WG2 - Informatics Standards in Pathology

Dr C.DANIEL

INSERM UMRS 872 eq 20 – Paris Descartes University

Georges Pompidou Hospital – AP-HP

Agenda

- Mission and objectives
- IHE Pathology : where are we?
- Where are we going?
  - WG members
  - Task distribution
  - 2008 roadmap
  - Meetings

Mission and objectives

"Integrating Pathology to Healthcare Enterprise"

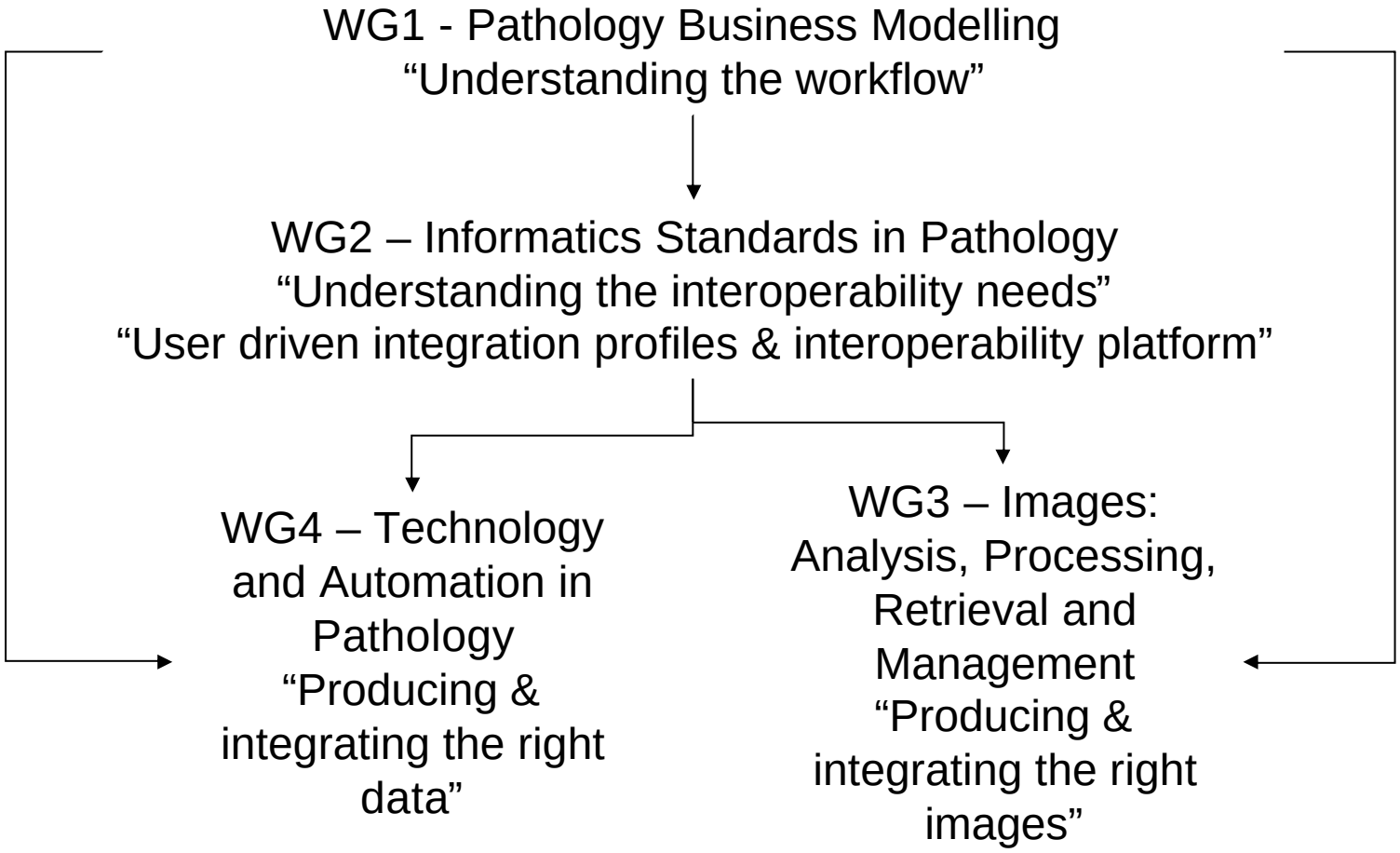
- Continuous cyclic framework to enhance the quality of care and research in pathology using (standardized) Information Technology
  - ***International :*** Developing collaborative work thanks telepathology services in Europe
  - ***National :*** Sharing anatomic pathology data and images within personal EHR
  - ***Hospital :*** Integrating Anatomic Pathology (AP) departments to Hospital Information Systems (ADT, PACS, report repositories, result trackers, etc)
  - ***Department :*** Integrating Anatomic Pathology equipments (anatomic pathology information system (PIS), slide scanners, computerized-microscope, image databases, tissue banks, slide or cassette engravers, immuno-histochemistry automatons, Tissue Micro-Arrayers, etc)
- Quality insurance, patient empowerment, translational medicine, economical and societal issues

Mission and objectives

"Integrating Pathology to Healthcare Enterprise"

- *Interoperability/integration framework (WG2)*
  - *Integrating proprietary and heterogeneous clinical and research databases and systems*
    - Semantic interoperability: various pieces of information and data must have unambiguous meaning in order to be interpreted together, aggregated and/or mined.
    - Security, privacy and confidentiality issues
- Purpose and scope : business modeling (Why?) (WG2-WG1)
- Data and images (What?) (WG2-WG3/4)
  - "Dirty useless world", Quality and reliability of real-world images and related clinical data (missing values, errors and noise, images without clinical context,inadequate sampling process, etc)

COST Action IC604 : EURO TELEPATH
Working group dependencies




IHE
IHE Changing the Way Healthcare CONNECTS
WWW.IHE.NET

Mission and objectives
IHE driven process

- Most of the main IHE Pathology participants are COST Action IC604 participants
  - Have done a good (even though simple!) job within 2 years
- IHE Pathology is now internationally visible
  - CAP supports the initiative
- COST Action IC604 : key role for Europe to keep the leadership in IHE Pathology (Planning & Technical Committee)
  - Recruiting new participants (users & vendors)
  - Attending IHE Pathology meetings & Tconf, DICOM WG26 (WG6), HL7 Pathology SIG (others) meetings

Informatics Standards in Pathology Issues

- Standardization efforts in medical informatics
  - European : CEN TC 251 (pr EN13606)
  - International : HL7, DICOM
- Limits
  - Inadequacy
    - Pathology is a specific healthcare domain
    - Existing DICOM and HL7 messages need to be adapted to be usable in the pathology
  - Ambiguity
    - Being DICOM or HL7 compliant does not imply direct integration (optional data fields)
    - Agreements among information systems to achieve interoperability.
- A specific workgroup of pathologists and vendors
  - The best use of international standards to reach users' needs
  - Integrating the Healthcare Enterprise

Integrating the Healthcare Enterprise

- Both a process and a forum for encouraging integration efforts
  - Technical framework for the implementation of established messaging standards to achieve specific clinical goals
  - Rigorous testing process for the implementation of this framework
  - Educational sessions & exhibits at major meetings of medical professionals

