e. it exists for a certain time. A Basic plays a Role for certain TimeSpans, modelled in the ternary relation "playsRole". For example in the context of a manufacturing organization system, the Basic "bottled water" can play the Role of a Product during the TimeSpan of the system. Within a University a person could, for example, play the Role of a lecturer for a TimeSpan of five years, become unemployed and then play the Role of a lecturer again for a further TimeSpan. Within the widely known ontology analysis methodology OntoClean, Roles are modelled as concepts which are not essential to their instances (anti-rigid), a typical example provided being a student (Guarino, 1998). (This vision of Roles is implemented within the Highfleet development environment as the metaproperty "MaterialRole"). However, this research takes the view that many Roles are essential to the System that incorporates them, for example it would be difficult for a university to exist without students. In addition, to model the concept of an empty role (i.e. a vacant or required role) it is essential that a Role concept cannot cease to be (is rigid). This research captures the changeability of Roles

through the playsRole relations which explicitly models the times in which individuals participate in a Role.

The modelling of Role as a specific concept is necessary to be able evaluate whether a system is capable of meeting specified requirements. The division of Basic and Role concepts enables the number of Role instances counted to differ from the number of Basic instances playing the Roles (see the Wieringa *et al.*, (1995) counting problem). For example, one person (instance of a Basic) can play two lecturer roles, the first time from June 1997 - July 2002 and the second time from May 2005 to the present date. A Basic can play more than one Role at the same time (e.g. a person could be a lecturer (context "university") and a parent (context "family"). A Role can be played by more than one Basic, e.g. the role of a laundry would require a washer and a drier. Product composed of Ingredients, Container There is no requirement for a Basic to play a Role (shown by the 0..* multiplicity next to the Role concept in the figure). Role and Basic concepts exist separately and have separate identities. There is also no requirement for a Role to be played by a Basic, enabling empty Roles to be modelled (e.g. if a person Joe left his Role as a lecturer the Role would still exist as a lecturer vacancy, the equipment features required to fulfil the Role of a cutting resource within a manufacturing cell would be present even though no equipment was available to cut).

In the literature there is discussion of the idea "Roles can play roles" (Steimann, 2000; Loebe, 2005; West, 2008). The rationale behind this premise is the need to capture conditions such as only an employee can play the Role of a manager. However, an "employee" cannot be a "manager" - it is the person (a Basic) who plays the Role of the employee who also plays the Role of the manager. A "RolePlaysRole" relation would imply that all employees would play the Role of a manager, which is unlikely to be the case. In FLEXINET "Role can play roles" conditions will be modelled through the use of constraints axioms. The use of constraints will also enable the following to be modelled: negative conditions such as "Roles cannot play Roles" (e.g. a person playing the role of an evaluator cannot also play the role of a manager at the same time) and cardinality conditions (e.g. only one person can play the Role of U.K. Prime Minister at a time).

The ideas on Roles proposed in FLEXINET share views with those of Kozaki *et al.* (2006), Kozaki *et al.* (2008) and Mizoguchi *et al.* (2012). In common with Mizoguchi *et al.* (2012) the concepts of Basic, Role and Role aggregation are captured. However in FLEXINET Time and Role context are explicitly modelled. Time is not considered by Mizoguchi *et al.* (2012) Roles are recognised as being context-

dependent but the context is not specified being left to the choice of the modeller, whereas in FLEXINET the context is defined as the System.

A Basic may affect the state of a role, e.g. the size of a Basic "bottled water" playing the Role of a product could influence the dimensions required for a packing resource Role. Additionally a Role may affect the state of a Role, e.g. within the lecturer Role more duties allotted to the administration Role would cause duties to be removed from the teaching Role).

The four key Roles that describe a system are input, output, resource and control. An input represents what is brought into and is transformed or consumed by the system to produce outputs. An output represents what is brought out from or is produced by the system. A resource is used by or supports the execution of the system. A control is a condition required to produce correct system output (PUBs, 1993; Athena, 2006).

A simple example of the key Roles applied to a Designed system is an IT System in which input Roles are played by the Basics information (for example in the form of keyboard signals and numbers), output Roles are played by information (e.g. in the form of monitor signals and numbers), the resource Role is played by a basic "person" (a Natural System) who acts as the operator and control Roles are played by the material "control unit" and the information "analysis algorithm".

A Natural Systems example is a tree. Input Roles are played by the Basics materials "carbon dioxide" and "water" and energy (solar) which also play Resource Roles for this system. Output Roles are played by the materials "glucose", "oxygen" (both produced by photosynthesis) and "water" (produced by transpiration). Control roles are played by the information "concentration of carbon dioxide", "light intensity", "temperature" (controlling photosynthesis), "humidity" and "wind strength" (controlling transpiration).

The remaining levels are under development with the full detail of the FLEXINET progress in this area being described in project deliverable D3.1.

## 3.2 Guideline for the development of a new standard

It is important to understand the process that the development of standards requires. The guideline for the development of a new standard is provided by the ISO Directives. The **ISO/IEC Directives** are published in two parts:

- Part 1: Procedures for the technical work

- Part 2: Rules for the structure and drafting of International Standards

**Presented here are the procedures for the technical work for developing international standards, as provided by the ISO Directives (ISO/IEC Directives, Part 1 — Consolidated ISO Supplement — Procedures specific to ISO, 5th edition, 2014).**

### The project approach

International Standards shall be developed on the basis of a project approach as described below.

### Project stages

Table 3-1 below shows the sequence of project stages through which the technical work is developed, and gives the name of the document associated with each project stage. The development of Technical Specifications, Technical Reports and Publicly Available Specifications is described in Clause 3.

The ISO and IEC Supplements to the ISO/IEC Directives give a matrix presentation of the project stages, with a numerical designation of associated sub-stages. To facilitate the monitoring of project development, ISO has adopted a systematic approach to project management, based on subdivision of projects into stages and sub-stages. These are illustrated graphically in figures 3.3 and 3.4 at the end of this section.

