PRODAEC INTEROPERABILITY

ISO TC 184

« Industrial Automation Systems and Integration »

LIRIS Laboratory - LYON

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GENERAL OVERVIEW of ISO TC 184

« Industrial Automation Systems and Integration »

-Organization,

-Programs,

-Benefits,

-Collaboration.

Some words about Global ISO : International Organization for Standardization (www.iso.org)

- legal association supported by a Central Secretariat (Geneva Switzterland)
- with 146 nationals members
- 188 Technical committees
- about 3000 technical bodies involving 35000 experts around the World
- responsible for all sectors excluding Electrotechnical(IEC) and Telecoms(ITU)

The main deliverable of ISO is the INTERNATIONAL STANDARD

- which embodies the essential principles of Global openness and Transparency, Consensus and Technical Coherence
- Total IS published: 13700 (900 in 2002)

  In progress: 4400

SCOPE OF ISO TC 184 "Industrial Automation Systems and Integration" was created in 1982.

- **"Standardization 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"**

  Excluded: electrical and electronic equipment (IEC/TC 44) and programmable logical controllers for general applications (IEC/TC 65)

The scope of ISO TC184 means that its standards are :

. applicable to manufacturing and process industries.

. applicable to all sizes of business.

. and extending exchanges across the globe through e.business

The market: Industry has to face competitive challenges.

- reduce costs of design,production,support,etc..
- improve quality and reliability.
- improve customer satisfaction.
- reduce lead time
- build alliances to rapidly meet markets needs.
- provide their markets with new and innovative products and services.
- move away from traditionnal process-oriented to an overall performance-related approach.
- A major impact: The Industrial use of Internet with the associated technologies.

Industry business response includes Investment in Industrial Automation and Exploitation of electronic business

ISO TC 184 STANDARDS ADD VALUE/BENEFIT TO SUCH AN INVESTMENT.

- Clear need for standards for the interfaces to simplify and reduce cost of integration.

- Information is a major asset in the supply chain : standards allow to protect information through the evolution of application.

- There is strong commercial pressure to exploit existing investments : standards facilitate the integration of new elements

- Change of business requirements demands flexible configuration of resources : standards ease configuration changes

- In the interactions of separate organizations : standards allow rapid creation or modification of alliances particularly for global supply chain.

TC 184 STANDARDS are required for such areas as Enterprise modeling and Systems Architecture,Communication,Data,Information processing control, Human,Mechanical and System operational aspects

OVERALL BENEFITS EXPECTED FROM ISO TC 184 WORKS

- The main benefit expected is to accompany the Economic and Industrial Growth by delivering IT standards that support Application Integration and BtoB Electronic commerce.

- TC184 works will facilitate the development of Manufacturing industries with regard to the New Economy based on IT innovation.

- Our works also will support the G8 dot.force initiative to open the global electronic market to developing countries.

MAJORS PLAYERS IN THE ISO TC 184:

- "ISO TC 184 customers"
  - Industrial enterprises and their products suppliers.
  - Suppliers of elements of industrial automation systems.
  - Systems integrators providing services.

All the major international companies from Automotive,Aeronautics,Space & Defense,Electric Device, Energy,Oil,Gas,Automation, IT and Software participate in ISO TC 184 works.

-TC184 Advisory Group: 40 recognised representatives from leading industries

- "Academia, Research Institutes" represent a major participation in the ISO TC 184 works.
  - Advisers, Consultants
  - Major National Bodies participate and support ISO TC 184 works (21 Participating countries, 22 Observer countries)

- ISO TC 184 has many liaisons/collaborations with others ISO TCs and organizations as CEN(TC 310),IEC(SB3),ANSI,ISA,IEEE,NEMA,AECMA,ASAM, MoU on e.business,ITU,UN/ECE,etc…..

ISO TC 184 ORGANIZATION

ISO TC 184 Industrial automation systems and integration — **ISO TC 184/Advisory Group**

ACTIVE	MAINTENANCE	VERY ACTIVE	VERY ACTIVE
ISO TC 184/SC 1 **Physical device control** Peter Muller (Siemens Allemagne)	**ISO TC 184/SC 2** **Robots for manufacturing environments** Hakan Brantmark(ABB Suède)	**ISO TC 184/SC 4** **Industrial data** Howard Mason (Bae Systems - UK)	**ISO TC 184/SC 5** **Architecture, communication and integration frameworks** Emmanuel de la Hostria (Rockwell -USA)
SC 1/WG 4 Programming languages for numerically controlled equipment START REVISION	No Working Group Project Teams to be created when launching New Work Items	**SC 4/WG 2** Standard for the neutral representation of standard parts - Parts Library : P-Lib	**SC 5/WG 1** Modelling and architecture
SC 1/WG 7 Data modeling for integration of physical device		**SC 4/WG 3** Product modeling : STEP – 9 Teams T1 «Shape Representation» ; T4 «Materials» ; T8 «Product Life Cycle» ; T9 «Engineering Analysis» ; T19 «Automotive» ; T20/T21 «Process Plant/Oil and Gas» ; T22 «Building & Construction» ; T23 «Ships» ; T24 «Manufacturing»	**SC 5/WG 2** Communications and interconnections
			SC 5/WG 4 Manufacturing software and its environment
WG 8 Distributed installation in Industrial applications			**SC 5/WG 5** Open systems application framework Device profiles
		SC 4/JWG 8 (joint working group with SC 5 Manufacturing process and management information: MANDATE	
		SC 4/JWG 9 (joint working group IEC TC 3) Electrical & electronic applications : STEP	**SC 5/WG 6** Application service Interface
SC 4/ Organizational structures : *- SC 4/ Quality Committee* *- SC 4/ Change Management Team* *- SC 4/ Policy and Planning Committee*		**SC 4/WG 11** EXPRESS language, implementation methods and conformance methods	**SC5/JWG 15** **(joint working group with IEC SC 65 A)** Enterprise-control system integration
		SC 4/WG 12 Common resources	