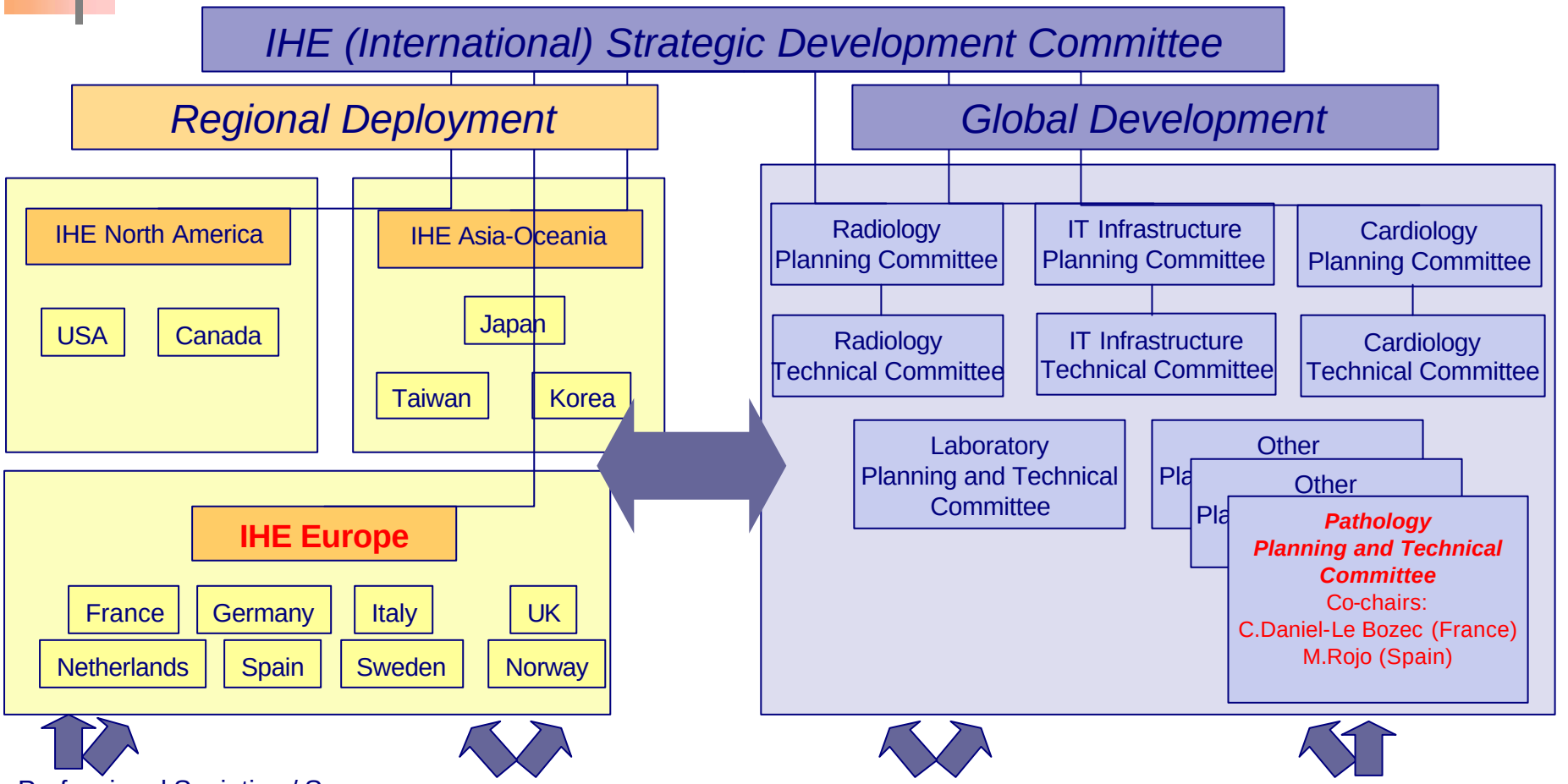
IHE : the grows

REGIONS

DOMAINS

- RADIOLOGY: 1998
- IT INFRASTRUCTURE: 2002
- LABORATORY: 2003
- CARDIOLOGY: 2004
- NUCLEAR MEDICINE: 2004
- PATHOLOGY: 2005
- RADIATION ONCOLOGY: 2005
- PATIENT CARE COORD: 2005
- EYECARE: 2005

IHE Organizational Structure



Professional Societies / Sponsors

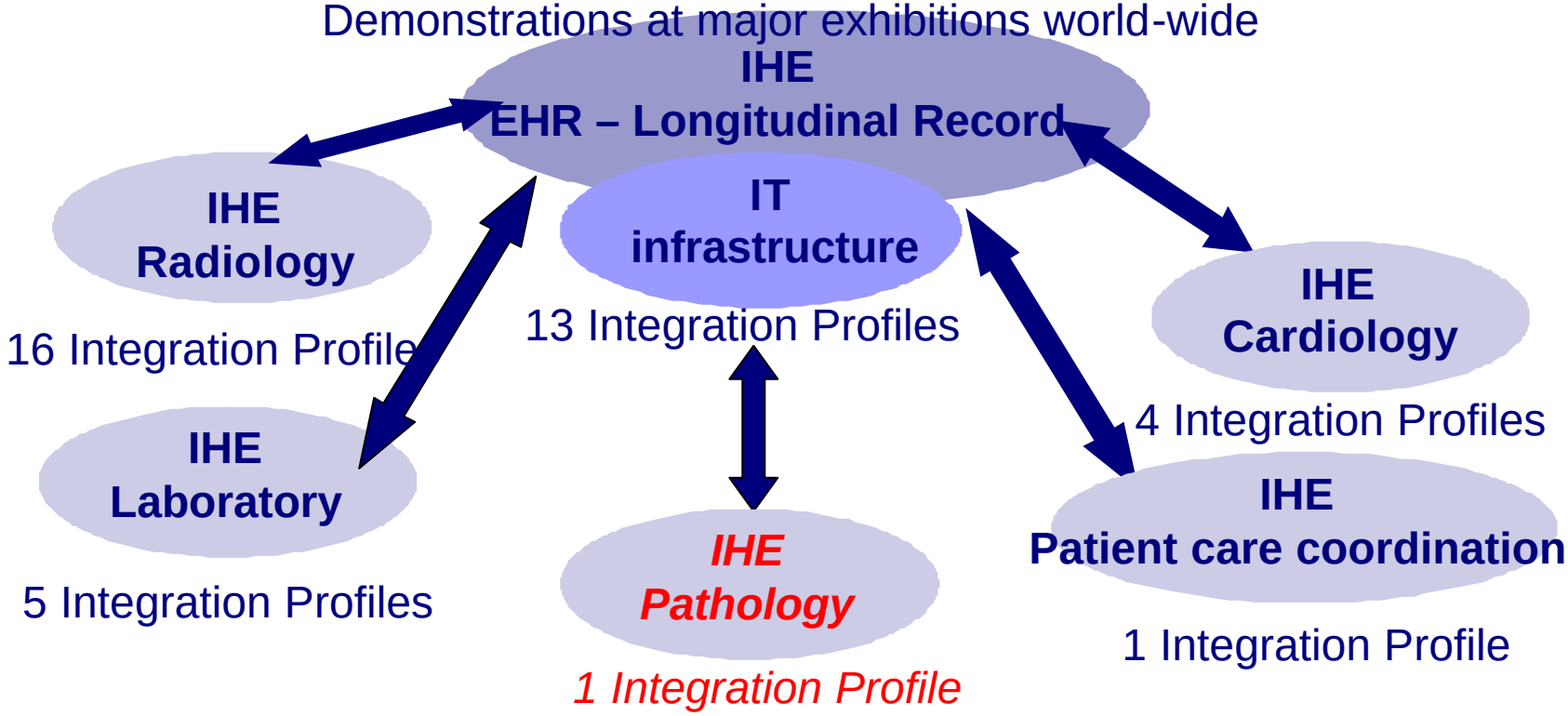
ACC HIMSS RSNA **CAP**
GMSIH SFR SFIL ADICAP
COCIR EAR-ECR DRG SEAP
SIRM BIR EuroRec
ESC SEIS

AHIS IRA JRS
METI-MLHW MEDIS-DC JAMI

Contributing and participating Vendors

Achievements and expanding scope

15 Active national chapters on 4 continents
4 Technical Frameworks
39 Integration Profiles, Testing at yearly Connectathons,
Demonstrations at major exhibitions world-wide



Other new domains : Oncology, Eye care, Intensive care devices, Pharmacy etc.

IHE pathology process

- IHE Pathology (launched in September 2005, Paris)
- Users
  - France : ADICAP (Association for the Development of Informatics in Cytology and Pathology), SFP (French Society of Pathology), GMSIH (Groupement pour la Modernisation du Système d'Information Hospitalier)
  - Spain : SEIS (Spanish Society of Health Informatics), SEAP (Spanish Society of Pathology), SESCAM
  - Germany
  - Italy
  - Japan
  - US : CAP
- Vendors
  - Acquisition modalities: Tribvn, Etiam (+/- Aperio, Zeiss, VMScope)
  - LIS: Technidata, Infologic
  - PACS Vendors: Agfa, GE
  - EHR: Medasys

Collaboration with standard organization : HL7 & DICOM

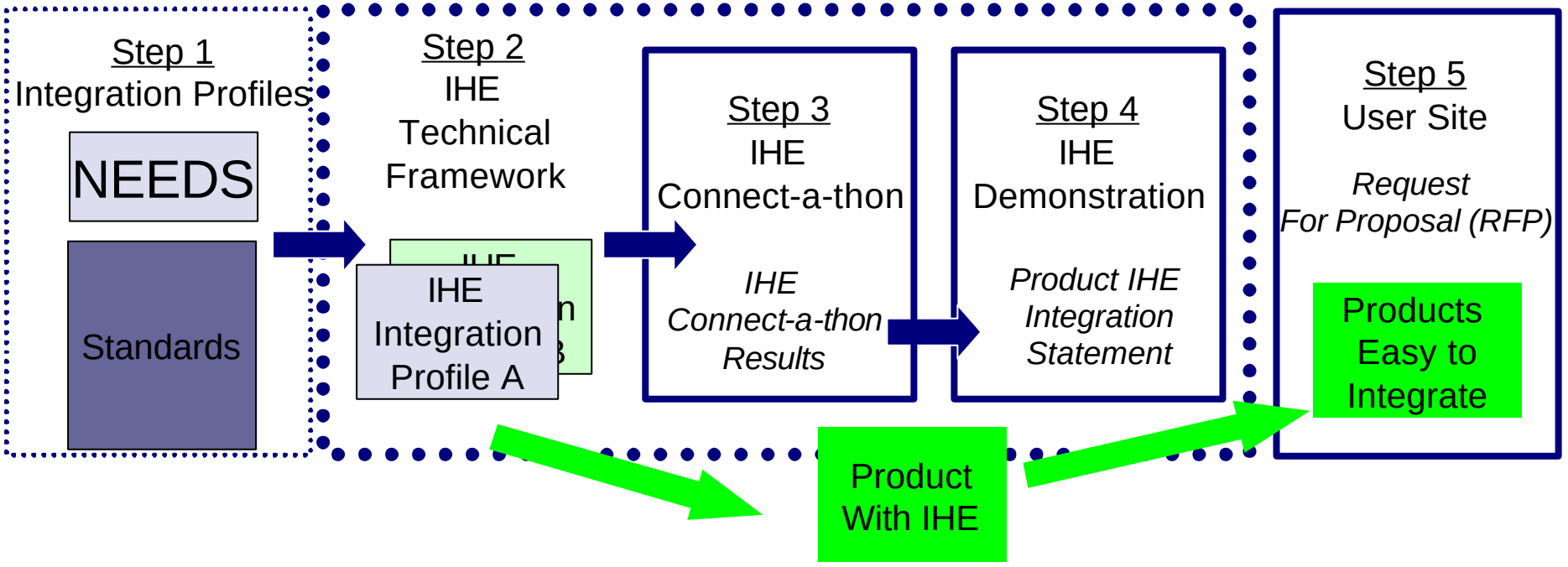
- HL7 : Health Level 7
  - Accredited Standards Developing Organization (SDO) operating in the healthcare domain
  - Members : Healthcare experts and information scientists
  - HL7 Pathology Special Interest Group (January 2006)
    - Specimen model, orders and reports aspects of the pathology workflow.