The project management system is associated with a detailed project tracking system that is a subset of the Harmonized Stage Code system ISO Guide 69:1999 Harmonized Stage Code system (Edition 2) — Principles and guidelines for use. Annex SD gives a matrix presentation of this project tracking system, with the numerical designation of associated sub-stages. A project is registered in the ISO Central Secretariat database as having reached each particular step when the action or decision indicated at that point has been taken and ISO Central Secretariat has been duly informed.

Table 3-1 illustrates the steps leading to publication of an International Standard.

| Project stage | Associated document |
|---|---|

| | Name | Abbreviation |
|---|---|---|
| Preliminary stage | Preliminary work item | PWI |
| Proposal stage | New work item proposal [a] | NP |
| Preparatory stage | Working draft(s) [a] | WD |
| Committee stage | Committee draft(s) [a] | CD |
| Enquiry stage | Enquiry draft [b] | ISO/DIS<br>IEC/CDV |
| Approval stage | final draft International Standard [c] | FDIS |
| Publication stage | International Standard | ISO, IEC or ISO/IEC |

a These stages may be omitted, as described in Annex F.

b Draft International Standard in ISO, committee draft for vote in IEC.

c May be omitted (see 2.6.4).

**Table 3-1: Project stages and associated documents**

**Project description and acceptance**

A project is any work intended to lead to the issue of a new, amended or revised International Standard. A project may subsequently be subdivided.

A project shall be undertaken only if a proposal has been accepted in accordance with the relevant procedures.

Each project in the programme of work shall be given a number (see IEC Supplements to the ISO/IEC Directives for document numbering at the IEC) and shall be retained in the programme of work under that number until the work on that project is completed or its deletion has been agreed upon. The technical committee or subcommittee may subdivide a number if it is subsequently found necessary to subdivide the project itself. The subdivisions of the work shall lie fully

within the scope of the original project; otherwise, a new work item proposal shall be made.

**Target dates**

The technical committee or subcommittee shall establish, for each project on its programme of work, target dates for the completion of each of the following steps:

- completion of the first working draft (in the event that only an outline of a working document has been provided by the proposer of the new work item proposal);
- circulation of the first committee draft;
- circulation of the enquiry draft;
- circulation of the final draft International Standard (in agreement with the office of the CEO);
- publication of the International Standard (in agreement with the office of the CEO).

NOTE: Committees may decide to skip the committee draft (CD) stage in accordance with Annex SS. The final draft International _Standard (FDIS) is now skipped by default.

These target dates shall correspond to the shortest possible development times to produce International Standards rapidly and shall be reported to the office of the CEO, which distributes the information to all national bodies. For establishment of target dates, see the respective Supplements to the ISO/IEC Directives.

In establishing target dates, the relationships between projects shall be taken into account. Priority shall be given to those projects intended to lead to International Standards upon which other International Standards will depend for their implementation. The highest priority shall be given to those projects having a significant effect on international trade and recognized as such by the technical management board.

The technical management board may also instruct the secretariat of the technical committee or subcommittee concerned to submit the latest available draft to the office of the CEO for publication as a Technical Specification.

All target dates shall be kept under continuous review and amended as necessary, and shall be clearly indicated in the programme of work. Revised target dates shall be notified to the technical management board. The technical management board

will cancel all work items which have been on the work programme for more than 5 years and have not reached the approval stage.

**General**

When a proposed new project is approved (whether for a new deliverable or for the revision of an existing deliverable), when submitting the results to the ISO Central Secretariat the committee secretariat shall also indicate the selected standards development track, as follows (all target dates are calculated from the date of adoption as an approved project, AWI (approved work item), stage 10.99):

NOTE: The deadlines for the various stages within the development tracks shall be established on a case-by-case basis.

- Accelerated standards development track – 24 months to publication
- Default standards development track – 36 months to publication
- Enlarged standards development track – 48 months to publication

The target dates shall be kept under continuous review by committee secretariats which shall ensure that they are reviewed and either confirmed or revised at each committee meeting. Such reviews shall also seek to confirm that projects are still market relevant and in cases in which they are found to be no longer required, or if the likely completion date is going to be too late, thus causing market players to adopt an alternative solution, the projects shall be cancelled.

**Automatic cancellation of projects (and their reinstatement)**

For projects approved on or after 1 September 2003, if the target date for DIS (stage 40.00) or FDIS (stage 50.00) is exceeded, the committee shall decide within 6 months on one of the following actions:

a) projects at the preparatory or committee stages: submission of a DIS - if the technical content is acceptable and mature; projects at the enquiry stage: submission of a second DIS or FDIS - if the technical content is acceptable and mature;
b) publication of a TS - if the technical content is acceptable but unlikely sufficiently mature for a future International Standard;

c) publication of a PAS if the technical content is acceptable but unlikely sufficiently mature for a future International Standard or a TS;
d) publication of a TR - if the technical content is not considered to be acceptable for publication as a TS or for a future International Standard but is nevertheless considered to be of interest to the public;
e) submission of a request for extension to the ISO/TMB - if no consensus can be reached but there is strong interest from stakeholders to continue – a committee may be granted one extension of up to 9 months for the total project duration but the publication of intermediary deliverables (such as PAS and TS) is recommended;
f) deletion of the work item - if the committee is unable to find a solution.

If, at the end of the six month period, none of the above actions has been taken, the project shall be automatically cancelled by the ISO Central Secretariat. Projects so deleted may only be reinstated with the approval of the ISO Technical Management Board.

**Project management**

The secretariat of the technical committee or subcommittee is responsible for the management of all projects in the programme of work of that technical committee or subcommittee, including monitoring of their progress against the agreed target dates.

If target dates are not met and there is insufficient support for the work (that is, the acceptance requirements for new work are no longer met), the committee responsible shall cancel the work item.

