Secretariat: MITA
1300 North 17th Street, Suite 900
Arlington, VA 22209, USA
http://www.dicomstandard.org
dicom@dicomstandard.org
+1-703-841-3259

MINUTES

DICOM WORKING GROUP SEVEN (RADIOTHERAPY)

Meeting Location	Online Meeting
Dates and Times	April 27-30, 2020 Monday - Thursday 9:00 – 13:00 EDT
Presiding Officers	Christof Schadt, Co-Chair Jim Percy, Co-Chair
Secretary	Shayna Knazik, DICOM

Participants

Name & Role	Affiliation	Mon	Tue	Wed	Thur
Jim Percy, Co-Chair	Elekta	X	X	X	X
Walter Bosch, Voting	AAPM	X	X	X	X
Yulong Yan, Voting	AAPM	X	X	X	
Bruce Curran, Voting	AAPM	X	X	X	
Bruce Rakes, Voting	Mevion	X	X	X	X
Kari Jyrkkälä, Voting	Varian	X	X	X	X
Ulrich Busch, Voting	Varian	X	X	X	X
David Wikler, Voting	IBA	X	X	X	X
Christof Schadt, Co-Chair	Brainlab	X	X	X	X
Harold Beunk, Observer	ICT		X		
Stefan Pall Boman, Voting	RaySearch	X			X
Chris Pauer, Voting	Sun Nuclear	X	X	X	X
Thomas Schwere, Observer	Varian			X	
Carolyn Hull, Alt. Voting	DICOM	X			
Shayna Knazik, Secretariat	DICOM	X	X	X	X
James Beck, Alt. Voting	Accuray		X	X	
Scott Hadley, Observer	UMich, IHE-RO			X	
Antje Schroeder, Guest	WG31, Siemens				X
Herve Hoehn, Guest	WG31, GE				X
Bruno Laffin	WG31				X
Stephen Vastagh	DICOM				X

Actual Week Schedule

	Monday	Tuesday	Wednesday	Thursday
Session 1 09:00-09:55	Setup, Administrative, Opening Group Status	Supp 160	Supp 160 with IHE-RO (SSS)	Supp 160
Session 2 10:00-10:50	New CPs	Supp 160	Supp 160	Sup 209 (Antje Schröder)
Session 3 11:10-12:00	Assigned CPs	Supp 160	Supp 160	Supp 160
Session 4 12:05-13:00	Sup 215	Supp 160	Supp 160	Supp 160 Future Meetings

Topics

Opening

Introduction of Shayna Knazik, new WG-07 Secretary and Senior Project Manager to DICOM.
The focus of the meeting is to be Supp 160
Google docs will be used to capture transient information, including meeting minutes.
Shayna reminded the group of antitrust rules and DICOM Patent Disclosure Policy.

Meeting Minutes

Meeting minutes from the last meeting have been reviewed by MITA legal.
Meeting minutes from the March 9-13, 2020 WG-07 were approved on 4/30/20 without objection or abstention.

Subgroup Reports

The IHE-RO Technical Committee met April 6-10. 2020. Topics discussed include:

TDW-II issues, identified in testing, are being addressed,
RO Treatment History (ROTH) is in development as a white paper
TPPC-Brachy extends Treatment Planning to Brachy
XRTS (formerly HIS) focuses on mapping RT information for HIS
Deformable Registration (DRRO) Profile is in review.
Sim to Setup Shift (SSS) Profile is to be discussed with Supp 160 later this meeting
Use of Unicode and Security issues in DICOM were discussed. Testing of secure transport within IHE-RO Connectathons is to be considered.
Query-Retrieve (QRRO) is in development. Need to define required keys for relational query Use Cases.
Interoperability concerns for a new intra-op RT technology were reviewed. On-boarding of new companies was considered.
HL7 and FHIR issues.
Brachy subgroup to meet.

Correction Proposals

CP status list is in Google docs

CP RT156 - Device Alternate Identifier Type has wrong conditions

CP RT 156 to be forwarded to WG-06

CP RT 157 - Enhance Base Beam Modifier Coordinate System Spec

WG-07 reviewed/revised version 02 of this CP. The Base Beam Modifier Coordinate System definition wording was revised. Keep definition of Base Beam Modifier Definition Plane. Correct “Base Beam Modifier Definition Plane” to “Beam Modifier Definition Plane” in diagrams.
CP RT 157 to be forwarded to WG-06,

CP2037 - Inner and Outer Contours

WG-06 has rejected this proposal to allow XOR definition of *excluded inner volumes* as breaking interoperability with existing applications.

Applications in other domains depend on keyholing to represent excluded inner volumes.
Most RT applications interpret (and produce) inner contours without keyholing. Many RT applications have never implemented keyholing. These applications violate what is written in the DICOM Standard Unfortunately, there is a very large body of RT data that is encoded in this manner.

