

MAKING INTEROPERABILITY HAPPEN

Implementing integrated information systems can be complex, expensive and frustrating. Healthcare professionals seeking to acquire or upgrade systems do not have a convenient, reliable way of specifying a level of adherence to communication standards sufficient to achieve truly efficient interoperability. Great progress has been made in establishing such standards—DICOM and HL7, notably, are now highly advanced. But a gap persists between the standards that make interoperability possible and the actual implementation of integrated systems. To fill in that gap has, until now, required expensive, site-specific interface development to integrate even standards-compliant systems.

The IHE initiative is designed to bridge the gap. Under IHE healthcare professionals, including members of its sponsoring organizations, the Healthcare Information

and Management Systems Society (HIMSS) and the Radiological Society of North America (RSNA), identify the integration capabilities they need to work efficiently in providing optimal patient care. Representatives of leading imaging and information systems companies then reach consensus on a specific implementation of established communication standards—DICOM, HL7, and potentially others—that provides those capabilities. Their selections are recorded in the IHE Technical Framework, a detailed resource for the implementation of standards that is freely available to the whole industry. The Technical Framework is open to public comment and is proven via an industry-wide testing and implementation process. The process works by annual cycles, expanding the scope of integration capabilities each year.

ACQUIRING INTEGRATED SYSTEMS

IHE Integration Profiles provide a common language for purchasers and vendors to discuss integration needs of healthcare enterprises and the integration capabilities of products. They are particularly useful for writing the integration portions of purchasing specifications. The goal for most healthcare organizations is to implement practical capabilities such as distributed access to diagnostic images or smooth departmental workflow. Integration Profiles allow communication about those high-level capabilities while referencing the underlying technical precision necessary to make them work. They give purchasers a tool that reduces the difficulty, cost and anxiety associated with implementing integrated systems.

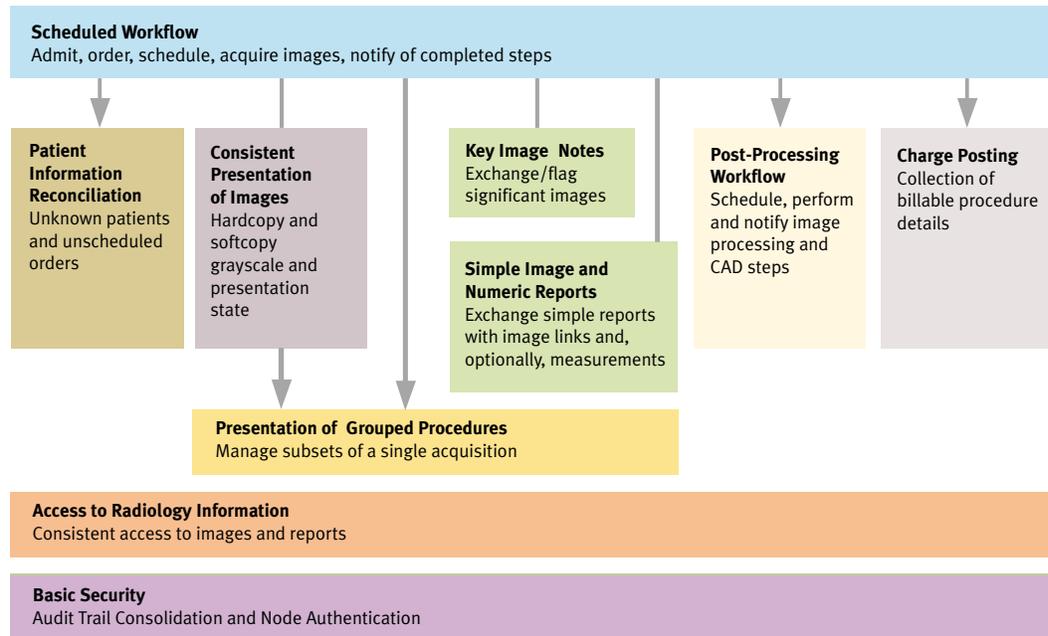
INTEGRATION PROFILES AND STANDARDS

IHE Integration Profiles organize and leverage the integration capabilities that can be achieved by coordinated implementation of communication standards. They do not replace conformance to standards, and users should continue to request that vendors provide statements of their conformance to relevant standards, such as DICOM and HL7.