**Project leader**

For the development of each project, a project leader (the WG convenor, a designated expert or, if appropriate, the secretary) shall be appointed by the technical committee or subcommittee, taking into account the project leader nomination made by the proposer of the new work item proposal. It shall be ascertained that the project leader will have access to appropriate resources for carrying out the development work. The project leader shall act in a purely international capacity, divesting him- or herself of a national point of view. The

project leader should be prepared to act as consultant, when required, regarding technical matters arising at the proposal stage through to the publication stage.

The secretariat shall communicate the name and address of the project leader, with identification of the project concerned, to the office of the CEO.

**Progress control**

Periodical progress reports to the technical committee shall be made by its subcommittees and working groups (see also ISO and IEC Supplements to the ISO/IEC Directives). Meetings between their secretariats will assist in controlling the progress.

The office of the CEO shall monitor the progress of all work and shall report periodically to the technical management board. For this purpose, the office of the CEO shall receive copies of documents as indicated in the ISO and IEC Supplements to the ISO/IEC Directives.

To enable ISO Central Secretariat to monitor the progress of all work and to report periodically to the ISO Technical Management Board, the committee secretariat shall ensure that the ISO Central Secretariat is notified each time a new document is distributed.

**Responsibility for keeping records**

The responsibility for keeping records concerning committee work and the background to the publication of International Standards and other ISO deliverables is divided between committee secretariats and the ISO Central Secretariat. The maintenance of such records is of particular importance in the context of changes of secretariat responsibility from one member body to another. It is also important that information on key decisions and important correspondence pertaining to the preparation of International Standards and other ISO deliverables should be readily retrievable in the event of any dispute arising out of the provenance of the technical content of the publications.

The secretariats of committees shall establish and maintain records of all official transactions concerning their committees, in particular reference copies of approved minutes of meetings and resolutions. Copies of working documents, results of ballots etc. shall be kept at least until such time as the publications to which they refer have been revised or have completed their next systematic review, but in any case for a

minimum of five years after the publication of the related International Standards or other ISO deliverable.

The ISO Central Secretariat shall keep reference copies of all International Standards and other ISO deliverables, including withdrawn editions, and shall keep up-to-date records of member body votes in respect of these publications. Copies of draft International Standards (DIS) and of final draft International Standards (FDIS), including associated reports of voting, and final proofs shall be kept at least until such time as the publications to which they refer have been revised or have completed their next systematic review, but in any case for a minimum of five years after publication.

**Preliminary stage**

Technical committees or subcommittees may introduce into their work programmes, by a simple majority vote of their P-members, preliminary work items (for example, corresponding to subjects dealing with emerging technologies), which are not yet sufficiently mature for processing to further stages and for which no target dates can be established.

Such items may include, for example, those listed in the strategic business plan, giving a prospective view on emerging needs.

All preliminary work items shall be registered into the programme of work.

All preliminary work items shall be subject to regular review by the committee. The committee shall evaluate the market relevance and resources required for all such items.

All preliminary work items that have not progressed to the proposal stage in the IEC by the expiration date given by the TC/SC and in ISO within 3 years will be automatically deleted from the programme of work.

This stage can be used for the elaboration of a new work item proposal and the development of an initial draft.

Before progressing to the preparatory stage, all such items shall be subject to approval in accordance with the procedures.

**Proposal stage**

A New Work Item Proposal (NWIP) is a proposal for:

- a new standard;
- a new part of an existing standard;
- a Technical Specification or a Publicly Available Specification.

An example of the form that needs to be completed in order to propose a new work item is provided in Annex A. The NWIP stage is not required for the revision or amendment of an existing standard or a TS (or a PAS if within its 6 year lifespan) provided that the committee passes a resolution containing the following elements: 1) target dates, 2) confirmation of scope, and 3) the convenor or project leader. The committee must however launch a call for experts (Form 4 is not required).

If the revision or the amendment results in an expanded scope, 2.3 applies (NWIP ballot shall be initiated and Form 4 is required).

A new work item proposal within the scope of an existing technical committee or subcommittee may be made in the respective organization by:

- a national body;
- the secretariat of that technical committee or subcommittee;
- another technical committee or subcommittee;
- an organization in liaison (in ISO, only category A liaisons);
- the technical management board or one of its advisory groups;
- the Chief Executive Officer.

Where both an ISO and an IEC technical committee are concerned, the Chief Executive Officers shall arrange for the necessary coordination.

Each new work item proposal shall be presented using the appropriate form, and shall be fully justified and properly documented.

The proposers of the new work item proposal shall:

- make every effort to provide a first working draft for discussion, or shall at least provide an outline of such a working draft;
- nominate a project leader.

The form shall be submitted to the office of the CEO or to the secretariat of the relevant committee for proposals within the scope of an existing committee.

The office of the CEO or the relevant committee chair and secretariat shall ensure that the proposal is properly developed in accordance with ISO and IEC requirements and provides sufficient information to support informed decision making by national bodies.

The Office of the CEO or the relevant committee chair and secretariat shall also assess the relationship of the proposal to existing work, and may consult interested parties, including the technical management board or committees conducting related existing work. If necessary, an ad hoc group may be established to examine the proposal. Any review of proposals should not exceed 2 weeks.

In all cases, the Office of the CEO or the relevant committee chair and secretariat may also include comments and recommendations to the proposal form.

Copies of the completed form shall be circulated to the members of the technical committee or subcommittee for P-member ballot and to the O-members for information.

The proposed date of availability of the publication shall be indicated on the form.

A decision upon a new work item proposal may be taken either by correspondence or at a meeting of a technical committee or subcommittee.

If a decision upon a new work item proposal is to be taken at a meeting, the proposal shall be put on the agenda.

Votes shall be returned within 3 months or at the meeting at which the decision is to be taken.

The committee may decide on a case-by-case basis by way of a resolution to shorten the voting period for new work item proposals to 2-months.

When completing the ballot form, national bodies shall provide a statement justifying their decision ("justification statement"). If no such statement is provided, the positive or negative vote of a national body will not be registered and considered.

