**Integrating the Healthcare Enterprise**

# IHE Radiation Oncology (RO) Technical Framework

# Volume 2
# IHE RO TF-2
# Transactions

**Revision 2.0 - Final Text**

**April 7, 2020**

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# 1 Introduction

Integrating the Healthcare Enterprise® (IHE) is an initiative designed to advance the integration of the health information systems. Its fundamental objective is to ensure that in the care of patients all required information for medical decisions is available to authorized healthcare professionals.

IHE is both a process and a forum for encouraging integration efforts. It defines technical frameworks for the implementation of established standards to achieve specific clinical goals. It includes a rigorous testing process for systems implementing this framework. And it organizes educational sessions and exhibits at major meetings of medical professionals to demonstrate the benefits of these frameworks and encourage their adoption by developers and users of health information systems.

IHE International, the organization overseeing development of the IHE Technical Frameworks is sponsored by the Healthcare Information and Management Systems Society (HIMSS) and the Radiological Society of North America (RSNA). The following organizations are responsible for sponsoring development activities in their respective domains:

- Anatomic Pathology – Association pour le Developpement de l'Informatique en Anatomie et Cytologie Pathologique (ADICAP)/ Groupement pour la Modernisation du Système d'Information Hospitalier (GMSIH)
- Cardiology – American College of Cardiology
- Dental – American Dental Association
- Eye Care – Academy of American Ophthalmologists
- IT Infrastructure –HIMSS
- Laboratory –GMSIH/ Société Française d'Informatique de Laboratoire (SFIL)
- Patient Care Coordination –American College of Physicians (ACP)/HIMSS
- Patient Care Devices –American College of Clinical Engineering (ACCE)/HIMSS
- Pharmacy – European Association of Hospital Pharmacists (EAHP)/Dutch National IT Institute for Healthcare (NICTIZ)/Phast
- Quality, Research and Public Health –American Heart Association, HIMSS, RSNA
- Radiation Oncology –American Society for Radiation Oncology (ASTRO)
- Radiology – RSNA
  - Mammography – American College of Radiology (ACR)/RSNA
  - Nuclear Medicine –Society of Nuclear Medicine

Other organizations representing healthcare professionals are invited to join in the expansion of the IHE process across disciplinary and geographic boundaries.

 

## 1.1 Overview of Technical Framework

The IHE Technical Frameworks are expanded after a period of public review, and maintained regularly through the identification and correction of errata. The IHE Radiation Oncology Technical Framework is maintained by the IHE Radiation Oncology Technical Committee. The current version specifies the IHE transactions defined and implemented as of the date of publication. The latest version of the document is always available at http://www.ihe.net/Technical_Frameworks.

The IHE Technical Framework identifies functional components of health information systems, called IHE Actors, and specifies their interactions as coordinated, standards-based transactions. Volume I provides a high-level view of IHE functionality, showing the transactions organized into functional units called Integration Profiles that highlight their capacity to address specific clinical needs. Volumes, II and III, provide detailed technical descriptions of each IHE transaction including the clinical problem it is intended to address and the IHE Actors and transactions it comprises.

The appendices following the main body of the document provide detailed discussion of specific issues related to the integration profiles and a glossary of terms and acronyms used.

Where applicable in these volumes, references are made to Technical Frameworks of other IHE domains. For the conventions used to reference Technical Frameworks from other domains, see Section 1.6.4 in this volume.

## 1.2 Audience

The intended audience of this document is:

- Technical staff of vendors participating in the IHE initiative
- IT departments of healthcare institutions
- Experts involved in standards development
- Anyone interested in the technical aspects of integrating healthcare information systems

## 1.3 Relationship to Standards

IHE does not define standards, but rather facilitates the use of existing standards — including HL7, W3C, Web Services, DICOM and others, as appropriate — in an integrated manner by specifying detailed implementations of these standards. When clarifications or extensions to standards are necessary, IHE refers recommendations to the relevant standards bodies. Vendors who have implemented IHE integration capabilities can use an IHE Integration Statement to describe the conformance of their product to the Actors and Profiles in the IHE Technical Framework. See RAD TF-1: Appendix D for the format of such IHE Integration Statements. IHE encourages implementers to ensure that products implemented in accordance with the IHE Technical Framework also meet the full requirements of the standards underlying IHE. Standards conformance claims should be made in direct reference to the specific standard in question.

 

## 1.4 Relationship to Real-world Architectures

The IHE Actors and transactions described in the IHE Technical Frameworks are abstractions of real-world health information systems. The IHE Technical Framework intentionally avoids associating functions or actors with specific product categories. For each actor, the IHE Technical Framework defines only those functions associated with their interactions with other health information systems. The IHE definition of an actor should therefore not be taken as the complete definition of any product that might implement it, nor should the framework itself be taken to comprehensively describe the architecture of a health information system.

IHE takes no position as to the relative merits of an integrated environment based on a single, all-encompassing information system versus one based on multiple systems that together achieve the same end.

## 1.5 Reserved

## 1.6 Conventions

This document has adopted the following conventions for representing the framework concepts and specifying how the standards upon which the IHE Technical Framework is based should be applied.

### 1.6.1 Actor and Transaction Diagrams and Tables

Each integration profile is a representation of a real-world capability that is supported by a set of actors that interact through transactions. Actors are information systems or components of information systems that produce, manage, or act on categories of information required by operational activities in the enterprise. Transactions are interactions between actors that transfer the required information through standards-based messages. The tables of actors and transactions starting with Section 3 indicate which transactions each actor in a given profile must support. The convention used in these diagrams is that the arrow indicating the direction for the transaction points from the initiator of the transaction to the destination. In some cases, a profile is dependent on a pre-requisite profile in order to function properly and be useful. For example, Presentation of Grouped Procedures depends on both Scheduled Workflow and Consistent Presentation of Images being implemented as pre-requisites. These dependencies can be found by locating the desired profile in Table 2-1 and seeing which profiles are listed as required pre-requisites. An actor must implement all required transactions in the pre-requisite profiles in addition to those in the desired profile. In some cases, the pre-requisite is that the actor selects any one of a given set of profiles to satisfy the pre-requisite. For example, Post-processing depends on any one of the content profiles being supported.

### 1.6.2 Process Flow Diagrams

The descriptions of integration profiles that follow include Process Flow Diagrams that illustrate how the profile functions as a sequence of transactions between relevant actors. These diagrams are intended to provide a “big picture” so the transactions can be seen in the context of the overall workflow. Certain transactions and activities not defined in detail by IHE are shown in these diagrams in italics to provide additional context on where the relevant IHE transactions fit

 

into the broader scheme of healthcare information systems. These diagrams are not intended to present the only possible scenario. Often other actor groupings are possible, and complementary transactions from other profiles may be interspersed. In some cases the sequence of transactions may be flexible. Where this is the case there will generally be a note pointing out the possibility of variations.

The convention used in these diagrams is that the arrow on the line for the transaction points from the initiator of the transaction to the destination.

### 1.6.3 Normative versus informative contents of the Technical Framework

Most parts of the Technical Framework describe required or optional characteristics of Integration Profiles, Actors and Transactions: these are normative. For a better understanding of the text, there also exist illustrating parts in the Technical Framework that are informative and non-normative.

According to IETF RFC2119, certain words indicate whether a specific content of the Technical Framework is normative: either required (e.g., “must”, “required”, “shall”) or optional (e.g., “may”, “recommended”). Informative content does not contain these key words.

### 1.6.4 Technical Framework Referencing

When references are made to a section within the same Technical Framework volume, a section number is used by itself. When references are made to other volumes or to a Technical Framework in another domain, the following format is used:

<domain designator> TF-<volume number>: <section number>, where

<domain designator> is a short designator for the IHE domain (ITI = IT Infrastructure, RO = Radiation Oncology)

<volume number> is the applicable volume within the given Technical Framework (e.g., 1, 2, 3), and

<section number> is the applicable section number.

For example: ITI TF-1: 3.1 refers to Section 3.1 in volume 1 of the IHE IT Infrastructure Technical Framework, RAD TF-3: 4.33 refers to Section 4.33 in volume 3 of the IHE Radiology Technical Framework.

When references are made to specific transactions (transaction numbers) the following format is used:

<domain designator>-<transaction number>

For example RAD-4 refers to transaction number 4 (Procedure Scheduled) in the Radiology Technical Framework.

## 1.7 History of Annual Changes

- 2007: Initiated the IHE Radiation Oncology Technical Frameworks with the *Basic Radiation Therapy Objects* Integration Profile (BRTO).

 

- 2011: Updated the front matter sections of Volumes 1 and 2 of the IHE Radiation Oncology Technical Frameworks to be consistent with newly released domain-wide sections.
- 2014: Updated Volumes 1 and 2 of the IHE Radiation Oncology Technical Frameworks to include approved 2013 change proposals and technical frameworks formatting changes.
- 2020: Updated Volumes 1 and 2 of the IHE Radiation Oncology Technical Frameworks to include profiles voted to Final Text  Also initiated a Volume 3 to include DICOM Content Modules.

## 1.8 Comments

AAPM welcomes comments on this document and the IHE-RO initiative. They should be submitted at http://www.ihe.net/Radiation_Oncology_Public_Comments or to:

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## 1.9 Copyright Licenses



### 1.9.1 Copyright of Base Standards



#### 1.9.1.1 DICOM (Digital Imaging and Communications in Medicine)

#### 1.9.1.2 HL7 (Health Level Seven)

HL7®, Health Level Seven®, CDA®, FHIR®, and the FHIR [FLAME DESIGN] ® are registered trademarks of Health Level Seven International.

Health Level Seven, Inc. has granted permission to IHE to reproduce tables from the HL7 standard. The HL7 tables in this document are copyrighted by Health Level Seven, Inc. All rights reserved. Material drawn from these documents is credited where used.

#### 1.9.1.3 LOINC (Logical Observation Identifiers Names and Codes)

LOINC® is registered United States trademarks of Regenstrief Institute, Inc.

#### 1.9.1.4 SNOMED CT (Systematized Nomenclature of Medicine -- Clinical Terms)

Some IHE Profiles incorporate SNOMED® CT, which is used by permission of the International Health Terminology Standards Development Organisation. SNOMED CT© was originally created by the College of American Pathologists. SNOMED CT is a registered trademark of the International Health Terminology Standards Development Organisation, all rights reserved.

## 1.10 Trademark

IHE® and the IHE logo are trademarks of the Healthcare Information Management Systems Society in the United States and trademarks of IHE Europe in the European Community. They may only be used with the written consent of the IHE International Board Operations Committee, which may be given to a Member Organization in broad terms for any use that is consistent with the IHE mission and operating principles.

## 1.11 IHE Technical Framework Development and Maintenance Process

The IHE Radiation Oncology Technical Framework is continuously maintained and expanded on a variable basis by the IHE Radiation Oncology Technical Committee. The development and maintenance process of the Framework follows a number of principles to ensure stability of the specification so that both vendors and users may use it reliably in specifying, developing and acquiring systems with IHE integration capabilities.

The first of these principles is that any extensions, clarifications and corrections to the Technical Framework must maintain backward compatibility with previous versions of the framework in order to maintain interoperability with systems that have implemented IHE Actors and Integration Profiles defined there.

The IHE Radiation Oncology Technical Framework is developed and re-published following a three-step process:

1. The Radiation Oncology Technical Committee develops supplements to the current stable version of the Technical Framework to support new functionality identified by the IHE Strategic and Planning Committees and issues them for public comment.
2. The Committee addresses all comments received during the public comment period and publishes an updated version of the Supplement for "Trial Implementation". It is this

version of the Supplement used by vendors in developing trial implementation software for the annual Radiation Oncology Connectathon.

3. The Committee regularly considers change proposals to the Trial Implementation version of a Supplement, including those from implementers who participate in the Connectathon. After resolution of all change proposals received, the Supplement is approved for Final Text and added to the current Technical Framework at its next revision.

# 2 Conventions

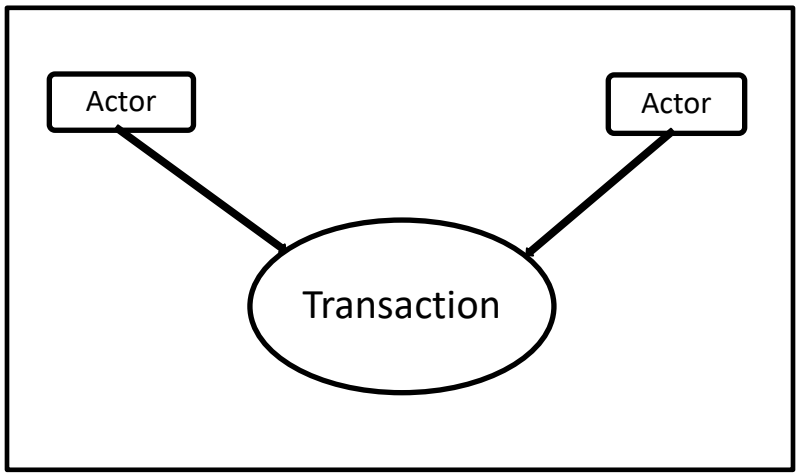
This document has adopted the following conventions for representing the framework concepts and specifying how the standards upon which the IHE Technical Framework is based shall be applied.

## 2.1 The Generic IHE Transaction Model

Transaction descriptions are provided in Section 3. In each transaction description, the actors, the roles they play, and the transactions between them are presented as use cases.

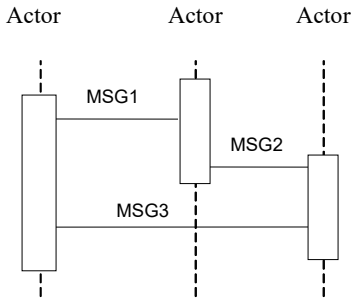
The generic IHE transaction description includes the following components:

- *Scope*: a brief description of the transaction.
- *Use Case Roles*: textual definitions of the actors and their roles, with a simple diagram relating them, e.g.,:




- *Referenced Standards*: the standards (stating the specific parts, chapters or sections thereof) to be used for the transaction.
- *Interaction Diagram*: a graphical depiction of the actors and transactions, with related processing within an actor shown as a rectangle and time progressing downward, similar to:




The interaction diagrams used in the IHE Technical Framework are modeled after those described in Grady Booch, James Rumbaugh, and Ivar Jacobson, *The Unified Modeling Language User Guide*, ISBN 0-201-57168-4. Simple acknowledgment messages are omitted from the diagrams for brevity.

- *Message definitions:* descriptions of each message involved in the transaction, the events that trigger the message, its semantics, and the actions that the message triggers in the receiver.

## 2.2 DICOM Usage Conventions

For some DICOM transactions described in this document, IHE has strengthened the requirements on the use of selected Type 2 and Type 3 attributes. These situations are explicitly documented in Section 3 and in the appendices. IHE specifically emphasizes that DICOM Type 2 attributes (for instance, Patient Name, Patient ID) shall be transmitted with zero length if the source system does not possess valid values for such attributes; in other words, the source system shall not assign default values to such attributes. The receiving system must be able to handle zero-length values for such attributes.

IHE has defined requirements related to the support for and use of attributes in DICOM storage transactions by both Service Class Users (SCUs) and Service Class Providers (SCPs). The list below may list usage conventions only found in IHE-RO profiles:

| | |
|---|---|
| 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. |

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.

IHE has also defined requirements related to the support for and use of matching and return keys in DICOM queries by both Service Class Users (SCUs) and Service Class Providers (SCPs). Matching keys are used to select instances for inclusion in the response by the query SCP to the SCU, whereas return keys only return specific data and are not used for matching.

- **Required matching key SCU:**

  A key that the Query SCU shall have the ability to offer to its user as a selection criterion. The definition of the means offered to the user of the Query SCU to trigger the sending of a matching key in the Query request is beyond the scope of IHE (e.g., enter a value, select an entry).

- **Required matching key SCP:**

  An IHE required matching key is processed by the Query SCP just as if it were a DICOM-required matching key. In most cases, IHE-required matching keys are also DICOM-required matching keys.

- **Required return key SCU:**

  A key that the Query SCU requests from the Query SCP, receives in the query responses, and displays for the user, if required. The definition of the means offered to the user of the Query SCU to request a return key (e.g., by default, check a box) and to make it visible to the user is beyond the scope of IHE.

- **Required return key SCP:**

  IHE-required return keys specified within DICOM as type 1 or type 2 return keys are processed according to their DICOM type. IHE-required return keys specified within DICOM as type 3 will be processed as if they were type 2.

Query Key Requirement Tables in the framework use the following legend to specify requirements for SCUs and SCPs:

R Required O Optional

The following modifiers are also used:

R+ The Requirement is an IHE extension of the DICOM requirements

R* The attribute is not required to be displayed

R+* The Requirement is an IHE extension of the DICOM requirements, but it is NOT required to be displayed

Table 2.2-1 in RAD TF-2 provides an example table defining matching and return keys. Note that sequence attributes are used as a structuring header in these matching and return key tables, and requirements are given for individual sequence items.

## 2.3 HL7 Profiling Conventions

HL7 profiling conventions are discussed in RAD TF-2:2.3. For those individuals interested, please refer to that reference.

## 2.4 HL7 Implementation Notes

### 2.4.1 Network Guidelines

The HL7 2.3.1 standard does not define a network communications protocol. The HL7 2.1 standard defines lower layer protocols in an appendix. These definitions were moved to the Implementation Guide in 2.2 and subsequent versions, but are not HL7 requirements. The IHE Framework makes these recommendations:

4. Applications shall use the Minimal Lower Layer Protocol defined in Appendix C of the HL7 Implementation Guide.
5. An application that wants to send a message (initiate a transaction) will initiate a network connection to start the transaction. The receiver application will respond with an acknowledgement or response to query but will not initiate new transactions on this network connection.

### 2.4.2 Message Control

According to the HL7 standard, each message shall begin with the MSH (message header) segment. Table RAD TF-2:2.4-1 identifies all required fields in this message. This table shall be interpreted according to the HL7 Standard unless otherwise noted in Section 2.3.

The IHE Technical Framework requires that applications support HL7-recommended values for the fields *MSH-1 Field Separator* and *MSH-2 Encoding Characters*.

Field *MSH-18 Character Set* shall only be valued if the message utilizes character sets other than ISO IR-6, also known as ASCII.

Implementations supporting sequence number protocol (and using the field *MSH-13 Sequence Number*) shall be configurable to allow them to perform transactions without such protocol.

### 2.4.3 Acknowledgment Modes

Applications that receive HL7 messages shall send acknowledgments using the HL7 Original Mode (versus Enhanced Acknowledgment Mode).

The IHE Technical Framework provides for each HL7 message to be acknowledged by the HL7 ACK message sent by the receiver of an HL7 message to its sender. The segments of the ACK message listed in the references below are required, and their detailed descriptions are provided in Tables RAD TF-2: 2.4-1, RAD TF-2: 2.4-2 and corresponding notes. The ERR segment is

optional and may be included if the *MSA-1 Acknowledgement Code* field identifies an error condition.

### 2.4.4 HL7 Versioning

The selection of a particular version of HL7 for any given HL7 based transaction within the Technical Framework is based upon a number of factors. These include:

- Whether the version of HL7 provides the functionality needed for the transaction.
- How widely the version of HL7 is supported at the time of specification

Since the transactions are self-contained communications, the implementation of each HL7 transaction may use a different version of HL7.

An application implementing an IHE transaction which uses HL7 messaging must comply with the message structure and contents defined by the specified version of HL7 and the Technical Framework. It is acceptable if the version (MSH-12) is higher than that specified in the Framework as long as the message structure and contents meet the requirements of the specification.

## 2.5 HL7 and DICOM Mapping Considerations

Field lengths are explicitly defined in the DICOM Standard, but an HL7 element might consist of multiple components that do not have a defined maximum length. It is recognized that there are some HL7 component lengths that could be longer than the DICOM attribute lengths. Data values for mapped fields are required not to exceed the smaller of either the HL7 or the DICOM field length definitions. Systems supporting alternative character sets must take into account the number of bytes per character in such sets. All systems are required to support the DICOM Default Character Set (ISO-IR 6 or ASCII). In addition, other character sets may be supported. Maintaining consistency of data encoded using alternative character sets is outside of the scope of the IHE Technical Framework.

Value Representations are not explicitly addressed. Attention shall be given to the mapping of the HL7 representation and the DICOM representation. Examples of these include Patient Name, dates and times.