Does it work to add an indicator? E.g., a new Enumerated Value to Contour Geometric Type (3006,0042) to indicate closed-planar *without keyholing*.

Proposal to add one of two options

1) Add a flag, e.g., ROI Inclusion Type to indicate how an ROI is represented. The presence of such an attribute would indicate new data. Applications that require keyholed data could look for this attribute and warn the user if it is absent.
2) Add a new Enumerated Value to Contour Geometric Type (3006,0042)

FFF example provides a similar situation for handling backward compatibility.

CP RT145 - Unattached Contours

Adds Recommended Pixel Grid Parameters and deprecates Attached Contours. Each ROI shall only be instantiated once.
WG-06 has rejected this proposal. We cannot specify “Recommended” parameters, only actual, retrospective values.
For now, there does not appear to be an interoperable method for representing “high resolution” contours with RT Structure Set.
There may be further discussion later in this meeting.

CPs Accepted by WG-06

CP2039 Enhanced BLD Offset Specification
CP2038 Structure Set Attributes to Confidentiality Profiles
CP2004 (formerly CP RT136) Make Frame Anatomy Optional in Parameter Map

Supplements

Supplement 215 - RT Ion Radiation Objects

Jim Percy reviewed Revision 10.
There is currently some inconsistency in references to “Ion” and “RT Ion” in the Supplement. (There is also some variation in similar references in the C-arm Radiations.) No changes for now.
RT Device Distance Reference Location Code Sequence - use Treatment Machine Isocenter or “Distal End of Applicator”, “Distal End of RT Accessory”, Distal End of MLC”? Discussion to be continued.

Variable Distance Accessory Device (Y/N flag) - when does this value change? Should this move to the CP level? Is it needed?
RT Accessory Slot ID - should this be Type 2C?

Supp 160 - Second Generation Radiotherapy Patient Setup

The group reviewed rev 24 of Supp 160 in preparation for reading with WG-06 if possible, in June 2020.

IODs Defined

The Supplement defines the following IODs: RT Radiation Set Delivery Instruction, RT Patient Treatment Setup, and RT Patient Position Reference Acquisition.
The Patient to Equipment Relationship defined by Supplement 175 which is in the Standard has been factored out as a Macro.

Patient Position Acquisition Devices

The scope of Patient Position Acquisition Devices defined in CID SUP160030 has been narrowed to the imaging techniques supported in the first generation. Other techniques can be added later. Inclusion of CT was discussed. Parameters for a request to acquire CTs are not well defined at present. The code for CT device has been retained for now.

Acquisition Initiation Parameters

Semantics and VR for Acquisition Initiation Parameters Attributes were reviewed. Uli will refactor parameters as a TID. Acquisition Initiation Type attribute was changed to Type 1.

Imaging Geometry

The General Radiation Imaging Geometry Macro defines imaging geometry abstractly, using 4x4 mapping matrices. For the imaging instruction, the positions and orientations of the imaging source and imager must be specified.

- Should physical device parameters also be included as annotation?
- Imager to Equipment Mapping Matrix defines location and orientation of imager source. The Projection Plane is defined in the imager source coordinate system.
- The location/orientation of the imager plane must also be defined (either in the imager source coordinate system or the equipment coordinate system).
- The location of the reconstructed image is defined by a Projection Matrix, which may not be needed for an imaging instruction.
- (Daily) calibration of imaging geometry - how can this be accomodated? Can corrections be included explicitly?

Background information:
Pinhole camera model (with orthogonal image plane)
https://openmvg.readthedocs.io/en/latest/openMVG/cameras/cameras/
Skewed image plane parameter
https://www.ics.uci.edu/~majumder/vispercep/cameracalib.pdf

Options for representing imaging source and imager plane geometry were discussed further..
Decision to specify both of these with respect to the equipment Frame of Reference as (a) Imaging Source to Equipment Mapping Matrix and (b) Imager to Equipment Mapping Matrix. Both are 4x4 homogeneous transformation matrices, represented in row-major order.

- What is the Equipment Frame of Reference that the imager is mapped to? For IEC coordinates, this could map to the IEC Image Receptor coordinate system.
- Need define the orientation of axes in the Imaging Source and Imager coordinate systems.

CT Radiation Imaging Geometry

Macro provides parameters for CBCT image acquisition. Compare to Defined CT Acquisition Module attributes. (Uses Attribute Value Constraint macro to specify value of acquisition parameters.)

More detailed input is needed.
Vendors, including Jim and Uli, to reach out to CBCT experts in their companies regarding what acquisition parameters are needed.
Supp 214 CBCT Structured Report may also contain helpful information.