Collaboration with standa organization : HL7 & DICOM

- DICOM : Digital Imaging and COmmunication in Medicine
  - Create standards for integration of electronic healthcare information in medical imaging
  - Network communication protocols between informatic modules in medical imaging
  - DICOM WG26 for pathology (October 2005)
- Pathology presents specific challenges and opportunities to DICOM.
  - Some pathology-related image formats do not as yet have applicable DICOM Information Object Definitions : whole slide images, high-order multi-spectral images, flow cytometry, electron microscopy and others
  - As pathology imaging studies tend to be of specimens and not of patients, patient and specimen identification specifications (PS 3.3 - 2004, Table C.7.1 and following) will require revision and extension for pathology use.
  - As pathology images are closely associated with tissue processing (i.e. fixing, staining, etc.) image metadata may need to include tissue processing information

IHE Process

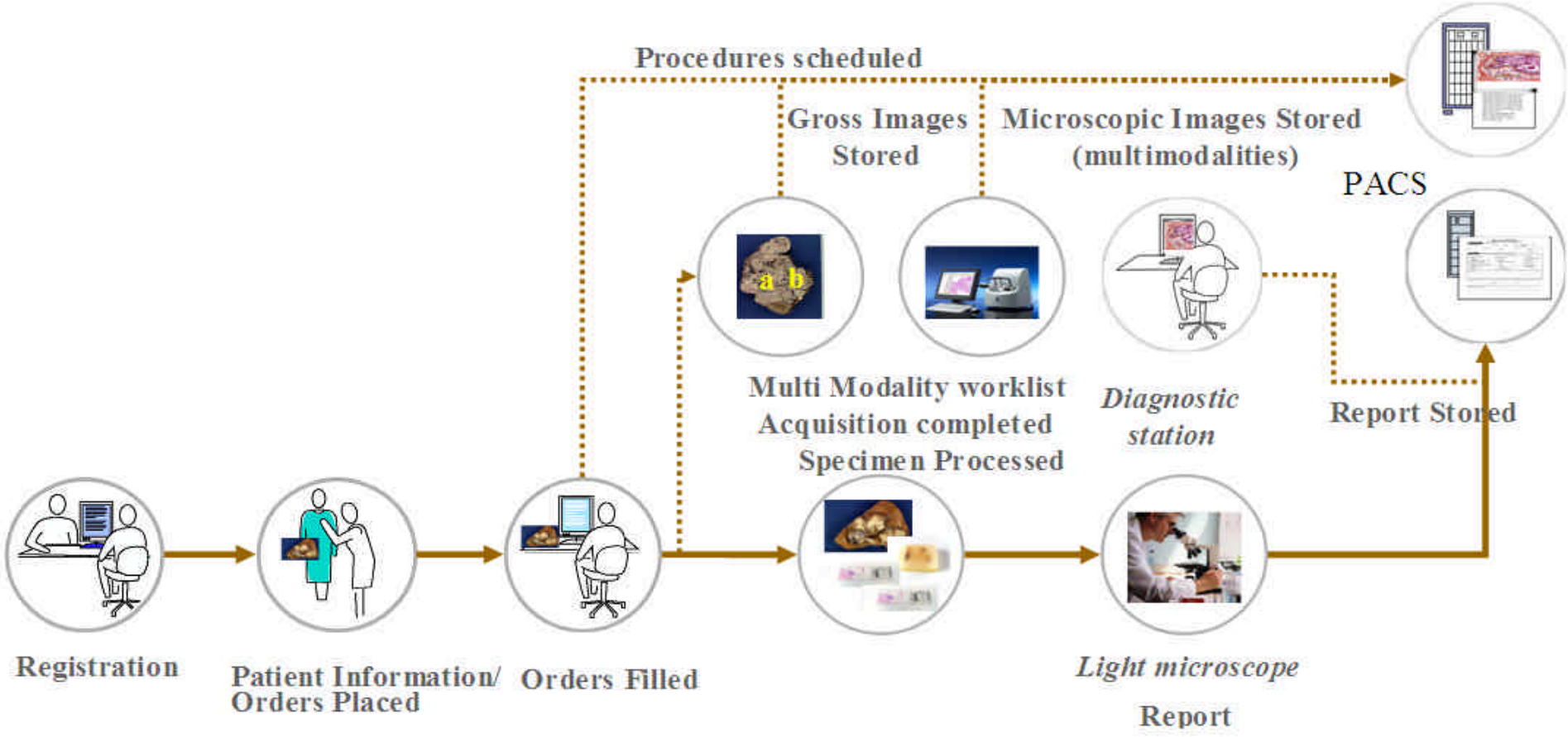
- Annual cycles – 5 steps



- IHE Integration Profiles at the heart of IHE : growing set of effective provider/vendor agreed solutions

Mission and objectives

Workflow & needs



Mission and objectives
IHE Pathology Technical Framework

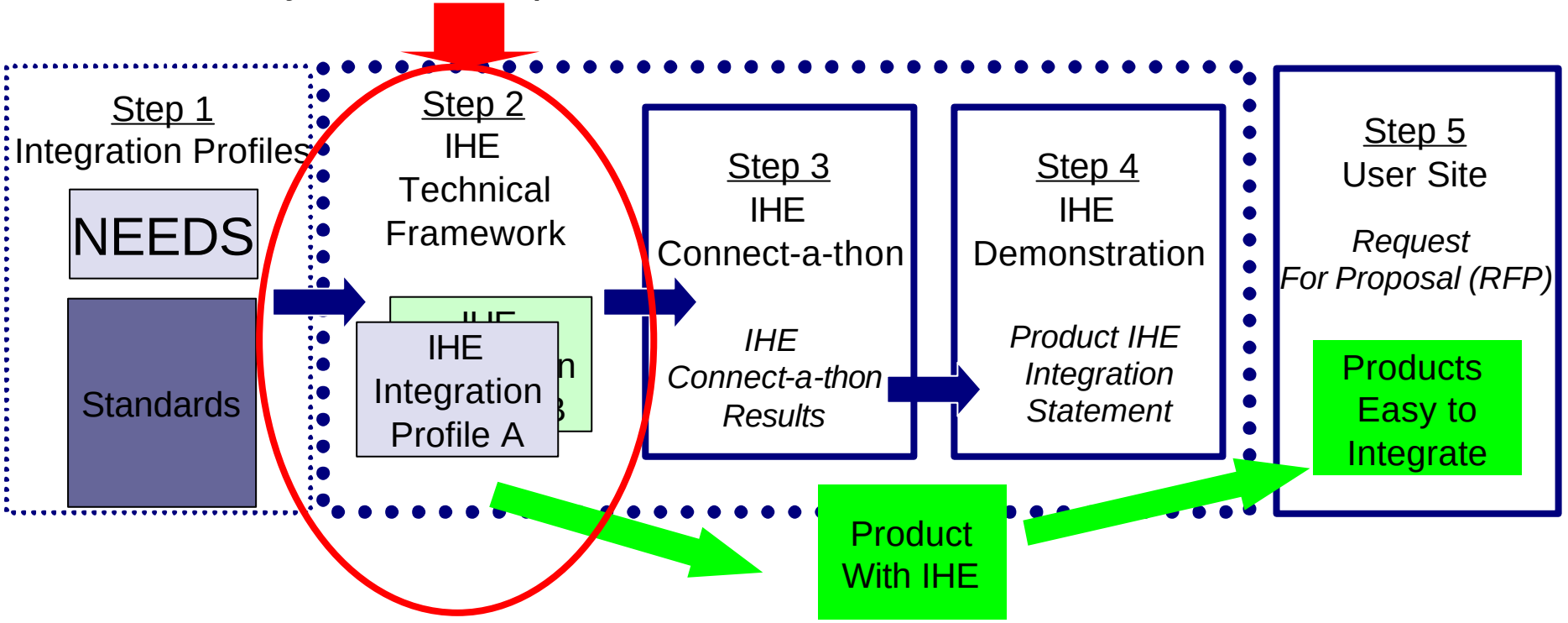
- The **Pathology Technical Framework** identifies the workflow, the IHE **actors** (i.e. functional components, application roles), and shows the **transactions** between them.
- This description is organized into functional units called **integration profiles** that address specific clinical needs. It also chooses the appropriate messages of established standards to cover this new domain, and defines their implementation.