**Acceptance requires**

a) approval of the work item by a simple majority of the P-members of the technical committees or subcommittees voting – abstentions are excluded when the votes are counted; and
b) a commitment to participate actively in the development of the project, i.e. to make an effective contribution at the preparatory stage, by nominating technical experts and by commenting on working drafts, by at least 4 P-members in committees with 16 or less P-members, and at least 5 P-members in committees with 17 or more P-members; only P-members having also approved the inclusion of the work item in the programme of work [see a)] will

be taken into account when making this tally. If experts are not nominated on the form accompanying an approval vote, then the national body's commitment to active participation will not be registered and considered when determining if the approval criteria have been met on this ballot.

If in the context of an NWIP, a member body does not provide a clear justification statement for why it voted "yes" or "no", the committee secretariat should go back to the member body and give it two (2) weeks to provide an explanation.

If the member body does not provide a response within that 2-week period, the vote will not be counted in the result.

Secretariats must not make value judgments about the justification and must ask the member body in case of doubt.

If member bodies do not name an expert in the Form, they have two (2) weeks following the result of the vote to name their expert. If this delay is not respected, the member body's vote will not be counted.

Individual committees may increase this minimum requirement of nominated experts.

In cases, where it can be documented that the industry and/or technical knowledge exists only with a very small number of P-members, then the committee may request permission from the technical management board to proceed with fewer than 4 or 5 nominated technical experts.

Once a new work item proposal is accepted, it shall be registered in the programme of work of the relevant technical committee or subcommittee as a new project with the appropriate priority and shall be registered by the office of the CEO. The agreed target dates shall be indicated on the appropriate form.

The voting results will be reported to the ISO Central Secretariat (using Form 6) or the IEC Central Office (using Form RVN) within 6 weeks after the close of the ballot.

The inclusion of the project in the programme of work concludes the proposal stage.

**Preparatory stage**

The preparatory stage covers the preparation of a Working Draft (WD) conforming to the ISO/IEC Directives, Part 2.

When a new project is accepted the project leader shall work with the experts nominated by the P-members during the approval.

The secretariat may propose to the technical committee or subcommittee, either at a meeting or by correspondence, to create a working group the convenor of which will normally be the project leader.

Such a working group shall be set up by the technical committee or subcommittee, which shall define the task(s) and set the target date(s) for submission of draft(s) to the technical committee or subcommittee. The working group convenor shall ensure that the work undertaken remains within the scope of the balloted work item.

In responding to the proposal to set up a working group those P-members having agreed to participate actively shall each confirm their technical expert(s). Other P-members or A- or D- liaison organizations may also nominate expert(s).

The project leader is responsible for the development of the project and will normally convene and chair any meetings of the working group. S/he may invite a member of the working group to act as its secretary.

Every possible effort shall be made to prepare both a French and an English version of the text in order to avoid delays in the later stages of the development of the project.

If a trilingual (English — French — Russian) standard is to be prepared, this provision should include the Russian version.

The preparatory stage ends when a working draft is available for circulation to the members of the technical committee or subcommittee as a first Committee Draft (CD) and is registered by the office of the CEO. The committee may also decide to publish the final working draft as a PAS to respond particular market needs.

If the committee has opted to skip the CD, the preparatory stage ends when the enquiry draft (DIS) is available for circulation.

**Committee stage**

The committee stage is the principal stage at which comments from national bodies are taken into consideration, with a view to reaching consensus on the technical content. National bodies shall therefore carefully study the texts of committee drafts and submit all pertinent comments at this stage.

Committees may decide to skip the CD stage in accordance with Annex SS.

Any graphical symbol shall be submitted to the relevant ISO committee responsible for the registration of graphical symbols (see Annex SH).

As soon as it is available, a committee draft shall be circulated to all P-members and O-members of the technical committee or subcommittee for consideration, with a clear indication of the latest date for submission of replies.

A period of 2, 3 or 4 months as agreed by the technical committee or subcommittee shall be available for national bodies to comment.

The default for CD circulation is 2 months.

Comments shall be sent for preparation of the compilation of comments, in accordance with the instructions given.

National bodies shall fully brief their delegates on the national position before meetings.

No more than 4 weeks after the closing date for submission of replies, the secretariat shall prepare the compilation of comments and arrange for its circulation to all P-members and O-members of the technical committee or subcommittee. When preparing this compilation, the secretariat shall indicate its proposal, made in consultation with the chair of the technical committee or subcommittee and, if necessary, the project leader, for proceeding with the project, either:

a) to discuss the committee draft and comments at the next meeting, or
b) to circulate a revised committee draft for consideration, or
c) to register the committee draft for the enquiry stage.

In the case of b) and c), the secretariat shall indicate in the compilation of comments the action taken on each of the comments received. This shall be made available to all P-members, if necessary by the circulation of a revised compilation of comments, no later than in parallel with the submission of a revised CD for consideration by the committee (case b) or simultaneously with the submission of the finalised version of the draft to the office of the CEO for registration for the enquiry stage (case c).

Committees are required to respond to all comments received.

If, within 2 months from the date of dispatch, 2 or more P-members disagree with proposal b) or c) of the secretariat, the committee draft shall be discussed at a meeting.

If a committee draft is considered at a meeting but agreement on it is not reached on that occasion, a further committee draft incorporating decisions taken at the meeting shall be distributed within 3 months for consideration. A period of 2, 3 or

4 months as agreed by the technical committee or subcommittee shall be available to national bodies to comment on the draft and on any subsequent versions.

Consideration of successive drafts shall continue until consensus of the P-members of the technical committee or subcommittee has been obtained or a decision to abandon or defer the project has been made.

The decision to circulate an enquiry draft shall be taken on the basis of the consensus principle.

It is the responsibility of the chair of the technical committee or subcommittee, in consultation with the secretary of his committee and, if necessary, the project leader, to judge whether there is sufficient support bearing in mind the definition of consensus given in ISO/IEC Guide 2:2004.