TID Proposal for Image Acquisition Parameters

Uli Busch reviewed a proposed TID representation of acquisition parameters using TIDs with the group (document version sup160_23_PatientSetup_UBU-TID). The TID approach using a Content Item Macro was compared with explicit encoding of DICOM Attributes to specify acquisition parameters. Issues of extensibility, ease of implementation, combination of conditions, value representation of parameters, and encoding of repetition flags/parameters were considered.
Decision to proceed to WG-06 with the TID approach.

Patient Setup UID

Discussion of the scope and semantics of Patient Setup UID. Does it represent an actual concept or is it purely a link between Radiation Instances? If Setup IODs provide a reference to Radiations, is this UID still needed?
Decision to remove Setup UID and retire the reference to Setup Instance in RT Radiation to avoid cyclic references between Radiations and Setups. The only linkage is now the reference to RT Radiations maintained in RT Setup Instances.

Coding for Patient Setup Techniques

Discussion of definitions for Patient Setup Techniques. Starting categories are Isocentric, Fixed SSD, “TBI”, Breast Bridge, Skin Apposition. Stereotactic. Are all of these setup *techniques*?
Change “... Setup Technique” to “... Setup Method” to decouple from treatment techniques.
Define CID as “Patient Setup Methods”.

Patient Alignment Devices: add “Ocular Gaze Fixation Device”

Christof to distribute codes to request definitions from clinical practitioners: New Codes 160

Supp 160 Scope Change

A proposal to move RT Position Reference Acquisition material to Supplement 213 to minimize uncertainty and delay in review of this material by WG-06 was considered. There appears to be substantial overlap between Reference Acquisition and Enhanced RT Image. Decision to focus on setup and treatment delivery in Supp 160 in preparation for presentation to WG-06 in June 2020.

Other Topics

Simulation to Setup Shift (IHE-RO Profile)

Thomas Schwere presented issues that arise in patient setup with multiple setup reference marks. (What is the reference position for Table Top Displacement values?)

The reference location typically changes after the first day of treatment. Patient is marked again after shift to isocenter. How is this change managed and communicated? If there are new shift values, these are stored in the TMS and recalled for subsequent fractions. The plan may or may not be updated.

In 1st Gen RT. the Setup Device Sequence can be used for this purpose. Setup Device Label (300A,01B8) = “Reference to Displacement Origin” and Setup Reference Description (300A,01D0) = label of displacement origin location.

In the 2nd Gen Treatment Delivery Instruction, there is a Displacement Reference Label, Displacement Matrix, and Patient Support Displacement Sequence. Reference Conceptual Volume. Action: Displacement Macro.

Reference to RT Structure Set from RT Dose

Radiopharmaceutical dosimetry applications want to store doses, but have no RT Plan instances to link to an RT Structure Set. Discussion of direct reference to RT Structure Sets from within an RT Dose instance.

Revisions of the DICOM Conformance Statement - DICOM WG-31

Antje Schroeder (WG-31, Siemens) presented work on updated DICOM conformance.
The existing DCS is too technical, difficult to use for comparing compatibility and interoperability, too repetitive, some missing information.
WG-31 is developing a new DCS template (Supp 209) and is seeking feedback from WGs.
Objective to avoid ambiguities and address currently undocumented features.
Structure of the new DCS is quite extensive, but not all information is required for all products.
Unneeded sections can be marked as not applicable (maintains section numbering).
Question regarding inclusion of Uniform Procedure Step. Security and workflow specifications are included.

Herve Hoehn (WG-31, GE) described Security features in the new DCS. Documents External Network Environment (non-DICOM network services), firewall configuration, DICOM security profiles (identity, etc.), Secure Transport Connection Profiles (TLS), Media Storage Security Profiles (data encryption), Attribute Confidentiality Profiles (anonymization), DIgital Signature Profiles (obsolete, to be replaced by WG14), Additional DICOM Security Profiles, User Identity Negotiation, Web Services security features (certificate management), and any additional security features.

DCS Appendices describe detailed specifications for DICOM Attributes in Shared Modules, Shared Private Modules, and IOD-specific Modules.

Future Meetings

- June 15-18, 2020 9:00am - 1:00pm EDT virtual meeting
- August 3-7, 2020, currently scheduled for Chicago

The group will continue with the 4 hours/4 days meeting agenda for now until the Corona situation gets resolved. Thus, the Chicago meeting topic will be revisited at the June meeting whether this will become a virtual meeting, too. Then, to compensate for the “missing” hours in August, another 4 day virtual meeting should be scheduled.
Extending the meeting to 6 hours per day was declined by most European participants as this would extend the meeting to the evening late evening.

Prepared and submitted by Shayna Knazik on 8/4/2020
Reviewed by Counsel Peter Tolsdorf on 8/7/2020