Mission and objectives
IHE Pathology Technical Framework

- Volume 1: high-level view of the domain, identifying actors and transactions
- Volume 2 provides a detailed technical description of each transaction and of its messages.
- This document is updated annually, following a period of public review, and maintained regularly through the identification and correction of errata.

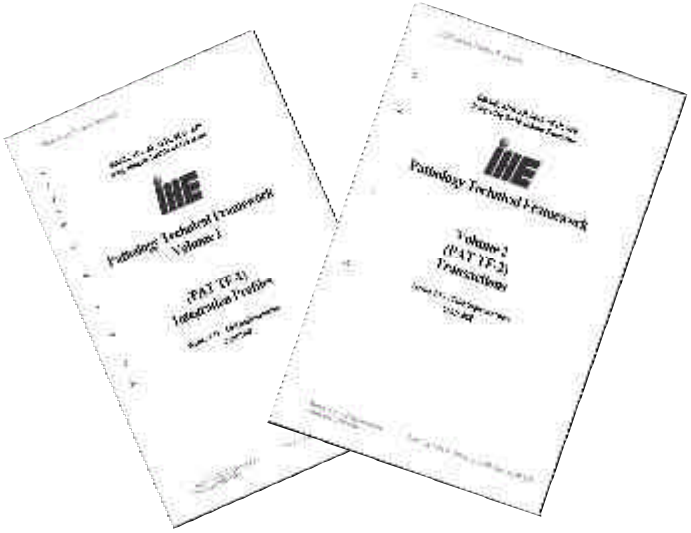
Where are we?

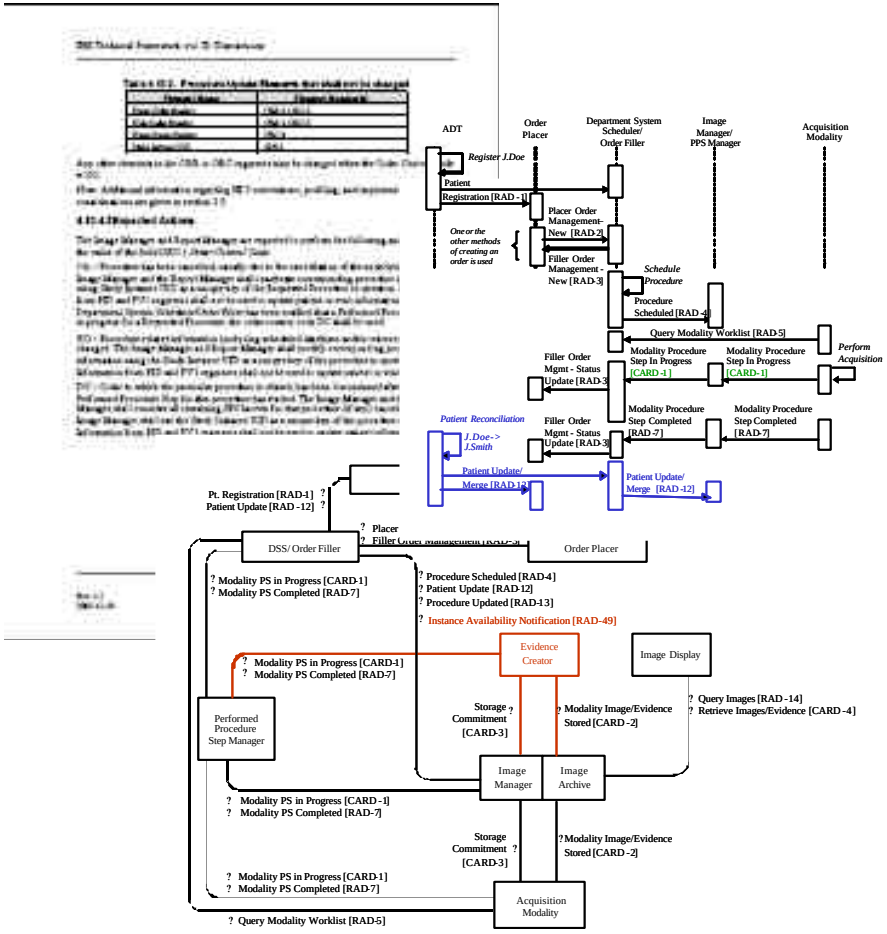
- Annual cycles – 5 steps



- IHE Integration Profiles at the heart of IHE : growing set of effective provider/vendor agreed solutions

Step 2 : IHE Technical Framework





Pathology TF

V1.13

FOR TRIAL IMPLEMENTATION

Volume 1 : 41 pages

Volume 2 : 79 pages

Scope & users needs

Value	Description	Addressed by Pathology TF 2007 – 2008
SP	Surgical Pathology -Surgical specimen -Biopsies	Yes (Use cases 1.1, 1.2, 1.3, 1.4) (Use cases 2.1, 2.2)
CP	Cytopathology (including fine needle aspiration biopsy – FNAB)	Yes (Use cases 3.1, 3.2)
CA	Clinical Autopsy	Yes (Use cases 4)
RP	Research in Pathology (TMA)	Partially (Use cases 5)

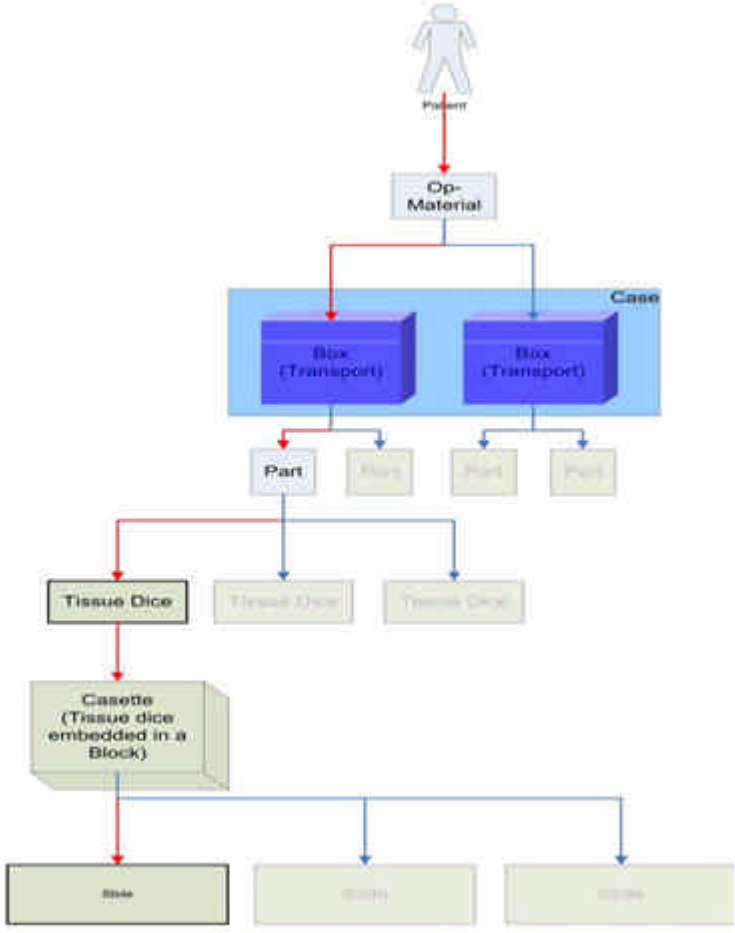
- **1 or n specimen per container**
- **1 or n procedure per order**

