DICOM Conformance Statement (DCS)

Our Communications Tool

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DCS - Our Communications Tool

❖ Documents how vendors implement DICOM into their products

❖ Required, Public, and often found on Vendor Web sites

❖ Follows a well defined format

❖ Facilitates comparisons of product implementations

12 years of Success

The More Information the Better!

❖ Detailed information aids a knowledgeable DICOM person greatly

❖ However, still very difficult for the non-DICOM knowledgeable person

❖ Many vendors have documented information beyond what DICOM requires

But not All!

Part 2 updated in 2004 via "Supplement 64"

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New DCS – Major Enhancement

❖ Based on real-world experiences using Conformance Statements

❖ Helps non-knowledgeable DICOM users with a Conformance Statement Overview (i.e. executive summary)

❖ More info to better prepare for installations and troubleshooting of DICOM

Easier to read, more details

Enhanced Product Examples

- ❖ Integrated Modality
  (I.e. modality with worklist, etc.)

- ❖ Radiology Information System (RIS)

- ❖ Image Viewer (workstation)

- ❖ Print Server

- ❖ Query/Retrieve Server

Annex A provides common template

Executive Summary

❖ The DICOM "One Pager"

❖ Explains DICOM functionality in:
"Laymen understandable terms"

❖ Marketing text instead of engineering (needs improvement in the real world)

❖ Table of SOP Classes and Roles supported (also includes Media)

Key for the Non-DICOM hospital personnel

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Overview - Great First Look

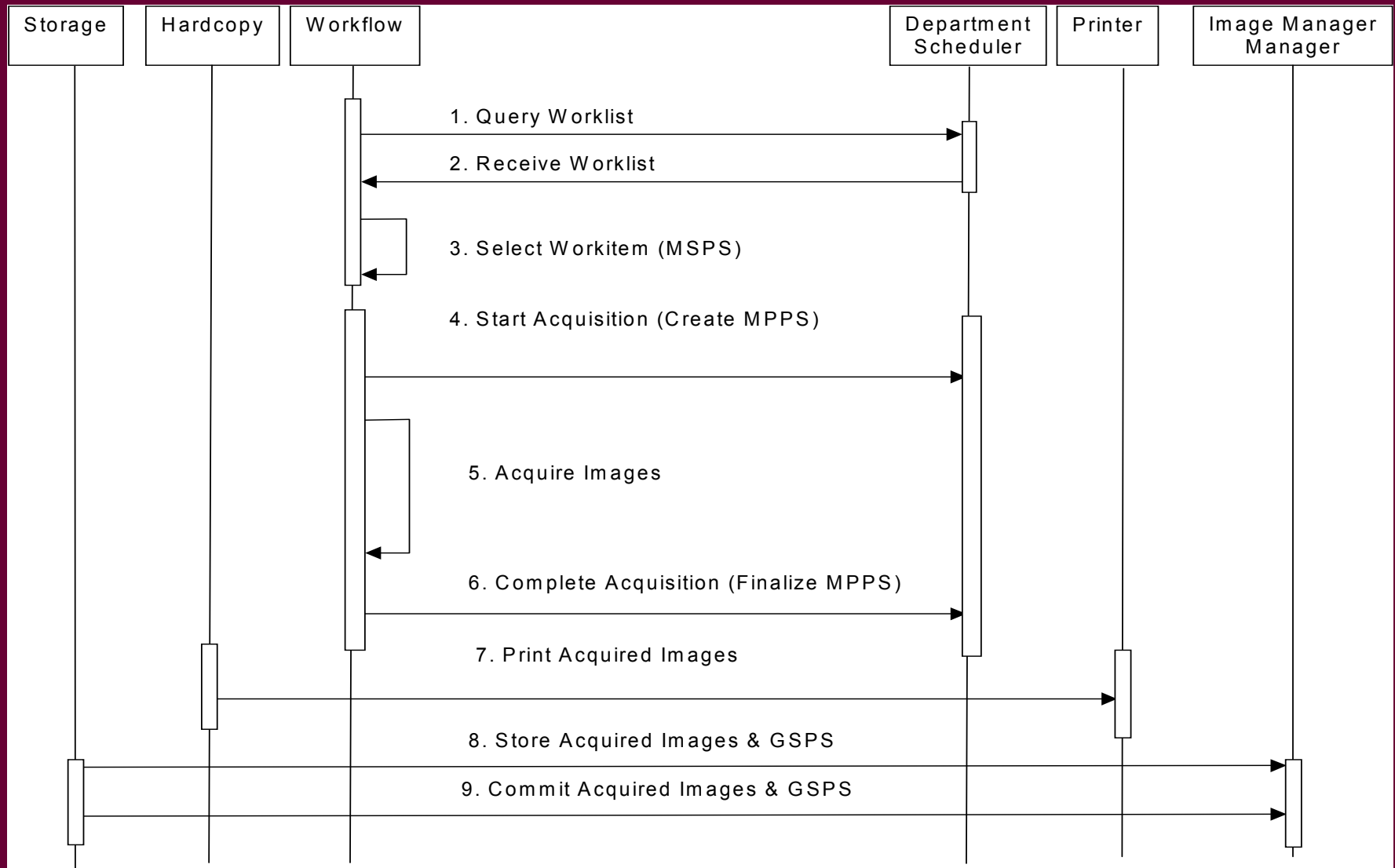| SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Image Transfer		
CT Image Storage	Yes	No
Query/Retrieve		
Study Root Information Model FIND	No	Yes
Study Root Information Model Move	No	Yes
Workflow Management		
Modality Worklist Information Model - Find	Yes	No
….		
Print Management		
Basics Grayscale Print Mgt.	Yes	No
….		