## 2.6 Use of Coded Entities and Coding Schemes

IHE does not produce, maintain or otherwise specify a coding scheme or other resource for controlled terminology (coded entities). Where applicable, coding schemes required by the HL7 and DICOM Standards take precedence. In the cases where such resources are not explicitly identified by the Standards, implementations may utilize any resource (including proprietary or local) provided any licensing/copyright requirements are satisfied.

# 3 IHE Transactions

This section defines each IHE transaction in detail, specifying the standards used, the information transferred, and the conditions under which the transaction is required or optional.

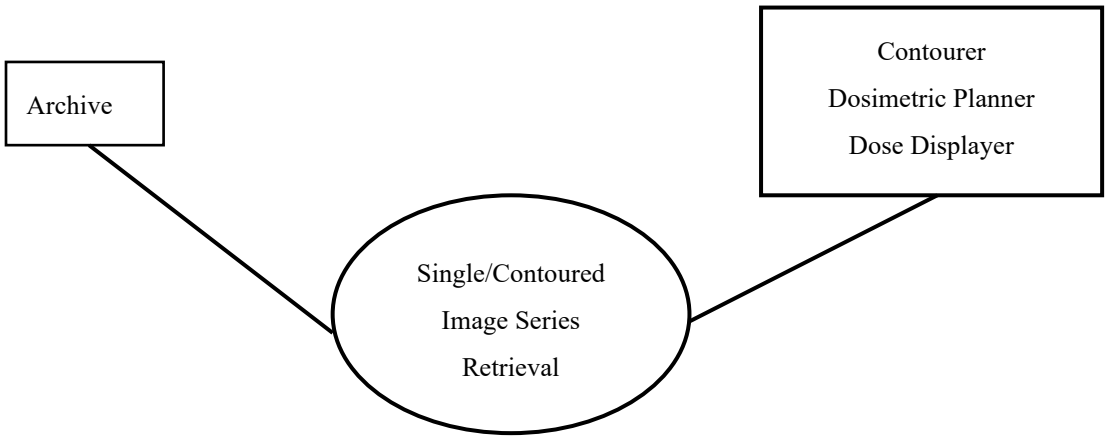
## 3.1 Single/Contoured Image Series Retrieval [RO-1]

This corresponds to transaction [RO-1] of the IHE Radiation Oncology Technical Framework. Transaction [RO-1] is used by the ***Archive***, ***Contourer***, ***Dosimetric Planner***, and ***Dose Displayer*** Actors.

### 3.1.1 Scope

This transaction is used to send a series of CT-Images from an ***Archive*** to an application.

### 3.1.2 Use Case Roles




**Actor:** Archive

**Role:** Send CT Series to Contourer, Dosimetric Planner or Dose Displayer

**Actor:** Contourer, Dosimetric Planner or Dose Displayer

**Role:** Receives and stores CT Series from Archive

### 3.1.3 Referenced Standards

DICOM 2018d Edition PS3.4: Storage Service Class.

### 3.1.4 Messages

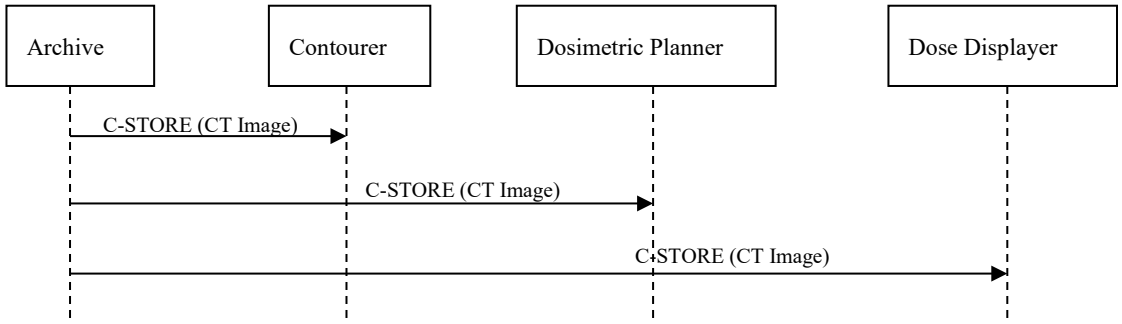



**Figure 3.1.4-1: Interaction Diagram**

### 3.1.4.1 Single/Contoured Image Series Retrieval

#### 3.1.4.1.1 Trigger Events

The user of the ***Contourer***, in order to generate a set of contours, determines that a certain CT-Series is required, and requests that the ***Archive*** send the necessary CT-Series to the ***Contourer***.

The user of a ***Dosimetric Planner***, in order to generate a dosimetric plan and calculate dose, determines that a certain CT Series is required, and requests that the ***Archive*** send the necessary CT series to the ***Dosimetric Planner***.

The user of a ***Dose Displayer***, in order to view dose, determines that a certain CT Series is required, and requests that the ***Archive*** send the necessary CT series to the ***Dose Displayer.***

The mechanism(s) by which these transfers are initiated is outside the scope of this profile.

#### 3.1.4.1.2 Message Semantics

The ***Archive*** uses the DICOM C-STORE message to transfer the all of the CT Images in the series to the ***Contourer***, ***Dosimetric Planner*** or ***Dose Displayer***. The ***Archive*** is the DICOM Storage SCU and the ***Contourer***, ***Dosimetric Planner*** or ***Dose Displayer*** is the DICOM Storage SCP.

#### 3.1.4.1.3 Expected Actions

The ***Contourer*** will store all of the CT Images, and will relate the images based on the study, series, and image identification information. These images will then be available to the user of the ***Contourer*** for use in construction a set of contours which will later be exported as an RT Structure Set ([RO-2]).

The ***Dosimetric Planner*** will store all of the CT Images, and will relate the images based on the study, series, and image identification information. These images will then be available to the user of the ***Dosimetric Planner*** for use in construction of a Dosimetric Plan which will later be exported ([RO-4]). These images will also be involved in the calculation of a related dose, which will be exported later as an RT Dose ([RO-BRTO-II-5]).

The ***Dose Displayer*** will store all of the CT Images, and will relate the images based on the study, series, and image identification information. These images will then be available to the user of the ***Dose Displayer*** for use in construction of a dose display.

### 3.1.5 Security Considerations

There are no explicit security considerations.

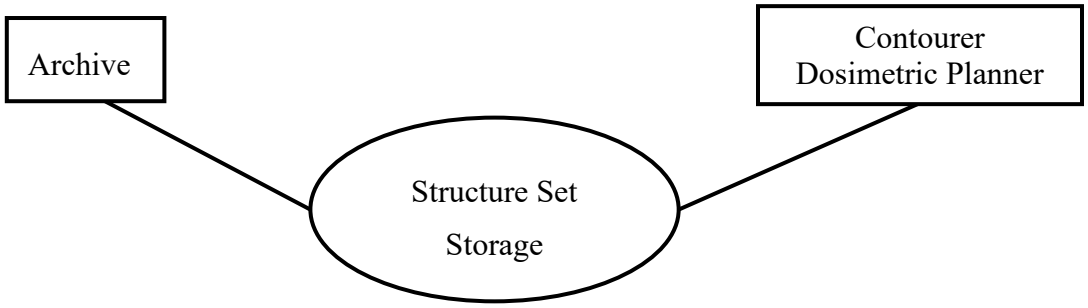
## 3.2 Structure Set Storage [RO-2]

This corresponds to transaction [RO-2] of the IHE Radiation Oncology Technical Framework. Transaction [RO-2] is used by the ***Archive*** and ***Contourer*** Actors.

### 3.2.1 Scope

In the Structure Set Storage Transaction, the ***Contourer*** stores an RT Structure Set on an ***Archive*** to make it available.

### 3.2.2 Use Case Roles




**Actor**: Contourer, Dosimetric Planner

**Role**: Sends RT Structure Set to Archive

**Actor**: Archive

**Role**: Stores RT Structure Set received from Contourer or Dosimetric Planner

### 3.2.3 Referenced Standards

DICOM 2018d Edition PS3.4: Storage Service Class.

### 3.2.4 Messages

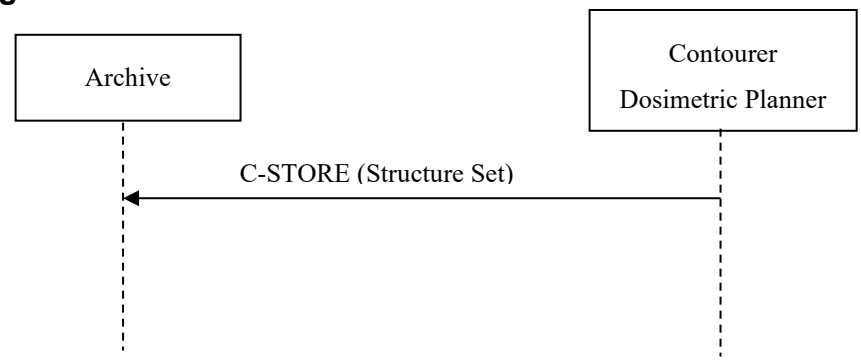



**Figure 3.2.4-1: Interaction Diagram**

#### 3.2.4.1 Structure Set Storage

##### 3.2.4.1.1 Trigger Events

The user of the ***Contourer*** selects an RT Structure Set to store.

##### 3.2.4.1.2 Message Semantics

The message semantics are defined by the DICOM Storage SOP Class. The ***Contourer*** or ***Dosimetric Planner*** is the storage SCU and the ***Archive*** is the storage SCP.

The Contours in the ROI Contour module are restricted to Geometric Type POINT and CLOSED_PLANAR. ROI contours must correspond to exported image plane locations. If a system does not support unequally-spaced slices, for example, that system is responsible for creating a resampled image set (see [RO-11]) and creating an RT Structure Set in which the ROI contours reference the resampled image set. Furthermore, absence of an ROI contour on slice(s) between those containing contours of that ROI does not imply the existence of the ROI on the intervening slice(s).

Also refer to RO TF-3: 7.3.4.1.1 for an overview of the specific requirements on the DICOM attributes that are included in an RT Structure Set instance. In particular, the RT Structure Set must share a single Frame of Reference UID with the images.

##### 3.2.4.1.3 Expected Actions

Upon receipt of the Structure Set, the ***Archive*** shall store it. This RT Structure Set is then available for subsequent retrieval ([RO-7]).

### 3.2.5 Security Considerations

There are no explicit security considerations.

## 3.3 Off-slice Structure Set Storage [RO-BRTO-II-1]

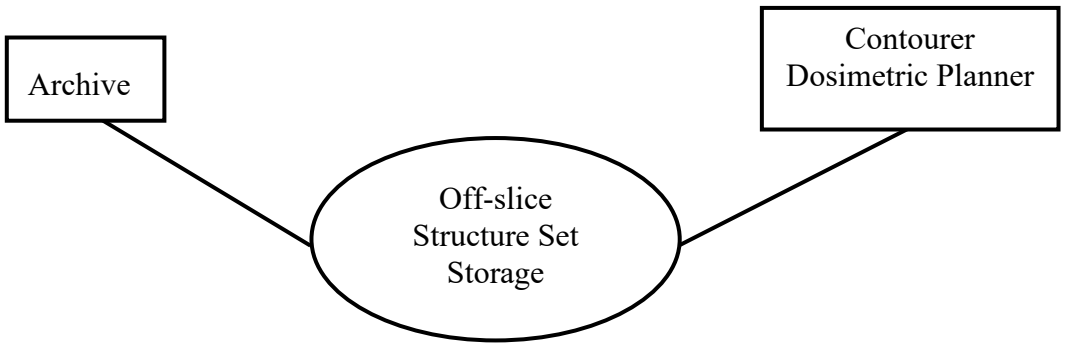
This corresponds to transaction [RO-BRTO-II-1] of the IHE Radiation Oncology Technical Framework. Transaction [RO-BRTO-II-1] is used by the *Archive* and *Contourer* Actors.

### 3.3.1 Scope

In the Off-slice Structure Set Storage Transaction, the *Contourer* stores an RT Structure Set on an *Archive* to make it available.

### 3.3.2 Use Case Roles




**Actor**: Contourer, Dosimetric Planner

**Role**: Sends off-slice RT Structure Set to Archive

**Actor**: Archive

**Role**: Stores off- slice RT Structure Set received from Contourer

### 3.3.3 Referenced standards

DICOM 2018d Edition PS3.4: Storage Service Class.

### 3.3.4 Messages

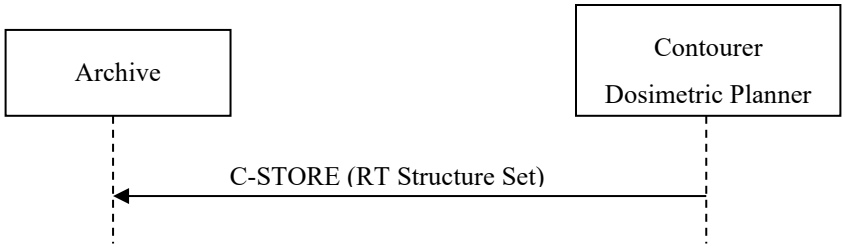



**Figure 3.3.4-1: Interaction Diagram**

#### 3.3.4.1 Structure Set Storage

##### 3.3.4.1.1 Trigger Events

The user of the ***Contourer*** selects an RT Structure Set to store.

#### 3.3.4.1.2 Message Semantics

The message semantics are defined by the DICOM Storage SOP Class. The ***Contourer*** or the ***Dosimetric Planner*** is the storage SCU and the ***Archive*** is the storage SCP.

The Contours in the ROI Contour module are restricted to Geometric Type POINT and CLOSED_PLANAR. If a ROI Contour contains off-slice information, the Contour Number (3006,0048) and the Attached Contours (3006,0049) attributes must be present for all Contour Sequence items (3006,0040) of this ROI. For Contour Sequence items that are not referencing any other Contour Sequence items, the Attached Contours (3006,0049) shall be present but empty. The Attached Contours (3006,0049) shall reference the nearest, directly connected contours with a lower Contour Number (3006,0048).

Note that any two non-disjoint contours will be connected by a path on the undirected graph defined by Attached Contour references. If the ROI is intersected by an image plane, there has to be a contour on that plane. All contours shall be parallel to the image plane. The distance between off-slice contours may vary.

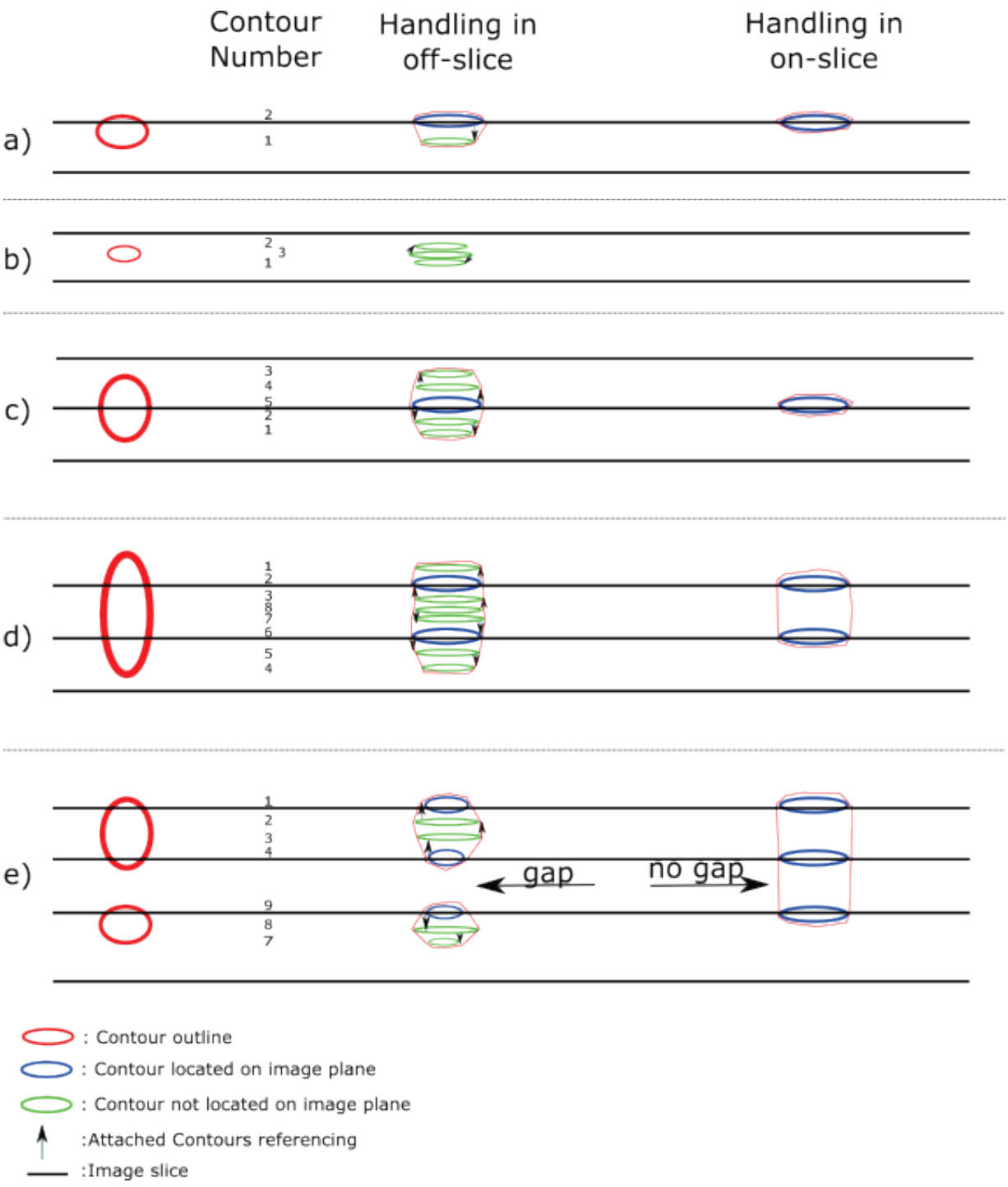



**Figure 3.3.4.1.2-1: Overview handling in off-slice and on-slice option**

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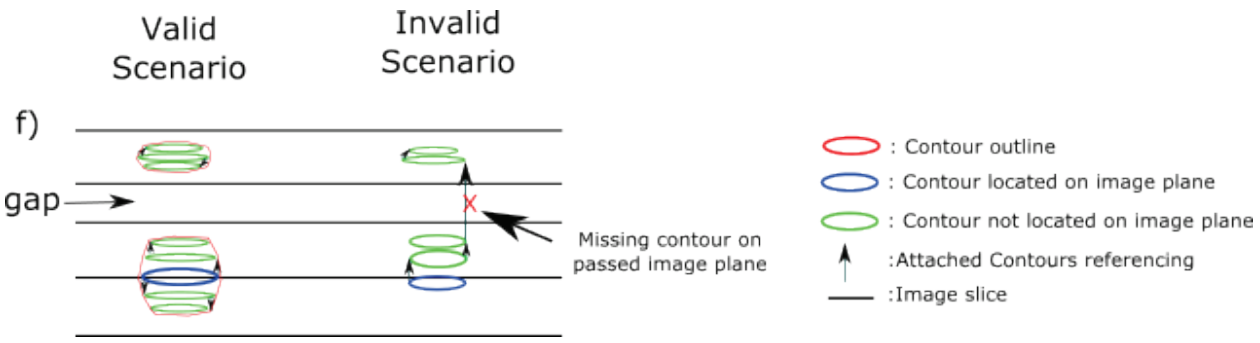



**Figure 3.3.4.1.2-2: Invalid scenario off-slice contours**

Figure 3.3.4.1.2-1 shows examples of off-slice contours with and without support of the off-slice option. Examples a) and c) show how to add a small caps to an object by adding an attached contour to the contour on the image slice. Example b) illustrates a very small object between two image slices which will only be shown in applications capable of off-slice handling. Examples c) and d) show that the order of contour number doesn't have to be continuous as long as the requirement of the Attached Contours (3006,0049) is fulfilled. An object having a gap is shown in example e). It can be created in off-slice handling by not connecting the contour with the Contour Number (3006,0048) 9 to the contour with the Contour Number (3006,0048) 4 as shown in example e). In on-slice handling it is not possible to properly encode this gap.