Integration Profiles rather provide a more precise definition of how standards are implemented. They define a specific implementation of standards that are designed to meet identified clinical needs. The IHE implementation of standards is also broadly supported by industry partners, carefully documented, reviewed and tested.

The Key to Integrated Systems | IHE Integration Profiles

FIGURE 1: IHE INTEGRATION PROFILES 2002-2003



IHE INTEGRATION PROFILES 2002-2003 (see Figure 1)

IHE has defined ten Integration Profiles as of its 2002-2003 cycle. The description of each Integration Profile given below includes the clinical problems addressed and the general categories of information and imaging systems involved. (Implementers and technical personnel who

need more detail should refer to volume I of the IHE Technical Framework, available at www.rsna.org/IHE.)

Scheduled Workflow (SWF) (see Figure 2)

The Scheduled Workflow Integration Profile establishes a seamless flow of information that supports efficient patient care workflow in a typical imaging encounter. It specifies transactions that maintain the consistency of patient information from registration through ordering, scheduling, imaging acquisition, storage and viewing. This consistency is also the foundation for subsequent workflow steps, such as reporting. Systems involved in this profile are:

- Enterprise-wide information systems that manage patient registration and services ordering (i.e., admit-discharge-transfer [ADT]/registration system and hospital information system [HIS])
- Radiology departmental information systems that manage department scheduling (i.e., radiology information system [RIS]) and image management/archiving (i.e., picture archiving and communication system [PACS])
- Acquisition modalities

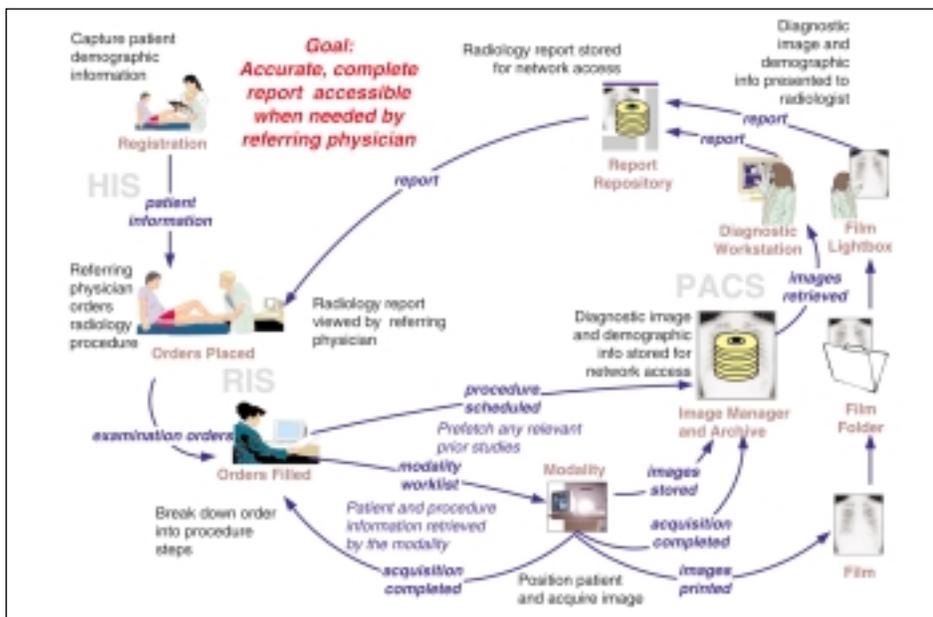


FIGURE 2: SCHEDULED WORKFLOW (SWF)

