Integrating the Healthcare Enterprise

IHE Radiation Oncology Technical Framework Supplement

High-Definition Structure Set Content (HDSS)

For review and comment only.

DO NOT implement this public comment version.

Revision 1.0 – Draft in Preparation for Public Comment

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Please verify you have the most recent version of this document. See here for Trial Implementation and Final Text versions and here for Public Comment versions.

Foreword

This is a supplement to the IHE Radiation Oncology Technical Framework V3.0. Each supplement undergoes a process of public comment and trial implementation before being incorporated into the volumes of the Technical Frameworks.

This supplement is published on May 20, 2025 for Public Comment. Comments are invited and can be submitted at http://www.ihe.net/Radiation_Oncology_Public_Comments/. In order to be considered in development of the Trial Implementation version of the supplement, comments must be received by July 19, 2025.

This supplement describes changes to the existing technical framework documents.

"Boxed" instructions like the sample below indicate to the Volume Editor how to integrate the relevant section(s) into the relevant Technical Framework volume.

Amend section X.X by the following:

Where the amendment adds text, make the added text **bold underline**. Where the amendment removes text, make the removed text ~~**bold strikethrough**~~. When entire new sections are added, introduce with editor's instructions to "add new text" or similar, which for readability are not bolded or underlined.

General information about IHE can be found at IHE.net.

Information about the IHE Radiation Oncology domain can be found at IHE Domains.

Information about the organization of IHE Technical Frameworks and Supplements and the process used to create them can be found at Profiles and IHE Process

The current version of the Radiation Oncology Technical Framework can be found at Radiation Oncology Technical Framework.

CONTENTS

Introduction to This Supplement

This content profile is motivated by the BRTO-II Profile that defines a Contourer based on an RT Structure Set with some limitations when it comes to resolution for smaller objects.

With different approaches being available in the DICOM Standard, this profile addresses a more modern approach to enable clinical systems to exchange geometric segment information without information loss.

Revision History

Date	Rev	Author	Change Summary
May 2025	1.0	IHE Radiation Oncology Technical Committee	Initial IHE Public Comment publication

Open Issues and Questions

#	Comment/Issue
1	Whereas the potential higher resolution that can be stored in the RT Structure Set will address part of the information loss, another aspect is the rotation of an ROI in case the source image data set is rotated with respect to the image data set referenced within the RT Structure Set. Therefore, the question is: should all ROIs retain their original orientation, i.e., the orientation of the source image series where they have been contoured on before being moved to the FOR of the RTSS, or should all ROIs be re-oriented in the orientation of the reference image set?
2	Can a Structure Set Instance contain both “regular” (aka BRTO-based) ROIs and “HD” contours defined by this profile? For example, an “EXTERNAL” contour enclosing the entire patient’s head where information loss is irrelevant with respect to the size of the volume does not require to be transmitted with additional information, therefore, the ROI can be encoded as defined in BRTO. On the other hand, a small anatomy where additional contour information is necessary is encoded as defined in the HDSS Profile. Both can exist in the same RT Structure Set Instance.
3	Should it be allowed to contain a single contour in both ways: one ROI defined as in BRTO and one ROI defined as in HDSS? A reason could be to be downward-compatible to older applications. Note: this currently leaves out the complexity that arises for e.g., Dose References in the RT Plan or the DVH in the RT Dose where only a single ROI can be referenced. Which one should be chosen for the reference?
4	Since this is a new profile, should it comply with the recommendation to use verb-noun construction for transaction names as requested in the template? Unless the goal is to be as close as possible with the existing BRTO-II transactions.
5	How are the actors to be grouped? Should we define “Required Actor Groupings” as defined in X.3 or should this rather be “Cross Profile Considerations” in X6?

Closed Issues

None

IHE Technical Frameworks General Introduction

The IHE Technical Frameworks General Introduction is shared by all of the IHE domain technical frameworks. Each technical framework volume contains links to this document where appropriate.

9 Copyright Licenses

IHE technical documents refer to, and make use of, a number of standards developed and published by several standards development organizations. Please refer to the IHE Technical Frameworks General Introduction, Section 9 - Copyright Licenses for copyright license information for frequently referenced base standards. Information pertaining to the use of IHE International copyrighted materials is also available there.

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IHE Technical Frameworks General Introduction Appendices

The IHE Technical Framework General Introduction Appendices are components shared by all of the IHE domain technical frameworks. Each technical framework volume contains links to these documents where appropriate.