ISO TC 184 AND ITS 4 SCs PROGRAMS

-SCOPE SC1: Physical Device Control (11 IS published)

.Standardization of progamming language dedicated to the applications of Numerical controlled Equipement.

-Key standards:

. Data Model for computerized numerical controllers:ISO 14649.

. Dimensional Measuring Interface(DMIS) ISO 22093

. Standardization on Distributed Installation in Industrial applications(Desina project) ISO 23570

- SCOPE SC2 : Robots for Manufacturing environment(18 IS published)

- Key standards: Mechanical interfaces ISO 9409-1 and Safety ISO 10218

- Redefinition of the SC2 scope in progress.

ISO TC 184 AND ITS 4 SCs PROGRAMS(continued)

-SCOPE SC4: Industrial Data (100 IS published)

. Standardization of information which is shared or exchanged in the area of industrial and manufacturing applications: representation of scientific, technical and industrial data.
. It includes organizational data, relation between enterprises and between components, supplier identification, personnel data for approvals identification.

-Key Standards:
. ISO 10303 STEP,13584 PLIB,15531 MANDATE,18629 PSL, 18876 Integration methodology.

-Key Achievements:
. STEP2 and PLIB completed,STEP modular architecture completed, Set of PDM modules completed.

-Future developments: Parametric/construction history, Component dictionaries based on PLIB, Interaction with other IT groups OAG,OASIS,OMG.

-Innovation: XML-based STEP repository, Opensource environment,Accessible through SC4online,Extracted into HTML for viewing and publication,Automated formating,hyperlinks and indexing(save 30% preparation time).

ISO TC 184 AND ITS 4 SCs PROGRAMS(continued)

-SCOPE SC5: Architecture,Communications,Integration,Framework
(15 IS published)

. Standardization in the field of architecture,communication and processes to enable manufacturing system integration,interworking and interoperability.
. It includes Automation glossary, Process representations and requirements for a Global programming environment.

-Key standards:
.ISO 19439/CEN TC310 Enterprise modeling,15704 Enterprise Architecture
.16100/JTC1 Manufacturing soft capability profiling for interoperability,
.15745/IEC65 open systems integration framework(device profiles),
.20242/ASAM Service interface for testing applications,
.18629/SC4 Process spec's language,IEC62264 Enterprise-control system integration.

-Study groups: on glossary for industrial automation integration and on diagnostics and maintenance integration.

-Future developments/Initiatives:
. Inter-process interoperabilty schema.
. Integration of security in manufacturing systems.
. Simulation application integration framework.
. Supply chain integration across manufacturing operations.

ISO TC 184 AND ITS SCs FUTURE CONSIDERATIONS.(listed)

- Target a single unified definition for enterprise information.
- Standards for validating quality of products models and long term data detention.
- Standards to provide complete infrastructure for definition,selection and acquisition of material from digital libraries.
- Definition of an enterprise model and exchange,sharing of enterprise models.
- Requirements for IT security(as well as for manufacturing control system).
- Taxonomy for software capability profiling for interoperability.
- Standard structure for manufacturing asset definition and management.
- Integration profiles for different classes of equipment.

ISO TC 184/CONCURRENT ENGINEERING RELATIVE TO STANDARDIZATION

-.In writing Standards, "Concurrence in Development" has to be managed:

- within a technical committee and its sub-committees
- within an International standards organization
- within a dedicated industry

- In using Standards, "Concurrence in Application" has to be managed:

- within a manufacturing application life cycle
- within a product life cycle
- within an enterprise life cycle
- within a supply chain life cycle

ISO TC 184/CONCURRENT ENGINEERING RELATIONSHIP

- A good Standard is the result of a successfull co-operation with high consensus of Suppliers, Users and Researchers.

• In Europe, CEN encourages research related to standards, CEN/STAR makes the evaluation of the projects.
CEN/STAR has defined 2 approaches: a pre-standard research and a co-standard research.

• Pre-standard research: we expect that the result lead to the development of a standard. Ex:In TC184 FunStep & Vamas have been submitted to CEN/STAR.