Figure 3.3.4.1.2-2 illustrates an invalid scenario in off-slice handling on the right side. Two contours that are not located on image slices shall be connected but the image slices that are intersected between those off-slice contours do not contain a contour definition. To correct this, additional contour definitions have to be done on these two image planes. If the invalid connecting Attached Contour is removed the definition would be correct too, but then it would represent a gap in off-slice handling (left side in example f).

Also refer to RO TF-3: 7.3.4.1.1 for an overview of the specific requirements on the DICOM attributes that are included in an RT Structure Set instance and refer to RO TF-3: 7.4.8.2.2 for the off-slice specific requirements for the RT ROI Contour Module. In particular, the RT Structure Set must share a single Frame of Reference UID with the images.

#### 3.3.4.1.3 Expected Actions

Upon receipt of the RT Structure Set, the ***Archive*** shall store it. This RT Structure Set is then available for subsequent retrieval ([RO-BRTO-II-2]).

## 3.4 Dosimetric Plan Storage [RO-4]

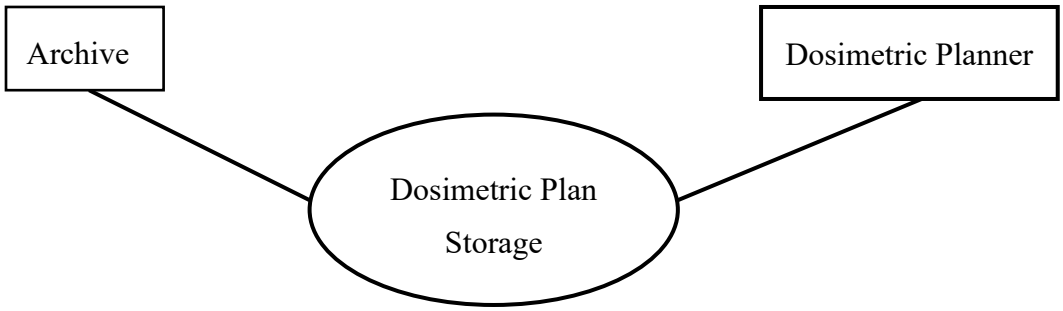
This section corresponds to transaction [RO-4] of the IHE-RO Technical Framework. Transaction [RO-4] is used by the ***Archive*** and ***Dosimetric Planner*** Actors.

### 3.4.1 Scope

In this transaction, the ***Dosimetric Planner*** sends the plan containing the references to the RT Structure Set to the ***Archive***.

### 3.4.2 Use Case Roles




**Actor:** Dosimetric Planner

**Role:** Transmit generated RT Plan to Archive.

**Actor:** Archive

**Role:** Accept and store RT Plan from Dosimetric Planner.

### 3.4.3 Referenced Standards

DICOM 2018d Edition, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.4.4 Messages

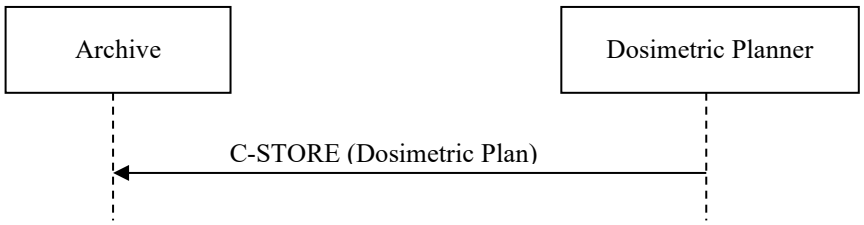



**Figure 3.4.4-1: Interaction Diagram**

#### 3.4.4.1 Dosimetric Plan Storage

##### 3.4.1.1.1 Trigger Events

The ***Dosimetric Planner*** transfers the ***Dosimetric Plan*** to the ***Archive***, once the dose calculation is finished.

##### 3.4.1.1.2 Message Semantics

The ***Dosimetric Planner*** uses the DICOM C-STORE message to transfer the plan. The ***Dosimetric Planner*** is the DICOM Storage SCU and the ***Archive*** is the DICOM Storage SCP.

The ***Dosimetric Planner*** may create a new series containing the RT Plan or may use an existing series, where previous RT Plan(s) are contained.

The study where the series of the RT Plan is contained shall be the same study as the one containing the RT Structure Set referenced in the RT Plan.

The purpose of the Dosimetric Plan transferred is to convey the reference to the RT Structure Set, which has been used in definition of the plan and which contains the references to the CT Images used for plan calculation. The ***Dose Displayer*** will use this sequence to retrieve the RT Structure Set and the CT images referenced in the RT Structure Set for display.

The IHE-RO extension of the DICOM requirements for the RT General Plan module can be found in RO TF-3: 7.4.3.1.1 and for the General Equipment module in RO TF-3: 7.4.1.5.1.

The Dosimetric Plan shall not contain an RT Brachy Application Setup module.

The Dosimetric Plan may have zero beams, i.e., it may lack an RT Beams module. This is to support teletherapy plans that do not match the traditional isocentric model.

Applications should display RT Plan Label, RT Plan Date and RT Plan Time in order to safely identify matching RT Dose and RT Plan pairs.

### 3.4.5 Security Considerations

There are no explicit security considerations.

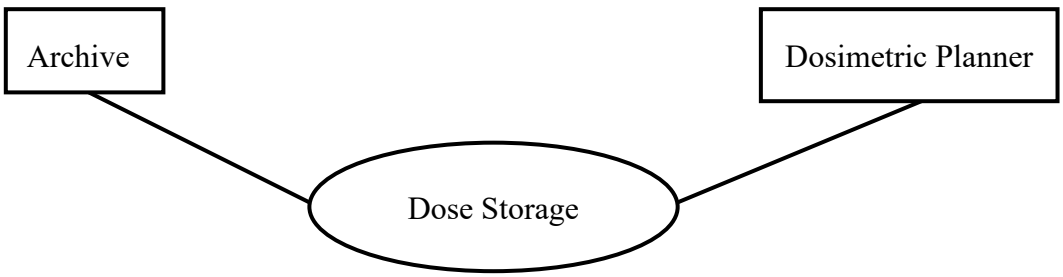
## 3.5 Dose Storage [RO-BRTO-II-5]

This corresponds to [RO-BRTO-II-5] of the IHE-RO Technical Framework. Transaction RO-[BRTO-II-5] is used by the ***Archive*** and ***Dosimetric Planner*** Actors.

### 3.5.1 Scope

In the Dose Storage transaction, the ***Dose planner*** sends the newly created Dose to the ***Archive***.

### 3.5.2 Use Case Roles




**Actor**: Dosimetric Planner

**Role**: Transmit generated Dose to the Archive

**Actor**: Archive

**Role**: Receives and stores Doses from the Dosimetric Planner

### 3.5.3 Referenced Standards

DICOM 2018d Edition PS3.4: Storage Service Class.

### 3.5.4 Messages

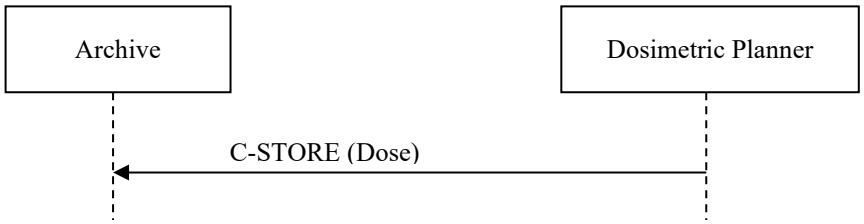



**Figure 3.5.4-1: Interaction Diagram**

#### 3.5.4.1 Dose Storage

##### 3.5.4.1.1 Trigger Events

The ***Dosimetric Planner*** transfers the Dose to the ***Archive*** within a DICOM association.

##### 3.5.4.1.2 Message Semantics

The ***Dosimetric Planner*** uses the DICOM C-STORE command to transfer the Dose. The ***Dosimetric Planner*** is the DICOM Storage SCU and the ***Archive*** is the DICOM Storage SCP.

Also refer to RO TF-3: 7.3.5.1.1 for an overview of Dose specific requirements on the DICOM attributes that are included in an RT Dose object.

##### 3.5.4.1.3 Representation of Dose

This transaction shall support dose represented as a three-dimensional dose array sampled onto transverse image planes in the same DICOM Patient coordinate system Frame of Reference as the diagnostic images used to compute it. The dose image shall be orthogonal with respect to the DICOM patient coordinate system.

Not supported are point doses, projection of dose onto an oblique plane and isodose contours. The dose pixels shall represent absolute physical dose in units of Gray. The value of Dose Units (3004,0002) shall be GY. The value of Pixel Representation (0028,0103) shall be 0; negative dose values shall not be present.

##### 3.5.4.1.4 Expected Actions

The ***Archive*** will store the received Dose.

The DICOM RT Dose object will be stored such that it can be later retrieved (see Dose Retrieval [RO-BRTO-II-6]) in a fashion meeting the requirements defined for a DICOM level 2 SCP (refer to DICOM PS 3.4 B.4.1).

### 3.5.5 Security Considerations

There are no explicit security considerations.

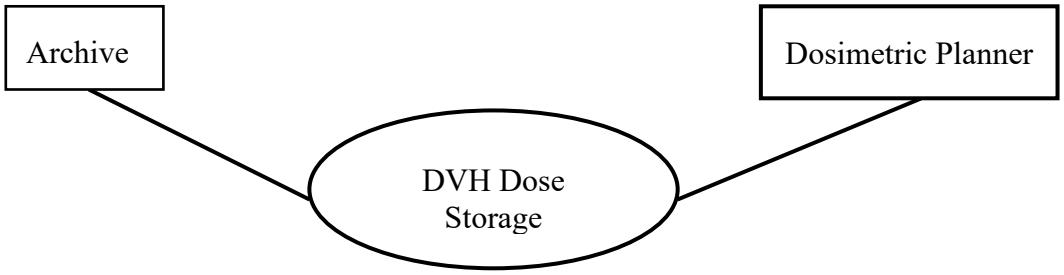
## 3.6 DVH Dose Storage [RO-BRTO-II-3]

This corresponds to [RO-BRTO-II-3] of the IHE-RO Technical Framework. Transaction [RO-BRTO-II-3] is used by the ***Archive, Dosimetric Planner and Dose Displayer*** Actors.

### 3.6.1 Scope

In the DVH Dose Storage transaction, the ***Dose Planner*** sends the newly created DVH to the ***Archive***.

### 3.6.2 Use Case Roles




**Actor**: Dosimetric Planner

**Role**: Transmit generated DVH Dose to the Archive

**Actor**: Archive

**Role**: Receives and stores DVH Doses from the Dosimetric Planner

### 3.6.3 Referenced Standard

DICOM 2018d Edition PS3.4: Storage Service Class.

### 3.6.4 Messages

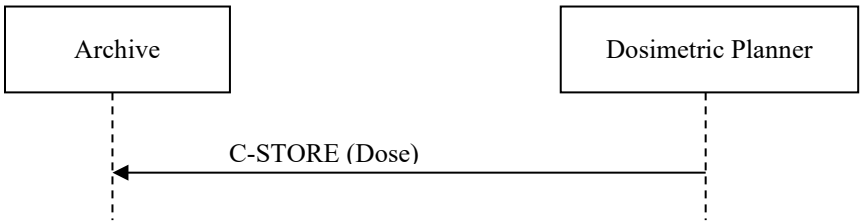



**Figure 3.6.4-1: Interaction Diagram**

#### 3.6.4.1 DVH Dose Storage

##### 3.6.4.1.1 Trigger Events

The ***Dosimetric Planner*** transfers the DVH Dose to the ***Archive*** within a DICOM association.

#### 3.6.4.1.2 Message Semantics

The ***Dosimetric Planner*** uses the DICOM C-STORE command to transfer the DVH Dose. The ***Dosimetric Planner*** is the DICOM Storage SCU and the ***Archive*** is the DICOM Storage SCP.

Also refer to RO TF-3: 7.3.5.1.1 and RO TF-3: 7.4.13.4.1 for an overview of DVH Dose specific requirements on the DICOM attributes that are included in an RT Dose object.

#### 3.6.4.1.3 Expected Actions

The ***Archive*** will store the received DVH Dose.

The DICOM RT Dose object will be stored such that it can be later retrieved (see DVH Dose Retrieval [RO-BRTO-II-4]) in a fashion meeting the requirements defined for a DICOM level 2 SCP (Refer to DICOM PS 3.4 B.4.1). The DVH content may be stored in the same RT Dose instance as the volumetric dose grid, or may be stored in a separate RT Dose instance, containing only the DVH content.

### 3.6.5 Security Considerations

There are no explicit security considerations.

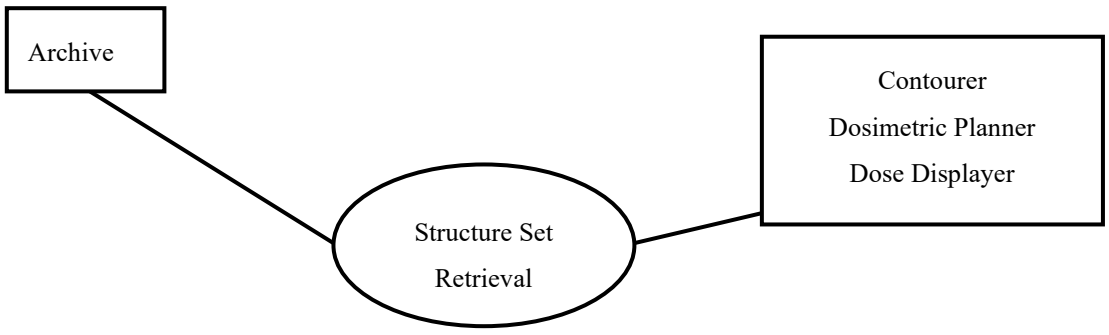
## 3.7 Structure Set Retrieval [RO-7]

This corresponds to [RO-7] of the IHE-RO Technical Framework. Transaction [RO-7] is used by the ***Archive, Contourer, Dosimetric Planner, and Dose Displayer*** Actors.

### 3.7.1 Scope

In the Structure Set Retrieval Transaction, the ***Archive*** stores an RT Structure Set on a ***Contourer***, ***Dosimetric Planner***, or ***Dose Displayer***.

### 3.7.2 Use Case Roles




**Actor**: Archive

**Role**: Sends RT Structure Set to Contourer, Dosimetric Planner, or Dose Displayer

**Actor**: Contourer, Dosimetric Planner, or Dose Displayer

**Role**: Stores RT Structure Set received from Archive

### 3.7.3 Referenced standards

DICOM 2018d Edition PS3.4: Storage Service Class.

### 3.7.4 Messages

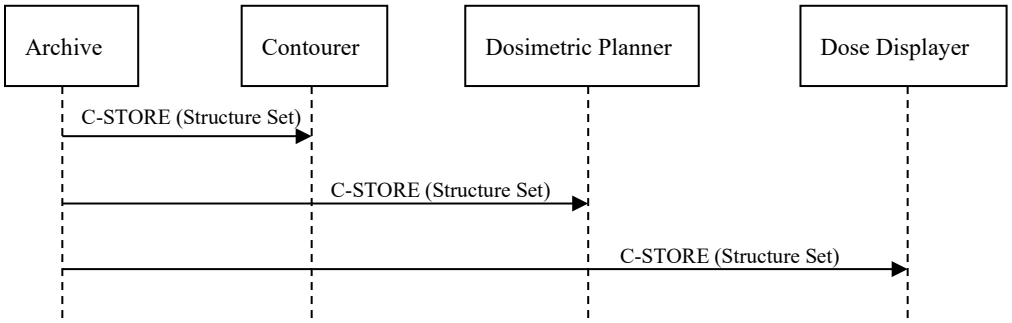



**Figure 3.7.4-1: Interaction Diagram**

#### 3.7.4.1 Structure Set Retrieval

##### 3.7.4.1.1 Trigger Events

The user of the ***Contourer*** determines that a new set of contours is to be based upon an existing RT Structure Set and requests that the ***Archive*** send this Structure Set to the ***Contourer***.

The user of the ***Dosimetric Planner*** determines that a new Dosimetric Plan is to be based upon an existing RT Structure Set and requests that the ***Archive*** send this RT Structure Set to the ***Dosimetric Planner***.

The user of the ***Dose Displayer*** determines that a dose display is to be based upon an existing Structure Set and requests that the ***Archive*** send this Structure Set to the ***Dose Displayer***.

The mechanism(s) by which these transfers are initiated is outside the scope of this profile.

##### 3.7.4.1.2 Message Semantics

The message semantics are defined by the DICOM Storage SOP Class. The ***Contourer***, ***Dosimetric Planner***, or ***Dose Displayer*** is the storage SCP and the ***Archive*** is the storage SCU.

Also refer to RO TF-3: 7.3.4.1.1 for an overview of the specific requirements on the DICOM attributes that are included in an RT Structure Set object.

##### 3.7.4.1.3 Expected Actions

The ***Contourer*** will store all of the RT Structure Set, and will relate it to images based on the study, series, and image identification information. The contours contained will then be available to the user of the ***Contourer*** for use in construction a new set of contours which will later be exported as a structure set ([RO-2]). This new RT Structure Set will have the same Frame of Reference UID and Study Instance UID of the original images and structure set. It may have the same Series Instance UID as the original RT Structure Set.

The ***Dosimetric Planner*** will store the RT Structure Set, and will relate it to images based on the study, series, and image identification information. These contours contained in this RT Structure Set will then be available to the user of the ***Dosimetric Planner*** for use in construction of a Dosimetric Plan which will later be exported ([RO-4]). These images will also be involved in the calculation of a related dose, which will be exported later as an RT Dose ([RO-BRTO-II-5]).

The ***Dose Displayer*** will store the RT Structure Set, and will relate it to images based on the study, series, and image identification information. These contours contained in this RT Structure Set will then be available to the user of the ***Dose Displayer*** for display in relation to images, doses in the same Frame of Reference.

If the stored RT Structure Set contains off-slice information ([RO-BRTO-II-2]) and the ***Contourer***, ***Dosimetric Planner*** or ***Dose Displayer*** does not support this, the consuming actor has to handle it safely.

### 3.7.5 Security Considerations

There are no explicit security considerations.

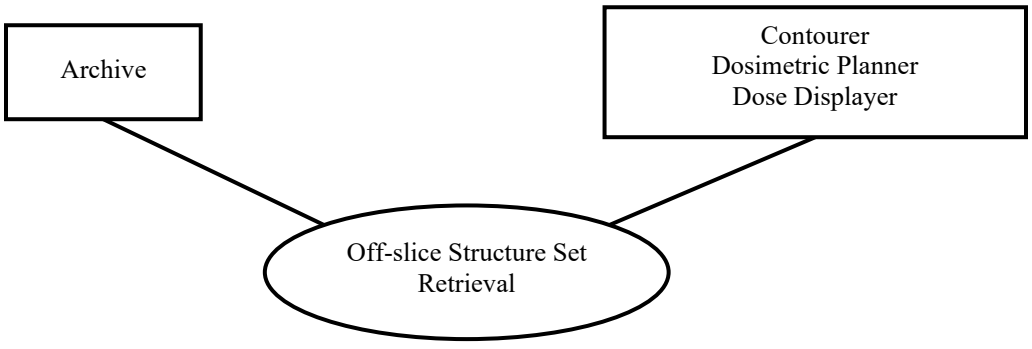
## 3.8 Off-slice Structure Set Retrieval [RO-BRTO-II-2]

This corresponds to [RO-BRTO-II-2] of the IHE-RO Technical Framework. Transaction [RO-BRTO-II-2] is used by the ***Archive, Contourer, Dosimetric Planner,*** *and* ***Dose Displayer*** Actors.

### 3.8.1 Scope

In the Off-slice Structure Set Retrieval Transaction, the Archive stores a Structure Set on a Contourer, Dosimetric Planner, or Dose Displayer.

### 3.8.2 Use Case Roles




**Actor**: Archive

**Role**: Sends off-slice RT Structure Set to Contourer, Dosimetric Planner or Dose Displayer

**Actor**: Contourer, Dosimetric Planner or Dose Displayer

**Role**: Stores off-slice RT Structure Set received from Archive

### 3.8.3 Referenced standards

DICOM 2018d Edition PS3.4: Storage Service Class.