Appendix A – Actors

*Add the following **new or modified** actors to the IHE Technical Frameworks General Introduction Appendix A:*

Actor	Definition
No new actors	

The table below lists *existing* actors that are utilized in this profile.

Complete List of Existing Actors Utilized in this Profile

Existing Actor Name	Definition
Content Creator	The Content Creator Actor creates content and transmits to a Content Consumer.
Content Consumer	The Content Consumer Actor views, imports, or performs other processing of content created by a Content Creator Actor.

Appendix B – Transactions

*Add the following **new or modified** transactions to the IHE Technical Frameworks General Introduction Appendix B:*

New (or modified) Transaction Name and Number	Definition
No new transactions	

Appendix D – Glossary

*Add the following **new or modified** glossary terms to the IHE Technical Frameworks General Introduction Appendix D:*

New (or modified) Glossary Term	Definition	Synonyms	Acronym/ Abbreviation
HD Contour	A geometric definition of an ROI with a different (potentially "higher") resolution and/or orientation than the image set referenced from the RT Structure Set Instance.		

Volume 1 – Profiles

Domain-specific additions

None

Add new Section X

X High-Definition Structure Set (HDSS) Profile

This profile specifies the content of DICOM RT Structure Set instances for high-definition contours where segmentation information may not only be defined on the image planes of the Series image used in defining the Structure Set. The additional segmentation information is stored as pixel information in object slices independent of the related image set with potentially different orientation and pixel resolution described by a specific sequence of attributes introduced in version 2020e of the DICOM Standard. This allows to retain additional segmentation information potentially available in a contouring application when transferring RT Structure Set objects to other applications.

HDSS is a Content Module profile.

X.1 HDSS Actors, Transactions, and Content Modules

This section defines the actors, transactions, and/or content modules in this profile. General definitions of actors are given in the Technical Frameworks General Introduction Appendix A. IHE Transactions can be found in the Technical Frameworks General Introduction Appendix B. Both appendices are located at https://profiles.ihe.net/GeneralIntro/index.html.

Figure X.1-1 shows the actors directly involved in the HDSS Profile and the direction that the content is exchanged.

A product implementation using this profile may group actors from this profile with actors from a workflow or transport profile to be functional. The grouping of the content module described in this profile to specific actors is described in more detail in Required Actor Groupings RO TF-1: X.6 or in Cross Profile Considerations RO TF-1: X.6.

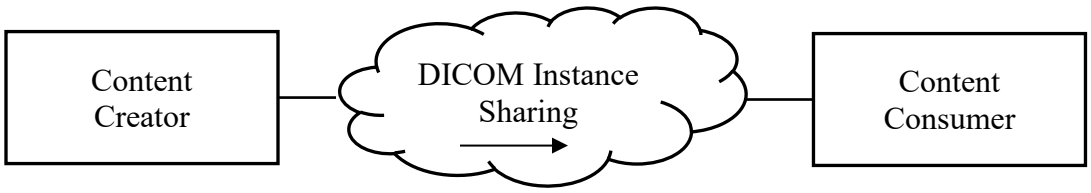

Figure X.1-1: HDSS Actor Diagram

Table X.1-1 lists the content module(s) defined in the HDSS Profile. To claim support with this profile, an actor shall support all required content modules (labeled "R") and may support optional content modules (labeled "O").

Table X.1-1: HDSS – Actors and Content Modules

Actors	Content Modules	Optionality	Reference
Content Creator	RT Structure Set for HDSS	R	RO TF-3: 7.3.4.1.3
Content Consumer	RT Structure Set for HDSS	R	RO TF-3: 7.3.4.1.3

X.1.1 Actor Descriptions and Actor Profile Requirements

Most requirements are documented in RO TF-3 Content Modules. This section documents any additional requirements on profile's actors.

X.1.1.1 Content Creator

In the context of HDSS Profile, a Content Creator sends an RT Structure Set instance containing HD and/or non-HD Contours.

X.1.1.2 Content Consumer

In the context of HDSS Profile, a Content Consumer receives an RT Structure Set instance containing HD and non-HD Contours.

X.2 HDSS Actor Options

Options that may be selected for each actor in this profile, if any, are listed in Table X.2-1. Dependencies between options, when applicable, are specified in notes.

Table X.2-1: High-Definition Structure Set – Actors and Options

Actor	Option Name	Reference
Content Creator	No options defined	--
Content Consumer	No options defined	--

X.3 HDSS Required Actor Groupings

An actor from this profile (Column 1) shall implement all of the required transactions and/or content modules in this profile ***in addition to all*** of the requirements for the grouped actor (Column 2) (Column 3 in alternative 2).

