# IHE-RO Technical Committee
# Draft Minutes
# March 7 - 12, 2008
# BrainLAB HQ, Munich, Germany
# 9:00am – 5:30pm

## Technical Committee Chairs:
## Bruce Curran, MS, ME
## Stuart Swerdloff, PhD

## IHERO Task Force Co-Chairs
## Jatinder Palta, Ph.D.
## Prabhakar Tripuraneni, M.D., F.A.C.R., F.A.S.T.R.O.

**Mission Statement:** *The American Society for Therapeutic Radiology and Oncology (ASTRO) has formed a multi-society Task Force to undertake an initiative to promote the Integration of the Healthcare Enterprise (IHE) – Radiation Oncology (RO), fostering seamless connectivity and integration of radiotherapy equipment and the patient health information systems. The Task Force will include members from ASTRO, RSNA, American Association of Physicists in Medicine (AAPM), the American College of Radiology (ACR) and the National Electrical Manufacturers Association (NEMA). In addition, members of the International community have also been invited to participate in IHE-RO. The IHE-RO Task Force, in close collaboration with radiotherapy product manufacturers, will develop appropriate integration profiles for radiation therapy and setup a demonstration of seamless communication among the full array of radiotherapy products.*

I. Call to Order
   a. Approval of Agenda
      - The agenda was reviewed and approved (posted on wiki)
   b. Approval of Minutes
      - There were no comments on previous minutes
   c. **Note: The minutes below are not necessarily in complete chronological order. Topics that are returned to during the meeting are generally chronicled in one section, rather than sporadically throughout the minutes.**
   d. Attendance: See IHE-RO Roster Spreadsheet for this meeting

II. Reports & Updates (3/7-8, 2008)
   a. IHE International Board Report
      - Curran reported on IHE International Activities.
   b. Domain Testing Report
      - Report posted on Wiki
   c. Decision on the viability of a 2008 Connectathon for the new Spatial Registration and Worklist Profiles
      - There was a discussion on the need for testing old profiles. There is some demand for testing 2007 for new products and new versions. It is clear that this will need to happen and there was general support that, assuming personnel from companies were already planning to be present, they were willing to participate.
      - If additional test data is made available, companies were willing to participate in testing against this data. It does need support from

the testers that protocols and testing be put  Ideally, the test cases and testing sheets would be placed on the IHE-RO server and then available for all to test to ahead of the formal Connectathon.

- We need to get a list of IHE positions, such as on the Testing & Tools Committee, and request individuals to join these committees.
- There was general consensus from the participants in the RT Worklist testing that their implementations were not yet ready for a formal Connectathon.  However, all felt that it was important to continue to show demonstrable progress.  One suggestion was to have a second Pre-Testing session coincident with the planned Connectathon.  More public opportunities that could be considered:
    1. A presentation on "Progress on the RT Worklist" as one of our theater sessions, probably with a clinical intro on what it is and why it's important.
    2. A panel discussion or 'works-in-progress' demo (latter not completely agreed).
- The Multi-Modality Registration for RT appears to be ready for Connectathon and Public Demonstration.  The public demonstration area should allow both the 2007 profile and the Registration profile to be done together.  There might be a future efforts booth where the worklist profile might be illustrated.
- The TC recommends to ASTRO that it move forward with negotiating an agreement with ICT for the Multi-modality Registration Test Tools. It recommends that the bid for the Worklist Test Tools be declined.
- It was also suggested that the ATC server be used as a repository for the distribution of Test Tools and Test Cases for both the 2007 and 2008 profiles.

d. Issues identified during Domain Testing

- Implications of IHE-Oncology on IHE-Radiation Oncology for vendors
    1. It was of general consensus that an ASTRO/ASCO led effort made sense if IHE-Oncology was to be formed.  In that case there would likely be some division of labor between RO-centric efforts in areas such as treatment planning and general Oncology interest in the Electronic Healthcare Record.
    2. It was noted that there is a lot of up-front planning to be done, so that getting a Planning Committee started and working on use cases would be recommended.
- Assessment of Supplement 74 by Radiation Oncology Vendors and how can external verification be accomplished (request from WG6)
    1. In general, initial implementations were successful in interoperating in a UPS Pull mode, using primarily C-FIND, N-SET, and N-ACTION messaging. Participants were satisfied with the Supplement 96 framework.
    2. Input Information Sequence: In RT we require use of Generalized SOP Instance Reference Macro (PS3.3 C17.3) in order that Performing Devices can obtain required input objects via C-MOVEs, where these objects may be located across different Studies, different archives, etc.
    3. UPS Pull vs Push was a source of considerable confusion in Accepted SOP vs Requested SOP, vs SOP Class UID vs negotiated transfer syntax. All necessary information is present in Supplement 96, but a blow-by-blow description or example would be good to avoid stumbling over issue for future implementors. For example, at least one respected toolkit

vendor was required to patch their product to support this correctly. Participants would have preferred to see a 'UPS' SOP Class, and UPS Push, UPS Pull etc as abstract syntaxes, rather than singling out UPS Push as the type of object instantiated, which lead to some of the confusion.