### 3.8.4 Messages

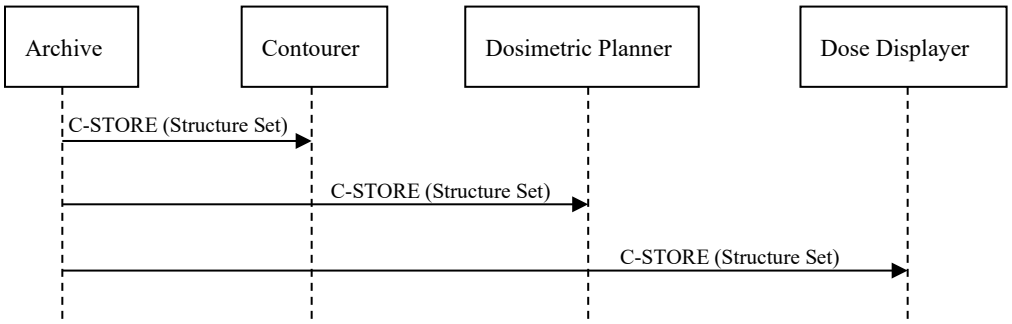



**Figure 3.8.4-1: Interaction Diagram**

#### 3.8.4.1 Off-Slice Structure Set Retrieval

##### 3.8.4.1.1 Trigger Events

The user of the ***Contourer*** determines that a new set off-slice contours is to be based upon an existing Structure Set and requests that the ***Archive*** send this Structure Set to the ***Contourer***.

The user of the ***Dosimetric Planner*** determines that a new dosimetric plan is to be based upon an existing Structure Set requests that the ***Archive*** send this Structure Set to the ***Dosimetric Planner***.

The user of the ***Dose Displayer*** determines that a dose display is to be based upon an existing Structure Set and requests that the ***Archive*** send this Structure Set to the ***Dose Displayer***.

The mechanism(s) by which these transfers are initiated is outside the scope of this profile.

##### 3.8.4.1.2 Message Semantics

The message semantics are defined by the DICOM Storage SOP Class. The ***Contourer***, ***Dosimetric Planner***, or ***Dose Displayer*** is the storage SCP and the ***Archive*** is the storage SCU.

Also refer to RO TF-3: 7.3.4.1.1 and RO TF-3: 7.4.8.2.2 for an overview of the specific requirements on the DICOM attributes that are included in an RT Structure Set instance. Additionally, the attributes mentioned in RO TF-3: 7.4.8.2.2 have to be present according to their requirements.

##### 3.8.4.1.3 Expected Actions

The receiving actor will receive the RT Structure Set, and will relate it to the referenced image instances. Contours not located on image slices will be arranged according to referenced contour

number in the Attached Contours (3006,0049). The contours contained will then be available to the user of the receiving actor.

The off-slice display has to be able to show the additional off-slice features (e.g., gaps).

### 3.8.5 Security Considerations

There are no explicit security considerations.

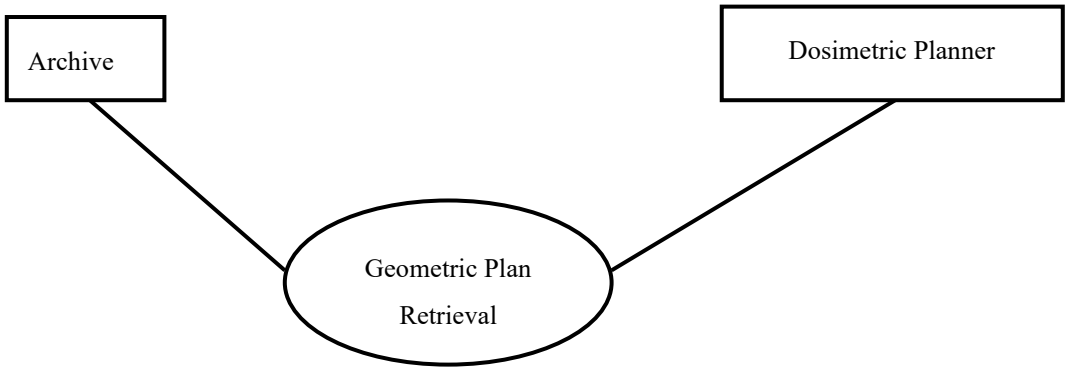
## 3.9 Geometric Plan Retrieval [RO-8]

This corresponds to [RO-8] of the IHE-RO Technical Framework. Transaction [RO-8] is used by the ***Archive*** and ***Dosimetric Planner*** Actors.

### 3.9.1 Scope

In the Geometric Plan Retrieval Transaction, the requested Geometric Plan is transferred from the ***Archive*** to the ***Dosimetric Planner***.

### 3.9.2 Use Case Roles




**Actor**: Dosimetric Planner

**Role**: Receives requested Geometric Plan from the Archive

**Actor**: Archive

**Role**: Sends requested Geometric Plan instance to the Dosimetric Planner

### 3.9.3 Referenced standards

DICOM 2018d Edition PS3.4: Storage Service Class.

### 3.9.4 Messages

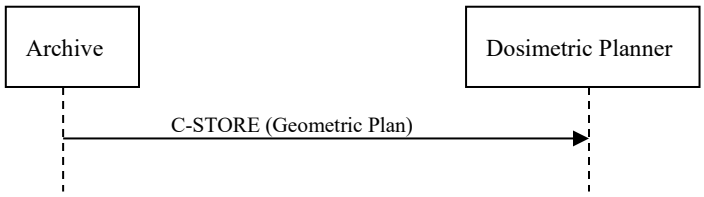



**Figure 3.9.4-1: Interaction Diagram**

#### 3.9.4.1 Geometric Plan Retrieval

##### 3.9.4.1.1 Trigger Events

The user of the ***Dosimetric Planner*** selects a Geometric Plan for completion of the plan and dose calculation.

##### 3.9.4.1.2 Message Semantics

The plan shall be sent from the ***Archive*** to the ***Dosimetric Planner***. Also refer to Section RO TF-3: 7.3.2.2.5 for an overview of Geometric Plan specific requirements on the DICOM attributes that are included in an RT Plan object.

##### 3.9.4.1.3 Expected Actions

The ***Archive*** shall return the requested Geometric Plan to the ***Dosimetric Planner***. The ***Dosimetric Planner*** shall validate the received Geometric Plan. In cases where the received Geometric Plan is valid, it shall be loaded into the ***Dosimetric Planner***. In cases where it is not valid, a warning message shall be displayed to the user, indicating the reason why it is not valid.

### 3.9.5 Security Considerations

There are no explicit security considerations.

## 3.10 Dosimetric Plan Retrieval [RO-9]

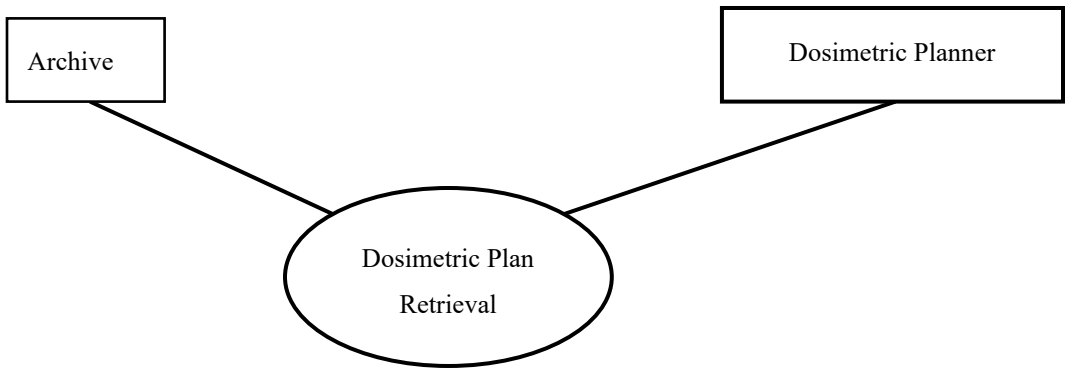
This corresponds to [RO-9] of the IHE-RO Technical Framework. Transaction [RO-9] is used by the ***Archive*** and ***Dose Displayer*** Actors.

### 3.10.1 Scope

In this transaction, the ***Dose Displayer*** retrieves the plan containing the references to the structure set from the ***Archive***.

### 3.10.2 Use Case Roles




**Actor**: Dose Displayer

**Role**: Accepts plan from Archive.

**Actor**: Archive

**Role**: Transmits plan to Dose Viewer.

### 3.10.3 Referenced Standards

DICOM 2018d Edition, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.10.4 Messages

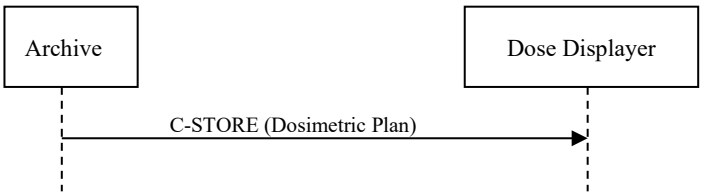



**Figure 3.10.4-1: Interaction Diagram**

#### 3.10.4.1 Dosimetric Plan Retrieval

##### 3.10.4.1.1Trigger Events

The ***Archive*** transfers the Dosimetric Plan to the ***Dose Displayer***. This action is initiated by the user in advance of the dose viewing session.

##### 3.10.4.1.2 Message Semantics

The ***Archive*** uses the DICOM C-STORE message to transfer the plan. The ***Archive*** is the DICOM Storage SCU and the ***Dose Displayer*** is the DICOM Storage SCP.

Also refer to RO TF-3: 7.3.2.2.1 and RO TF-3: 7.3.2.2.4 for an overview of the RT Plan specific requirements on the DICOM attributes that are included in a Dosimetric Plan.

### 3.10.5 Security Considerations

There are no explicit security considerations.

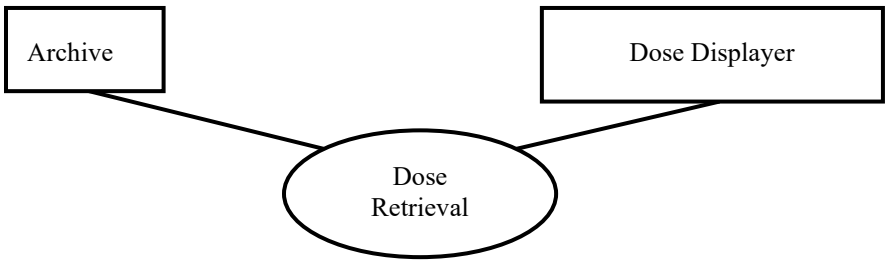
## 3.11 Dose Retrieval [RO-BRTO-II-6]

This corresponds to [RO-BRTO-II-6] of the IHE-RO Technical Framework. Transaction [RO-BRTO-II-6] is used by the ***Archive*** and ***Dose Displayer*** Actors.

### 3.11.1 Scope

In the Dose Retrieval Transaction, the requested Dose is transferred from the ***Archive*** to the ***Dose Displayer***.

### 3.11.2 Use Case Roles




**Actor**: Dose Displayer

**Role**: Receives requested Dose from the Archive

**Actor**: Archive

**Role**: Sends requested Dose instance to the Dose Displayer

### 3.11.3 Referenced standards

DICOM 2018d Edition PS3.4: Storage Service Class.

### 3.11.4 Messages

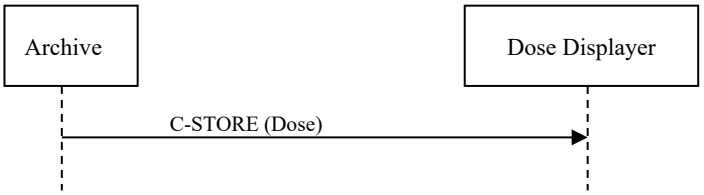



**Figure 3.11.4-1: Interaction Diagram**

#### 3.11.4.1 Dose Retrieval

##### 3.11.4.1.1 Trigger Events

The user of the ***Dose Displayer*** selects a Dose for display in the context of a particular CT Image Set and the targets and avoidance structures defined by an RT Structure Set.

##### 3.11.4.1.2 Message Semantics

The ***Archive*** uses the DICOM C-STORE message to transfer the dose. The ***Archive*** is the DICOM Storage SCU and the ***Dose Displayer*** is the DICOM Storage SCP.

Also refer to RO TF-3: 7.3.5.1.1 for an overview of Dose specific requirements on the DICOM attributes that are included in an RT Dose object.

##### 3.11.4.1.3 Representation of Dose

This transaction shall support Dose represented as a three-dimensional dose array sampled onto transverse image planes in the same DICOM Patient coordinate system Frame of Reference as the diagnostic images used to compute it. The dose image shall be orthogonal with respect to the DICOM patient coordinate system. The dose planes shall have equidistant spacing with allowed tolerance of 0.01mm.

Not supported are point doses, projection of dose onto an oblique plane and isodose contours. The dose pixels shall represent absolute physical dose in units of Gray. The value of Dose Units (3004,0002) shall be GY. The value of Pixel Representation (0028,0103) shall be 0; negative dose values shall not be present.

##### 3.11.4.1.4 Expected Actions

Upon receiving the request for retrieval, the ***Archive*** shall return the requested Dose to the ***Dose Displayer***.

### 3.11.5 Security Considerations

There are no explicit security considerations.

## 3.12 DVH Dose Retrieval [RO-BRTO-II-4]

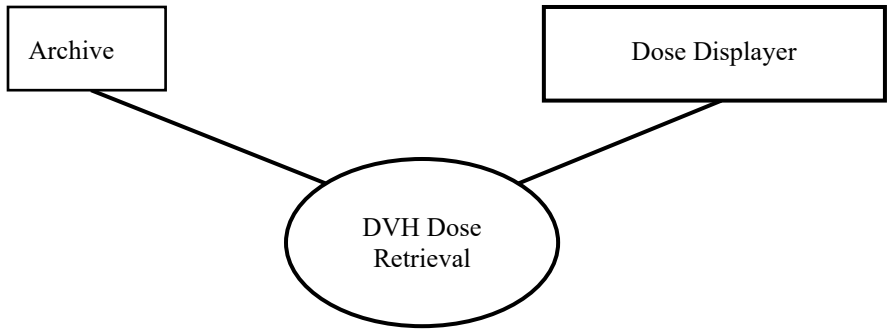
In the DVH Dose Retrieval Transaction, the requested DVH Dose is transferred from the ***Archive*** to the ***Dose Displayer***.

### 3.12.1 Scope

In the DVH Dose Retrieval Transaction, the requested DVH Dose is transferred from the ***Archive*** to the ***Dose Displayer***.

### 3.12.2 Use Case Roles




**Actor**: Dose Displayer

**Role**: Receives requested DVH Dose from the Archive

**Actor**: Archive

**Role**: Sends requested DVH Dose instance to the Dose Displayer

### 3.12.3 Referenced standards

DICOM 2018d Edition PS3.4: Storage Service Class.

### 3.12.4 Messages

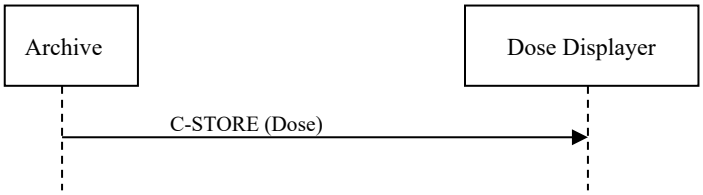



**Figure 3.12.4-1: Interaction Diagram**

#### 3.12.4.1 DVH Dose Retrieval

##### 3.12.4.1.1 Trigger Events

The user of the ***Dose Displayer*** selects a DVH Dose for display in the context of a particular dose distribution defined by itself or another RT Dose and the targets and avoidance structures defined by an RT Structure Set.

##### 3.12.4.1.2 Message Semantics

The ***Archive*** uses the DICOM C-STORE message to transfer the dose. The ***Archive*** is the DICOM Storage SCU and the ***Dose Displayer*** is the DICOM Storage SCP.

Also refer to RO TF-3: 7.3.5.1.1 and RO TF-3: 7.4.13.4.1 for an overview of DVH Dose specific requirements on the DICOM attributes that are included in an RT Dose object.

The DVH content may be stored in the same RT Dose instance as the volumetric dose grid, or may be stored in a separate RT Dose instance, containing only the DVH content.

#### 3.12.4.1.4 Expected Actions

Upon receiving the request for retrieval, the ***Archive*** shall return the requested DVH Dose to the ***Dose Displayer***.

### 3.12.5 Security Considerations

There are no explicit security considerations.

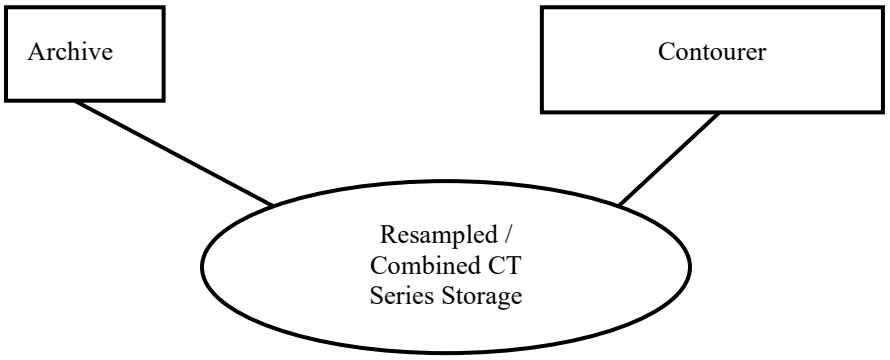
## 3.13 Resampled/Combined CT Series Storage[RO-11]

This corresponds to [RO-11] of the IHE-RO Technical Framework. Transaction [RO-11] is used by the ***Archive*** and ***Contourer*** Actors.

### 3.13.1 Scope

In the Resampled/Combined CT Series Storage Transaction, the ***Contourer*** stores CT Images which have been combined or resampled into a single series on the ***Archive***.

### 3.13.2 Use Case Roles




**Actor**: Contourer

**Role**: Sends CT Images to the Archive

**Actor**: Archive

**Role**: Stores CT Images received from Contourer

### 3.13.3 Referenced standards

DICOM 2018d Edition PS3.4: Storage Service Class.

### 3.13.4 Messages

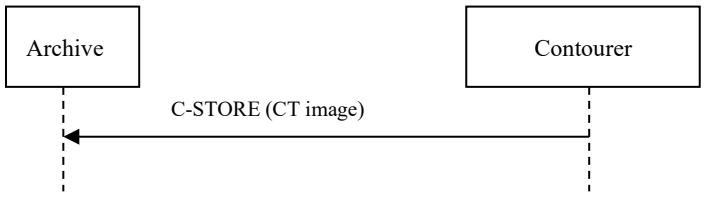



**Figure 3.13.4-1: Interaction Diagram**

#### 3.13.4.1 Resampled/Combined CT Series Storage

##### 3.13.4.1.1 Trigger Events

The ***Contourer*** has constructed a new CT Series. It has either combined CT Images from multiple series or has resampled CT Images from a single series to yield a more desirable slice spacing. The ***Contourer*** must export a single CT image series including all images on which Structure Set contours are defined. This new series must be stored on the ***Archive*** to make the images available for subsequent planning or review. This transaction must be performed prior to storage of a structure set ([RO-2]) which is based upon this new series.

##### 3.13.4.1.2 Message Semantics

The message semantics are defined by the DICOM Storage SOP Class. The ***Archive*** is the SCP of this service class, and the ***Contourer*** is the SCU of this service Class.

Also refer to RO TF-3: 7.3.3.2.3 for an overview of the specific requirements on the DICOM attributes that are included in a CT Image object. In particular, these CT Images are required to share a study instance UID, and a frame of reference UID, and a series instance UID.

##### 3.13.4.1.3 Expected Actions

Upon receiving the CT Series, the ***Archive*** will store the images, and will make this series available for subsequent retrieval ([RO-1]).

### 3.13.5 Security Considerations

There are no explicit security considerations.