Consensus: "General agreement, characterized by the absence of sustained opposition to substantial issues by any important part of the concerned interests and by a process that involves seeking to take into account the views of all parties concerned and to reconcile any conflicting arguments."

NOTE: "Consensus need not imply unanimity."

The following applies to the definition of consensus:

In the process of reaching consensus, many different points of views will be expressed and addressed as the document evolves. However, "sustained oppositions" are views expressed at minuted meetings of committee, Working Group (WG) or other groups (e.g. task forces, advisory groups, etc.) and which are maintained by an important part of the concerned interest and which are incompatible with the committee consensus. The notion of "concerned interest(s)" will vary depending on the dynamics of the committee and must therefore be determined by the committee leadership on a case by case basis. The concept of sustained opposition is not applicable in the context of member body votes on CD, DIS or FDIS since these are subject to the applicable voting rules.

Those expressing sustained oppositions have a right to be heard and the following approach is recommended when a sustained opposition is declared:

- The leadership must first assess whether the opposition can be considered a "sustained opposition", i.e. whether it has been sustained by an important part of the concerned interest. If this is not the case, the leadership will

register the opposition (i.e. in the minutes, records, etc.) and continue to lead the work on the document.

- If the leadership determines that there is a sustained opposition, it is required to try and resolve it in good faith. However, a sustained opposition is not akin to a right to veto. The obligation to address the sustained oppositions does not imply an obligation to successfully resolve them.

The responsibility for assessing whether or not consensus has been reached rests entirely with the leadership. This includes assessing whether there is sustained opposition or whether any sustained opposition can be resolved without compromising the existing level of consensus on the rest of the document. In such cases, the leadership will register the opposition and continue the work.

Those parties with sustained oppositions may avail themselves of appeals mechanisms as detailed in Clause 5.

Within ISO and JTC 1, in case of doubt concerning consensus, approval by a two-thirds majority of the P-members of the technical committee or subcommittee voting may be deemed to be sufficient for the committee draft to be accepted for registration as an enquiry draft; however every attempt shall be made to resolve negative votes.

Abstentions are excluded when the votes are counted, as well as negative votes not accompanied by technical reasons.

The secretariat of the technical committee or subcommittee responsible for the committee draft shall ensure that the enquiry draft fully embodies decisions taken either at meetings or by correspondence.

When consensus has been reached in a technical committee or subcommittee, its secretariat shall submit the finalized version of the draft in electronic form suitable for distribution to the national members for enquiry, to the office of the CEO (with a copy to the technical committee secretariat in the case of a subcommittee) within a maximum of 4 months.

The secretariat shall submit the proposed draft International Standard (DIS) to the ISO Central Secretariat in electronic format together with a completed explanatory report (ISO form 8A) and the compilation of comments and actions taken in response to comments on the final CD.

The committee stage ends when all technical issues have been resolved and a committee draft is accepted for circulation as an enquiry draft and is registered by

the office of the CEO. Texts that do not conform to the ISO/IEC Directives, Part 2 shall be returned to the secretariat with a request for correction before they are registered.

If the technical issues cannot all be resolved within the appropriate time limits, technical committees and subcommittees may wish to consider publishing an intermediate deliverable in the form of a Technical Specification pending agreement on an International Standard.

**Enquiry stage**

At the enquiry stage, the enquiry draft (DIS in ISO, CDV in IEC) shall be circulated by the office of the CEO to all national bodies for a 3-month vote.

NOTE: In the IEC, the TC/SC concerned may decide, on a case-by-case basis, to extend the voting period to 5 months.

For policy on the use of languages, see Annex E in ISO/IEC Directives, Part 1: Consolidated ISO Supplement - Procedures Specific to ISO.

National bodies shall be advised of the date by which completed ballots are to be received by the office of the CEO.

At the end of the voting period, the Chief Executive Officer shall send within 4 weeks to the chair and secretariat of the technical committee or subcommittee the results of the voting together with any comments received, for further speedy action.

Votes submitted by national bodies shall be explicit: positive, negative, or abstention.

A positive vote may be accompanied by editorial or technical comments, on the understanding that the secretary, in consultation with the chair of the technical committee or subcommittee and project leader, will decide how to deal with them.

If a national body finds an enquiry draft unacceptable, it shall vote negatively and state the technical reasons. It may indicate that the acceptance of specified technical modifications will change its negative vote to one of approval, but it shall not cast an affirmative vote which is conditional on the acceptance of modifications.

An enquiry draft is approved if:

a) a two-thirds majority of the votes cast by the P-members of the technical committee or subcommittee are in favour, and
b) not more than one-quarter of the total number of votes cast are negative.

Abstentions are excluded when the votes are counted, as well as negative votes not accompanied by technical reasons.

Comments received after the normal voting period are submitted to the technical committee or subcommittee secretariat for consideration at the time of the next review of the International Standard.

On receipt of the results of the voting and any comments, the chair of the technical committee or subcommittee, in cooperation with its secretariat and the project leader, and in consultation with the office of the CEO, shall take one of the following courses of action:

a) when the approval criteria of 2.6.3 are met, in IEC to register the enquiry draft, as modified, as a final draft International Standard, or in ISO to proceed to publication.

NOTE: There is an option to include the FDIS stage.

**Optional FDIS – implementation**

Where the DIS meets the necessary approval criteria, the project proceeds to publication. However, the committee leadership can decide to include the FDIS stage if needed.

The committee leadership should take this decision based on the following, and inform the committee members accordingly:

- The DIS voting results and comments
- Knowledge of the committee and subject area
- The ISO Global Relevance policy

NOTE: See Annex SM Global relevance of ISO technical work and publications.

This means that if a significant number of countries, with a major interest in the subject area make comments at DIS which result in substantial technical changes, then further work and an FDIS vote is required.