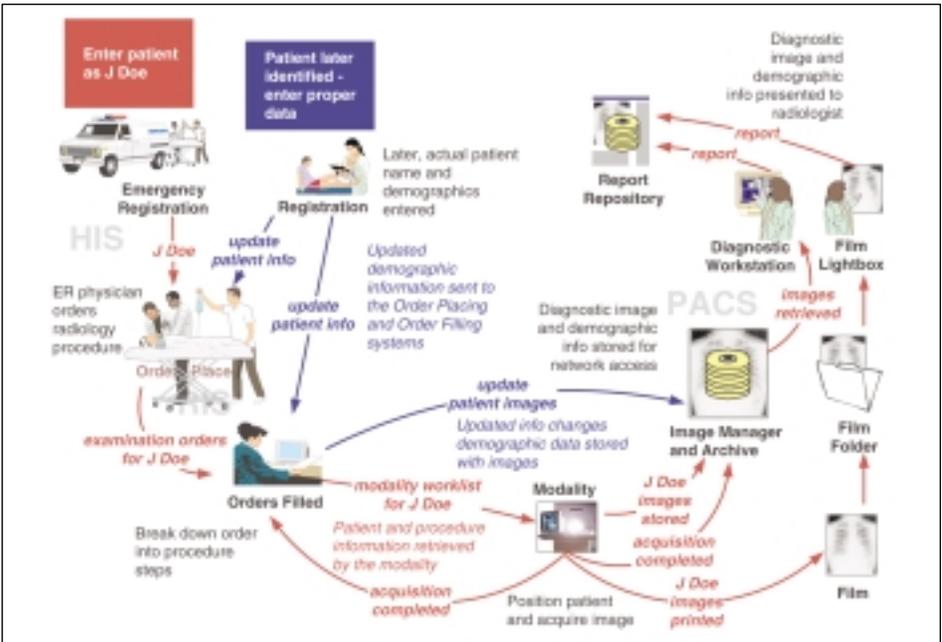


FIGURE 3: PATIENT INFORMATION RECONCILIATION (PIR)

Patient Information Reconciliation (PIR)
 (see Figure 3)

This Integration Profile extends Scheduled Workflow by providing the means to match images acquired for an unidentified patient (for example, during a trauma case) with the patient’s registration and order history. In the example of the trauma case, this allows subsequent reconciliation of the patient record with images acquired (either without a prior registration or under a generic registration) before the patient’s identity could be determined. Enabling this after-the-fact matching greatly simplifies these exception-handling situations. Systems involved in this integration profile are:

- Enterprise-wide information systems that manage patient registration and services ordering (ADT/registration system, HIS)
- Radiology departmental information systems that manage department scheduling (RIS) and image management/archiving (PACS)
- Acquisition modalities

Consistent Presentation of Images (CPI)
 (see Figure 4)

The CPI Integration Profile specifies a number of transactions that maintain the consistency of presentation for grayscale images and their presentation state information (including user annotations, shutters, flip/rotate, display area, and zoom). It