• Co-Standard research: Necessary works to be conducted in order to complete a standard program. Also submitted to CEN/STAR

ISO TC 184/CONCURRENT ENGINEERING RELATIONSHIP

Certainly we have common interest working together

What do Research and Academia bring to Standardization?

- Large resources contribution to the standard developments.
- Upgrading the standard development to the most advanced technical works.
- Advanced support to standard technical development.

What do Standard bring to Research and Academia?

- Knowlegde of the Industrial needs,methods and environment.
- Make the research works valuable and applicable to the industry
- Enlarge the audience beyond the Scientific Community

"RESEARCH and ACADEMIA" have a large contribution to the ISO TC 184 OVERALL OBJECTIVES :

- MARKET RELEVANCE : deliver the expected standards to the Industry.

Your technical coherence

- TIME to MARKET : improve our development performance.

Your tehnical expertise

- CO-OPERATION/JOINT WORKING GROUP "Taking on board all good work".

your experience in international cross-fertilization

- RESOURCES MANAGEMENT : clear priorities and remain focused on target.

your team involvement

- PROMOTION of TC 184 WORKS: Standards not enough used in the industry.

Through the Education and Research community

ISO TC 184/CONCURRENT ENGINEERING RELATIONSHIP

As a conclusion:

- **ISO TC 184 is very pleased to have a large participation of members from Research Institutes and from the Academia in the different Sub-Committees.**

- **With Academia and Research, we share the same ethics and principles required by central ISO for developing Standards: Openness, Transparency, Consensus and Technical coherence.**

- **Your contribution is really a key factor for the publication of the right standard at the right time.**

- **ISO TC184 is totally open to explore new ways to improve our partnership**

Annexe 1

Plus d'information sur:

- PLIB - Parts Libraries (ISO 13584)
- STEP - Product Model Data (ISO 10303)
- Manufacturing Management Data - MANDATE (ISO 15531)
- Process Specification Language (ISO 18629)
- IIDEAS (ISO 18876)

Parts Library (PLib)

As a exemple

- Scope
  - To develop a computer-interpretable representation parts library data:
    "Represent as data the whole content of usual component paper catalogues"
- Objective
  - To provide a **neutral mechanism capable of transferring** parts library data
  - To define a **basis for implementing and sharing databases** of parts library data

Parts Library (PLib)

- Content: Two major parts
  - *Dictionaries:*
    To capture and to identify (Globally Unique Identifiers) product categories and properties that have the "same semantic meaning"
    - *Joint development with IEC SC3D*
  - *Libraries / catalogues:*
    To represent content of component libraries and catalogues
    - *population,*
    - *selection process,*
    - *component behaviour*
    - *component representation (e; g., geometry)*

Parts Library (PLib)

- Applications: 4 domains:
  - Electronic exchange of supplier catalogues (switching from document to data)
  - Define IT infrastructure of the extended entreprise: PDM + Component repository + Applications
  - Fundamental capability for e-business: to characterize product by unambiguous characteristcs
  - To generate Web site for product description and selection

Parts Library (PLib)

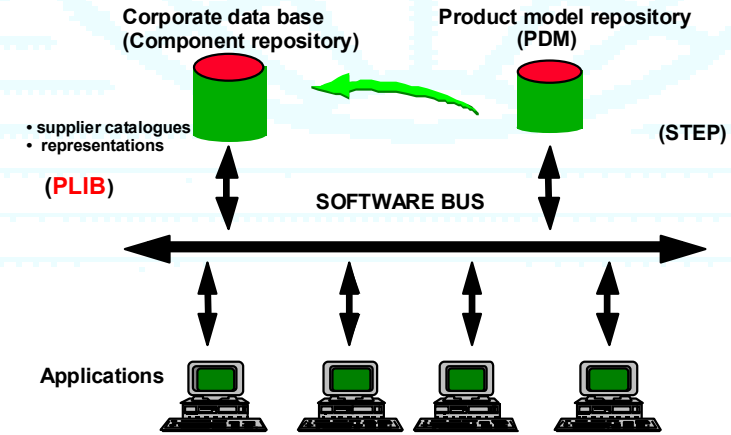
- Applications: 4 domains:
  - **Electronic exchange of supplier catalogues (switching from document to data)**

```
ISO-10303-21;
HEADER;

/* DICTIONARY BSU for reference */
/*BSU for supplier */
#20 = SUPPLIER_BSU ('80///A123ER456YT',
/* BSU for component_class */
#60 = CLASS_BSU ('PAW', '001', #20);
/* BSU for properties */
#90 = PROPERTY_BSU ('d_in', '001', #50);
….
```