Specimen model : Usual situation

Specimen can be identified by containers' ID

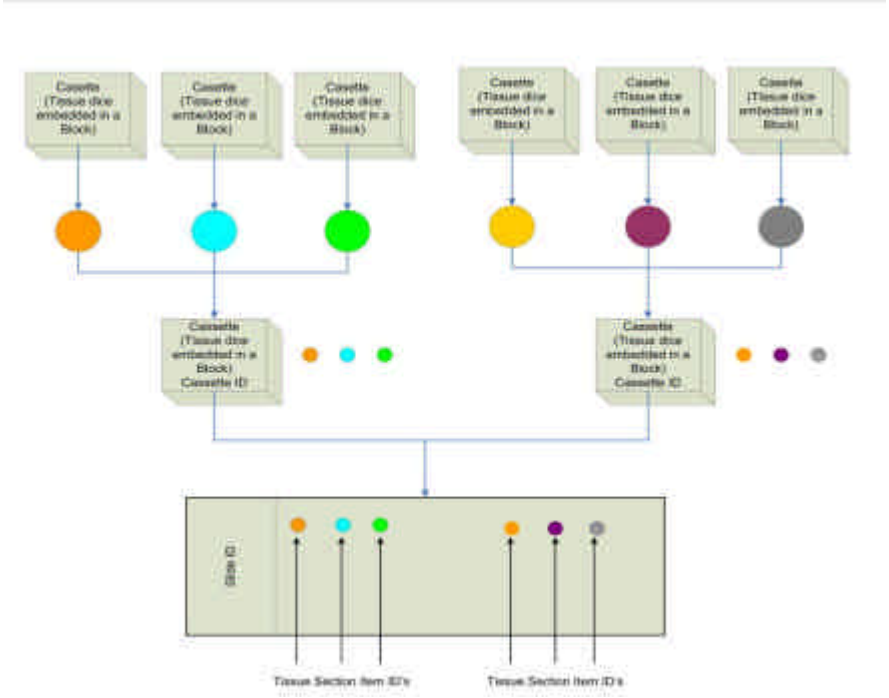
Gross imaging

Virtual slide



Specimen model : Unusual situations (research) : Tissue Micro Arrays

- More than one tissue item on slide coming from the DIFFERENT BLOCKS coming, from DIFFERENT PARTS and from DIFFERENT PATIENTS



Scope : Pathology WF integration profile

- Continuity and integrity of basic pathology data acquired for examinations being ordered for an identified inpatient or outpatient. It focuses on the main transactions of:
  - **a) the ordering aspects of the workflow**
  - **b) the reporting aspects of the workflow**
    - For this cycle, the reporting workflow is basic.
  - **c) the imaging aspects of the workflow**.
    - This Integration Profile also describes evidence creation.

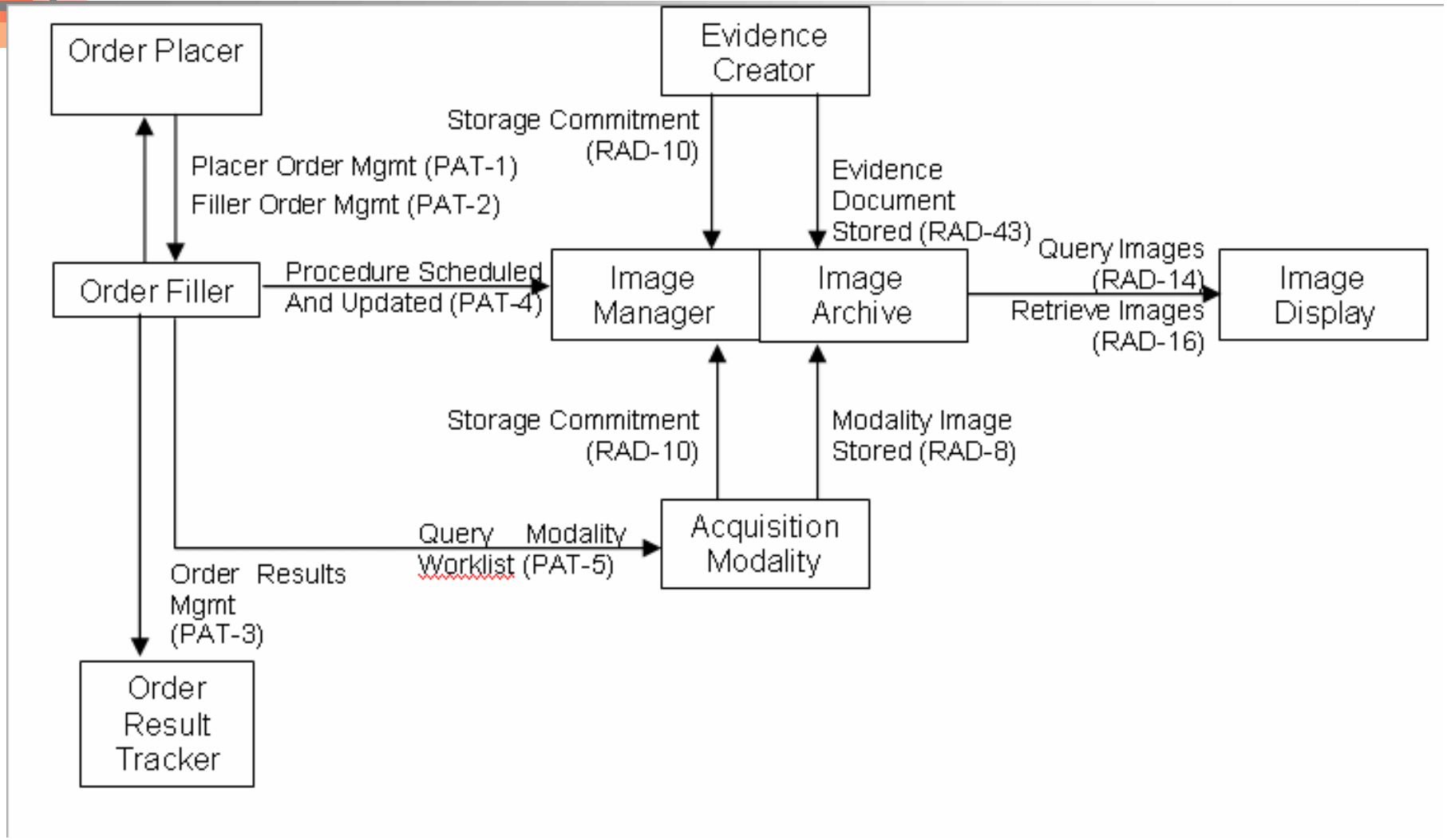
Contributors (Volume 1)

- GMSIH (Groupement pour la Modernisation du Système d'Information Hospitalier)
- ADICAP (Association pour le Développement de l'Informatique en Cytologie et Anatomie Pathologique)
- AP-HP
- SEIS (Spanish Health Informatics Society)
- SEAP (Spanish Society of Pathology)
- SFP (French Society of Pathology)
- DICOM and its affiliate organizations (DICOM WG26, DICOM WG6)
- HL7 and its affiliate organizations (HL7 pathology SIG)
- IHE organization in each participating country: IHE-France, IHE-Spain.
- IHE-J (IHE Japan)

Contributors (volume 2)

- MEDASYS (Gif sur Yvette)
- TRIBVN (Châtillon)
- TECHNIDATA (Montbonnot Saint Martin)
- ETIAM (Rennes)
- GE Healthcare (US)
- INFOLOGIC (Valence)
- Charité Universitätsmedizin Berlin (Germany)
- Servicio de Salud de Castilla-La Mancha (Spain)

