Agenda

- Introduction
- Steps of effectively deploying DICOM based systems
- New developments in DICOM to support effective deployment
Deploying a New System - Where to start?
Steps for effectively deploying DICOM Systems

- Planning
- Purchasing
- Installation
- Maintenance
- Troubleshooting
Planning

OR HOW TO FIGURE OUT WHAT YOU NEED
Before you even start …

- Remember
  - Not one single solution fits all environments
  - Standards like DICOM help integration but are not a „one stop shop“
  - The customers owns the deployment
Therefore ...

Identify what you need

- What are the workflows that need to be supported, e.g. for a PACS:
  - Information sharing inside the department, across departments or even across enterprises
  - Access Information through mobile devices
  - Support for advanced display features (3D visualization, segmentation, CAD, ...)
- What type of data need to be supported?
- What other systems are part of the environment?

⇒ IHE may give some guidance
How IHE can help?

- IHE defines profiles, which address interoperability issues in specific clinical scenarios
  - Implementation guides, which define how to use underlying standards for these scenarios.
  - Examples are Scheduled Workflow, Cross-Enterprise Document Sharing, Radiation Exposure Management, ...

- IHE provides the opportunity to test these profiles against other vendor implementations at the so-called Connectathon
Identify DICOM Features and underlying Technology

- Basic DICOM features
  - Send and receive of imaging objects (e.g. between Modalities, PACSs and Workstations)
  - Query and retrieve of imaging objects (e.g. between PACS and Workstations)
  - Provide Patient and Procedure Information through Modality Worklists (e.g. between RIS and Modalities)

- Some more advanced DICOM features
  - Reliable Storage of images
  - Workflow Management
  - Exchange of report information, key images, image manipulations, scanner protocols, ...

- Underlying Technology
  - Conventional DICOM Services based on TCP/IP
  - Web Services using REST
Purchasing
THE DEVIL IS IN THE DETAIL
How to translate clinical workflow into DICOM

- Some DICOM Terms you may run into
  - Service Object Pair (SOP)
  - Information Object Definition (IOD)
  - Service Class User and Service Class Provider

- Some examples:
  - My CT scanner shall be able to send images to the PACS:
    The CT scanner shall support the CT Image Storage SOP Class as a SCU
  - My CT Scanner shall be capable to receive the worklist from the RIS
    The CT scanner shall support the Modality Worklist Information Model – FIND SOP Class as a SCU

⇒ Compare those features across all product's DICOM Conformance Statements
What is the DICOM Conformance Statement

- Document describing the DICOM implementation of a specific product following a well-defined standardized format
- Can be used to compare functionality of two different products based on supported SOP Classes

<table>
<thead>
<tr>
<th>SOP Class</th>
<th>UID</th>
<th>SCU</th>
<th>SCP</th>
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<tbody>
<tr>
<td>Transfer</td>
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<td>CT Image Storage</td>
<td>1.2.840.10008.5.1.4.1.1.2</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Workflow Management</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Modality Worklist</td>
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<td></td>
<td></td>
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<tr>
<td>Information Model - FIND</td>
<td>1.2.840.10008.5.1.4.31</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

- Provide lots of technical details that can be used for configuration and troubleshooting

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Could the new system easily be integrated into my environment

- Compare the DCS, pay attention to specific SOP Classes, e.g.
  - Storage
    - Enhanced multiframe objects vs single frame objects
    - Features for advanced visualization: Presentation states, fusion objects, segmentation objects, ...
    - Structured Reports (for communication of measurements, CAD results or dose information, ...)
    - Key Object Selection Documents and their usages (flagging Key Images, as a manifest for cross-enterprise document sharing or image object change management)
  - Supported Transfer Syntaxes
- Is Workflow management needed, e.g. support for?
  - Modality Performed Procedure Steps for tracking acquisition workflow
    - Support for additional information like dose, material usage information, cancelation reasons, ...
  - Unified Procedure Steps for worklist management
  - Storage Commitment for reliable storage
Installation

HOW DO WE MAKE IT WORK
Configuration of systems

- General Configuration parameters
  - Host name, AE title, Port for local and remote systems
  - Web Service end points
- Service specific parameters
  - Extended negotiation parameters
  - Transfer syntaxes
- System specific Configuration parameters
  - Supported Services
  - Code Sets
  - Acquisition Protocols
⇒ Refer to the DICOM Conformance Statement for details.
Maintenance
Ensuring Interoperability when

- Adding new DICOM devices to the system configuration
- Upgrading existing systems to a newer version
- Adding additional code set
- Enabling additional licensable features
Troubleshooting
What to do, when DICOM Communication is not working

- Ensure network connectivity (ping, DICOM Verification Requests)
- Check DCS for technical incompatibilities, status codes, ...
- Use publicly available tools for
  - Capturing network traffic
  - Review DICOM Header content
  - DICOM Object validation
  - Simulators provided in validation toolkits
New Developments in DICOM to help effective Deployment
Conformity Assessment (Supplement 207)

- The current DICOM standard contains a lot of conformance related requirements but no information on how to assess conformance
  - Currently conformance is assessed by vendors themselves
- Regulatory Initiatives throughout the world are working on conformity assessment programs.
- Extend DICOM standard with
  - additional conformance clauses
  - test scenario’s, test cases, and guidance on conformance assessment reporting.
  ⇒ Provide one framework, that vendors can comply to
Impact on effective deployments

Supplement 207 will provide

- A standardized verification framework, that will lead to better verified products
  - Products released will be conforming to their DICOM Conformance Statement

- A proper way of documenting evidence of the validation activities for DICOM feature.

⇒ Facilitate better integration of products into clinical environments though
  ⇒ better assessment of compatibility of DICOM implementations
Revisions to the DICOM Conformance Statement Template (Supplement 209)

- Current DICOM Conformance Statements
  - tend to be long and incomplete,
  - vary between vendors,
  - lack important information
  - and require a lot of technical background knowledge

- New work item to improve content and structure of DCS to
  - Better meet needs of all user groups (clinical, sales, service, engineering…)
  - Better facilitate comparability of different product’s DICOM functionality
  - Avoid ambiguities/inconsistencies between different vendor documentation

- A survey was performed to identify pain points and areas for improvement
Areas of improvement

- Less repetitive information
- More concise representation of information (e.g. in tables)
- Improve documentation of networking services
- More consistent documentation of IODs created
- Better documentation of private attributes, SOP Classes
- Provide documentation of display capabilities
- Information that belongs together should be in one place
- More information in overview
- Provide template in addition to normative text
New Structure

1. Overview
2. Table of Contents
3. Introduction/Disclaimer
4. Product Description
5. Service and Interoperability Description
6. DICOM Configuration
7. Network Communication Details
8. Security
Impact on effective deployment

- More easily find information relevant for different user groups
- Better facilitate comparability of different product’s DICOM functionality
- Avoid ambiguities/inconsistencies between different vendor documentation
- Address topics currently not addressed (e.g. display features)
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Thanks for your attention