  - **Define IT infrastructure of the extended entreprise:**

    PDM + Component repository + Applications



PLib reference model for technical information infrastructure

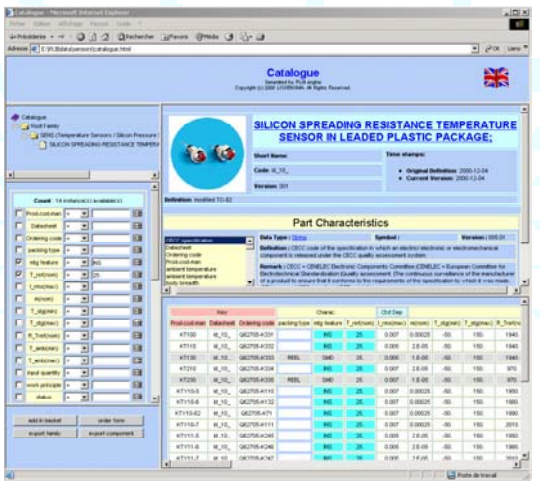
Parts Library (PLib)

– Fundamental capability for e-business: to characterize product by unambiguous characteristcs

0112/2///61630-4	AAA 000-001	AAF307-005

factor of permeability of magnetic material at specified frequency...

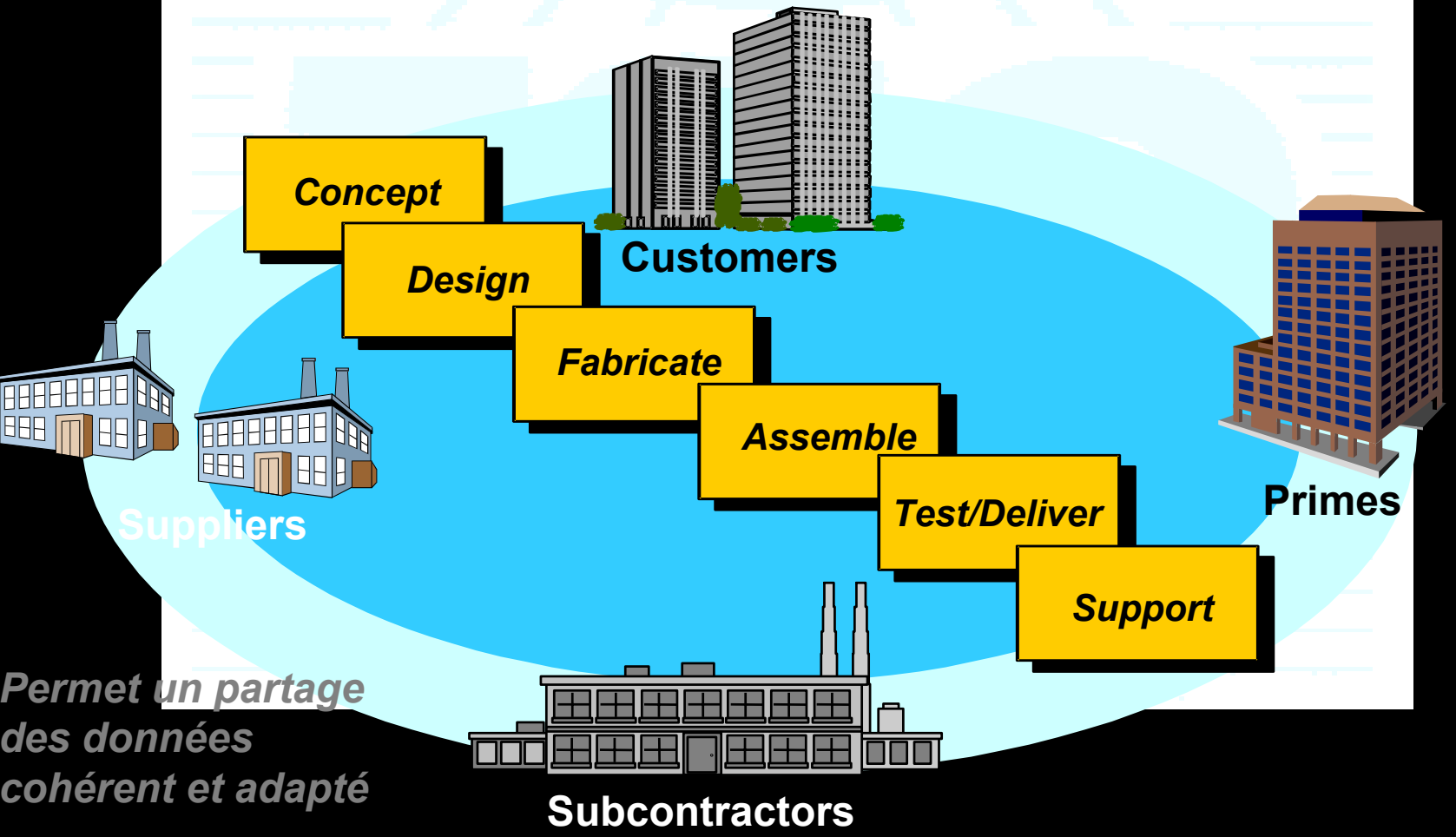
– To generate Web site for product description and selection



PLIB - Parts Libraries (ISO 13584)