Actors & Transactions



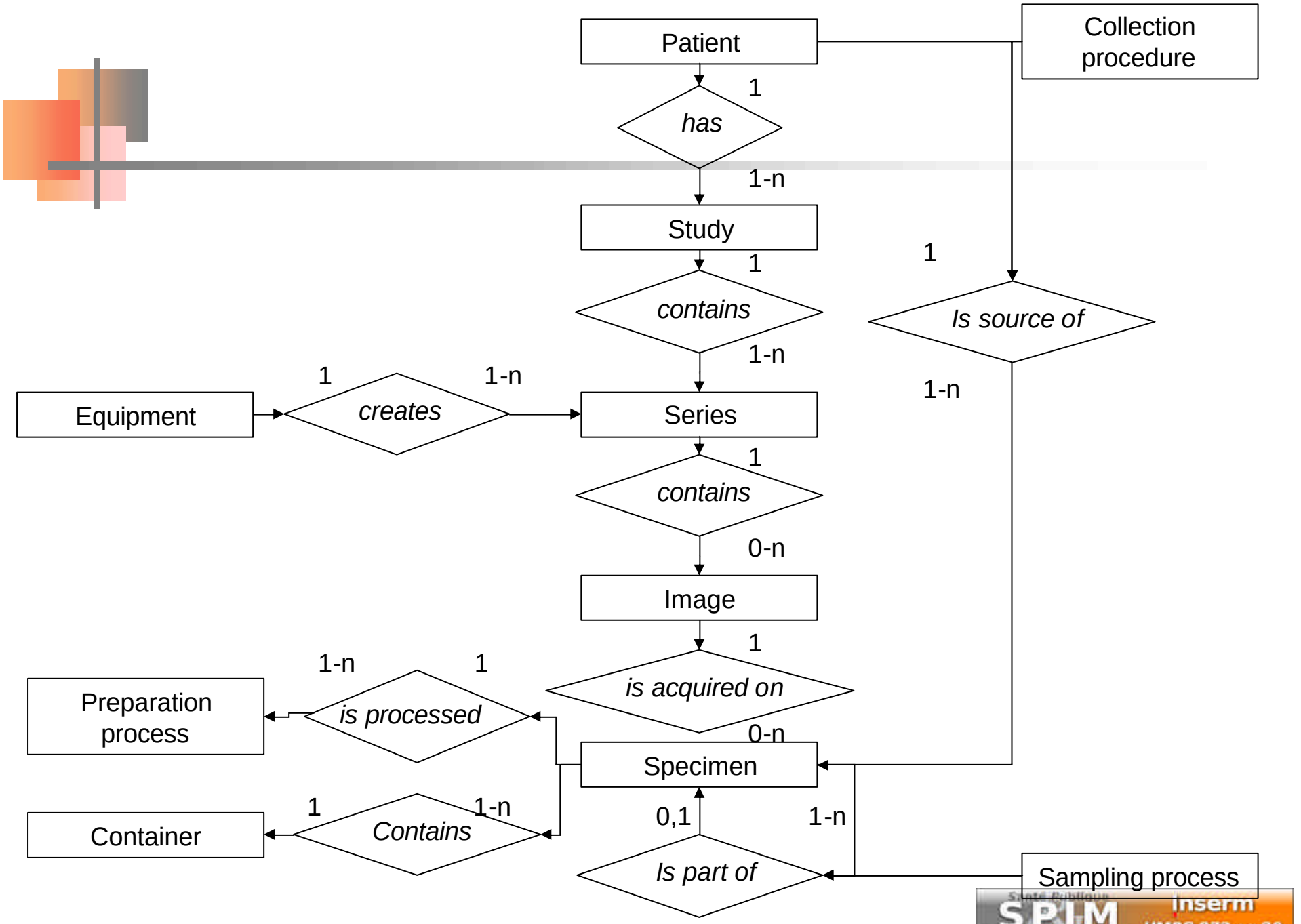
Relationships to other IP

- **Radiology**
  - Scheduled Workflow (SWF)
- **Laboratory**
  - Laboratory Scheduled Workflow (LSWF)
- **Infrastructure**
  - Patient Administration Management (PAM)

Standards

- **HL7 v2.5**
  - OML^O21/ORL^O21 + pièces jointes
  - ORU^R01 + compte-rendu(s) joint(s)

- **DICOM**
  - DICOM 2007 PS 3.4: Storage Service Class
  - DICOM 2007 PS 3.4: Storage Commitment Push Model SOP Class
  - DICOM 2007 PS 3.4: Query/Retrieve Service Class
  - Supplément 122 : Specimen Identification and Revised Pathology SOP Classes


Patient
Collection procedure
1
has
1-n
Study
1
contains
1-n
1
Is source of
1-n
1
creates
1-n
Equipment
Series
1
contains
0-n
Image
1
is acquired on
0-n
1-n
1
Preparation process
is processed
Specimen
1
Contains
1-n
Container
0,1
1-n
Is part of
Sampling process

Specimen model (IHE, DICOM, HL7)

- **Three** parallel efforts : IHE-pathology, DICOM WG 26,HL7 Pathology Special Interest Group
  - Yet distinct, each with its own purpose and organizational context
- **Aligned**
  - **One** specimen model established in common across both standards.

Join meetings : example

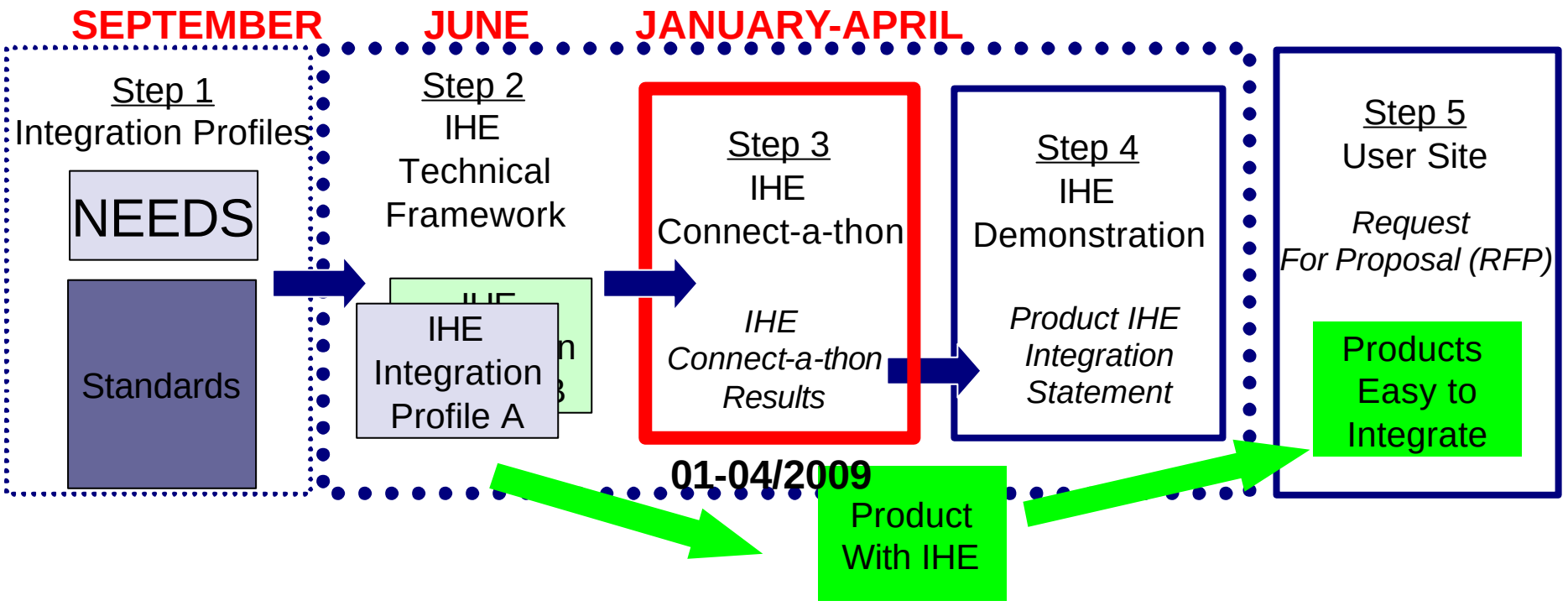
- **Cologne, Germany. May 1st, 2007.**
- Tuesday, May 1st – Q1, Q2 and Q3 : joint HL7 AP SIG – DICOM WG26 joint meeting

  - DICOM Specimen Model (Supplement 122).

  Tuesday, May 1st Q4 : joint HL7 AP SIG - Lab SIG – (DICOM WG26) meeting

  - DICOM Specimen model in context of HL-7 Specimen Model

Step 3 : Implementation & test



Step 3 : Implementation & test

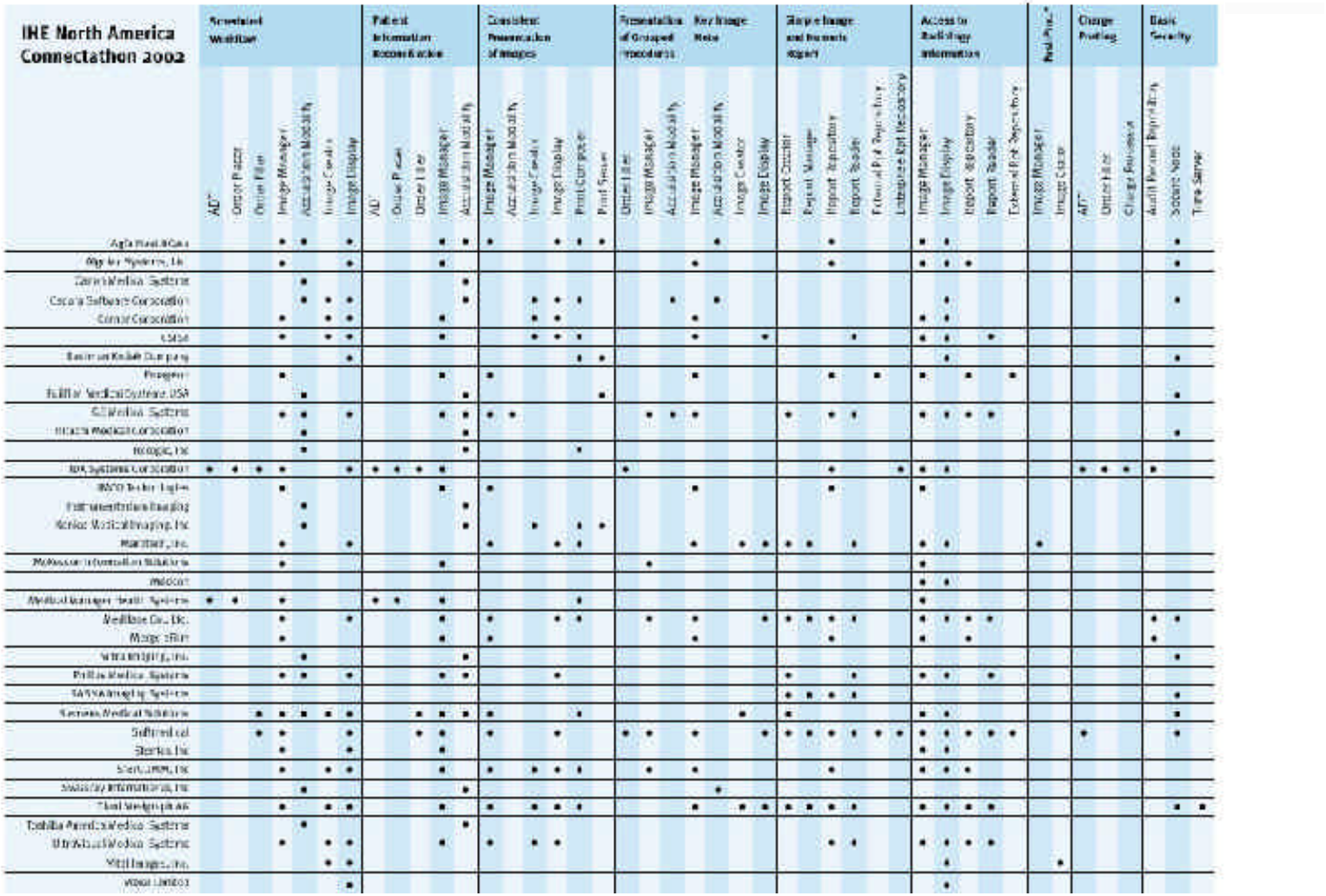
IHE Connectathon (US January-Europe: April)