The Details – the real DCS

- ❖ After the overview, it really requires real DICOM experience to read the DCS
  - ▪ Implementation
  - ▪ Integration
  - ▪ Training
  - ▪ Know how to read DICOM Standard ……
- ❖ Need to learn DICOM terms and concepts
  - ▪ SOP Classes, IODs, SCU/SCP…
  - ▪ Abstract Syntax, Presentation Context…
  - ▪ Modules, Attributes, Context Tables…..

New DCS –Technical Changes

- ❖ Table of Contents, Definitions, Terms, Abbreviations
    - ▪ Some help to novice, much more help to technical

- ❖ Better "Sequencing of Real-World Activities"
    - ▪ Defines interactions between this vendor and others
    - ▪ Recommends UML Sequence Diagrams (Unified Modeling Language)
        - » Shows the typical "DICOM Flow" of the product
        - » Easy to understand, even without UML knowledge

Wording describing UML also key!

Modality – UML Example

Storage	Hardcopy	Workflow	Department Scheduler	Printer	Image Manager Manager

1. Query Worklist

2. Receive Worklist

3. Select Workitem (MSPS)

4. Start Acquisition (Create MPPS)

5. Acquire Images

6. Complete Acquisition (Finalize MPPS)

7. Print Acquired Images

8. Store Acquired Images & GSPS

9. Commit Acquired Images & GSPS

AE Specification

❖ AE Specs and Annexes are probably the most important sections of DCS

❖ Association Negotiation

❖ SOP Specific (for each SOP)

❖ Used most by knowledgeable DICOM person

Provides the "real details"

Association Negotiation

- ❖ Describes how you Establish and/or Receive DICOM network connections

- ❖ Presentation Contexts, Abstract and Transfer Syntaxes, etc.

- ❖ Added "Sequence of Activity" UML plus text to association and SOP class flow

- ❖ More compression in the world today so documenting Transfer Syntax polices important
  – *What about Lossy compression?*

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SOP Specifics

- ❖ Improvements to describe behavior of SOP Class

- ❖ Includes statuses for DICOM Commands and the behavior based on those statuses
    - Do you abort failed statues, log the event?
    - Try to recover and how?
    - What do you do when you are successful?
    - Use optional but important attributes Offending Element or Error Comment?

- ❖ Define time-outs and actions taken

- ❖ These sections have traditionally been weak and improvements are needed

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SOP Specifics – Part 4

❖ Each individual SOP Class also defines required information

❖ Example – Storage Commitment states

- The SCU shall specify the behavior and actions performed when a success status is received (i.e. if and when local SOP Instances copies are deleted)

- The SCU shall specify the behavior and actions performed when a failure status is received (i.e. recovery mechanisms, etc.)

Don't forget requirements defined by SOP Class

Attributes, Attributes, Attributes

- ❖ Major improvement in the requirements to document "how attributes are used"

- ❖ Query attributes listed in AE Specifications (I.e. Composite Queries and Worklist)

- ❖ Annexes created to specify IODs in detail

- ❖ Many vendors have already been doing this – *But many have not!*

Don't just list attributes tell us how they are used!