4. It is very important that intended conceptual semantics for COMPLETED and CANCELED be stated in Supplement 96, esp in RO where a procedure can be partially completed. One could consider adding PARTIALLY_COMPLETED state, but we understand this has very wide implications for Supplement 96. RT is OK with there not being an explicit PARTIALLY_COMPLETED status, although this not optimal because PARTIAL and CANCEL difference very important for us.

- Comments for WG7 and WG6 on Supplement 74:
  1. The domain testing used Supplement Part 17 internal verification, and some associated defined terms. This is the first step in scheduled workflow for radiation oncology, using UPS workflow. It is anticipated that external verification will be implemented by one or more vendors sometime in 2008, which will test the normalized object definitions in Supplement 74.
- How will Gazelle development (IHE Testing and Tools new Test Tool Platform) affect IHE-RO
  1. There was a short discussion on this. Curran will put together a more complete presentation/discussion on how Gazelle development might affect IHE-RO testing and test tools.
- The role and scope of emulators in Worklist testing, Connectathon, and Public Demonstration
  1. In general most TDD-type devices will not provide an actual treatment machine for the Connectathon and Public Demonstration. It could be possible to bring the actual user interface software, then provide the emulation at the next level down.
- How does IHE-RO manage testing of existing profiles for new vendors / new products
  1. It was general consensus that we will need to be able to test relevant (not deprecated) profiles in future years. Manufacturers are generally willing to assist in such testing as long as they are present for other reasons.
- The progress of the 2008 IHE-RO Test Tools
  1. Test tool progress was reviewed. ASTRO currently has a bid from ICT. (see discussion on Connectathon above for more details.)
- It was confirmed that TMS actors shall supply a Study Instance UID to Treatment Delivery Devices. This confirms the profile as written.
- There was a discussion on the sequence of transforms that exists in the Spatial Registration Object. At present it is required that there be one transform for each sequence item in the Registration Sequence. For the primary image dataset, the transformation matrix shall always be identity. Although somewhat superfluous, having this identity matrix allows conformance with recommendations put forth in other usages of the Spatial Registration Object outside Radiation Oncology.
- A discussion was also held on the limitation in the profile to solely one pair of transformations (e.g. a primary and a single secondary

image dataset/frame-of-reference) in the Spatial Registration Object. While this could be relaxed in future profiles, it is also consistent with some out-of-band implementations that use Blended Presentation state.

- Common Instance Reference Module - This is currently a mandatory module which includes the Series and Instance Reference Macro. This macro includes a required sequence of references to other instances that reference this object. However, there can be cases where no other references exist. (This problem is currently under review elsewhere and the sequence will likely be changed to 1C.) However, until that time, it was agreed to recommend that no mention of this sequence be made in the profile, and no semantics be associated with the sequence for purposes of the profile. Thus, no change in the current profile as written.
- Discussion on exceptions to the 2008 RT Worklist Profile for devices (optionality of Retrieval of Required Objects)
    1. David continued our discussion on what constitutes conformance for the RT Worklist Profile. Specifically, is it required that TDD and related actors be capable of retrieving data such as plans, images, etc from a TMS or archive rather than always having the data available privately. A proposal from IMPAC was that actors must be capable of receiving such information (and tested to it), but wouldn't have to grab it if it had it. If a device was not capable of receiving such objects (e.g. the objects weren't standard), then it was OK for it to be out-of-band.

       This proposal has implications for other devices in the future. For example, if a Treatment Planning System wants to do a CT-SIM, the TPS needs to be capable of using C-Move to acquire the image dataset from wherever it is stored. This is different from many current products, where specific image datasets are pushed to a device and stored in a buffer, then read when the application does the import. In a worklist environment, you would move the images as you need them (though an application could read ahead in the worklist to pre-fetch).
    2. The TC discussed at length the issue of how input objects are obtained when performing a procedure step. The group decided upon the following strategy:
        a. A Performing Device shall be required to support a Study-Root C-MOVE for all SOP Instances that it needs to obtain externally. In other words, if there is some other mechanism (typically a C-STORE from another system) that is used, the Performing Device cannot rely upon this mechanism.
        b. However, if a Performing Device does already have input object instances, then it is not required to issue a C-MOVE to obtain those instances again. This would occur either because the objects have been transmitted previously, or because the objects are generated internally in the Performing Device.
        c. Finally, if there are no external object instances required, then no C-MOVEs are required, and the transaction effectively becomes optional in this case.