- Open invitation to vendor community
- IHE provides advance testing tools (MESA)
  - Vendors must succeed preliminary tests before registration
- IHE connectathon
  - Neutral testing organization and supervision by project management team
  - Thousands of cross-vendor tests performed
  - Results recorded and published

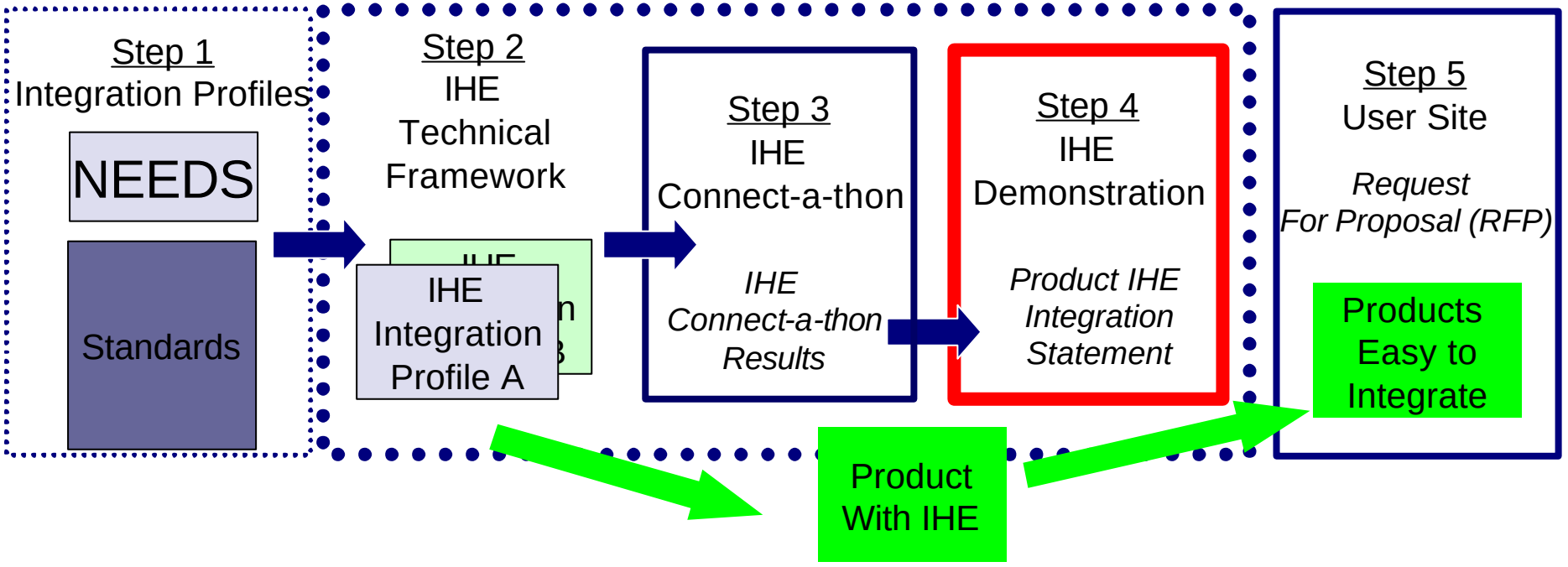
Step 3: IHE Connectathon

Noordwijkerhout 2005: 300 participants, 100 systems, 62 vendors

Step 3: IHE Connectathon - Results



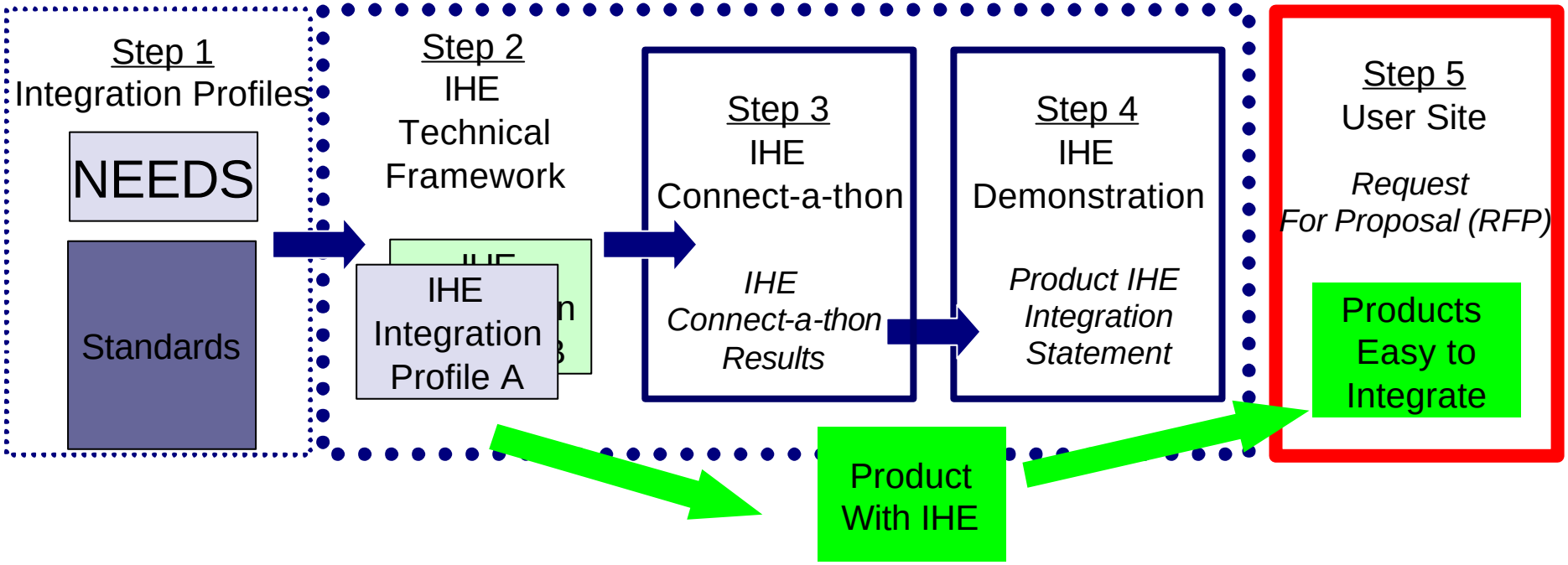
Step 4 : Demonstration



Step 4 : Demonstration

Hôpital Expo, May 2004

Step 5 : IHE Integration Statements



Step 5 : IHE Integration Statement

Vendors claim compliance to *IHE Integration Profiles* by publishing an *IHE Integration Statement* for each product.

IHE | **Product Evaluation Worksheets**

COMPANY: _____

PRODUCT NAME AND VERSION: _____

PRODUCT AVAILABLE: _____

NOTES: _____

INTEGRATION PROFILES AND ACTORS IMPLEMENTED

☐ **Scheduled Workflow**

☐ ADT Patient Registration	☐ Acquisition Modality	☐ Image Manager	☐ Image Display
☐ Order Placer	☐ PPS Manager	☐ Image Archive	☐ Image Creator
☐ Dept System Scheduler/Order Filler			

☐ **Patient Information Reconciliation**

☐ ADT Patient Registration	☐ Acquisition Modality	☐ Image Manager	☐ Order Placer
☐ PPS Manager	☐ Image Archive	☐ Dept System Scheduler/Order Filler	

☐ **Consistent Presentation of Images**

☐ Print Composer	☐ Acquisition Modality	☐ Image Manager	☐ Image Display
☐ Print Server	☐ PPS Manager	☐ Image Archive	☐ Image Creator

WG2 – Informatics Standards in Pathology

- *Standardization bodies : DICOM, HL7, SNOMED, CEN*
- Actual work packages
  - DICOM
    - WG2.1 : Adoption requirements to use JPEG2000 in DICOM
    - WG2.2 : Propose DICOM headings to enable JPEG2000 wrappings
    - WG2.4 : Edition of implementation
  - HL7, SNOMED, CEN
    - WG2.3 : Participation in all standards bodies and initiatives
  - Scientific societies, external working groups
    - WG2.5 Liaising with European and national scientific societies, external working groups