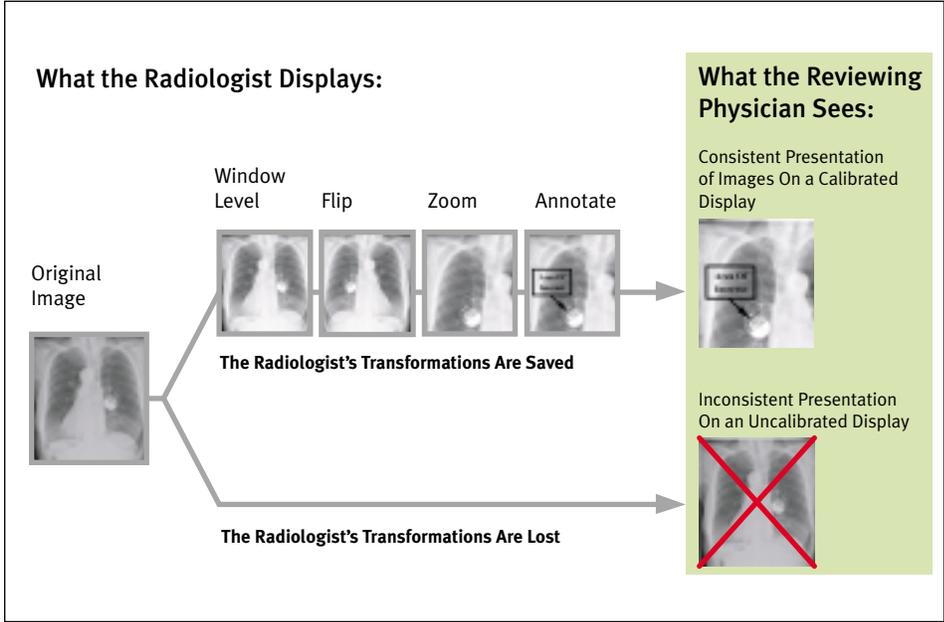


FIGURE 4: CONSISTENT PRESENTATION OF IMAGES (CPI)

also defines a standard contrast curve, the Grayscale Standard Display Function, against which different types of display and hardcopy output devices can be calibrated. Thus it supports hardcopy, softcopy and mixed environments.

The systems included in this profile are hospital-wide and radiology-department image rendering systems such as:

- Review or diagnostic image softcopy display stations (stand-alone or integrated with a HIS, RIS or PACS)
- Image management and archiving systems (PACS)
- Hardcopy image producing systems on various media such as film or paper
- Acquisition modalities

Presentation of Grouped Procedures (PGP) (see Figure 5)

The PGP Integration Profile addresses the complex information management problems entailed when information for multiple procedures is obtained in a single acquisition step (for example CT of the chest, abdomen and pelvis). PGP provides the ability to view image subsets resulting from a single acquisition and relate each image subset to a different requested procedure. A single acquired image set is produced, but

the combined use of scheduled workflow and consistent presentation of images transactions allows separate viewing and interpretation of the subset of images related to each requested procedure. Among other benefits, this allows generating reports that match local billing policies without additional intervention.

The PGP Integration Profile extends the Scheduled Workflow Integration Profile and the Consistent Presentation of Images Integration Profile. Systems involved include:

- Acquisition modalities
- Image management and archiving systems (PACS)
- Radiology departmental information systems that manage department scheduling (RIS)
- Diagnostic image softcopy display stations (integrated with a RIS or a PACS)

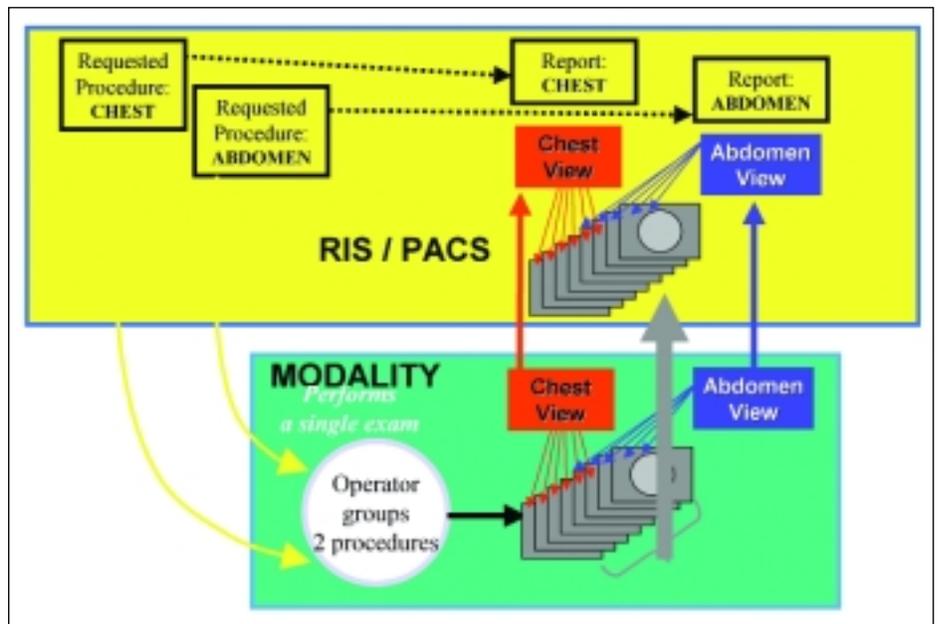


FIGURE 5: PRESENTATION OF GROUPED PROCEDURES (PGP)

Access to Radiology Information (ARI)

(see Figure 6)

The Access to Radiology Information Integration Profile specifies support for query transactions providing access to radiology information, including images and related reports. This is useful both to the radiology department and to other departments such as pathology, surgery and oncology. Non-radiology information (such as lab reports) may also be accessed if made available in DICOM format.