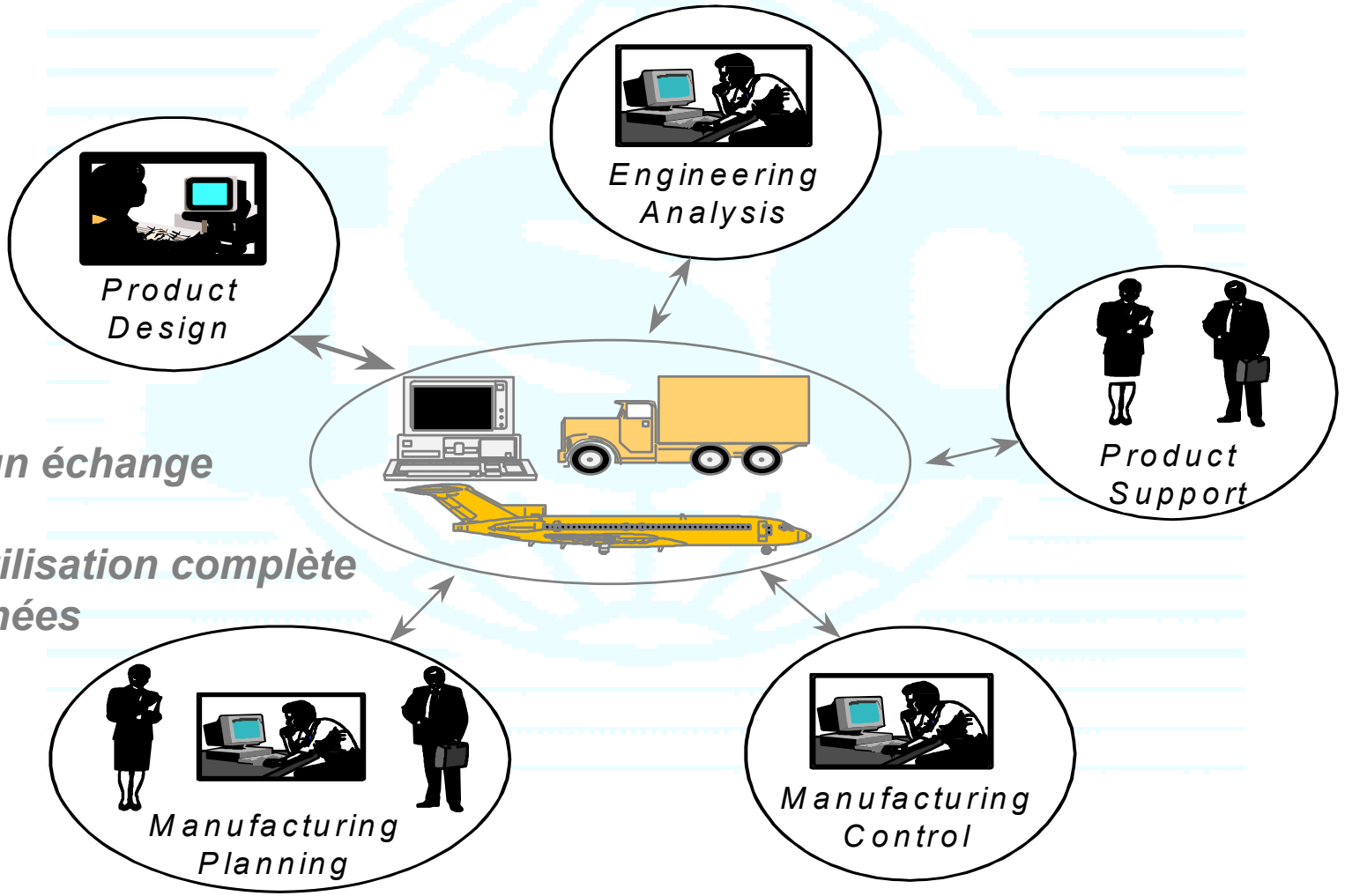
- Description of supplier part library structure
  - Supporting automatic integration into user libraries
- Representations of lists of “similar parts” - related by geometry, part of same product, etc
  - defined explicitly or implicitly
  - dictionary data exchange (developed jointly with IEC 61360-2)
- API for generating geometric models
- Structuring for part family definitions
- Supplier codes
- View exchange protocols
  - Parametric programs
  - ISO 10303 compliant models
- Some shared resources with STEP

Échange des données du produit : La vue « Cycle de vie »



Permet un partage des données cohérent et adapté

Échange des données du produit : La vue « fonctionnelle »