Projects being carried out under the Vienna Agreement usually go through an FDIS vote:

a) in the case of an enquiry draft where no negative votes have been received, to proceed directly to publication, or
b) when the approval criteria are not met;
c) to circulate a revised enquiry draft for voting, or

NOTE: A revised enquiry draft will be circulated for a voting period of 2 months, which may be extended up to 5 months in IEC and up to 3 months in ISO at the request of one or more P-members of the committee concerned.

d) to circulate a revised committee draft for comments, or
e) to discuss the enquiry draft and comments at the next meeting.

Not later than 3 months after the end of the voting period, a full report shall be prepared by the secretariat of the technical committee or subcommittee and circulated by the office of the CEO to the national bodies. The report shall:

a) show the result of the voting;
b) state the decision of the chair of the technical committee or subcommittee;
c) reproduce the text of the comments received; and
d) include the observations of the secretariat of the technical committee or subcommittee on each of the comments submitted.

Every attempt shall be made to resolve negative votes.

If, within 2 months from the date of dispatch, two or more P-members disagree with decision of the chair, the draft shall be discussed at a meeting.

Committees are required to respond to all comments received.

When the chair has taken the decision to proceed to the approval stage or publication stage, the secretariat of the technical committee or subcommittee shall prepare, within a maximum of 4 months after the end of the voting period and with the assistance of its editing committee, a final text and send it to the office of the CEO for preparation and circulation of the final draft International Standard.

The secretariat shall provide the office of the CEO with the text in a revisable electronic format and also in a format which permits validation of the revisable form.

Texts that do not conform to the ISO/IEC Directives, Part 2 shall be returned to the secretariat with a request for correction before they are registered.

The revised text shall be submitted to ISO Central Secretariat in electronic format together with the decision of the chair taken as a result of the voting, using ISO Form 13, and including a detailed indication of the decisions taken for each comment as Annex B to the ISO Form 13.

The enquiry stage ends with the registration, by the office of the CEO, of the text for circulation as a final draft International Standard or publication as an International Standard.

**Approval stage**

At the approval stage, the final draft International Standard (FDIS) shall be distributed by the office of the CEO within 3 months to all national bodies for a 2 month vote.

National bodies shall be advised of the date by which ballots are to be received by the office of the CEO.

Votes submitted by national bodies shall be explicit: positive, negative, or abstention.

If a national body votes affirmatively, it shall not submit any comments.

If a national body finds a final draft International Standard unacceptable, it shall vote negatively and state the technical reasons. It shall not cast an affirmative vote that is conditional on the acceptance of modifications.

A final draft International Standard having been circulated for voting is approved if

a) a two-thirds majority of the votes cast by the P-members of the technical committee or subcommittee are in favour, and
b) not more than one-quarter of the total number of votes cast are negative.

Abstentions are excluded when the votes are counted, as well as negative votes not accompanied by technical reasons.

Technical reasons for negative votes are submitted to the technical committee or subcommittee secretariat for consideration at the time of the next review of the International Standard.

The secretariat of the technical committee or subcommittee has the responsibility of bringing any errors that may have been introduced in the preparation of the draft to the attention of the office of the CEO by the end of the voting period; further editorial or technical amendments are not acceptable at this stage.

Within 2 weeks after the end of the voting period, the office of the CEO shall circulate to all national bodies a report showing the result of voting and indicating either the formal approval by national bodies to issue the International Standard or formal rejection of the final draft International Standard.

Technical reasons for negative votes shall be appended for information only.

If the final draft International Standard has been approved in accordance with the conditions, it shall proceed to the publication stage.

If the final draft International Standard is not approved in accordance with the conditions, the document shall be referred back to the technical committee or subcommittee concerned for reconsideration in the light of the technical reasons submitted in support of the negative votes.

The committee may decide to:

- resubmit a modified draft as a committee draft, enquiry draft or, in ISO and JTC 1, final draft International Standard;
- publish a Technical Specification;
- cancel the project.

The approval stage ends with the circulation of the voting report stating that the FDIS has been approved for publication as an International Standard, with the publication of a Technical Specification, or with the document being referred back to the committee.