This profile includes both enterprise-wide and radiology-department imaging and reporting systems such as:

- Review or diagnostics image softcopy display stations (stand-alone or integrated with a HIS, RIS, PACS or Modality)
- Reporting stations (stand-alone or integrated with a HIS, RIS, PACS or Modality)
- Image management and archiving systems (PACS)
- Report repositories (stand-alone or integrated with a HIS, RIS or PACS)

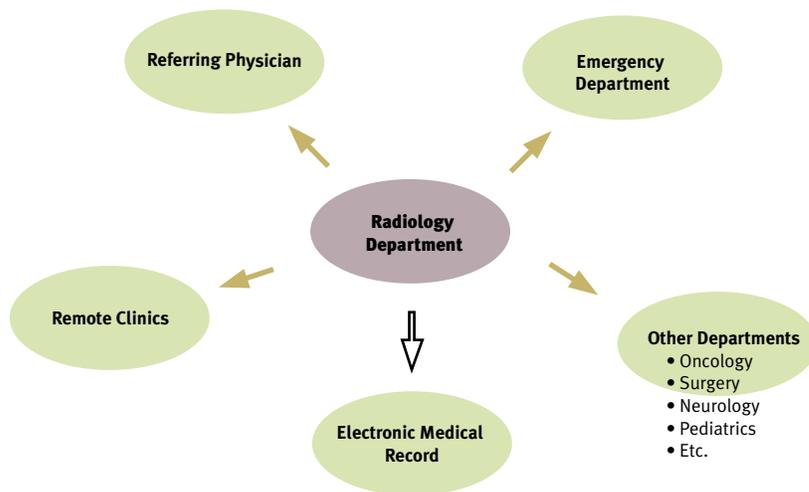


FIGURE 6: ACCESS TO RADIOLOGY INFORMATION (ARI)

Key Image Note (KIN)

(see Figure 7)

The Key Image Note Integration Profile enables a user to flag as significant one or more images in a study by referencing them in a note linked with the study. This note includes a title stating the purpose of the flagged images and a user comment field. These notes will be properly stored, archived and displayed as the images move among systems that support the profile. Physicians may attach key image notes to images for a variety of purposes: referring physician access, teaching files selection, consultation with other departments, and image quality issues, to name a few.

This integration profile includes both the department imaging systems and the hospital-wide image distribution such as:

- Review or diagnostics image softcopy display stations (stand-alone or integrated with a HIS, RIS, PACS or modality)
- Image management and archiving systems (PACS)
- Acquisition modalities