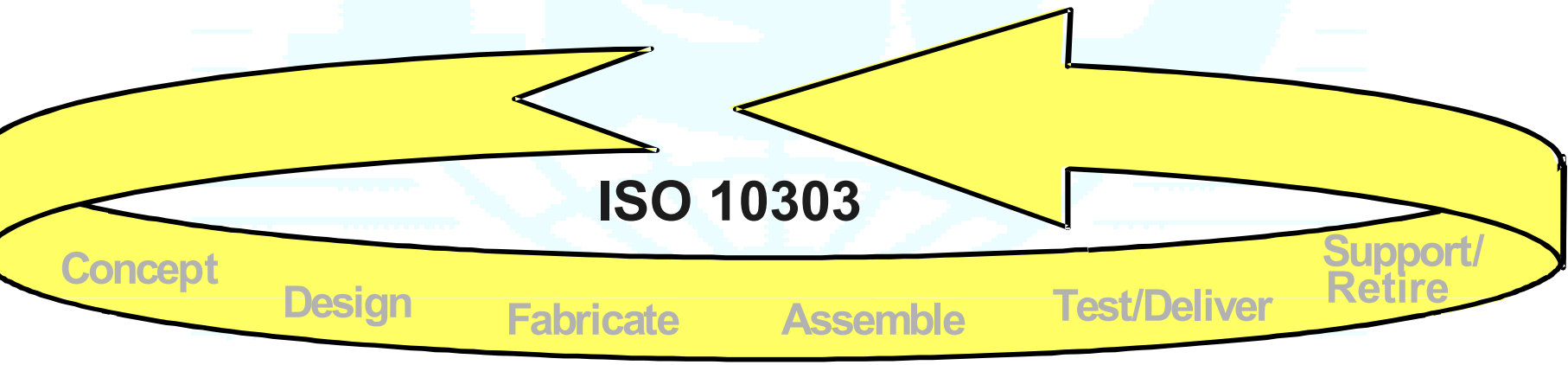


ermet un échange
récis
t une utilisation complète
es données

Domaine d'étude de STEP

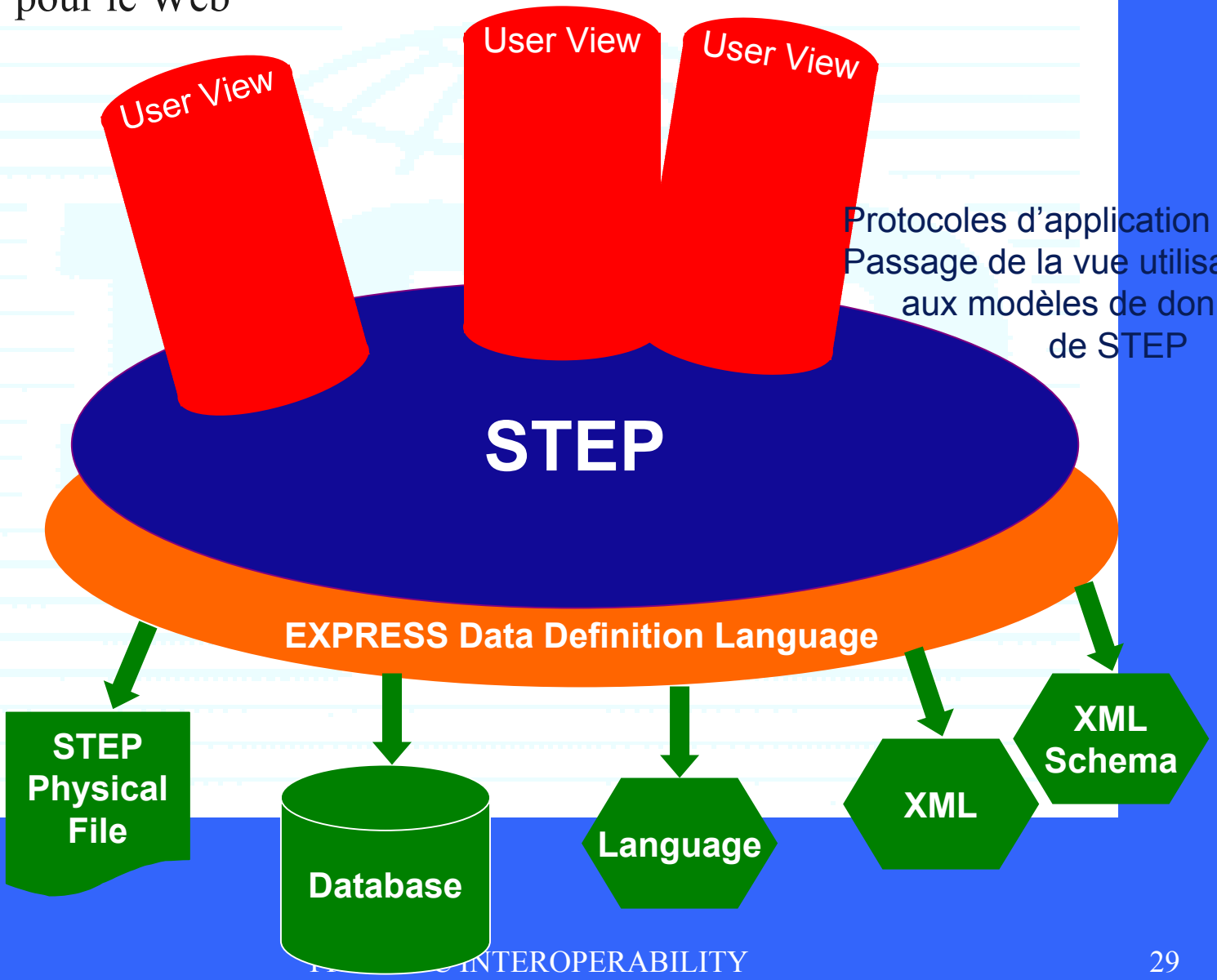
STandard for the Exchange of Product Model Data

Décrit les données de produit tout au long du cycle de vie du produit.