If this is a content profile, and actors from this profile are grouped with actors from a workflow or transport profile, the Reference column references any specifications for mapping data from the content module into data elements from the workflow or transport transactions.

In some cases, required groupings are defined as at least one of an enumerated set of possible actors; this is designated by merging column one into a single cell spanning multiple potential grouped actors. Notes are used to highlight this situation.

Section X.5 describes some optional groupings that may be of interest for security considerations and Section X.6 describes some optional groupings in other related profiles.

Table X.3-1: High-Definition Structure Set - Required Actor Groupings

HDSS Actor	Actor(s) to be grouped with	Reference	Content Bindings Reference
Content Creator	None	--	--
Content Consumer	None	--	--
Content Creator	BRTO-II/Contourer	RO TF-1: 3.1	See Note 1
	MMRO-III/Registered Contourer	RO TF-1: 4.1	See Note 1
Content Consumer	BRTO-II/Contourer	RO TF-1: 3.1	See Note 1
	BRTO-II/Dosimetric Planner	RO TF-1: 3.1	See Note 1
	BRTO-II/Dose Displayer	RO TF-1: 3.1	See Note 1
	MMRO-III/Registered Contourer	RO TF-1: 4.1	See Note 1
	MMRO-III/Registered Display	RO TF-1: 4.1	See Note 1
	MMRO-III/Registered Dose Display	RO TF-1: 4.1	See Note 1

Note 1: HDSS actor shall be grouped with at least one of the actors specified in the list.

X.4 HDSS Overview

X.4.1 Concepts

Not applicable.

X.4.2 Use Cases

X.4.2.1 Use Case #1: HD Contours Transfer

Contours created for treatment planning may be defined using MR, anatomical atlas or CAD model pixel planes which may present a different orientation and a higher resolution than the CT image planes used for computation of dose distribution.

X.4.2.1.1 HD Contours Transfer Use Case Description

For contouring of small segments that may only be visible on e.g., MR data sets with a high resolution, or segments which may be derived from e.g., an anatomical atlas or a CAD definition (such as a brachy catheter or a table top model) that has a higher resolution than the registered image data set, information may be lost in case the segmented information is moved from one

image set to another one and converted to an RT Structure Set that is encoded as defined by the IHE-RO BRTO-II Profile.

Using the HDSS Profile, it is possible to retain the original spatial orientation and resolution and therefore, the volume may be reconstructed by a consumer in a way that it matches the originating segmentation on the producing system in order to be applied in subsequent processing steps, e.g., calculating a DVH.

X.4.2.1.2 HD Contours Transfer Process Flow

X.4.1.2.1 Pre-conditions

A simulation CT is available.

MR imaging, anatomical atlas or CAD model high-resolution information is available.

X.4.1.2.2 Main Flow

- Perform automatic or manual segmentation of high-resolution information to define small Regions of Interest (ROI) contours.
- Perform automatic or manual segmentation of simulation CT images to define larger ROIs contours.
- Create a DICOM RT Structure Set instance including small and larger ROIs contours.
- Store the DICOM RT Structure Set.

X.4.1.2.3 Post-conditions

The stored RT Structure Set instance can be used to perform subsequent processing steps, e.g., calculating a DVH without loss of information.

X.5 HDSS Security Considerations

The security considerations for a content module are dependent upon the security provisions defined by the grouped actor(s).

X.6 HDSS Cross Profile Considerations

BRTO-II – Basic Radiation Therapy Objects - II

A Contourer in BRTO-II might be grouped with a Content Creator to allow computation of DVH and display of contours using original ROIs' orientation and resolution.

A Contourer in BRTO-II might be grouped with a Content Consumer to allow re-contouring of contours using original ROIs' orientation and resolution.

A Dosimetric Planner in BRTO-II might be grouped with a Content Consumer to allow computation of DVH using original ROIs' orientation and resolution.

A Dose Displayer in BRTO-II might be grouped with a Content Consumer to allow display of contours using original ROIs' orientation and resolution.

MMRO-III – Multimodality Image Registration for Radiation Oncology – III

A Registered Contourer in MMRO-III might be grouped with a Content Creator to allow computation of DVH and display of contours using original ROIs' orientation and resolution.

A Registered Contourer in MMRO-III might be grouped with a Content Consumer to allow re-contouring of contours using original ROIs' orientation and resolution.