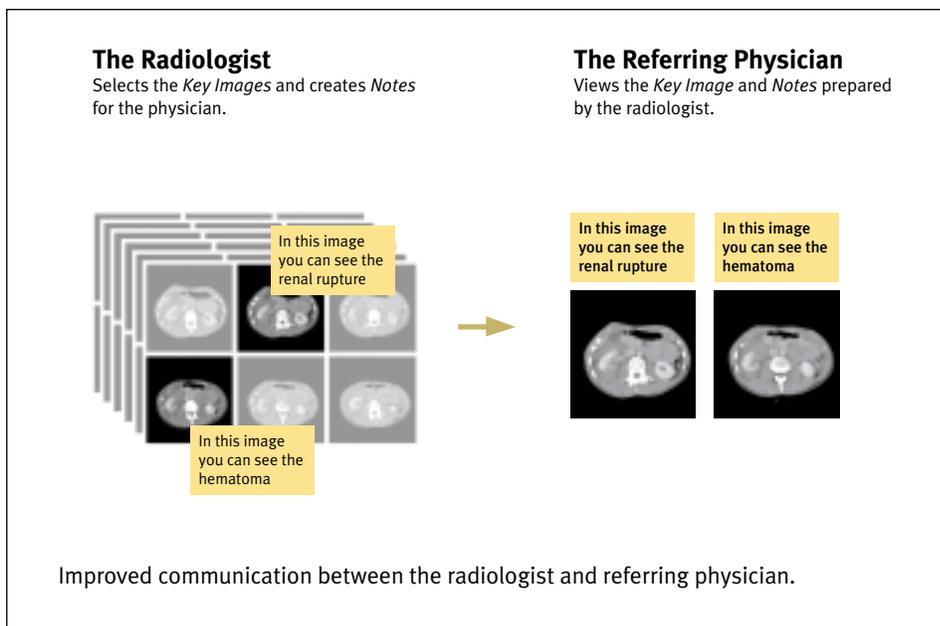


FIGURE 7: KEY IMAGE NOTE (KIN)

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FIGURE 8: SIMPLE IMAGE AND NUMERIC REPORT (SINR)

Simple Image and Numeric Report (SINR) (see Figure 8)

The Simple Image and Numeric Report Integration Profile facilitates the growing use of digital dictation, voice recognition, and specialized reporting packages, by separating the functions of reporting into discrete actors for creation, management, storage and viewing. Separating these functions while defining transactions to exchange the reports between them enables a vendor to include one or more of these functions in an actual system.

The reports exchanged have a simple structure: a title; an observation context; and one or more sections each with a heading, text, image references, and, optionally, coded measurements. Some elements can also be coded to facilitate computer searches. Such reports can be input to the formal radiology report, thus avoiding reentry of information.

This integration profile involves both the department imaging and reporting systems and the hospital-wide information systems such as:

- Review or diagnostics image softcopy display stations (stand-alone or integrated with a HIS, RIS, PACS or Modality)

- Reporting stations (stand-alone or integrated with a HIS, RIS, PACS or Modality)
- Report management systems (stand-alone or integrated with a HIS, RIS, PACS or Modality)
- Report repositories (stand-alone or integrated with a HIS, RIS or PACS)

Post-Processing Workflow (PWF) (see figure 9)

The Post-Processing Workflow Integration Profile addresses the need to schedule and track the status of the steps of the typical post-processing workflow, such as Computer-Aided Detection or Image Processing. Worklists for each of these tasks are generated and can be queried, work items can be selected and the resulting status returned from the system performing the work to the system managing the work.

- Image management and archiving systems (PACS)
- Radiology departmental information systems that manage department scheduling (RIS)
- Diagnostic image softcopy display stations (integrated with a RIS or a PACS), especially those that perform post-processing functions such as Computer Aided Detection and Image Processing

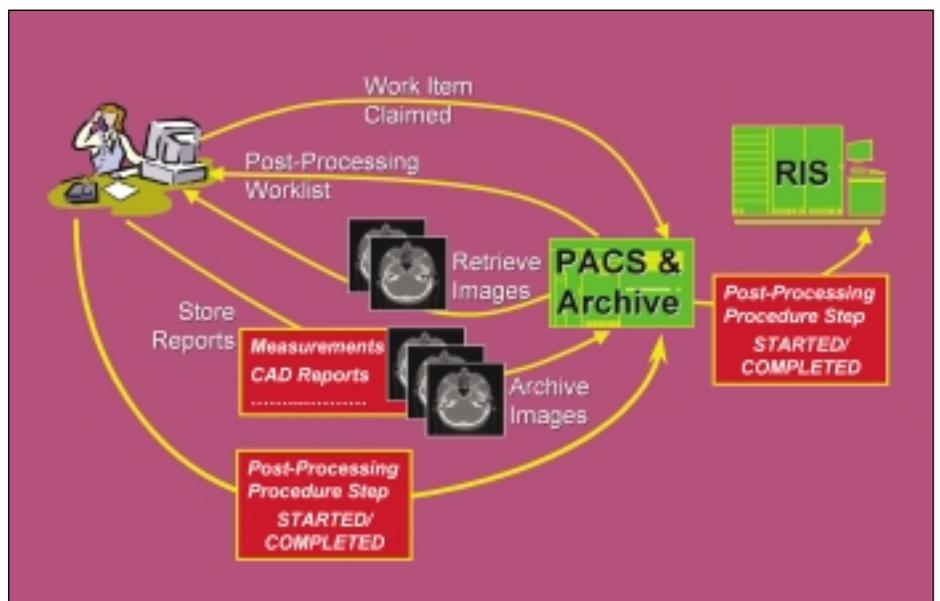


FIGURE 9: POST-PROCESSING WORKFLOW (PWF)