As Defined Configurations | **As Planned Configurations** | **As Built Configurations** | **As Maintained Configurations**

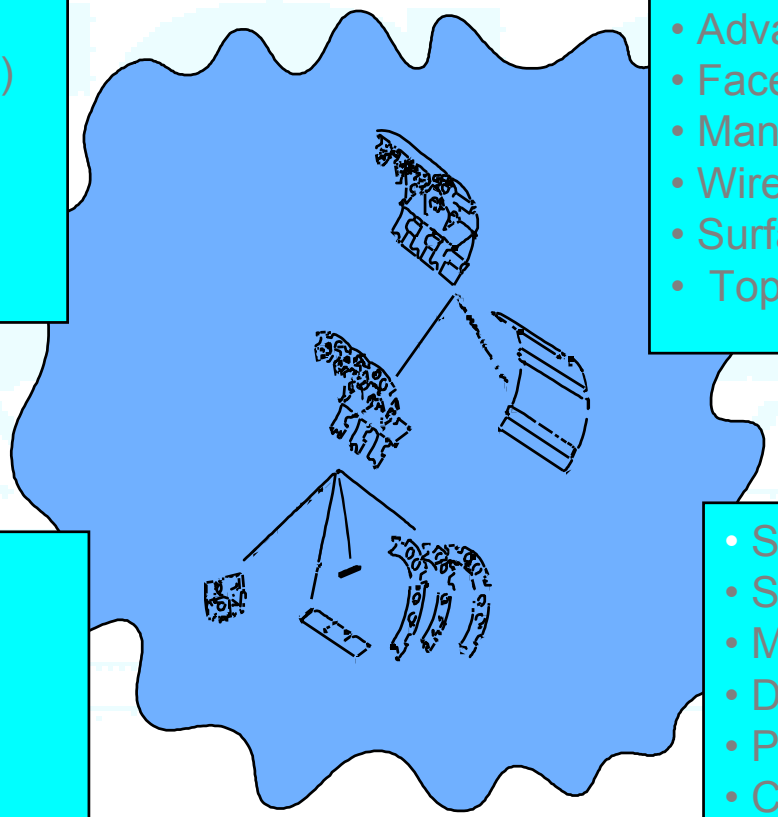
STEP pour le Web



Protocoles d'application :
Passage de la vue utilisateu
aux modèles de donnée
de STEP

AP 203: Configuration Controlled Design of Mechanical Parts

Configuration Management
- Authorisation
- Control(Version/Revision)
- Effectivity
- Release Status
- Security Classification
- Supplier



- Geometric Shapes
- Advanced BREP Solids
- Faceted BREP Solids
- Manifold Surfaces with Topology
- Wireframe with Topology
- Surfaces and Wireframe without
- Topology

- Product Structure
- Assemblies
- Bill of Materials
- Part
- Substitute Part
- Alternate Part

- Specifications
- Surface Finish
- Material
- Design
- Process
- CAD Filename

AP 214: Core Data for Automotive Mechanical Design Processes

Geometry
- Solids Data
- Surface Data
- Wireframe
- Measured Data

Presentation
- Drawing
- Visualization

Analysis
- Simulation

Manufacturing
- NC-Data
- Process Plans

Technology Data
- Material Data
- Form Features
- Tolerance Data
- Surface Conditions