## 3.14 Registered Structure Set Storage [RO-MMRO-1]

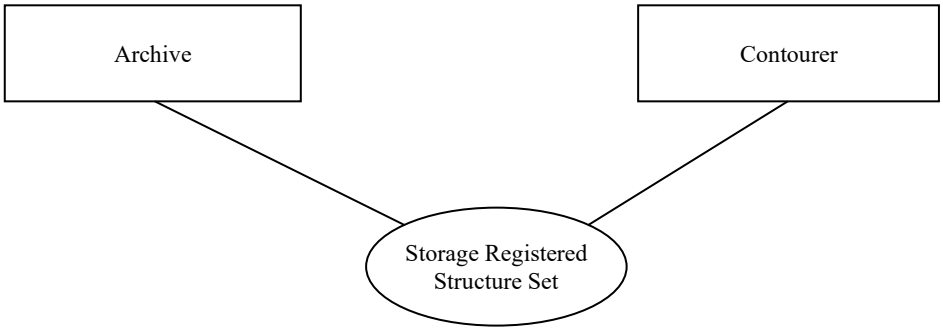
This section corresponds to Transaction [RO-MMRO-1] of the IHE-RO Technical Framework. Transaction [RO-MMRO-1] is used by the ***Registered Contourer*** and ***Archive*** Actors.

### 3.14.1 Scope

In the Registered Structure Set Storage Transaction, the Registered Contourer stores a Structure Set on an Archive to make it available.

### 3.14.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Archive |
| **Role:** | Receive and store a Structure Set instance from the Registered Contourer |
| **Actor:** | Registered Contourer |
| **Role:** | Send a Structure Set instance for storage |

### 3.14.3 Referenced standards

DICOM 2018d PS3.4: Storage Service Class

DICOM 2018d PS 3.4: RT Structure Set Storage

### 3.14.4 Messages

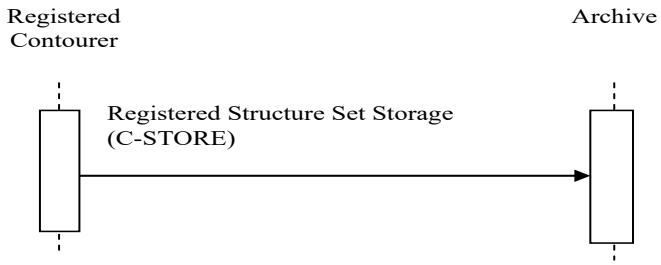



**Figure 3.14.4-1: Interaction Diagram**

#### 3.14.4.1 Registered Structure Set Storage

##### 3.14.4.1.1 Trigger Events

The user of the Registered Contourer selects a one or more Structure Sets to store.

#### 3.14.4.1.2 Message Semantics

The message semantics are defined by the DICOM Storage SOP Class. The Registered Contourer is the storage SCU and the Archive is the storage SCP.

The Contours in the ROI Contour module are restricted to Geometric Type POINT and CLOSED_PLANAR. ROI contours must correspond to exported image plane locations. If a system does not support unequally-spaced slices, for example, that system is responsible for creating a resampled image set (see [RO-11]) and creating a structure set in which the ROI contours reference the resampled image set. Absence of an ROI contour on a slice between slices on which contours are defined implies that the ROI does not intersect that slice.

An RT Structure Set object generated by a Registered Contourer will reference images from a single series and share the Frame of Reference UID of that series. It is implied that the coordinates in that object will exist in the coordinate system identified by the FoR UID. Finally, contours will exist on the same plane as the referenced image slices.

To make ROI's available to the downstream planning process or to the 2018 Basic RT Objects Interoperability II Profile's Contourer Actor, the Registrator Actor shall be able not only to transform contours from a source Frame of Reference to the Registered Frame of Reference, but also to resample the contour to the planes of the images referenced in the RT Structure Set which corresponds to the Registered Frame of Reference.

The set of contours transmitted in an RT Structure Set must not assume interpolation of contours across image slices. Absence of an ROI contour on a slice between slices on which contours are defined implies that the ROI does not intersect that slice.

The MMRO Profile has implicit limitations imposed by its dependency on the IHE-RO BRTO Profile. These limitations are described in the MMRO Profile description in Volume 1 of the IHE-RO Technical Frameworks.

Also refer to RO TF-3: 7.3.4.1.2 for an overview of the specific requirements on the DICOM attributes that are included in an RT Structure Set object. In particular, the structure set must share a single frame of reference UID with the images.

#### 3.14.4.1.3 Expected Actions

Upon receipt of the Structure Set, the Archive shall store it. This Structure Set is then available for subsequent retrieval (RO-7 and MMRO-4).

### 3.14.5 Expected Actions

There are no explicit considerations.

## 3.15 Registered Structure Set Retrieval [RO-MMRO-2]

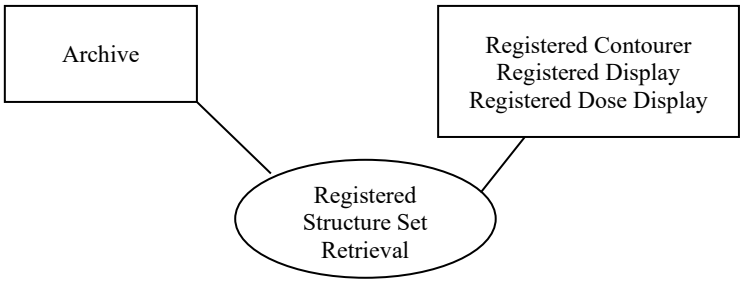
This section corresponds to Transaction [RO-MMRO-2] of the IHE-RO Technical ***Framework. Transaction*** [RO-MMRO-2] ***is used by the Registered Contourer, Registered Display, Registered Dose Display***, and ***Archive*** Actors.

### 3.15.1 Scope

In the Registered Structure Set Retrieval Transaction, the ***Archive*** stores a Structure Set on a ***Registered Contourer***, ***Registered Display*** or ***Registered Dose Display***.

### 3.15.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Archive |
| **Role:** | Send Registered Structure Set instance(s) to the receiving actor |
| **Actor:** | Registered Contourer, Registered Display, Registered Dose Display |
| **Role:** | Receive Registered Structure Set instances from the Archive |

### 3.15.3 Referenced standards

DICOM 2018d PS3.4: Storage Service Class

DICOM 2018d PS 3.4: RT Structure Set Storage

### 3.15.4 Messages

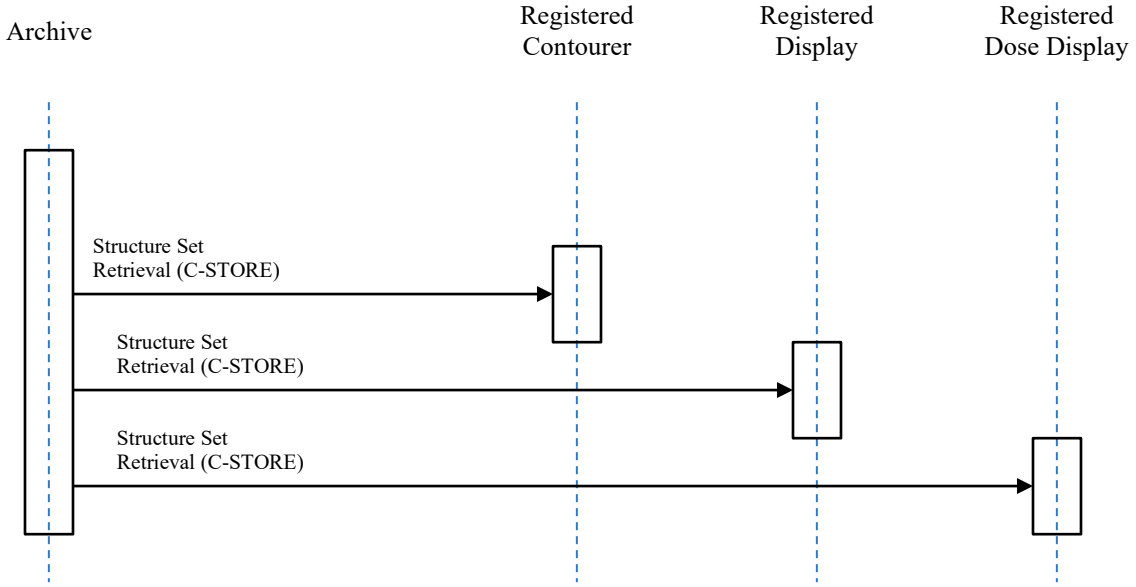



**Figure 3.15.4-1: Interaction Diagram**

#### 3.15.4.1 Registered Structure Set Retrieval

##### 3.15.4.1.1 Trigger Events

The user of the ***Registered Contourer*** determines that a new set of contours is to be based upon an existing Structure Set, and requests that the ***Archive*** send this Structure Set to the ***Registered Contourer***.

The user of the ***Registered Display*** determines that a display is to be based upon an existing Structure Set, and requests that the ***Archive*** send this Structure Set to the ***Registered Display***.

The user of the ***Registered Dose Display*** determines that a dose display is to be based upon an existing Structure Set, and requests that the ***Archive*** send this Structure Set to the ***Registered Dose Display***.

The mechanism(s) by which these transfers are initiated is outside the scope of this profile.

##### 3.15.4.1.2 Message Semantics

The message semantics are defined by the DICOM Storage SOP Class. The ***Registered Contourer***, ***Registered Display*** or ***Registered Dose Display*** is the storage SCP and the ***Archive*** is the storage SCU.

Absence of an ROI contour on a slice between slices on which contours are defined implies that the ROI does not intersect that slice.

Also refer to RO TF-3: 7.3.4.1.2 for an overview of the specific requirements on the DICOM attributes that are included in an RT Structure Set object. In particular, the structure set must

have the same study instance UID, but a different series instance UID, than the CT image series upon which the contours are based.

#### 3.15.4.1.3 Expected Actions

The ***Registered Contourer*** will upload image data sets, related structure sets and spatial registration objects. It will present the user with a ***Registered Display***, and allow the user to then construct a new set of contours which will later be exported as a new structure set (MMRO-3: Registered Structure Set Storage). The new structure set will have the same Frame of Reference UID and Study Instance UID of the original base image data set and structure set.

The ***Registered Display*** will load image data sets, related structure sets and spatial registration objects. It will display the information to the user.

The ***Registered Dose Display*** will load image data sets, related structure sets, dose and spatial registration objects. It will display the information to the user.

The ***Registered Contourer*** will load all of the Structure Set, and will relate it to images based on the Frame of Reference UID. The contours contained will then be available to the user of the ***Registered Contourer*** for use in construction a new set of contours which will later be exported as a structure set (MMRO-3: Registered Structure Set Storage). This new structure set will have the same frame of reference UID and study instance UID of the original images and structure set.

### 3.15.5 Security Considerations

There are no specific considerations.

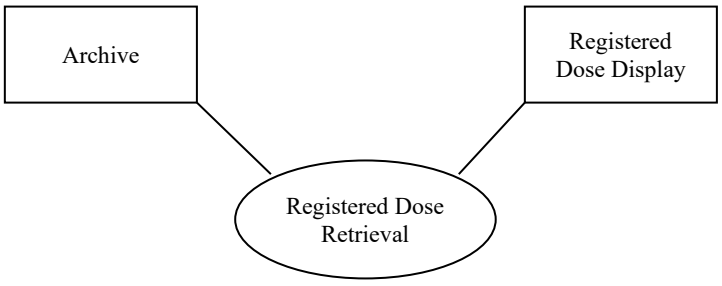
## 3.16 Registered Dose Retrieval [RO-MMRO-3]

This section corresponds to [RO-MMRO-3] of the IHE-RO Technical Framework. Transaction [RO-MMRO-3] is used by the ***Archive*** and ***Registered Dose Display*** Actors.

### 3.16.1 Scope

In the Registered Dose Retrieval Transaction, the requested RT Dose is transferred from the ***Archive*** to the ***Registered Dose Display***.

### 3.16.2 Use Case Roles



| | |
|---|---|
| **Actor:** | Archive |
| **Role:** | Sends Registered Dose instance to the Registered Dose Display |
| **Actor:** | Registered Dose Display |
| **Role:** | Receives the Registered Dose instance from the Archive |

### 3.16.3 Referenced Standards

DICOM 2018d PS3.4: Storage Service Class

DICOM 2018d PS 3.4: RT Dose Storage

### 3.16.4 Messages

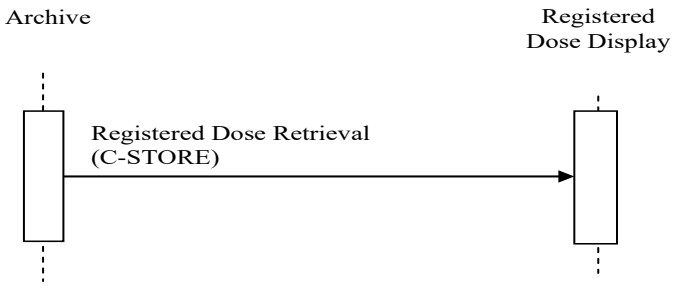



**Figure 3.16.4-1: Interaction Diagram**

#### 3.16.4.1 Registered Dose Retrieval

##### 3.16.4.1.1 Trigger Events

The user of the ***Registered Dose Display*** selects an RT Dose instance for display in the context of a one or more CT Image Sets and the targets and avoidance structures defined by corresponding RT Structure Set.

##### 3.16.4.1.2 Message Semantics

The ***Archive*** uses the DICOM C-STORE message to transfer the dose. The ***Archive*** is the DICOM Storage SCU and the ***Registered Dose Display*** is the DICOM Storage SCP.

This transaction shall support Dose represented as a three-dimensional dose array sampled onto axial image planes in the same DICOM Patient coordinate system Frame of Reference as the diagnostic images used to compute it. The dose image shall be orthogonal with respect to the DICOM patient coordinate system: the value of Image Orientation (Patient) (0020,0037) shall be [±1, 0, 0, 0, ±1, 0], within an uncertainty of 0.001 Radians. Dose Planes may be irregularly spaced, and they need not correspond to image planes.

Not supported are point doses, projection of dose onto an oblique plane, iso-dose contours and dose-volume histograms. The dose pixels shall represent absolute physical dose in units of Gray.

The value of Dose Units (3004,0002) shall be GY. The value of Pixel Representation (0016,0103) shall be 0; negative dose values shall not be present.

The RT Dose shall always share the same Frame of Reference as the related RT Plan.

#### 3.16.4.1.3 Expected Actions

Upon receiving the request for retrieval, the ***Archive*** shall return the requested RT Dose to the ***Registered Dose Display***. The ***Registered Dose Display*** shall validate the received RT Dose. If the received RT Dose is valid, it shall be loaded in the ***Registered Dose Display***. If it is not valid, a warning message shall be displayed to the user, indicating the reason why it is not valid.

The received Dose will be displayed in the same coordinate system as the image set on which it was computed.

### 3.16.5 Security Considerations

There are no specific considerations.

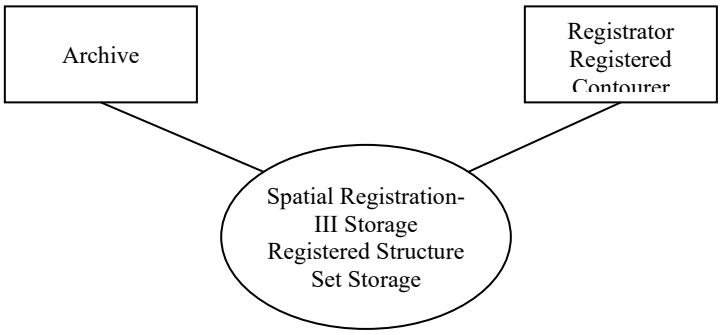
## 3.17 Spatial Registration Storage [RO-MMRO-4]

This section corresponds to the Spatial Registration Storage transaction of the IHE-RO Technical Framework. Transaction [RO-MMRO-4] is used by the ***Archive*** and ***Registrator*** Actors.

### 3.17.1 Scope

In the Spatial Registration-III Storage transaction, the ***Registrator*** sends one or more Spatial Registration instances to the ***Archive***. Spatial registration objects define how the pixel coordinates of one image data set are transformed to another coordinate system (for example to a coordinate system defined by another image data set thus allowing each dataset to be spatially aligned).

### 3.17.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Archive |
| **Role:** | Accept and store Spatial Registration instances from Registrator Actors |

| | |
|---|---|
| **Actor:** | Registrator |
| **Role:** | Create and transmit Spatial Registration instances to an Archive |

### 3.17.3 Referenced Standards

DICOM 2018d PS 3.4: Storage Service Class

DICOM 2018d PS 3.4: Spatial Registration Storage

### 3.17.4 Messages

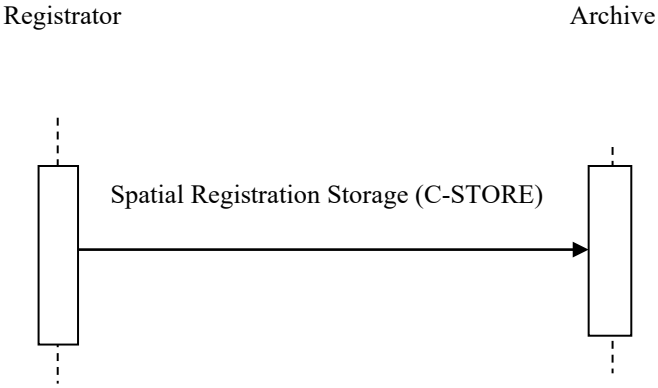



**Figure 3.17.4-1: Interaction Diagram**

#### 3.17.4.1 Spatial Registration-III Storage

##### 3.17.4.1.1 Trigger Events

A ***Registrator*** chooses to transfer one or more Spatial Registration objects to the ***Archive***. This may follow creation of the Spatial Registration object as part of a registration process.

##### 3.17.4.1.2 Message Semantics

The ***Registrator*** uses the DICOM C-STORE message to transfer the Spatial Registration objects. The ***Registrator*** acts in the role of the DICOM Storage SCU and the ***Archive*** is the DICOM Storage SCP.

The ***Registrator*** is responsible for warning the user of mismatched patient demographics within registered series.

The Spatial Registration shall contain two Registration Sequences. Refer to DICOM 2018d PS 3.17 Figure O.4-1 for informative details on the structure of the Registration Sequences.

When registering volumetric datasets with different Frames of Reference, each Registration Sequence shall define the transformation of the corresponding Original Dataset into the Registered Frame of Reference. Typically, one of the Registration Sequences will contain an IDENTITY transform, indicating that the corresponding original dataset established the

Registered Frame of Reference. In that case the Frame of Reference of the Spatial Registration object may be the same as the Frame of Reference of that Original Dataset.

When registering more than 2 Frames of Reference each Spatial Registration object shall include a reference to the Registered Frame of Reference UID with an IDENTITY transformation as one of the elements of the Registration Sequence. Each Spatial Registration object shall specify its Frame of Reference UID attribute to be the same as the Registered Frame of Reference UID.

This profile shall not allow the re-registration of multiple series with the same Frame of Reference. The actor may re-write one or both of the series with new Frames of Reference and perform the registration on the new series. This capability is not required to satisfy this transaction.

A Registration Sequence item shall contain a Frame of Reference and a list of images which have been available to the user at the time of definition and contributed to the definition of the spatial registration. Images not included in the list of images shall not be assumed to be consistent with the Spatial Registration recorded, e.g., registration of these images is unverified.

Contrary to prior versions of this profile, the MMRO-III Profile does not have any implicit limitations: there is no requirement to specify a “base” or “primary” image set that is a CT. There is also no limitation that registrations shall be performed to a specific “base” or “primary” image set.

Modifying an existing Spatial Registration Object shall result in a new instance with a new instance UID.

The Spatial Registration object shall be stored:

- in the Study to which the Registered Frame of Reference belongs. This Study is identified by the Study UID of the images which establish the Registered Frame of Reference in the Spatial Registration objects as described above.
- in a different series from images.

Also refer to RO TF-3: 7.3.10.1.1 for an overview of the specific requirements on the DICOM attributes that are included in a Spatial Registration object.

#### 3.17.4.1.3 Expected Actions

The Archive will store the received Spatial Registration objects. The Spatial Registration objects shall be stored such that they can be later retrieved (see MMRO-III-2 Spatial Registration Retrieval) in a fashion meeting the requirements defined for a DICOM Level 2 Storage SCP (see DICOM 2018d PS 3.4 B.4.1).

### 3.17.5 Security Considerations

No specific considerations.