A Registered Display in MMRO-III might be grouped with a Content Consumer to allow computation of DVH and display of contours using original ROIs' orientation and resolution.

A Registered Dose Display in MMRO-III might be grouped with a Content Consumer to allow display of contours using original ROIs' orientation and resolution.

Appendices to Volume 1

Not applicable.

Volume 2 – Transactions

Not applicable.

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Appendices to Volume 2

Not applicable.

Volume 3 – Content Modules

7 Radiation Oncology DICOM Content Definitions

DICOM Content Definitions constrain the use of instances of specific DICOM IODs (also referred to as DICOM objects). This typically means placing requirements on the creators of those instances, although requirements may also be placed on the receivers and users.

The most common such requirements are to:

- Make a module that is optional (U) in a DICOM IOD be required or conditional,
- Make an attribute that is optional (Type 3) in a DICOM Module be required or conditional,
- Require that an attribute that is optional (Type 3) in a DICOM Module be absent
- Constrain the content of an attribute to be empty
- Constrain the content of an attribute to be populated in a certain way, such as:
  - Constraining the value to be taken from a specific table
  - Constraining the value to be copied from a specific source
  - Constraining the value to encode certain information
- Require that an attribute be displayed/accessible to the operator

Reiterating DICOM requirements is kept to a minimum sufficient to provide context for the IHE requirements. Implementers are still required to be familiar with, and conform to, the underlying DICOM specification.

Content Definitions may be referenced from a Profile independent of transactions to constrain content without specifying the transport. Content Definitions may also be referenced from within a Transaction specification to constrain the content without duplicating the same constraint text across multiple related transactions.

For attributes that are optional, the creator is permitted but not required to include them, and the receiver is permitted but not required to ignore them.

7.1 Conventions

DICOM Conventions are defined in Appendix E to the *IHE Technical Frameworks General Introduction*.

Table 7.1.2-1: Usage of DICOM Modules in IHE

M / C / U	As defined in DICOM PS 3.3
R	The Module is defined as Conditional (C) or User Option (U) in DICOM. The Requirement is an IHE extension of the DICOM requirements, and the module shall be present.

RC	The Module is defined as Conditional (C) or User Option (U) in DICOM. The Requirement is an IHE extension of the DICOM requirements, and the module shall be present when the specified conditions apply.

Table 7.1.2-2: Usage of DICOM Attributes in IHE

O	The attribute or its value is optional, i.e., in DICOM it is Type 2 or 3.
O+*	The attribute is optional, but additional constraints have been added. Note: The specification approach does not force a Type 2 or Type 3 value to become a Type 1 by stating O+.
R	The attribute is required, and is not an IHE extension of the DICOM requirements; i.e., it is already Type 1 in DICOM, but additional constraints are placed by IHE, for example on the value set that may be used for the attribute.
R+	The Requirement is an IHE extension of the DICOM requirements, and the attribute shall be present, i.e., is Type 1, whereas the DICOM requirement may be Type 2 or 3.
RC+	The Requirement is an IHE extension of the DICOM requirements, and the attribute shall be present when the condition is satisfied, i.e., is Type 1C, whereas the DICOM requirement may be Type 2 or 3. If the condition is not fulfilled, the DICOM definitions apply. Note, that this means that the attribute may be present / have a value also in case the condition does not apply.
D	The requirements of DICOM apply unchanged, but the attribute needs to be displayed.
-	No IHE extension of the DICOM requirements is defined. The attribute is listed for better readability or similar purpose.
X+	The attribute information is required to be absent. DICOM Type 2 attributes shall be present with no value. DICOM Type 3 attributes shall be absent.

7.1.1 DICOM Structured Report

Conventions for constraining instances of DICOM Structured Reports as IHE Content Definitions are not yet worked out. In many cases, requiring the use of a specific DICOM SR Template may be sufficient.

7.1.2 Display Requirements

If a requirement lists *, then that attribute is not required to be displayed.

7.2 General Definitions

See TF-3: 7.2

7.3 IOD Definitions

This section contains DICOM IOD specifications referenced in profiles of the IHE Radiation Oncology domain, specifying the parts of the DICOM Standard used and the extended IHE requirements.

7.3.1 Prescription IODs

This section is present only to convey the envisioned section numbering.

7.3.2 Plan IODs

This section is present only to convey the envisioned section numbering.

7.3.3 Image IODs

This section is present only to convey the envisioned section numbering.