Specification/Configuration
- Product Structure Data
- Management Data

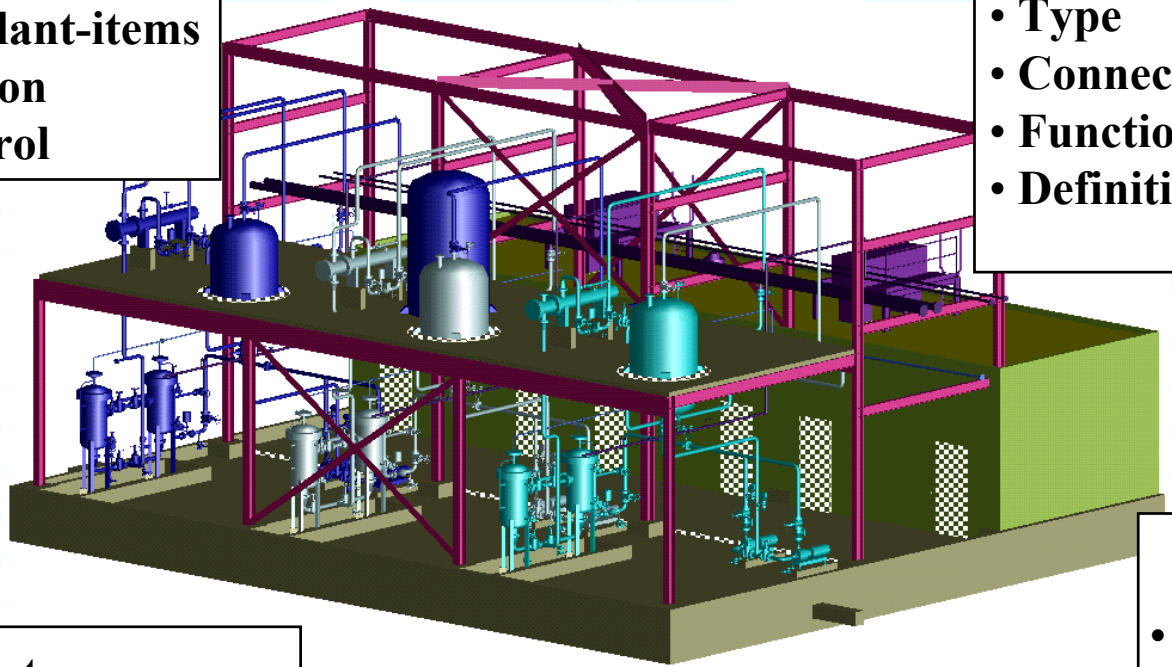
AP227: Plant Spatial Configuration

Plant Layout

Location of Plant-items
Site Description
Change Control

Plant Item

- **Type**
- **Connections**
- **Functional/Physical**
- **Definition/Occurrence**



Plant Systems

- **Line Definitions**
- **Composition**
- **Capabilities**
- **Component Connectivity**

Functional/Analysis

- **Interference**
- **Performance Requirements**
- **Requirement Satisfaction**

Shape

- **Explicit Shape**
- **Brep**
- **CSG**

-> Plus d'info en Annexe 2

STEP – Résumé et conclusions intermédiaires

- STEP est plus qu'un format neutre pour échanger la géométrie des pièces. Il s'appuie sur la technologie Web et permet l'utilisation des données de produits où et quand cela est nécessaire :
  - au sein de l'entreprise étendue,
  - tout le long du cycle de vie du produit.

- STEP est un moyen normalisé de structurer l'information pour soutenir les processus utilisés et faciliter la mise en oeuvre de nouveaux processus tels que :
  - Ingénierie concourante,
  - e-procurement et gestion de la chaîne d'approvisionnement.
  - Soutien logistique du contractant.

- STEP est indépendant de la technologie. Il s'attache au contenu sémantique et pérenne des données des produits.

- STEP fournit un mécanisme l'archivage, et au-delà, les données légales.

Impact économique de STEP dans les industries aéronautique, automobile et navale aux US

- La mise en œuvre de STEP dans ces industries :
  - Potentiellement 928 million d'économies annuelles à l'horizon 2010 dans les seules applications de CAO et CFAO (Hors PDM) aux Etats-Unis.
  - 50% des économies dans l'industrie automobile (27% dans l'aéronautique), et TRES majoritairement chez les sous-traitants (niveau 1 et au delà)
- L'échantillon final de l'étude:
  - 100 entreprises (66% de réponses représentant 4% de l'emploi industriel du secteur)
- Questions :
  - Quid des résultats d'une étude équivalente en Europe ou en France ?
  - Quid de la mise en œuvre d'autres applications industrielles basées sur STEP (PDM)
  - Quid du Protocole d'Application 214 (Non pris en compte dans l'étude) ?
  - Quid de la mise en oeuvre d'autres normes de l'ISO TC 184 (PLIB, MANDATE, …)?

Manufacturing Management Data - MANDATE (ISO 15531)

- External communications
  - Basic principles for ordering and controlling manufacturing flows - closely linked to e-commerce
- Manufacturing Resource usage
  - Monitoring the usage of manufacturing resources for planning purposes
- Flow control
  - Data to control and monitor flow of material in an enterprise

Process Specification Language (ISO 18629)

- PSL provides a generic language for describing a discrete manufacturing process throughout the entire production process
- PSL enables the interoperability of manufacturing processes between software applications that utilize different process models and process representations
- PSL is based on a core which defines axioms for the concepts of activity, activity-occurrence, timepoint, and object such that any two process-related applications must share these axioms in order to exchange process information
- Under development jointly with TC184/SC5

IIDEAS (ISO 18876)

- Integration of industrial data for exchange, access and sharing
- Information integration architecture across multiple models
  - integration of data from different sources, different data models, and in different modelling languages
  - enable sharing of the same data between different applications
  - resolution of structural conflicts between models developed with different objectives
  - translation of data and data models between different encodings and modelling languages
- Standard (Technical Specification) comprises:
  - Architecture overview and description
  - Integration and mapping methodology

All the ISO TC 184 and its SCs warmly thank you for your total involvement in standards.