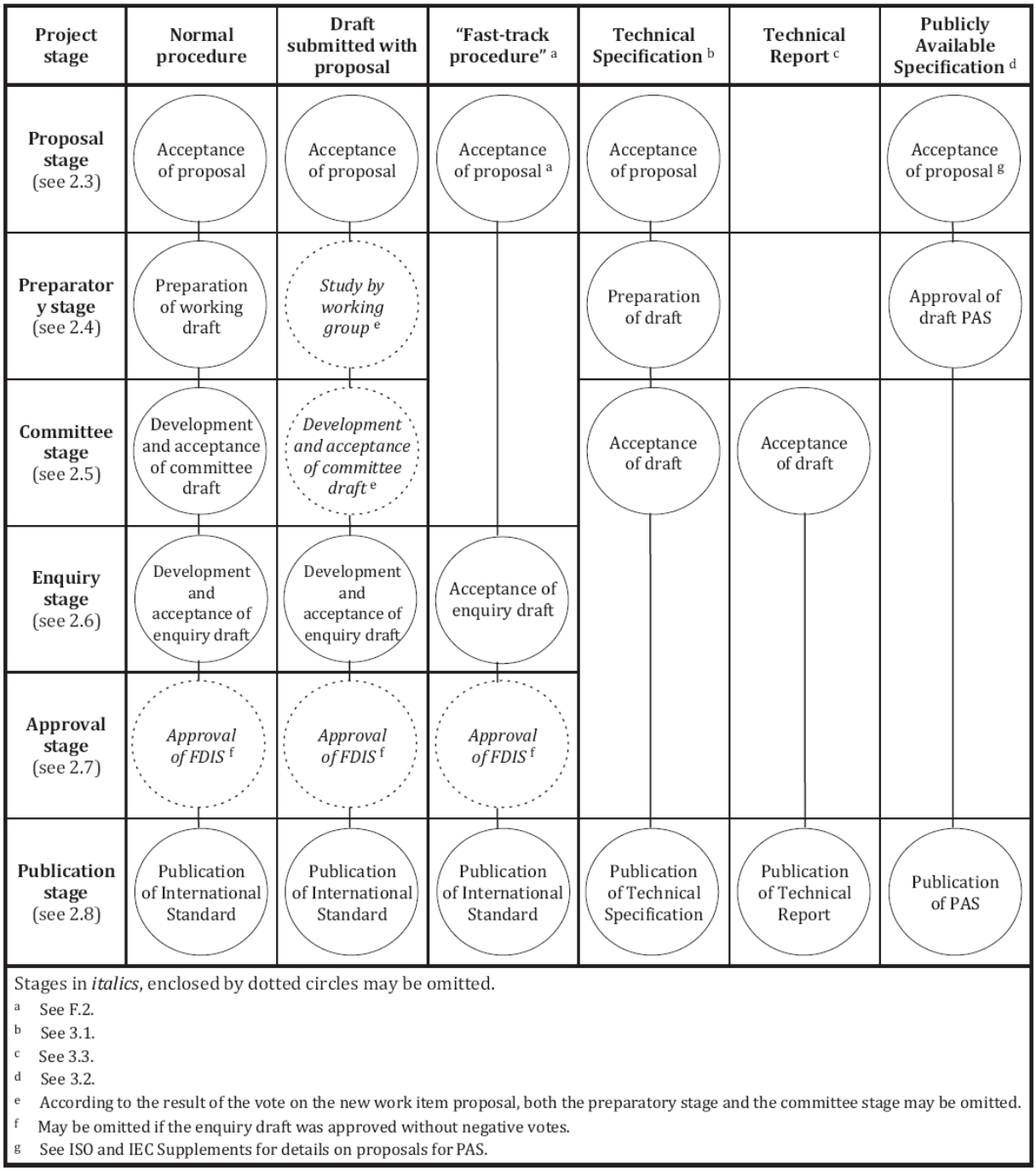
**Publication stage**

Within 1 month in ISO and 1,5 months in IEC, the office of the CEO shall correct any errors indicated by the secretariat of the technical committee or subcommittee, and print and distribute the International Standard.

The publication stage ends with the publication of the International Standard.

| STAGE | SUB-STAGE | | | | | | |
|---|---|---|---|---|---|---|---|
| | 00 Registration | 20 Start of main action | 60 Completion of main action | 90 Decision | | | |
| | | | | 92 Repeat an earlier phase | 93 Repeat current phase | 98 Abandon | 99 Proceed |
| 00 Preliminary stage | 00.00 Proposal for new project received | 00.20 Proposal for new project under review | 00.60 Close of review | | | 00.98 Proposal for new project abandoned | 00.99 Approval to ballot proposal for new project |
| 10 Proposal stage | 10.00 Proposal for new project registered | 10.20 New project ballot initiated | 10.60 Close of voting | 10.92 Proposal returned to submitter for further definition | | 10.98 New project rejected | 10.99 Approval to New project approved |
| 20 Preparatory stage | 20.00 New project registered in TC/SC work programme | 20.20 Working draft (WD) study initiated | 20.60 Close of comment period | | | 20.98 Project deleted | 20.99 WD approved for registration as CD |
| 30 Committee stage | 30.00 Committee draft (CD) registered | 30.20 CD study/ballot initiated | 30.60 Close of voting/ comment period | 30.92 CD referred back to Working Group | | 30.98 Project deleted | 30.99 CD approved for registration as DIS |
| 40 Enquiry stage | 40.00 DIS registered | 40.20 DIS ballot initiated: *5 months* | 40.60 Close of voting | 40.92 Full report circulated: DIS referred back to TC or SC | 40.93 Full report circulated: decision for new DIS ballot | 40.98 Project deleted | 40.99 Full report circulated: DIS approved for registration as FDIS |
| 50 Approval stage | 50.00 FDIS registered for formal approval | 50.20 FDIS ballot initiated: *2 months.* Proof sent to secretariat | 50.60 Close of voting. Proof returned by secretariat | 50.92 FDIS referred back to TC or SC | | 50.98 Project deleted | 50.99 FDIS approved for publication |
| 60 Publication stage | 60.00 International Standard under publication | | 60.60 International Standard published | | | | |
| 90 Review stage | | 90.20 International Standard under periodical review | 90.60 Close of review | 90.92 International Standard to be revised | 90.93 International Standard confirmed | | 90.99 Withdrawal of International Standard proposed by TC or SC |
| 95 Withdrawal stage | | 95.20 Withdrawal ballot initiated | 95.60 Close of voting | 95.92 Decision not to withdraw International Standard | | | 95.99 Withdrawal of International Standard |

**Figure 3-3: Matrix presentation of project stages**




Stages in *italics*, enclosed by dotted circles may be omitted.

a See F.2.
b See 3.1.
c See 3.3.
d See 3.2.
e According to the result of the vote on the new work item proposal, both the preparatory stage and the committee stage may be omitted.
f May be omitted if the enquiry draft was approved without negative votes.
g See ISO and IEC Supplements for details on proposals for PAS.

**Figure 3-4: Options for development of a project (a simplified diagram of the options)**

## 3.3 Activities and anticipated timescales towards standardisation

The ideal route to standardisation of this work is through ISO. We believe this to be the case as global uptake of this approach is fundamental to industry realising its full benefit. Although this provides a greater challenge to the team because of the need to draw in at least 5 counties to support the standardisation work, we will pursue this approach in the first instance. We will look to other routes, such as EN, if the international standardisation community does not recognise the importance of the work.

1. The first activity towards standardisation is therefore to engage with the standardisation community and to this end we are now in discussion with ISO TC184 SC4 with the following actions in mind:

(i) To present the FLEXINET activity to the ISO TC184 SC4 community in order to develop their broad support. We plan to present the project at the next ISO TC 184 SC4 meeting "industry day" on 5th November 2014. This will both build support and open discussion on the preferred routes to standardisation. This latter issue is important as our 'systems' approach has potential implications that go beyond our focus on global production networks.