7.3.4 RT Structure Set IODs

7.3.4.1 RT Structure Set for General Use

This section is present only to convey the envisioned section numbering.

7.3.4.1.1 RT Structure Set for Basic Interoperability

7.3.4.1.2 RT Structure Set Multimodality Content

7.3.4.1.3 RT Structure Set for HDSS

7.3.4.1.3.1 Referenced Standards

DICOM 2024b PS 3.3: A.19 RT Structure Set IOD

7.3.4.1.3.2 IOD Definition

Table 7.3.4.1.2.2-1: Usage of DICOM Modules in IHE

IE	Module	Reference	Usage	IHE-RO Usage
Patient	Patient	C.7.1.1	M	R See Section 7.4.1.1.1 (Base Content)
	Clinical Trial Subject	C.7.1.3	U	U
Study	General Study	C.7.2.1	M	R See Section 7.4.1.2.1 (Base Content)
	Patient Study	C.7.2.2	U	U
	Clinical Trial Study	C.7.2.3	U	U

IE	Module	Reference	Usage	IHE-RO Usage
Series	RT Series	C.8.8.1	M	R See Section 7.4.1.4.1 (Base Content)
	Clinical Trial Series	C.7.3.2	U	U
Frame of Reference	Frame of Reference	C.7.4.1	U	R See Section 7.4.1.7.1 (Base Content)
Equipment	General Equipment	C.7.5.1	M	R See Section 7.4.1.5.1 (Base Content)
Structure Set	Structure Set	C.8.8.5	M	R See Section 7.4.8.3.3
	ROI Contour	C.8.8.6	M	See Section 7.4.8.2.3
	RT ROI Observation	C.8.8.8	M	R See Section 7.4.8.1.2
	Approval	C.8.8.16	U	U
	SOP Common	C.12.1	M	R
	Common Instance Reference	C.12.2	U	C – Required if reference information is available

7.4 Module Definitions

This section contains DICOM Module specifications referenced in Section 7.3 IOD Definitions or otherwise in profiles of the IHE Radiation Oncology domain, specifying the extended IHE requirements.

7.4.1 General Modules

7.4.2 Workflow-Related Modules

7.4.3 General Plan-Related Modules

7.4.4 Plan-Related Modules in Planning

7.4.5 Plan-Related Modules in Delivery

7.4.6 Image-Related Modules in Planning

7.4.7 Image-Related Modules in Delivery

7.4.8 Segment-Related Modules

7.4.8.1 RT ROI Observation Module

7.4.8.1.1 RT ROI Observation Module Base Content

This section is present only to convey the envisioned section numbering.

7.4.8.1.2 RT ROI Observation Module for HDSS

7.4.8.1.2.1 Referenced Standards

DICOM 2024b PS 3.3: C.8.8.8 RT ROI Observations Module

7.4.8.1.2.2 Module Definition

Table 7.4.8.1.2.2-1: Usage of DICOM Attributes in IHE

Attribute Name	Tag	Type	Attribute Description
ROI Contour Sequence	(3006,0039)	1	Sequence of Contour Sequences defining ROIs. One or more Items shall be included in this Sequence.
>Referenced ROI Number	(3006,0084)	1	Uniquely identifies the referenced ROI described in the Structure Set ROI Sequence (3006,0020).
>ROI Display Color	(3006,002A)	-	Not required - no compliant implementation shall rely on this element being present for proper operation. However applications are allowed to be aware of this element and use it to map display colors.
>Recommended Display Grayscale Value	(0062,000C)	-	Not required - no compliant implementation shall rely on this