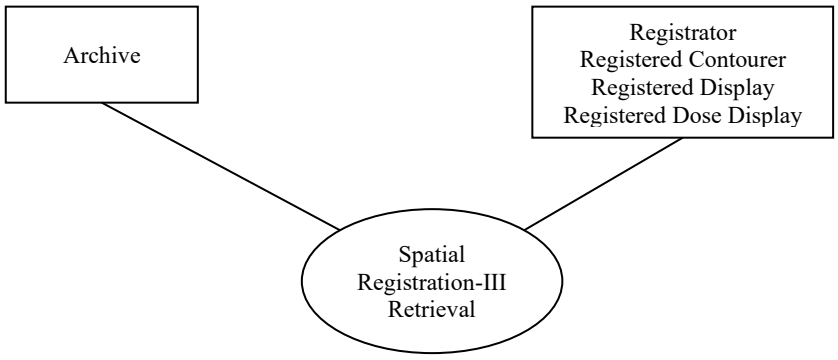
## 3.18 Spatial Registration-III Retrieval [RO-MMRO-5]

This section corresponds to Transaction [RO-MMRO-5] of the IHE-RO Technical Framework. Transaction [RO-MMRO-5] is used by the ***Registered Contourer***, ***Registered Display***, ***Registered Dose Display*** and ***Archive*** Actors. It is optionally used by the Registrator.

### 3.18.1 Scope

A ***Registered Contourer***, ***Registered Display*** or ***Registered Dose Display*** receives from an ***Archive*** one or more Spatial Registration objects carrying the transformation information to be applied to two image data sets intended for further processing or fused display. A ***Registrator*** may (optional transaction) receive from an ***Archive*** one or more Spatial Registration objects.

### 3.18.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Archive |
| **Role:** | Send Spatial Registration instance(s) to the receiving actor |
| **Actor:** | Registered Contourer, Registered Display, Registered Dose Display |
| **Role:** | Receive Spatial Registration instances from the Archive |
| **Actor:** | Registrator (optional) |
| **Role:** | Receive Spatial Registration instances from the Archive |

### 3.18.3 3.18.3 Referenced Standards

DICOM 2018d PS 3.4: Storage Service Class

DICOM 2018d PS 3.4: CT Image Storage

DICOM 2018d PS 3.4: MR Image Storage

DICOM 2018d PS 3.4: Positron Emission Tomography Image Storage

DICOM 2018d PS 3.4: Spatial Registration Storage

### 3.18.4 Messages

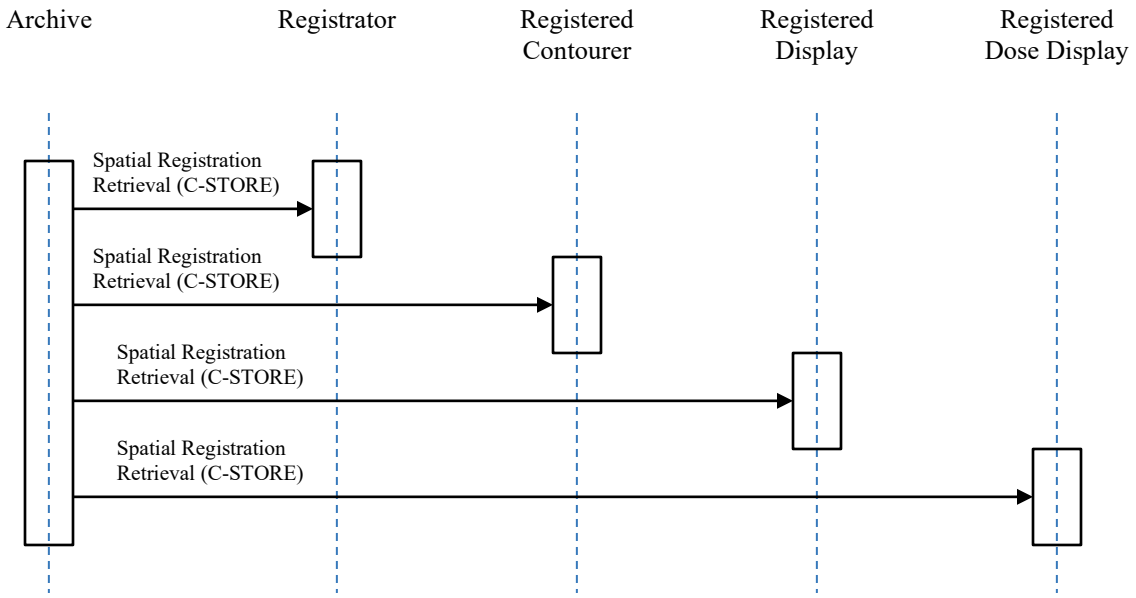



**Figure 3.18.4-1: Interaction Diagram**

#### 3.18.4.1 Spatial Registration-III Storage

##### 3.18.4.1.1 Trigger Events

The ***Registered Contourer***, ***Registered Display***, ***Registered Dose Display*** or (optionally) ***Registrator*** receives one or more specific Spatial Registration objects from the ***Archive***.

##### 3.18.4.1.2 Message Semantics

The ***Archive*** uses the DICOM C-STORE message to transfer the Spatial Registration objects. The ***Registered Contourer***, ***Registered Display*** or ***Registered Dose Display*** is the DICOM Storage SCU and the ***Archive*** is the DICOM Storage SCP.

It is the responsibility of the ***Registered Contourer***, ***Registered Display*** or ***Registered Dose Display*** to apply the Spatial Registration as defined in DICOM. Refer to DICOM 2018d PS 3.4, Annex C, for detailed descriptive semantics.

It is the responsibility of the ***Registered Contourer***, ***Registered Display*** or ***Registered Dose Display*** to verify that the Registration Sequence item in the Spatial Registration contains a Frame of Reference and a list of images. Image instances present but not included in the list of images shall not be assumed to be consistent with the Spatial Registration recorded, e.g., registration of these images is unverified.

The ***Registered Contourer***, ***Registered Display*** or ***Registered Dose Display*** may want to re-organize the order and direction of Registrations accordingly.

Also refer to RO TF-3: 7.3.10.1.1 for an overview of the specific requirements on the DICOM attributes that are included in a Spatial Registration object.

#### 3.18.4.1.3 Expected Actions

The ***Archive*** establishes a DICOM association with the ***Registered Contourer***, ***Registered Display*** or ***Registered Dose Display***, and uses the DICOM Spatial Registration Storage SOP Class to transfer the requested Spatial Registration objects.

The ***Registered Contourer***, ***Registered Display*** or ***Registered Dose Display*** shall use the most recently received instances to ensure that the most recent patient data from the Archive is displayed.

### 3.18.5 Security Considerations

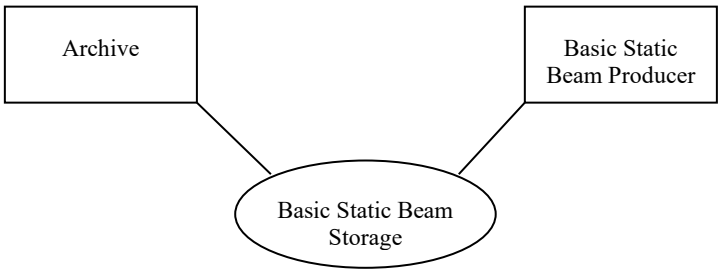
No specific considerations.

## 3.19 Basic Static Beam Storage [RO-TPPC-01]

### 3.19.1 Scope

In the Basic Static Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-01: Basic Static Beam Storage stores the plan to the Archive

### 3.19.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Basic Static Beam Producer |
| **Role:** | Creates Basic Static Beam RT Plan and stores plan to an RT Archive |
| **Actor:** | Archive |
| **Role:** | Accept and store RT Plan from Basic Static Beam Producer |

### 3.19.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

## 3.19.4 Messages

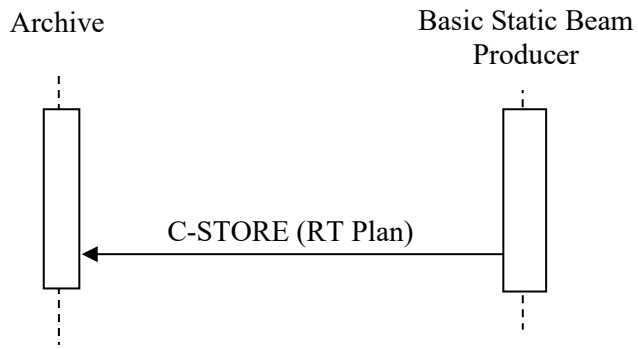



**Figure 3.19.4-1: Interaction Diagram**

### 3.19.4.1 Basic Static Beam Storage

#### 3.19.4.1.1 Trigger Events

The Basic Static Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

#### 3.19.4.1.2 Message Semantics

The Basic Static Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Basic Static Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Basic Static Beam Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

##### 3.19.4.1.2.1 Storage of RT Plan containing a Basic Static Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

#### 3.19.4.1.2.2 Optional Modifiers

The Basic Static Beam Producer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Compensator Beam Modifier | 7.4.4.3.3 |
| Bolus Beam Modifier | 7.4.4.3.1 |
| Block Beam Modifier | 7.4.4.3.2 |

#### 3.19.4.1.3 Expected Actions

The Archive stores the RT Plan.

### 3.19.5 Security Considerations

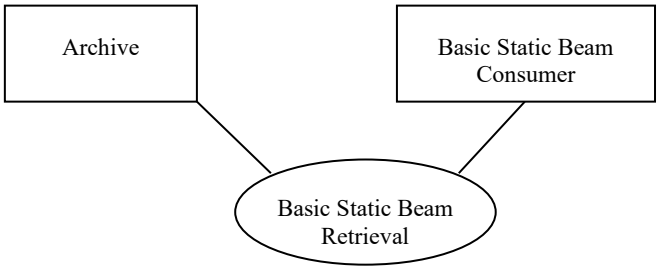
There are no specific security considerations.

## 3.20 Basic Static Beam Retrieval [RO-TPPC-02]

### 3.20.1 Scope

In the Basic Static Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-01: Basic Static Beam Storage, retrieves the plan from the Archive.

### 3.20.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Basic Static Beam Consumer |
| **Role:** | Stores plan transmitted from Archive |
| **Actor:** | Archive |
| **Role:** | Transmits Plan to Basic Static Beam Consumer |

### 3.20.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.20.4 Messages

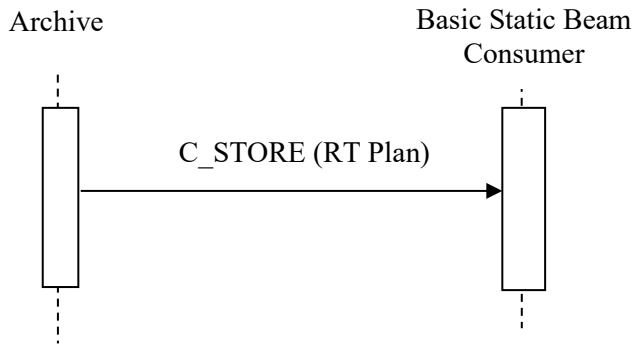



**Figure 3.20.4-1: Interaction Diagram**

#### 3.20.4.1 Basic Static Beam Retrieval

##### 3.20.4.1.1 Trigger Events

The Archive transfers the plan to the Basic Static Beam Consumer.

##### 3.20.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Basic Static Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.20.4.1.2.1 Storage of RT Plan containing a Basic Static Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.20.4.1.2.2 Optional Modifiers

The Basic Static Beam Consumer may support the following optional modifications :

| Optional Modifiers | Section |
|---|---|
| Compensator Beam Modifier | RO TF-3: 7.4.4.3.3 |
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.20.4.1.3 Expected Actions

The Basic Static Beam Consumer stores the RT Plan.

### 3.20.5 Security Considerations

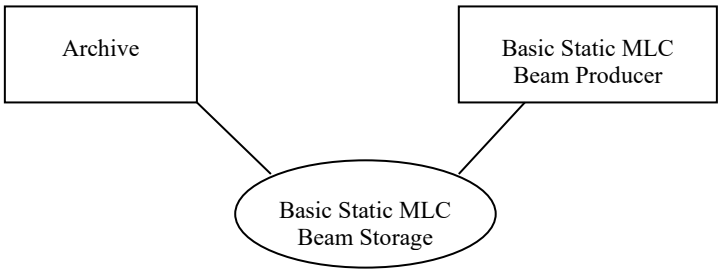
There are no specific security considerations.

## 3.21 Basic Static MLC Beam Storage [RO-TPPC-03]

### 3.21.1 Scope

In the Basic Static MLC Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-03: Basic Static MLC Beam Storage stores the plan to the Archive

### 3.21.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Basic Static MLC Beam Producer |
| **Role:** | Creates Basic Static MLC Beam RT Plan and stores plan to an RT Archive |
| **Actor:** | Archive |
| **Role:** | Accept and store RT Plan from Basic Static MLCBeam Producer |

### 3.21.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.21.4 Messages

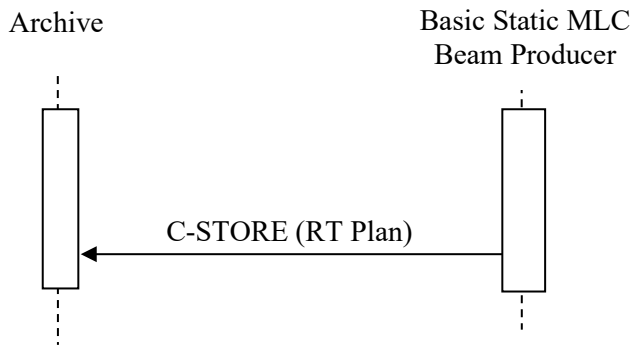



**Figure 3.21.4-1: Interaction Diagram**

#### 3.21.4.1 Basic Static MLC Beam Storage

##### 3.21.4.1.1 Trigger Events

The Basic Static MLC Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

##### 3.21.4.1.2 Message Semantics

The Basic Static MLC Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Basic Static MLC Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Basic Static MLC Beam Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

###### 3.21.4.1.2.1 Storage of RT Plan containing a Basic Static MLC Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.21.4.1.2.2 Optional Modifiers

The Basic Static MLC Beam Producer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Compensator Beam Modifier | RO TF-3: 7.4.4.3.3 |
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.21.4.1.3 Expected Actions

The Archive stores the RT Plan.

### 3.21.5 Security Considerations

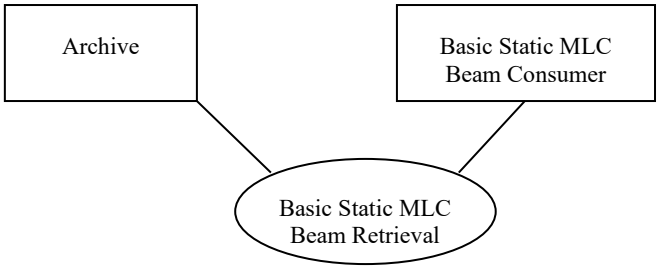
There are no specific security considerations.

## 3.22 Basic Static MLC Beam Retrieval [RO-TPPC-04]

### 3.22.1 Scope

In the Basic Static MLC Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-03: Basic Static MLC Beam Storage, retrieves the plan from the Archive.

### 3.22.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Basic Static MLC Beam Consumer |
| **Role:** | Stores plan transmitted from Archive |
| **Actor:** | Archive |
| **Role:** | Transmits Plan to Basic Static MLC Beam Consumer |

### 3.22.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.22.4 Messages

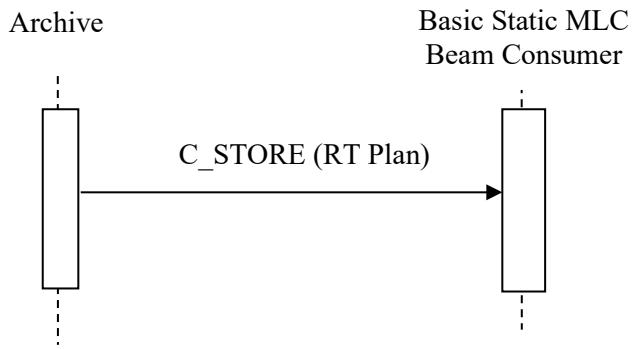



**Figure 3.22.4-1: Interaction Diagram**

#### 3.22.4.1 Basic Static MLC Beam Retrieval

##### 3.22.4.1.1 Trigger Events

The Archive transfers the plan to the Basic Static Beam Consumer.

##### 3.22.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Basic Static MLC Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.22.4.1.2.1 Storage of RT Plan containing a Basic Static MLC Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.22.4.1.2.2 Optional Modifiers

The Basic Static Beam Consumer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Compensator Beam Modifier | RO TF-3: 7.4.4.3.3 |
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |

| Optional Modifiers | Section |
|---|---|
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.22.4.1.3 Expected Actions

The Basic Static MLC Beam Consumer stores the RT Plan.

### 3.22.5 Security Considerations

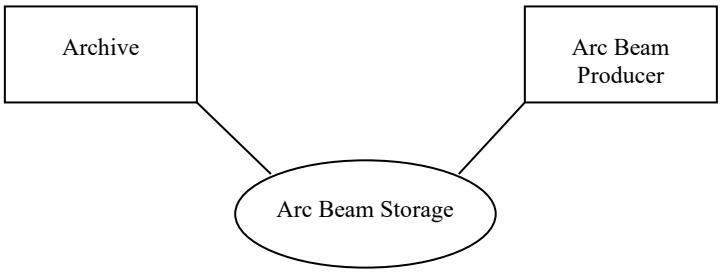
There are no specific security considerations.

## 3.23 Arc Beam Storage [RO-TPPC-05]

### 3.23.1 Scope

In the Arc Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-05: Arc Beam Storage stores the plan to the Archive

### 3.23.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Arc Beam Producer |
| **Role:** | Creates Arc Beam RT Plan and stores plan to an RT Archive |
| **Actor:** | Archive |
| **Role:** | Accept and store RT Plan from Basic Arc Beam Producer |

### 3.23.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.23.4 Messages

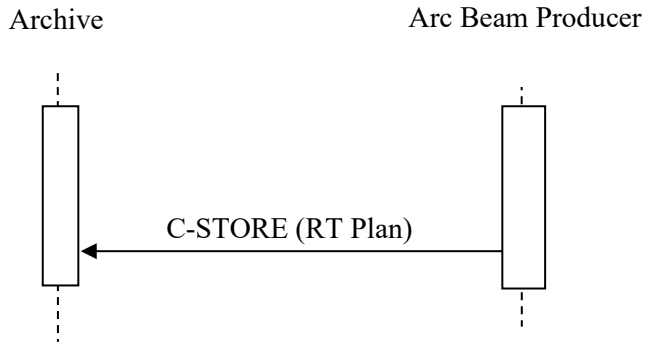



**Figure 3.23.4-1: Interaction Diagram**

#### 3.23.4.1 Arc Beam Storage

##### 3.23.4.1.1 Trigger Events

The Arc Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

##### 3.23.4.1.2 Message Semantics

The Arc Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Arc Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Arc Beam Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

###### 3.23.4.1.2.1 Storage of RT Plan containing an Arc Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

##### 3.23.4.1.2.2 Optional Modifiers

The Arc Beam Producer may support the following optional :

| Optional Modifiers | Section |
|---|---|
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.23.4.1.3 Expected Actions

The Archive stores the RT Plan.

### 3.23.5 Security Considerations

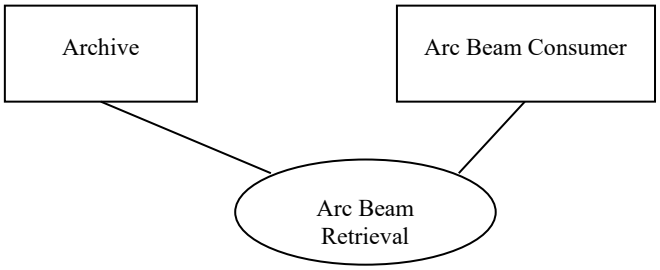
There are no specific security considerations.

## 3.24 Arc Beam Retrieval [RO-TPPC-06]

### 3.24.1 Scope

In the Arc Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-05: Arc Beam Storage, retrieves the plan from the Archive.