(ii) During that SC4 meeting to engage with members of JWG8 to discuss and debate the detail of the standardisation activity in order to prepare a more detailed plan of action. JWG8 is an SC4 and SC5 joint working group related to "manufacturing process and management information".

2. The next step in the standardisation process is then to raise a new work item (NWI). This we will do after the November SC4 meeting. By that time both the general structure of the FLEXINET formal ontologies and the level 1 ontology will be well advanced and ready for documentation. Raising a NWI will initiate the full standardisation process.

It should be noted that the default timescale to move from a NWI to a developed standard is 3 years. This process will take us beyond the end of the project and so a fully successful result will depend on other subsequent funding. This is a common problem in taking research results to standardisation. FLEXINET will nonetheless

continue to push this aspect of the work and look to ways in which to carry on this activity beyond the end of the project.

# Annex A: New work item proposal (NWI) form

| NEW WORK ITEM PROPOSAL | |
|---|---|
| Closing date for voting | Reference number (to be given by the Secretariat) |
| Date of circulation | ISO/TC / SC **N** |
| Secretariat | ☐ **Proposal for new PC** |

A proposal for a new work item within the scope of an existing committee shall be submitted to the secretariat of that committee with a copy to the Central Secretariat and, in the case of a subcommittee, a copy to the secretariat of the parent technical committee. Proposals not within the scope of an existing committee shall be submitted to the secretariat of the ISO Technical Management Board.
The proposer of a new work item may be a member body of ISO, the secretariat itself, another technical committee or subcommittee, or organization in liaison, the Technical Management Board or one of the advisory groups, or the Secretary-General.
The proposal will be circulated to the P-members of the technical committee or subcommittee for voting, and to the O-members for information.

IMPORTANT NOTE: Proposals without adequate justification risk rejection or referral to originator.
Guidelines for proposing and justifying a new work item are contained in Annex C of the ISO/IEC Directives, Part 1.

☐ The proposer has considered the guidance given in the Annex C during the preparation of the NWIP.

Proposal (to be completed by the proposer)

| |
|---|
| Title of the proposed deliverable.<br>*(In the case of an amendment, revision or a new part of an existing document, show the reference number and current title)*<br>English title<br><br>French title<br>(if available) |
| Scope of the proposed deliverable. |
| Purpose and justification of the proposal*<br><br>**The reason for requiring justification statements with approval or disapproval votes is primarily to collect input on market or stakeholder needs, and on market relevance of the proposal, to benefit the development of the proposed ISO standard(s). Any NSB vote in relation to a proposal for new work may result in significant commitments of resources by all parties (NSBs, committee leaders and delegates/experts) or may have significant implications for ISO's relevance to the global community. It is especially important that NSBs consider and express why they vote the way they do. In addition, it is felt that it would be useful for ISO and its committees to have documentation as to why the NSBs feel a proposal has market need and market relevance. Therefore, please ensure that your justifying statements with your approval or disapproval vote convey the reason(s) why your national consensus does or does not support the market need and/or global relevance of the proposal.* |
| If a draft is attached to this proposal,:<br>Please select from one of the following options (note that if no option is selected, the default will be the first option):<br>☐ Draft document will be registered as new project in the committee's work programme (stage 20.00)<br>☐ Draft document can be registered as a Working Draft (WD – stage 20.20)<br>☐ Draft document can be registered as a Committee Draft (CD – stage 30.00)<br>☐ Draft document can be registered as a Draft International Standard (DIS – stage 40.00) |
| Is this a Management Systems Standard (MSS)?<br>☐ Yes ☐ No<br>NOTE: if Yes, the NWIP along with the Justification study (see Annex SL of the Consolidated ISO Supplement) must be sent to the MSS Task Force secretariat (mss@iso.org) for approval before the NWIP ballot can be launched. |
| Indication(s) of the preferred type or types of deliverable(s) to be produced under the proposal.<br>☐ International Standard ☐ Technical Specification ☐ Publicly Available Specification ☐ Technical Report |
| Proposed development track ☐ 1 (24 months) ☐ 2 (36 months - default) ☐ 3 (48 months) |

FORM 4 (ISO) v. 2013 Page 1 of 2

New work item proposal

| |
|---|
| Known patented items (see ISO/IEC Directives, Part 1 for important guidance)<br>☐ Yes ☐ No If "Yes", provide full information as annex |
| A statement from the proposer as to how the proposed work may relate to or impact on existing work, especially existing ISO and IEC deliverables. The proposer should explain how the work differs from apparently similar work, or explain how duplication and conflict will be minimized. |
| **A listing of relevant existing documents at the international, regional and national levels.** |
| A simple and concise statement identifying and describing relevant affected stakeholder categories (including small and medium sized enterprises) and how they will each benefit from or be impacted by the proposed deliverable(s) |

| Liaisons: | Joint/parallel work: |
|---|---|
| A listing of relevant external international organizations or internal parties (other ISO and/or IEC committees) to be engaged as liaisons in the development of the deliverable(s). | Possible joint/parallel work with:<br>☐ IEC (please specify committee ID)<br>☐ CEN (please specify committee ID)<br>☐ Other (please specify) |

| |
|---|
| A listing of relevant countries which are not already P-members of the committee. |
| Preparatory work (at a minimum an outline should be included with the proposal)<br>☐ A draft is attached ☐ An outline is attached ☐ An existing document to serve as initial basis<br>The proposer or the proposer's organization is prepared to undertake the preparatory work required ☐ Yes ☐ No |

| Proposed Project Leader (name and e-mail address) | Name of the Proposer (include contact information) |
|---|---|

| |
|---|
| Supplementary information relating to the proposal<br>☐ This proposal relates to a new ISO document;<br>☐ This proposal relates to the adoption as an active project of an item currently registered as a Preliminary Work Item;<br>☐ This proposal relates to the re-establishment of a cancelled project as an active project.<br>Other: |

Annex(es) are included with this proposal (give details)

☐

## Annex B: References

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