Note: The TMS must have knowledge of the plan to be delivered, obtained outside the scope of the profiles. This precondition will be added to the appropriate transactions.

3. A second area of discussion had to do with the reading of Treatment Records for completion of partial treatments. In the Tomo case, the partial treatment record simply contains the meterset. It needs the full treatment record, which it has. However, similarly to the treatment plan, as long as Tomo agrees that the information is in accordance with its own data, things are fine.
4. The last question was how the TMS acquires the plan IOD. What happens when no such entity (such as in Tomo) exists? We need to add some verbiage to the TF to state the desired behavior for this case.
5. On Saturday, we reviewed the changes made by Dave reviewing the above discussion.
    a. Some slight wording changes were made for clarification in volume 1. **The TC then approved the changes to V1 of the Technical Frameworks, including the changes from Scott Johnson regarding the Registration Profile**. (Note: A later version is approved below.)
    b. The committee then similarly reviewed changes to Volume 2. There was some discussion again on the wording that specifies the requirements for concordance with the profile when data objects are previously cached on the treatment device.
        i. One case of note is that the structure set and imaging shall be specified explicitly in the input set supplied by the TMS. These objects might not be the same as those in the Plan object, as the imaging and structures needed for positioning may be different than those the plan was based on.
        ii. A second issue arises when input objects are supplied that are irrelevant to the TDD. This could be viewed as a safety issue, thus resulting in a cancel of the UPS. There must be software on the TDD or similar device to handle this appropriately.
        iii. There was considerable discussion on the requirements for validation of the Plan and the need to move it during the UPS. After several iterations, a consensus was not reached by the end of Saturday. People will consider further and the discussion will resume on Monday.
6. On Monday we resumed this discussion. Stuart noted his review of the Mission and Values of IHE, as relates to our discussion. Stuart suggested that IHE-RO should define its mission statement, so that we have a definitive goal which can help solve some discussions on similar issues. This goes

beyond the high level statement from ASTRO that is currently on our agendas.

a. We reviewed the current IHE Mission statement, as defined in the Interim Constitution.
b. Curran noted the issues of centralized storage of EHR information rather than RadOnc systems acting as a source of such information. If Rad Onc systems cannot provide that information in a timely fashion, Hospital IT departments will require the duplication of information for their EHRs.
c. A proposal was made to create a parallel track for TMS and Treatment Scheduler actors, where the latter was solely responsible for minimal scheduling. The TMS vendors were asked whether they would participate in the latter actor. In principle, no companies were interested in a scheduler-only actor. There is a possibility that an intermediate view with a limited data-management path vs full data-management path could be determined, but better definition of the limited data must be made for all to agree.

7. After lunch on Monday, David reviewed briefly his proposal for changes to Volume 2. The section on general requirements was not controversial, but a later section which allowed vendors of TDD systems to reject plans that it did not create did evoke some discussion. This was altered to a statement indicating that a TDD was not obliged to accept inputs that it considered unsafe or incomplete. This statement was felt to be highly appropriate and acceptable to all.
8. On Tuesday, the revisions were reviewed. Some modifications were made to the section on receiving information considered unsafe, in order to add conformity to the mechanisms used in reporting this information to the TMS. As well, some formatting errors were identified and cleaned up as well as some comments identified by Christof. **The TC then approved the changes to V1 and V2 of the Technical Frameworks, including the changes in both the Worklist and Registration Profiles**. **Version 2.1 of the 2008 Technical Frameworks was posted to the BBS for distribution.**

III. 2009 IHE-RO Profile (3/8, 10-12/2008)

a. Enterprise User Authentication

- Curran presented a slide summary on the EUA profile. While the profile is well-defined, there were a number of questions on how widely accepted the profile is, has it been implemented, and what level of support is commonly available in radiation oncology environments.
- Action Items:
  1. Continue to get information from ITI-Planning on implementation and acceptance of EUA
  2. Discuss with ITI-Planning on how new vendors could be tested to the EUA Profile
     a. A follow-up from the ITI-PC Co-chair indicated concurrence with the comments from Steve summarized

above. He also copied the ITI-TC co-chairs for their opinions.