Attribute Name	Tag	Type	Attribute Description
			element being present for proper operation. However applications are allowed to be aware of this element and use it to map display colors.
>Recommended Display CIELab Value	(0062,000D)	-	Not required - no compliant implementation shall rely on this element being present for proper operation. However applications are allowed to be aware of this element and use it to map display colors.
>Source Pixel Planes Characteristics Sequence	(3006,004A)	R+*	The characteristics of the pixel planes from which the grid-based representation of the Contours was derived. Only a single Item is permitted in this Sequence. See DICOM Standard, PS3.3, Section C.8.8.6.4. Note: This is not useful if Contour Geometric Type (3006,0042) equals POINT, OPEN_PLANAR or OPEN_NONPLANAR Required if the ROI is transmitted as an HD Contour. Conforming implementations must properly interpret the values in this Sequence to instantiate a pixel-based representations of an ROI.
>>Pixel Spacing	(0028,0030)	R+*	Physical distance in the patient between the center of each pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm. See DICOM Standard, PS3.3, Section 10.7.1.3 for further explanation. These values may either directly be used by a consumer to construct a pixel grid or to verify whether the pixel spacing created by the consumer is reasonable when compared to the source pixel spacing. In order to avoid any information loss, it is highly recommended that these values match or are close.
>>Spacing Between Slices	(0018,0088)	R+*	Spacing between adjacent slices, in mm. The spacing is measured from the center-to-center of each slice, and shall not be negative.
>>Image Orientation (Patient)	(0020,0037)	R+*	The direction cosines of the first row and the first column with respect to the patient. See DICOM Standard, PS3.3, Section C.7.6.2.1.1.
>>Image Position (Patient)	(0020,0032)	R+*	The x, y and z coordinates in mm of the upper left hand corner of the pixel matrix in the Patient-Based Coordinate System described in DICOM Standard, PS3.3, Section C.7.6.2.1.1.
>>Number of Frames	(0028,0008)	R+*	Number of source pixel planes

Attribute Name	Tag	Type	Attribute Description
			This value may be used as a check against the representation in the source system. It is not expected that these values exactly match.
>>Rows	(0028,0010)	R+*	Number of rows in the source pixel planes. This value may be used as a check against the representation in the source system, but may be different on the consumer side. It is not expected that these values exactly match.
>>Columns	(0028,0011)	R+*	Number of columns in the source pixel planes. This value may be used as a check against the representation in the source system, but may be different on the consumer side. It is not expected that these values exactly match.
>Source Series Sequence	(3006,004B)	R+*	Identifies the Image Series on which the ROI was defined. One or more Items are permitted in this Sequence. Note: The referenced Series may or may not have the same Frame of Reference UID (0020,0052) as this Instance, and there may be more than one referenced Series within the same Frame of Reference UID (0020,0052). The referenced Series may or may not contain the images referenced in the Contour Image Sequence (3006,0016). Required if the ROI was defined on a DICOM image series.
>>Series Instance UID	(0020,000E)	1	Unique identifier of the Series containing the referenced Instances.
>Contour Sequence	(3006,0040)	R+*	Sequence of Contours defining ROI. Shall be present
>>Contour Number	(3006,0048)	3	Identification number of the contour. The value of Contour Number (3006,0048) shall be unique within the Contour Sequence (3006,0040) in which it is defined. No semantics or ordering shall be inferred from this Attribute.
>>Contour Image Sequence	(3006,0016)	R*	Sequence of images containing the contour. Required if Source Pixel Planes Characteristics Sequence (3006,004A) is not present, i.e., a non-HD Contour. Shall not be present otherwise. If present, only a single Item shall be included in this Sequence.
>>>Include Table 10-3 "Image SOP Instance Reference Macro Attributes"			
>>Contour Geometric Type	(3006,0042)	1	Geometric type of contour. See DICOM Standard, PS3.3, Section C.8.8.6.1.

Attribute Name	Tag	Type	Attribute Description
			Shall be of value **POINT** single point **CLOSED_PLANAR** closed contour (polygon) containing coplanar points **CLOSEDPLANAR_XOR** closed contour (polygon) containing coplanar points of an inner or outer contour combined using an XOR operator Conforming implementations must properly interpret this value.
>>Number of Contour Points	(3006,0046)	1	Number of points (triplets) in Contour Data (3006,0050).
>>Contour Data	(3006,0050)	R+*	Sequence of (x,y,z) triplets defining a contour in the Patient-Based Coordinate System described in Section C.7.6.2.1.1 (mm). See DICOM Standard, PS3.3, Section C.8.8.6.1 and Section C.8.8.6.3. Note: Contour Data may not be properly encoded if Explicit VR Transfer Syntax is used and the VL of this Attribute exceeds 65534 bytes. For non-HD Contours: The z-coordinate of the contour points shall match the z-coordinate on the plane of the referenced Contour Image, if present, or the z-coordinate on the (potentially tilted) corresponding Source Pixel Plane, if present, within 0.01mm. See DICOM Standard, PS3.3, Section C.8.8.6.4 for details on Source Pixel Planes. See Note 1.

Note 1: Contour Data (3006, 0050) has a different requirement in other sections of this document, primarily that all z-coordinates have to have the same value as the z-coordinate of the referenced image plane.

7.4.8.2 ROI Contour Module

7.4.8.2.1 ROI Contour Module Base Content

This section is present only to convey the envisioned section numbering.