### 3.24.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Arc Beam Consumer |
| **Role:** | Stores plan transmitted from Archive |
| **Actor:** | Archive |
| **Role:** | Transmits Plan to Arc Beam Consumer |

### 3.24.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.24.4 Messages

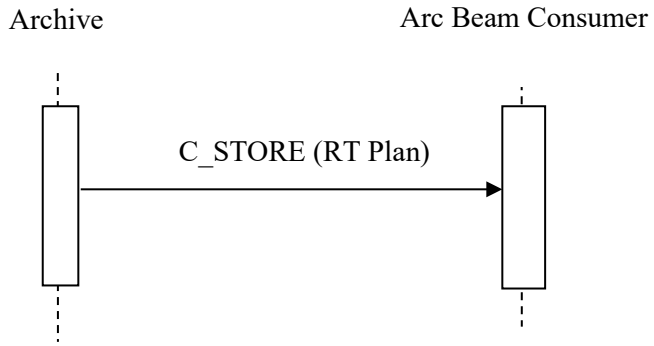



**Figure 3.24.4-1: Interaction Diagram**

#### 3.24.4.1 Arc Beam Retrieval

##### 3.24.4.1.1 Trigger Events

The Archive transfers the plan to the Arc Beam Consumer.

##### 3.24.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Arc Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.24.4.1.2.1 Storage of RT Plan containing an Arc Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.24.4.1.2.2 Optional Modifiers

The Arc Beam Consumer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.24.4.1.3 Expected Actions

The Arc Beam Consumer stores the RT Plan.

### 3.24.5 Security Considerations

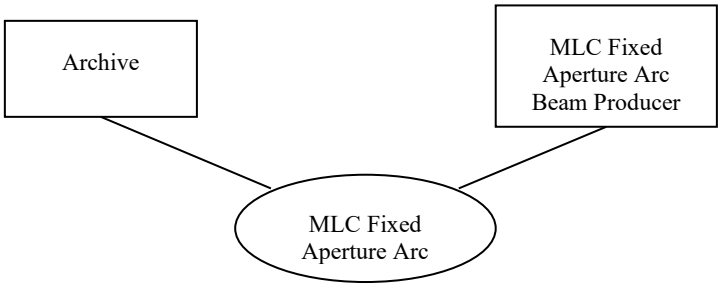
There are no specific security considerations.

## 3.25 MLC Fixed Aperture Arc Beam Storage [RO-TPPC-07]

### 3.25.1 Scope

In the MLC Fixed Aperture Arc Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-07: MLC Fixed Aperture Arc Beam Storage stores the plan to the Archive

### 3.25.2 Use Case Roles




| | |
|---|---|
| **Actor:** | MLC Fixed Aperture Arc Beam Producer |
| **Role:** | Creates MLC Fixed Aperture Arc Beam RT Plan and stores plan to an RT Archive |
| **Actor:** | Archive |
| **Role:** | Accept and store RT Plan from MLC Fixed Aperture Arc Beam Producer |

### 3.25.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.25.4 Messages

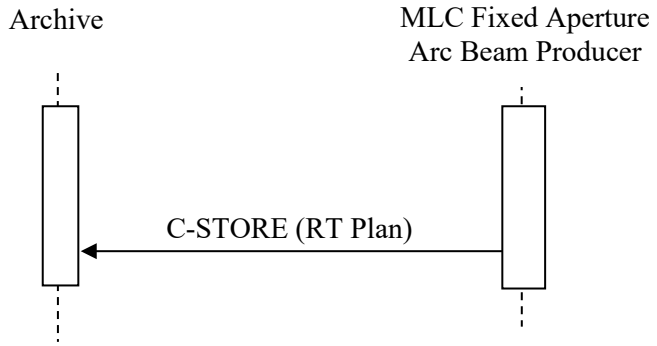



**Figure 3.25.4-1: Interaction Diagram**

#### 3.25.4.1 MLC Fixed Aperture Arc Beam Storage

##### 3.25.4.1.1 Trigger Events

The MLC Fixed Aperture Arc Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

##### 3.25.4.1.2 Message Semantics

The MLC Fixed Aperture Arc Beam Producer uses the DICOM C-STORE message to transfer the plan.

The MLC Fixed Aperture Arc Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The MLC Fixed Aperture Arc Beam Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

###### 3.25.4.1.2.1 Storage of RT Plan containing a MLC Fixed Aperture Arc Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.25.4.1.2.2 Optional Modifiers

The MLC Fixed Aperture Arc Beam Producer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |

#### 3.25.4.1.3 Expected Actions

The Archive stores the RT Plan.

### 3.25.5 Security Considerations

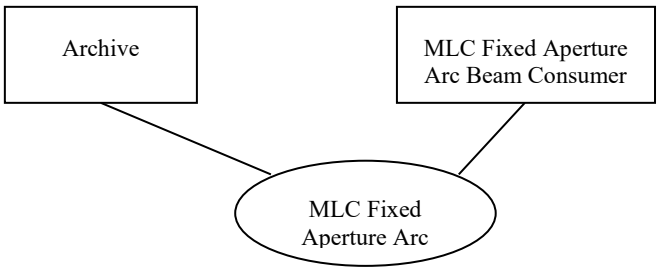
There are no specific security considerations.

## 3.26 MLC FIXED APERTURE ARC Beam Retrieval [RO-TPPC-08]

### 3.26.1 Scope

In the MLC Fixed Aperture Arc Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-07: MLC Fixed Aperture Arc Beam Storage, retrieves the plan from the Archive.

### 3.26.2 Use Case Roles




| | |
|---|---|
| **Actor:** | MLC Fixed Aperture Arc Beam Consumer |
| **Role:** | Stores plan transmitted from Archive |
| **Actor:** | Archive |
| **Role:** | Transmits Plan to MLC Fixed Aperture Arc Beam Consumer |

### 3.26.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.26.4 Messages

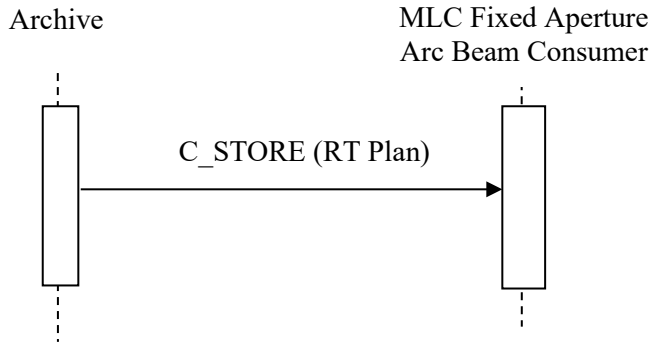



**Figure 3.26.4-1: Interaction Diagram**

#### 3.26.4.1 MLC Fixed Aperture Arc Beam Retrieval

##### 3.26.4.1.1 Trigger Events

The Archive transfers the plan to the MLC Fixed Aperture Arc Beam Consumer.

##### 3.26.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the MLC Fixed Aperture Arc Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.26.4.1.2.1 Storage of RT Plan containing a MLC Fixed Aperture Arc Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.26.4.1.2.2 Optional Modifiers

The MLC Fixed Aperture Arc Beam Consumer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |

#### 3.26.4.1.3 Expected Actions

The MLC Fixed Aperture Arc Beam Consumer stores the RT Plan.

### 3.26.5 Security Considerations

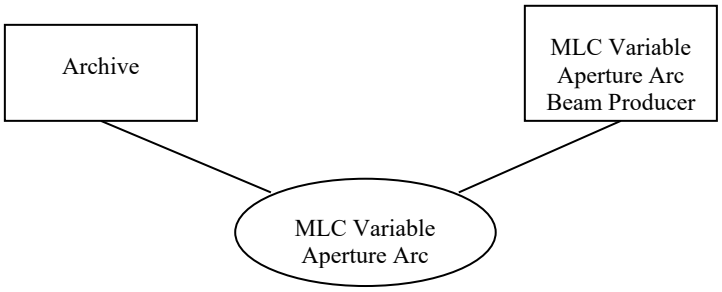
There are no specific security considerations.

## 3.27 MLC Variable Aperture Arc Beam Storage [RO-TPPC-09]

### 3.27.1 Scope

In the MLC Variable Aperture Arc Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-09: MLC Variable Aperture Arc Beam Storage stores the plan to the Archive

### 3.27.2 Use Case Roles




| | |
|---|---|
| **Actor:** | MLC Variable Aperture Arc Beam Producer |
| **Role:** | Creates MLC Variable Aperture Arc Beam RT Plan and stores plan to an RT Archive |
| **Actor:** | Archive |
| **Role:** | Accept and store RT Plan from MLC Variable Aperture Arc Beam Producer |

### 3.27.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.27.4 Messages

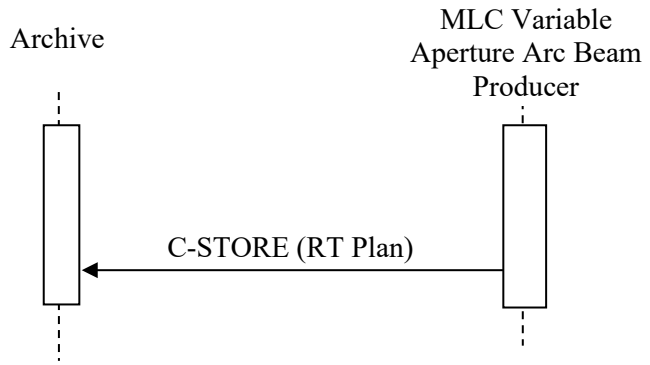



**Figure 3.27.4-1: Interaction Diagram**

#### 3.27.4.1 MLC Variable Aperture Arc Beam Storage

##### 3.27.4.1.1 Trigger Events

The MLC Variable Aperture Arc Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

##### 3.27.4.1.2 Message Semantics

The MLC Variable Aperture Arc Beam Producer uses the DICOM C-STORE message to transfer the plan.

The MLC Variable Aperture Arc Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The MLC Variable Aperture Arc Beam Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

###### 3.27.4.1.2.1 Storage of RT Plan containing a MLC Variable Aperture Arc Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

#### 3.27.4.1.2.2 Optional Modifiers

The MLC Variable Aperture Arc Beam Producer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.27.4.1.3 Expected Actions

The Archive stores the RT Plan.

### 3.27.5 Security Considerations

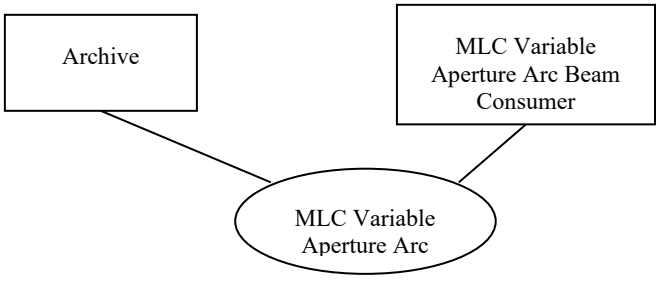
There are no specific security considerations.

## 3.28 MLC Variable Aperture Arc Beam Retrieval [RO-TPPC-10]

### 3.28.1 Scope

In the MLC Variable Aperture Arc Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-09: MLC Variable Aperture Arc Beam Storage, retrieves the plan from the Archive.

### 3.28.2 Use Case Roles




| | |
|---|---|
| **Actor:** | MLC Variable Aperture Arc Beam Consumer |
| **Role:** | Stores plan transmitted from Archive |
| **Actor:** | Archive |
| **Role:** | Transmits Plan to MLC Variable Aperture Arc Beam Consumer |

### 3.28.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.28.4 Messages

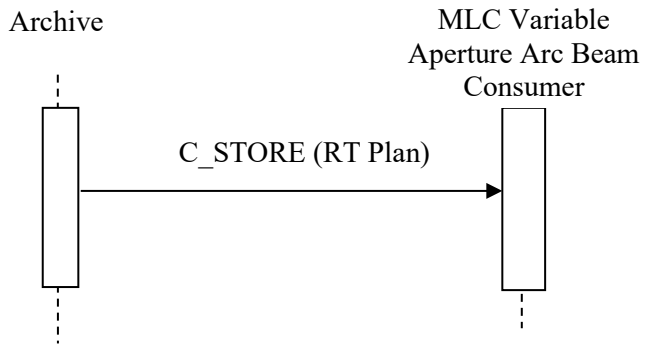



**Figure 3.28.4-1: Interaction Diagram**

#### 3.28.4.1 MLC Variable Aperture Arc Beam Retrieval

##### 3.28.4.1.1 Trigger Events

The Archive transfers the plan to the MLC Variable Aperture Arc Beam Consumer.

##### 3.28.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the MLC Variable Aperture Arc Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.28.4.1.2.1 Storage of RT Plan containing a MLC Variable Aperture Arc Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

#### 3.28.4.1.2.2 Optional Modifiers

The MLC Variable Aperture Arc Beam Consumer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.28.4.1.3 Expected Actions

The MLC Variable Aperture Arc Beam Consumer stores the RT Plan.

### 3.28.5 Security Considerations

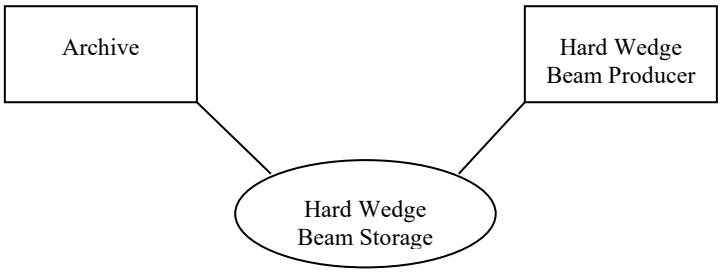
There are no specific security considerations.

## 3.29 Hard Wedge Beam Storage [RO-TPPC-11]

### 3.29.1 Scope

In the Hard Wedge Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-11: Hard Wedge Beam Storage stores the plan to the Archive

### 3.29.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Hard Wedge Beam Producer |
| **Role:** | Creates Hard Wedge Beam RT Plan and stores plan to an RT Archive |
| **Actor:** | Archive |
| **Role:** | Accept and store RT Plan from Hard Wedge Beam Producer |

### 3.29.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

## 3.29.4 Messages

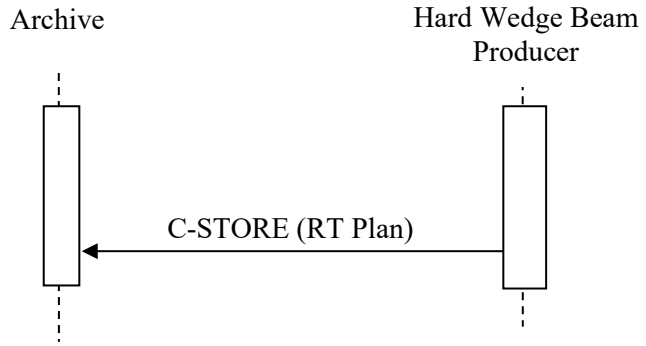



**Figure 3.29.4-1: Interaction Diagram**

### 3.29.4.1 Hard Wedge Beam Storage

#### 3.29.4.1.1 Trigger Events

The Hard Wedge Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

#### 3.29.4.1.2 Message Semantics

The Hard Wedge Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Hard Wedge Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Hard Wedge Beam Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

##### 3.29.4.1.2.1 Storage of RT Plan containing a Hard Wedge Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

#### 3.29.4.1.2.2 Optional Modifiers

The Hard Wedge Beam Producer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Compensator Beam Modifier | RO TF-3: 7.4.4.3.3 |
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.29.4.1.3 Expected Actions

The Archive stores the RT Plan.

### 3.29.5 Security Considerations

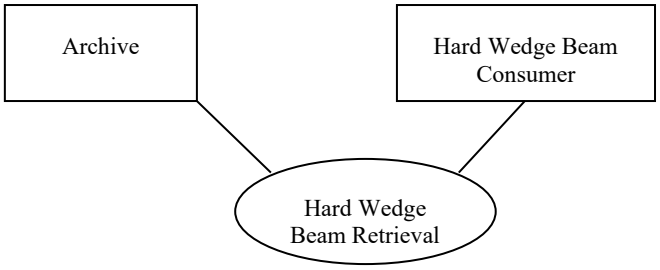
There are no specific security considerations.

## 3.30 Hard Wedge Beam Retrieval [RO-TPPC-12]

### 3.30.1 Scope

In the Hard Wedge Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-11: Hard Wedge Beam Storage, retrieves the plan from the Archive.

### 3.30.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Hard Wedge Beam Consumer |
| **Role:** | Stores plan transmitted from Archive |
| **Actor:** | Archive |
| **Role:** | Transmits Plan to Hard Wedge Beam Consumer |

### 3.30.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

## 3.30.4 Messages

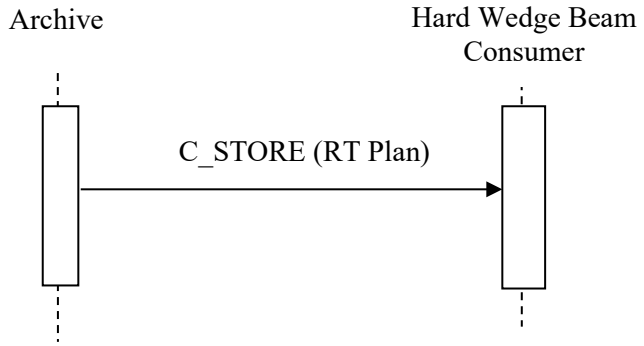



**Figure 3.30.4-1: Interaction Diagram**

### 3.30.4.1 Hard Wedge Beam Retrieval

#### 3.30.4.1.1 Trigger Events

The Archive transfers the plan to the Hard Wedge Beam Consumer.

#### 3.30.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Hard Wedge Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

##### 3.30.4.1.2.1 Storage of RT Plan containing a Hard Wedge Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

##### 3.30.4.1.2.2 Optional Modifiers

The Hard Wedge Beam Consumer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Compensator Beam Modifier | RO TF-3: 7.4.4.3.3 |
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |

| Optional Modifiers | Section |
|---|---|
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

2180

#### 3.30.4.1.3 Expected Actions

The Hard Wedge Beam Consumer stores the RT Plan.

### 3.30.5 Security Considerations

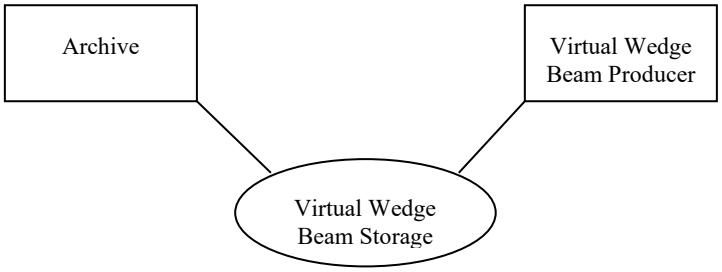
There are no specific security considerations.

2185 ## 3.31 Virtual Wedge Beam Storage [RO-TPPC-13]

### 3.31.1 Scope

In the Virtual Wedge Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-13: Virtual Wedge Beam Storage stores the plan to the Archive

2190 ### 3.31.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Virtual Wedge Beam Producer |
| **Role:** | Creates Virtual Wedge Beam RT Plan and stores plan to an RT Archive |
| **Actor:** | Archive |
| **Role:** | Accept and store RT Plan from Virtual Wedge Beam Producer |

### 3.31.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.31.4 Messages

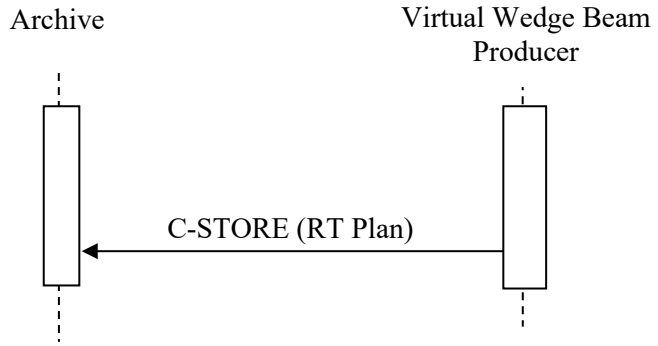



**Figure 3.31.4-1: Interaction Diagram**

#### 3.31.4.1 Virtual Wedge Beam Storage

##### 3.31.4.1.1 Trigger Events

The Virtual Wedge Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

##### 3.31.4.1.2 Message Semantics

The Virtual Wedge Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Virtual Wedge Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Virtual Wedge Beam Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

###### 3.31.4.1.2.1 Storage of RT Plan containing a Virtual Wedge Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

A virtual wedge does not actually have an actual wedge angle (300A,00D5) in the same sense as a physical wedge. Most treatment planning systems, however, incorporate the concept of such an angle for reference during the planning and delivery process. This ‘physical’ setting of the delivery device should be placed in the wedge angle (300A,00D5) attribute.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

#### 3.31.4.1.2.2 Optional Modifiers

The Virtual Wedge Beam Producer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Hard Wedge Beam Modifier | RO TF-3: 7.4.4.3.4 |
| Compensator Beam Modifier | RO TF-3: 7.4.4.3.3 |
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

### 3.31.4.1.3 Expected Actions

The Archive stores the RT Plan.