3. Talk with Steve Moore on Test Tools for the EUA profiles.
    a. Curran reported that he had received an e-mail from Steve. He indicated that the profile has had few takers and little testing. This is primarily due to issues of kerberizing http transactions, which may not significantly affect RO. He suggested discussing with the ITI-TC, which we will do after hearing from the ITI-PC chair (expected 3/11/08).
    b. The ITI PC Co-chair confirmed the observations of Steve, copying the ITI TC Co-chairs for their opinions (no update as of 3/16/2008).

b. Advanced Plan Integration
- What is the scope of this work effort?
    1. Could it be extended to include the TMS and TDD? Or should it continue to model only Planning and Dose Review?
    2. Items that could be included in the extension
        a. Structure Set
            i. Add Bolus to available ROI types
            ii. Allow Density Overrides
        b. Dosimetric Plans
            i. Electrons
            ii. Dynamic Plans
            iii. Beam-line modifiers (Compensators, Boli, …)
        c. Consumer of Dosimetric Plan?
            i. TDD, TMS, DosePlanner
    3. What are the Use Cases?
        a. Composite Planning
        b. Old Plan / New Plan Compositing
        c. Planning w/old Dose
        d. Re-planning after plan review
        e. General increase in plan capabilities
    4. New Concept of an enhanced dose viewer
        a. Allow additional actors for plan interpretation
        b. Could be complementary to Dose Display or subsume it

c. Extended Objects / Actors
- Extension to Imaging Modalities
    1. CT, MR, PET
    2. CT, MR can be primary
    3. Primary image dataset must be axial, orthogonal and all axes are parallel to the DICOM patient axes.
    4. Secondary image datasets are not required to be axial, must be orthogonal.
    5. Multi-series Image datasets will be handled by a specialized actor
    6. Handling of skewed datasets
        a. Some MR series (Datasets do not have table normal along gravity)
        b. Slice-dependent Registrations (SRS Frames)
            i. Should there be an additional actor for correcting or a separate profile.
    7. Should decubitus orientations be handled? Sitting Positions?
        a. Decubitis: Yes

        b. Sitting: No
    8. Should we handle imaging position vs treatment position swapping? No
    9. All actors must be able to handle unevenly-spaced slices. This may require an actor to create new image series and new structure sets.
- New Actor – Series Combiner
    1. Reads multiple series into a single series
- Registrator
    1. No need, would be same as 2008
- Contourer
    1. Simple Contourer (essentially 2007 w/no multi-series)
        a. Single imaging dataset on single series
    2. Advanced Contourer (essentially 2008 w/no multi-series)
        a. Can handle CT, MR and PET as imaging datasets
        b. Can handle multiple Structure Sets
        c. Can handle Spatial Registration Objects
    3. Structure Sets will only reference a single series
    4. ROI Observations
        a. Doesn't appear to be any new Physical Properties
    5. Suggestion to test random-numbered ROIs
    6. Additional Data that is not HFS
- Geometrical Plan Actor
    1. Arc Beams
    2. Applicators & electrons
    3. Machine Name: must still test to no machine name, but applications are not required to forward with none.
    4. No changes in Setup, Fractionation, etc.
    5. If the Geom Planner changes the SSet, it may store a new S-Set (new Transaction)
- Dosimetric Plan Actor
    1. Dynamic
        a. S&S, SlidWind, Arc, ConfArc, VMAT, Static
    2. Beam Modifiers
        a. Wedges
        b. Compensators
        c. Boli
        d. Applicators
    3. Can read an existing plan
    4. Does not read in existing dose
    5. If the Dose Planner changes the SSet, it may store a new S-Set (new Transaction)
- Dose Display Actor
    1. Simple Dose Displayer (2007 w/added primary display)
        a. Single Image dataset / single dose display
        b. Imaging types (CT-required, others by Int State)
    2. Complex Dose Displayer
        a. Multi-modality display / spatial reg objects
        b. Can import multiple dose/plan pairs – NO
    3. Will test for minimal plan, no one required to generate
- Should a TMS actor be added to the profile as a consumer of Dosimetric Plan?

1. This would be a content profile. However, there would be no way, outside of inspection, to test the TMS, since it is an actor that only has inputs.
2. There was not strong support for this, though the idea of adding content in the D-Plan was supported by all.