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Query Attributes

Module Name / Attribute Name	Tag	VR	M	R	Q	D	IOD
SOP Common							
Specific Character Set	(0008,0005)	CS		x			
Scheduled Procedure Step							
Scheduled Procedure Step Sequence	(0040,0100)	SQ		x			
> Scheduled Station AET	(0040,0001)	AE	(S)			x	
> Scheduled Procedure Step Start Date	(0040,0002)	DA	S			x	
> Scheduled Procedure Step Start Time	(0040,0003)	TM		x		x	
> Modality	(0008,0060)	CS	S	x			
> Scheduled Performing Physician's Name	(0040,0006)	PN		x	x	x	x
> Scheduled Procedure Step Description	(0040,0007)	LO		x		x	x
> Scheduled Station Name	(0040,0010)	SH		x			
> Scheduled Procedure Step Location	(0040,0011)	SH		x			
> Scheduled Protocol Code Sequence	(0040,0008)	SQ		x			x
> Pre-Medication	(0040,0012)	LO		x		x	
> Scheduled Procedure Step ID	(0040,0009)	SH		x		x	x
> Requested Contrast Agent	(0032,1070)	LO		x		x	

M – Matching, R – Return Key, Q- User Query Enabled, D – Displayed, IOD – placed in IOD

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Annex - IODs

❖ Specifies each IOD created (including Privates IODs)

❖ Attribute, Tag, VR and Value

❖ Values should contain the range and source (I.e. auto generated, user input, worklist, etc.)

❖ Content Items in Templates, Private Attributes…

Very powerful in the hands of a strong integrator

Range and User Input

❖ **Recommended Range values:**

- VNAP - Value Not Always Present (attribute sent zero length if no value is present)
- ANAP - Attribute Not Always Present
- ALWAYS - Always Present with a value
- EMPTY - Attribute is sent without a value

❖ **Recommended Source values:**

- USER - the attribute value source is from User input
- AUTO - the attribute value is generated automatically
- MWL,MPPS, - value received using Modality Worklist, Modality Performed Procedure Step, etc.
- CONFIG - the attribute value source is a configurable parameter

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IOD Table Example

IE	Module	Reference	Presence of Module
Patient	Patient	Table B.8.1-3	ALWAYS
Study	General Study	Table B.8.1-4	ALWAYS
	Patient Study	Table B.8.1-5	Not Used
Series	General Series	Table B.8.1-6	ALWAYS
Equipment	General Equipment	Table B.8.1-7	ALWAYS
Image	General Image	Table B.8.1-8	ALWAYS
	Image Pixel	Table B.8.1-10	ALWAYS
	Cine	Table B.8.1-11	Only if Multi-frame

Module Table Example

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020,000D)	UI	From Modality Worklist or generated by device	ALWAYS	MWL/ AUTO
Study Date	(0008,0020)	DA	<yyyymmdd>	ALWAYS	AUTO
Study Time	(0008,0030)	TM	<hhmmss>	ALWAYS	AUTO
Referring Physician's Name	(0008,0090)	PN	From Modality Worklist	VNAP	MWL
Study ID	(0020,0010)	SH	Requested Procedure ID from Worklist or User Input	VNAP	MWL/ USER
Accession Number	(0008,0050)	SH	From Modality Worklist or user input	VNAP	MWL/ USER
Study Description	(0008,1030)	LO	Comment text box in study list. Maximum 1024 characters.	VNAP	USER
Referenced Study Sequence	(0008,1110)	SQ	From Modality Worklist	VNAP	MWL

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Miscellaneous

- ❖ More definitive description of configurable parameters
  - ▪ Network (local and remote), time-outs, Application parameters…

- ❖ Coded terminology and/or templates

- ❖ Grayscale Image Consistency (I.e. Presentation State, Print LUT, …)

- ❖ Characters Sets, Security, Private Data

New DICOM Conformance Statement

❖ Understand how products connect to each other

❖ Summary improves understanding for the novice

❖ Enhanced details for the knowledgeable
  ▪ UML flow diagrams, Command statues and behavior
  ▪ SOP Class behavior, how are Attributes used, not just a list
  ▪ And much more……..

❖ Not widely deployed but on the rise
  Encourage the new format!

DCS - A Proven Success for 12 Years!

Thank You and Enjoy the Conference!

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