WG2 – Informatics Standards in Pathology Tasks

- T2.1 - Defining strategic integration profiles
  - Driven by users' needs (dependency with WG1: Pathology Business Modelling)
    - "The right information, at the right time, at the right place, provided to the right HC professional"
  - IHE Technical framework (dependency with WG3/4)
    - *WG2.1 : Adoption requirements to use JPEG2000 in DICOM*
    - *WG2.2 : Propose DICOM headings to enable JPEG2000 wrappings*
    - *WG2.4 : Edition of implementation*

WG2 – Informatics Standards in Pathology Work packages

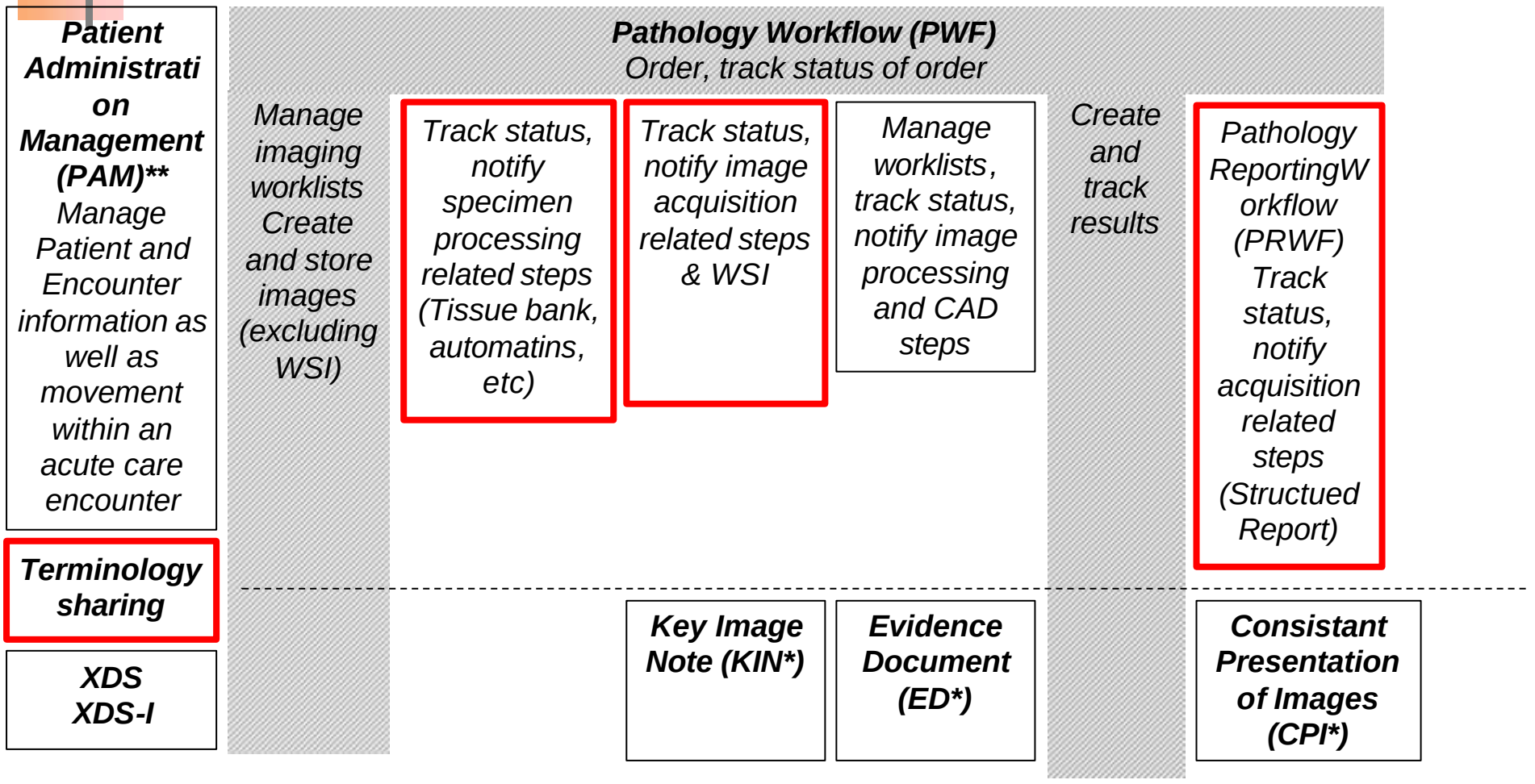
- T2.2 - Contribution to operational standards
  - *WG2.3 : Participation in all standards bodies and intiatives)*
    - Standardization bodies (DICOM, HL7 (OMG))
    - jpeg2000
    - **CEN ?**
    - IHTSDO (SNOMED), IHE (Pathology, ITI Terminology),
  - *WG2.5 Liaising with (US?), European and national scientific societies, external working groups*
    - Semantic interoperability: CTS2
    - Interoperability platform: OpenSC, DebugIT, CaBIG
- T2.3 - Interoperability platform
  - Terminology resources & ontologies for anatomic pathology (SNOMED CT, LOINC, ADICAP, etc) (IHT SDO)
  - Information models (CEN? – HL7 templates, archetypes)
    - HL7 v3 D-MIM specimen model
    - HL7 Continuity of Care Document (CCD) (structured report)

T2.1 - Defining strategic integration profiles

Where are we going?
IHE Integration Pathology WF
Open issues

- Query/return keys for DICOM WL (HL7/DICOM specimen related items alignment) (CD, JK, EC)
- Example of messages for trial implementation
  - Order : PAT1-PAT2 (ML?)
  - Procedure update, Modality WL : PAT4,PAT5 (JK,VD,EC?)
  - Report : PAT3 (?)
- New transaction from Image Manager to Order Filler (notification that a DICOM instance has been stored)
- DICOM supp122/IHE TF appendix alignment (CD)

Where are we going?



Where are we going?
IHE Integration Profile Proposals

- Editor & contributors
  - **Proposals** ue for Toledo face-to-face meeting (May 17, 2008)

  WG1 will provide the business model
- Proposals
  - Integrating whole slides images to PACS (WG3 – BB, JK, VDM, MA?) : Appropriatness of jpeg2000, JPsearch, MPEG in pathology, alternative (MS) : Pathology domain??
  - Using terminology services to address semantic interoperability in anatomic pathology (CD,VDM, AL, VP, RL, Mondeca??)
  - Defining HL7 templates for structured reports in anatomic pathology (CD, Santéos??)
  - Integrating PIS and Tissue banks, immunohistochemstery automatons or TissueMacro Arrayers (WG4) (?)
  - Others?

Where are we going?
DICOM WG26 Roadmap (WG3)

- **Short-Term Objectives**
  - Gross imaging and associated description and overlay;
  - Slide microscopy – either key images or whole-slide microscopic imaging (WSI) – taking into account that each magnification level from the macroscopic to low, medium and high magnification microscopy could have specific uses;
  - Hyperspectral and other related modalities;
  - Drawings and measuring, at gross and microscopy levels;
  - Cross-references between physical objects and their images. (This may require adopting or developing a standard for defining "unique identifiers" for arbitrary objects, such as GUIDs, OIDs, urn's, hierarchical naming schemes, etc.)
  - Accessing multi-gigabyte image objects at multiple resolutions. (The image space of interest involves mapping from a submicron to multi-centimeter object scales, to image dimensions in the range of 100 to 102 layers x 107 pixels x 107 pixels.)

Where are we going?
DICOM WG26 Roadmap (WG3)

- **Future Work Items**
  - Structured Reports and/or Evidence Documents in Pathology involving full demographic information;
  - Correlation of radiologic and pathologic images, including image-guided biopsies;
  - Coding information based upon existing WHO codification (SNOMED and also ADICAP thesaurus);
  - Navigating in a hierarchy of images by means of annotations of images and/or drawings (e.g., gross imaging annotated with blocks' localization);
  - Dealing with Tissue Micro Arrays (one slide for hundreds of patient) with a link to patient information;
  - Integration of automated image analysis tools with WSI.

T2.2 - Contribution to operational standards

Contribution to standards
Who? How?

- IHE-DICOM-HL7 (CD,JK) : IHE TF (WG2/WG3)
  - IHE Pathology -DICOM WG26 : Toledo : face to face meeting
    - Planning & Technical committee vote
    - Integration Profile proposals review & ballot
    - Roadmap (agenda of Tconf&meetings)
- Jpeg2000 (MA) (WG3) : march-april 08 meeting
  - Announce of the COST action and expected activities
  - feed back expected
- *IHTSDO (SNOMED) (AL)*
- *CEN (MG) SEIS*

- *Terminology : IHE (Pathology, ITI Terminology), Semantic interoperability: CTS2 ? (METU CEN Semantic interoperability)*
- *Interoperability platform: OpenSC, DebugIT, CaBIG ?*

- Support of COST

T2.3 - Interoperability platform (Integration platform) ?