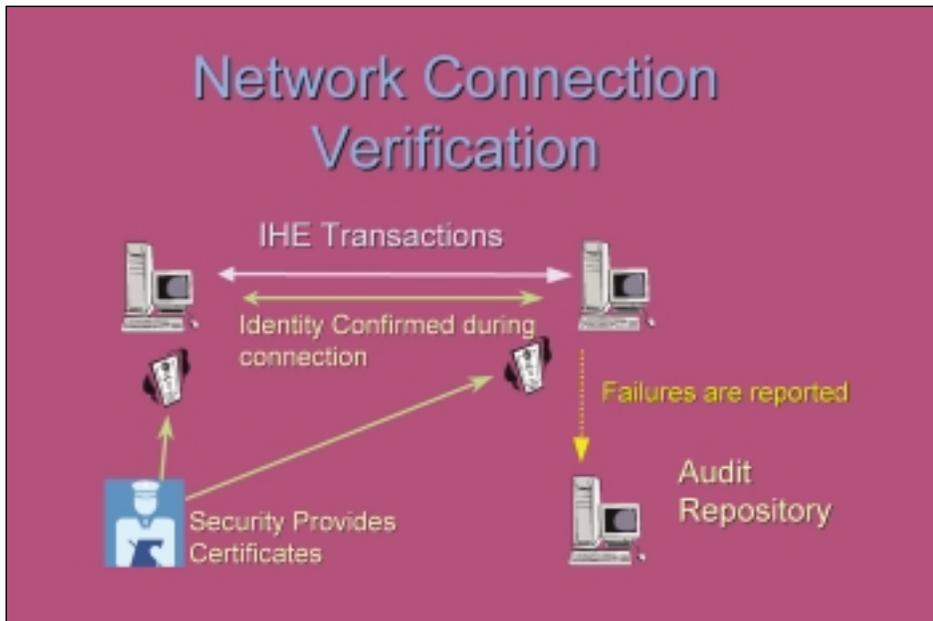


FIGURE 11: BASIC SECURITY (SEC)

Basic Security (SEC)

(see figure 11)

The Basic Security Integration Profile establishes basic security measures that can help protect the confidentiality of patient information as part of an institution’s overall security policies and procedures. It provides institutions with a mechanism to consolidate audit trail events on user activity across several systems interconnected in a secure manner.

- Imaging and information systems throughout the enterprise

AVAILABLE HERE AND NOW

These Integration Profiles have been implemented and tested by a group of vendors representing an overwhelming share of the imaging and information systems market. These vendors and others have begun to offer IHE integration capabilities in commercial products. Moreover, institutions worldwide have begun using IHE Integration Profiles to acquire and implement integrated systems. IHE Integration Profiles help users and vendors organize their integration priorities and communicate about plans and requirements.

OTHER RESOURCES

Targeted educational sessions at the annual meetings of HIMSS and RSNA provide more detailed information suited to the needs of clinicians, administrators, systems integrators, users and purchasers.

Additional publications are also available to expand your knowledge of IHE.

- IHE: FAQ presents essential background information on the IHE initiative in a question and answer format.
- IHE Product Evaluation Worksheets offer a convenient way for potential purchasers in discussions with vendors to record the integration capabilities of particular products.
- IHE Connectathon Results summarizes the results achieved by vendors in a face-to-face testing event in the IHE testing and implementation process.
- Finally, the IHE Technical Framework provides a fully detailed technical resource for implementing integrated imaging and information systems in healthcare.

These and other documents are available on the IHE Web pages hosted by RSNA, www.rsna.org/IHE.