- Scott re-presented his White Paper on beam instances. This described how we might provide a reasonable test suite. He initially categorized beams into a series of classes {static, motor-wedge, arc, conf arc, S&S, DynWin, …}. He then made a table that related beam types to various modifiers.
    1. Simple Beam Definition:
        a. Beam Name: Mandatory, must be unique in 16 characters and propagated
        b. Mandatory Elements:
            i. Beam Number
            ii. Beam Name
            iii. Beam Type := Static
            iv. Radiation Type := Photon
            v. H-D Tech: Not Present
            vi. Machine Name
            vii. Primary Dose Unit
            viii. SAD
            ix. BLD Sequence
            x. Ref. Pat Setup
            xi. Treatment Delivery Type := Treatment
            xii. # Wedges := {0,1}
                1. Wedge Number
                2. Wedge Type := Standard
                3. Wedge ID
                4. Wedge Angle
                5. Wedge Orientation
            xiii. # Compensators := {0,1} (??)
                1.
            xiv. # Boli := {0,1}
                1. Bolus ID
            xv. Applicator Sequence: NOT PRESENT
            xvi. Final Cumulative MU Weight
            xvii. # Control Points: := 2
                1. Nominal Beam Energy
                2. Isocenter Position
                3. SSD
- General Plan Module
    1. Plan Intent Mandatory
    2. Composite Plans – mixed sentiments
        a. Issues of poor support in current attributes
    3. Other attributes as 2007
- Prescription Module – Will not use
    1. Should we have a Prescriber Actor?
    2. Simple or Complex Prescriptions
    3. Is this meaningful w/o Composite Plans
- Tolerance Tables Module
    1. If no TMS, then don't care
- Patient Setup Module
    1. Is presently required

2. Patient Position now has 8 positions
3. Check with Planning Committee as to value of this sequence. There are several paths that can be used in patient positioning, and the structures here can be pretty clunky. If dominant path, then might choose to implement, otherwise probably not.

- RT Fraction Scheme
  1. Same constraints as 2007 Profile
- RT Beams Module
  1. Generalized to electrons, dynamic beams, & High-Dose Tech.
  2. Image lists can be there, but not relied on
  3. Wedges allowed
  4. Compensators allowed
  5. Bolus allowed
  6. Blocks as 2007
  7. Applicators
- RT Dose Object
  1. Still only Plan Dose

d. After this review, we now need to make a final definition on the 2009 profile commitments. We have the following on the table:
   - RT Delivery Workflow (delayed from 2008)
     1. Have a good handle on TDD – TMS interactions, may be some unknowns if we get TPD or PPS actors. May also be some implications with Tool Kit vendors on later changes.
   - EUA Profile (possible concern from ITI conversations)
   - Extended RT Objects (define scope for final use)

IV. New Business

a. Bill's Test Data (Registration Phantoms)
   - Bill reviewed his generated phantoms to give everyone a conception of what he is doing. He passed around a thumb drive for people to grab the files and check prior to moving them to the ATC site for distribution.
   - He asked that individuals should send him suggestions for test cases. There was concern that there should be small and big angle rotations (> 10 degrees) to more fully test applications.
   - There was some discussion on what might happen with a 180 rotation, such as an HFS / FFS error.

b. Beam Assignments

| | |
|---|---|
| • Basic Static | BC |
| • Basic Static w/Compensators | BC |
| • Motorized Wedges | BC |
| • Virtual Wedges | BC |
| • Arc | JS |
| • Conformal Arc | JS |
| • Step & Shoot | SJ |
| • Sliding Window | BC |
| • Electron | BC |
| • Stereotactic | CS |
| • IMAT/VMAT | UB |

V. Future Meetings

a. Connectathon
   - July 31 – Aug 5, 2008: Houston, TX

b. Face-to-Face Meetings

- TC Meeting, Aug 6. 2008 9-12: Houston, TX
- Th-Sa, ASTRO Annual Meeting, Sep 25-27, 2008
- Dec 15-19, 2008 Location TBD

c. T-Cons
- Thursday, April 17th, 12:00 – 2:00 pm, EDT
- Thursday, May 22nd, 12:00 – 2:00 pm, EDT
- Thursday, June 26th. 12:00 – 2:00 pm, EDT

d. Other meetings of note
- DICOM WG-7
  1. April 22-25, 2008: Rosslyn, VA
  2. June 16-19, 2008: Albuquerque, NM
  3. October 21-24, 2008: Tampa, FL
- IHE-RO Planning Committee
  1. March 20, 2008 TCON: 2:00 – 3:30 pm EDT
  2. May 22, 2008 TCON: 2:00 – 3:30 pm EDT
  3. During Connectathon?
  4. At ASTRO Annual Meeting

VI. Adjourn

a. The meeting adjourned at 5:05 pm on 12 March, 2008.