7.4.8.2.2 ROI Contour Module Off-slice

This section is present only to convey the envisioned section numbering.

7.4.8.2.3 ROI Contour Module for HDSS

7.4.8.2.3.1 Referenced Standards

DICOM 2023e Edition PS3.3

7.4.8.2.3.2 Module Definition

Attribute Name	Tag	Type	Attribute Description
ROI Contour Sequence	(3006,0039)	1	Sequence of Contour Sequences defining ROIs. One or more Items shall be included in this Sequence.
>Referenced ROI Number	(3006,0084)	1	Uniquely identifies the referenced ROI described in the Structure Set ROI Sequence (3006,0020).
>ROI Display Color	(3006,002A)	-	Not required - no compliant implementation shall rely on this element being present for proper operation. However applications are allowed to be aware of this element and use it to map display colors.
>Recommended Display Grayscale Value	(0062,000C)	-	Not required - no compliant implementation shall rely on this element being present for proper operation. However applications are allowed to be aware of this element and use it to map display colors.
>Recommended Display CIELab Value	(0062,000D)	-	Not required - no compliant implementation shall rely on this element being present for proper operation. However applications are allowed to be aware of this element and use it to map display colors.
>Source Pixel Planes Characteristics Sequence	(3006,004A)	R+*	The characteristics of the pixel planes from which the grid-based representation of the Contours was derived. Only a single Item is permitted in this Sequence. See DICOM Standard, PS3.3, Section C.8.8.6.4. Note: This is not useful if Contour Geometric Type (3006,0042) equals POINT, OPEN_PLANAR or OPEN_NONPLANAR Required if the ROI is transmitted as an HD Contour. Conforming implementations must properly interpret the values in this Sequence to instantiate a pixel-based representations of an ROI.
>>Pixel Spacing	(0028,0030)	R+*	Physical distance in the patient between the center of each pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm. See DICOM Standard, PS3.3, Section 10.7.1.3 for further explanation. These values may either directly be used by a consumer to construct a pixel grid or to verify whether the pixel spacing created by the consumer

Attribute Name	Tag	Type	Attribute Description
			is reasonable when compared to the source pixel spacing. In order to avoid any information loss, it is highly recommended that these values match or are close.
>>Spacing Between Slices	(0018,0088)	R+*	Spacing between adjacent slices, in mm. The spacing is measured from the center-to-center of each slice, and shall not be negative.
>>Image Orientation (Patient)	(0020,0037)	R+*	The direction cosines of the first row and the first column with respect to the patient. See DICOM Standard, PS3.3, Section C.7.6.2.1.1.
>>Image Position (Patient)	(0020,0032)	R+*	The x, y and z coordinates in mm of the upper left hand corner of the pixel matrix in the Patient-Based Coordinate System described in DICOM Standard, PS3.3, Section C.7.6.2.1.1.
>>Number of Frames	(0028,0008)	R+*	Number of source pixel planes This value may be used as a check against the representation in the source system. It is not expected that these values exactly match.
>>Rows	(0028,0010)	R+*	Number of rows in the source pixel planes. This value may be used as a check against the representation in the source system, but may be different on the consumer side. It is not expected that these values exactly match.
>>Columns	(0028,0011)	R+*	Number of columns in the source pixel planes. This value may be used as a check against the representation in the source system, but may be different on the consumer side. It is not expected that these values exactly match.
>Source Series Sequence	(3006,004B)	R+*	Identifies the Image Series on which the ROI was defined. One or more Items are permitted in this Sequence. Note: The referenced Series may or may not have the same Frame of Reference UID (0020,0052) as this Instance, and there may be more than one referenced Series within the same Frame of Reference UID (0020,0052). The referenced Series may or may not contain the images referenced in the Contour Image Sequence (3006,0016). Required if the ROI was defined on a DICOM image series.
>>Series Instance UID	(0020,000E)	1	Unique identifier of the Series containing the referenced Instances.
>Contour Sequence	(3006,0040)	R+*	Sequence of Contours defining ROI. Shall be present

Attribute Name	Tag	Type	Attribute Description
>>Contour Number	(3006,0048)	3	Identification number of the contour. The value of Contour Number (3006,0048) shall be unique within the Contour Sequence (3006,0040) in which it is defined. No semantics or ordering shall be inferred from this Attribute.
>>Contour Image Sequence	(3006,0016)	R*	Sequence of images containing the contour. Required if Source Pixel Planes Characteristics Sequence (3006,004A) is not present, i.e., a non-HD Contour. Shall not be present otherwise. If present, only a single Item shall be included in this Sequence.
>>>Include Table 10-3 "Image SOP Instance Reference Macro Attributes"			
>>Contour Geometric Type	(3006,0042)	1	Geometric type of contour. See DICOM Standard, PS3.3, Section C.8.8.6.1. Shall be of value **POINT** single point **CLOSED_PLANAR** closed contour (polygon) containing coplanar points **CLOSEDPLANAR_XOR** closed contour (polygon) containing coplanar points of an inner or outer contour combined using an XOR operator Conforming implementations must properly interpret this value.
>>Number of Contour Points	(3006,0046)	1	Number of points (triplets) in Contour Data (3006,0050).
>>Contour Data	(3006,0050)	R+*	Sequence of (x,y,z) triplets defining a contour in the Patient-Based Coordinate System described in Section C.7.6.2.1.1 (mm). See DICOM Standard, PS3.3, Section C.8.8.6.1 and Section C.8.8.6.3. Note: Contour Data may not be properly encoded if Explicit VR Transfer Syntax is used and the VL of this Attribute exceeds 65534 bytes. For non-HD Contours: The z-coordinate of the contour points shall match the z-coordinate on the plane of the referenced Contour Image, if present, or the z-coordinate on the (potentially tilted) corresponding Source Pixel Plane, if present, within 0.01mm. See DICOM Standard, PS3.3, Section C.8.8.6.4 for details on Source Pixel Planes. See Note 1.

Note 1: Contour Data (3006, 0050) has a different requirement in other sections of this document, primarily that all z-coordinates have to have the same value as the z-coordinate of the referenced image plane.

7.4.8.3 Structure Set Module

7.4.8.3.1 Structure Set Module Base Content

This section is present only to convey the envisioned section numbering.

7.4.8.3.2 Structure Set Module in Multi-modality

This section is present only to convey the envisioned section numbering.

7.4.8.3.3 Structure Set Module for HDSS

7.4.8.3.3.1 Referenced Standards

DICOM 2024b PS 3.3: C.8.8.5 RT Structure Set Module

7.4.8.3.3.2 Module Definition

Table 7.4.8.1.3.2-1: Usage of DICOM Attributes in IHE

Attribute Name	Tag	Type	Attribute Description
Structure Set Label	(3006,0002)	1	User-defined label for Structure Set.
Structure Set Name	(3006,0004)	3	User-defined name for Structure Set.
Structure Set Description	(3006,0006)	3	User-defined description for Structure Set.
Instance Number	(0020,0013)	3	A number that identifies this object Instance.
Structure Set Date	(3006,0008)	2	Date at which the content of the Structure Set was last modified.
Structure Set Time	(3006,0009)	2	Time at which the content of the Structure Set was last modified.
Referenced Frame of Reference Sequence	(3006,0010)	3	Sequence describing Frames of Reference in which the ROIs are defined. One or more Items are permitted in this Sequence. See Section C.8.8.5.1.
>Frame of Reference UID	(0020,0052)	1	Uniquely identifies Frame of Reference within Structure Set.
…			

Attribute Name	Tag	Type	Attribute Description
Source Series Information Sequence	(3006,004C)	R+*	Information about Image Series that are sources of ROIs in this Instance. This also includes Series present in the RT Referenced Series Sequence (3006,0014). The Image Series may have been the source of the definition, but the ROI has been resampled to the Image Series referenced in the Referenced Frame of Reference Sequence (3006,0010). One or more Items are permitted in this Sequence.
>Modality	(0008,0060)	1	Type of device, process or method that originally acquired or produced the data used to create the Instances in this Series.
>Series Date	(0008,0021)	1	Date the Series started.
>Series Time	(0008,0031)	1	Time the Series started.
>Series Description	(0008,103E)	1	Description of the Series.
>Series Instance UID	(0020,000E)	1	Unique identifier of the Series.
>Series Number	(0020,0011)	1	A number that identifies this Series.
Structure Set ROI Sequence	(3006,0020)	1	ROIs for current Structure Set. One or more Items shall be included in this Sequence.
>ROI Number	(3006,0022)	1	Identification number of the ROI. The value of ROI Number (3006,0022) shall be unique within the Structure Set in which it is created.

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Appendices to Volume 3

Not applicable.

Volume 4 – National Extensions

Add appropriate Country section

3 National Extensions for <Country Name or IHE Organization>

Not applicable.

Appendices to Volume 4

Not applicable.