### 3.31.5 Security Considerations

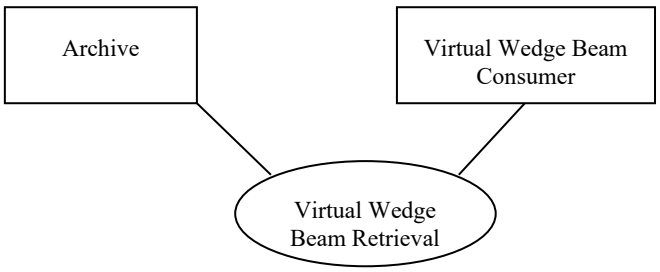
There are no specific security considerations.

## 3.32 Virtual Wedge Beam Retrieval [RO-TPPC-14]

### 3.32.1 Scope

In the Virtual Wedge Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-13: Virtual Wedge Beam Storage, retrieves the plan from the Archive.

### 3.32.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Virtual Wedge Beam Consumer |
| **Role:** | Stores plan transmitted from Archive |
| **Actor:** | Archive |
| **Role:** | Transmits Plan to Virtual Wedge Beam Consumer |

### 3.32.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.32.4 Messages

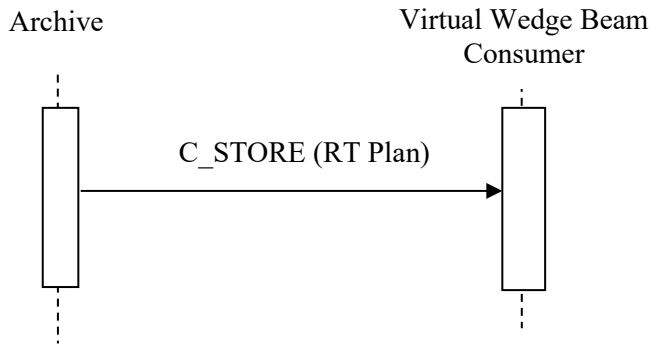



**Figure 3.32.4-1: Interaction Diagram**

#### 3.32.4.1 Virtual Wedge Beam Retrieval

##### 3.32.4.1.1 Trigger Events

The Archive transfers the plan to the Virtual Wedge Beam Consumer.

##### 3.32.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Virtual Wedge Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.32.4.1.2.1 Storage of RT Plan containing a Virtual Wedge Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.32.4.1.2.2 Optional Modifiers

The Virtual Wedge Beam Consumer may support the following optional:

| Optional Modifiers | Section |
|---|---|
| Hard Wedge Beam Modifier | RO TF-3: 7.4.4.3.4 |
| Compensator Beam Modifier | RO TF-3: 7.4.4.3.3 |
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.32.4.1.3 Expected Actions

The Virtual Wedge Beam Consumer stores the RT Plan.

### 3.32.5 Security Considerations

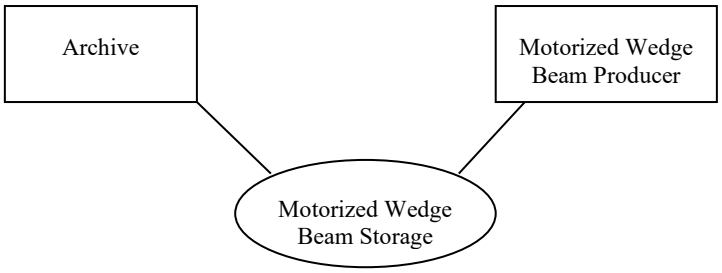
There are no specific security considerations.

## 3.33 Motorized Wedge Beam Storage [RO-TPPC-15]

### 3.33.1 Scope

In the Motorized Wedge Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-15: Virtual Wedge Beam Storage stores the plan to the Archive

### 3.33.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Motorized Wedge Beam Producer |
| **Role:** | Creates Motorized Wedge Beam RT Plan and stores plan to an RT Archive |
| **Actor:** | Archive |
| **Role:** | Accept and store RT Plan from Motorized Wedge Beam Producer |

### 3.33.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.33.4 Messages

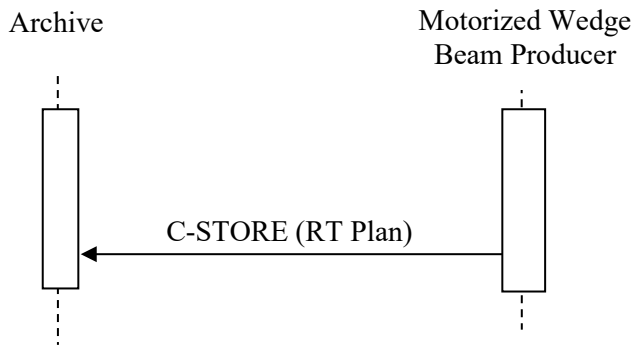



**Figure 3.33.4-1: Interaction Diagram**

#### 3.33.4.1 Motorized Wedge Beam Storage

##### 3.33.4.1.1 Trigger Events

The Motorized Wedge Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

##### 3.33.4.1.2 Message Semantics

The Motorized Wedge Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Motorized Wedge Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Motorized Wedge Beam Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

###### 3.33.4.1.2.1 Storage of RT Plan containing a Motorized Wedge Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

In the delivery of a motorized wedge beam the wedge angle (300A,00D5) could represent either the effective angle of the total beam delivery or the angle of the physical wedge moved into the beam. For the TPPC Profile, the physical angle of the motorized wedge should be placed into the wedge angle (300A,00D5) attribute.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

#### 3.33.4.1.2.2 Optional Modifiers

The Motorized Wedge Beam Producer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Hard Wedge Beam Modifier | RO TF-3: 7.4.4.3.4 |
| Compensator Beam Modifier | RO TF-3: 7.4.4.3.3 |
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.33.4.1.3 Expected Actions

The Archive stores the RT Plan.

### 3.33.5 Security Considerations

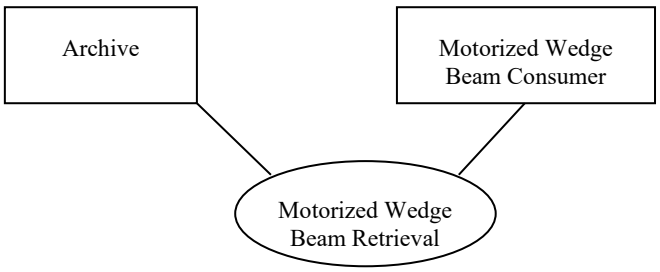
There are no specific security considerations.

## 3.34 Motorized Wedge Beam Retrieval [RO-TPPC-16]

### 3.34.1 Scope

In the Motorized Wedge Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-15: Motorized Wedge Beam Storage, retrieves the plan from the Archive.

### 3.34.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Motorized Wedge Beam Consumer |
| **Role:** | Stores plan transmitted from Archive |
| **Actor:** | Archive |
| **Role:** | Transmits Plan to Motorized Wedge Beam Consumer |

### 3.34.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.34.4 Messages

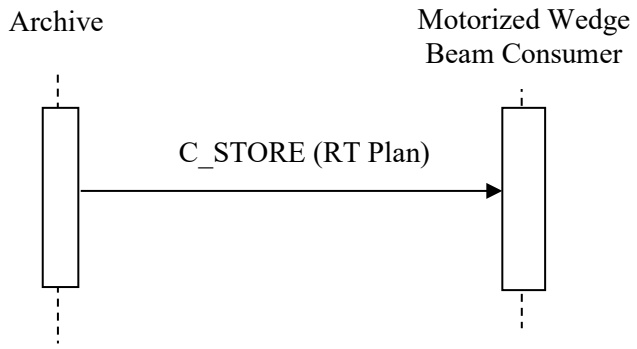



**Figure 3.34.4-1: Interaction Diagram**

#### 3.34.4.1 Motorized Wedge Beam Retrieval

##### 3.34.4.1.1 Trigger Events

The Archive transfers the plan to the Motorized Wedge Beam Consumer.

##### 3.34.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Motorized Wedge Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.34.4.1.2.1 Storage of RT Plan containing a Motorized Wedge Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in Section 7.3.2.1.

###### 3.34.4.1.2.2 Optional Modifiers

The Motorized Wedge Beam Consumer may support the following optional:

| Optional Modifiers | Section |
|---|---|
| Hard Wedge Beam Modifier | RO TF-3: 7.4.4.3.4 |
| Compensator Beam Modifier | RO TF-3: 7.4.4.3.3 |
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.34.4.1.3 Expected Actions

The Motorized Wedge Beam Consumer stores the RT Plan.

### 3.34.5 Security Considerations

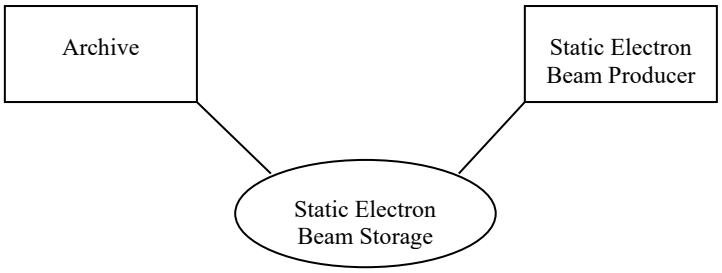
There are no specific security considerations.

## 3.35 Static Electron Beam Storage [RO-TPPC-17]

### 3.35.1 Scope

In the Static Electron Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-17: Static Electron Beam Storage stores the plan to the Archive

### 3.35.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Static Electron Beam Producer |
| **Role:** | Creates Static Electron Beam RT Plan and stores plan to an RT Archive |
| **Actor:** | Archive |
| **Role:** | Accept and store RT Plan from Static Electron Beam Producer |

### 3.35.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.35.4 Messages

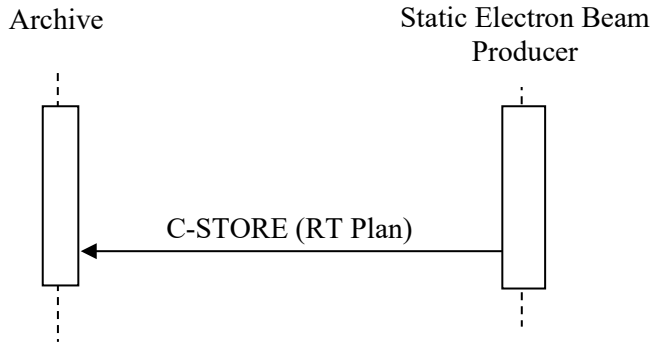



**Figure 3.35.4-1: Interaction Diagram**

#### 3.35.4.1 Static Electron Beam Storage

##### 3.35.4.1.1 Trigger Events

The Static Electron Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

##### 3.35.4.1.2 Message Semantics

The Static Electron Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Static Electron Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Static Electron Beam Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

###### 3.35.4.1.2.1 Storage of RT Plan containing a Static Electron Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.1.1.

###### 3.35.4.1.2.2 Optional Modifiers

The Static Electron Beam Producer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Compensator Beam Modifier | RO TF-3: 7.4.4.3.3 |
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.35.4.1.3 Expected Actions

The Archive stores the RT Plan.

### 3.35.5 Security Considerations

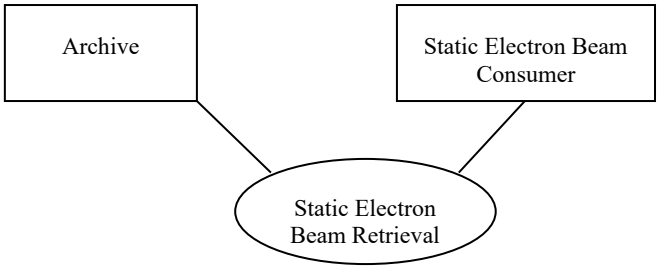
There are no specific security considerations.

## 3.36 Static Electron Beam Retrieval [RO-TPPC-18]

### 3.36.1 Scope

In the Static Electron Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-17: Static Electron Beam Storage, retrieves the plan from the Archive.

### 3.36.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Static Electron Beam Consumer |
| **Role:** | Stores plan transmitted from Archive |
| **Actor:** | Archive |
| **Role:** | Transmits Plan to Static Electron Beam Consumer |

### 3.36.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.36.4 Messages

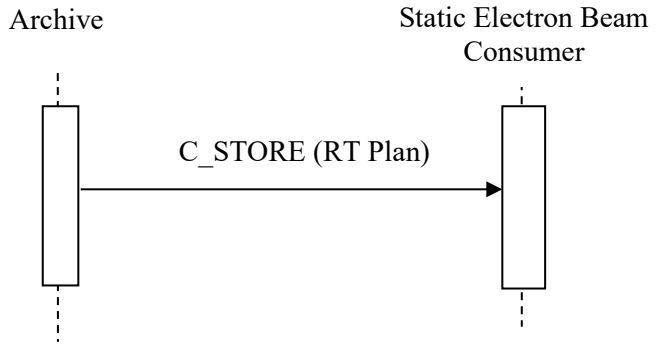



**Figure 3.36.4-1: Interaction Diagram**

#### 3.36.4.1 Static Electron Beam Retrieval

##### 3.36.4.1.1 Trigger Events

The Archive transfers the plan to the Static Electron Beam Consumer.

##### 3.36.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Static Electron Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.36.4.1.2.1 Storage of RT Plan containing a Static Electron Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

##### 3.36.4.1.2.2 Optional Modifiers

The Static Electron Beam Consumer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Compensator Beam Modifier | RO TF-3: 7.4.4.3.3 |
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |

| Optional Modifiers | Section |
|---|---|
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.36.4.1.3 Expected Actions

The Static Electron Beam Consumer stores the RT Plan.

### 3.36.5 Security Considerations

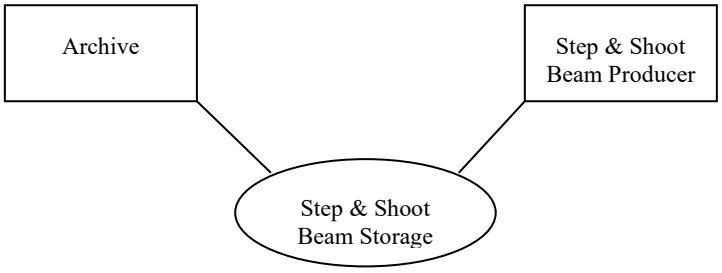
There are no specific security considerations.

## 3.37 Step & Shoot Beam Storage [RO-TPPC-19]

### 3.37.1 Scope

In the Step & Shoot Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-19: Step & Shoot Beam Storage stores the plan to the Archive

### 3.37.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Step & Shoot Beam Producer |
| **Role:** | Creates Step & Shoot Beam RT Plan and stores plan to an RT Archive |
| **Actor:** | Archive |
| **Role:** | Accept and store RT Plan from Step & Shoot Beam Producer |

### 3.37.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.37.4 Messages

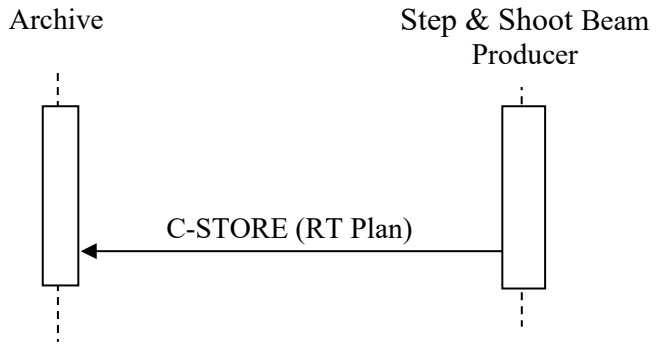



**Figure 3.37.4-1: Interaction Diagram**

#### 3.37.4.1 Step & Shoot Beam Storage

##### 3.37.4.1.1 Trigger Events

The Step & Shoot Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

##### 3.37.4.1.2 Message Semantics

The Step & Shoot Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Step & Shoot Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Step & Shoot Beam Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

###### 3.37.4.1.2.1 Storage of RT Plan containing a Step & Shoot Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.37.4.1.2.2 Optional Modifiers

The Step & Shoot Beam Producer may support the following optional :

| Optional Modifiers | Section |
|---|---|
| Hard Wedge Beam Modifier | RO TF-3: 7.4.4.3.4 |
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.37.4.1.3 Expected Actions

The Archive stores the RT Plan.

### 3.37.5 Security Considerations

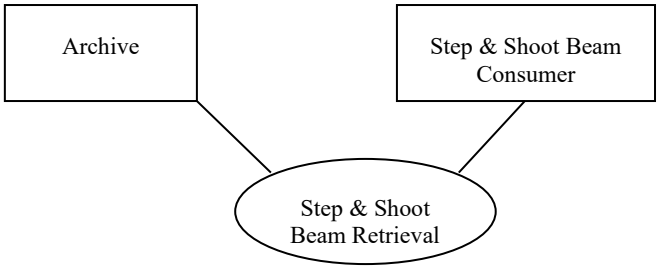
There are no specific security considerations.

## 3.38 Step & Shoot Beam Retrieval [RO-TPPC-20]

### 3.38.1 Scope

In the Step & Shoot Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-19: Step & Shoot Beam Storage, retrieves the plan from the Archive.

### 3.38.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Step & Shoot Beam Consumer |
| **Role:** | Stores plan transmitted from Archive |
| **Actor:** | Archive |
| **Role:** | Transmits Plan to Step & Shoot Beam Consumer |

### 3.38.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

## 3.38.4 Messages

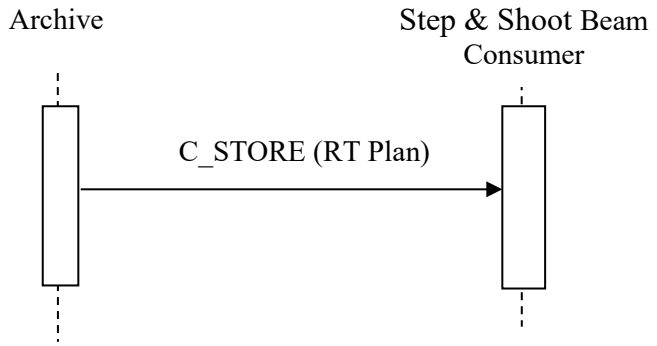



**Figure 3.38.4-1: Interaction Diagram**

### 3.38.4.1 Step & Shoot Beam Retrieval

#### 3.38.4.1.1 Trigger Events

The Archive transfers the plan to the Step & Shoot Beam Consumer.

#### 3.38.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Step & Shoot Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

##### 3.38.4.1.2.1 Storage of RT Plan containing a Step & Shoot Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

##### 3.38.4.1.2.2 Optional Modifiers

The Step & Shoot Beam Consumer may support the following optional:

| Optional Modifiers | Section |
|---|---|
| Hard Wedge Beam Modifier | RO TF-3: 7.4.4.3.4 |
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |

| Optional Modifiers | Section |
|---|---|
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.38.4.1.3 Expected Actions

The Step & Shoot Beam Consumer stores the RT Plan.

### 3.38.5 Security Considerations

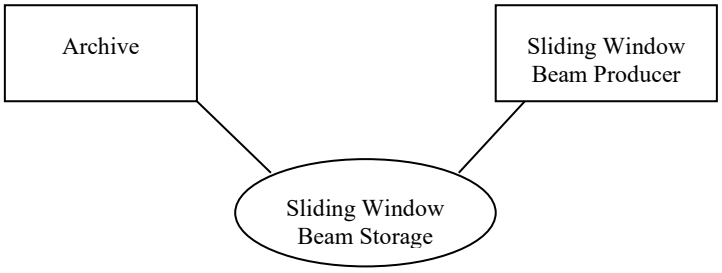
There are no specific security considerations.

## 3.39 Sliding Window Beam Storage [RO-TPPC-21]

### 3.39.1 Scope

In the Sliding Window Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-21: Sliding Window Beam Storage stores the plan to the Archive

### 3.39.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Sliding Window Beam Producer |
| **Role:** | Creates Sliding Window Beam RT Plan and stores plan to an RT Archive |
| **Actor:** | Archive |
| **Role:** | Accept and store RT Plan from Sliding Window Beam Producer |

### 3.39.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.39.4 Messages

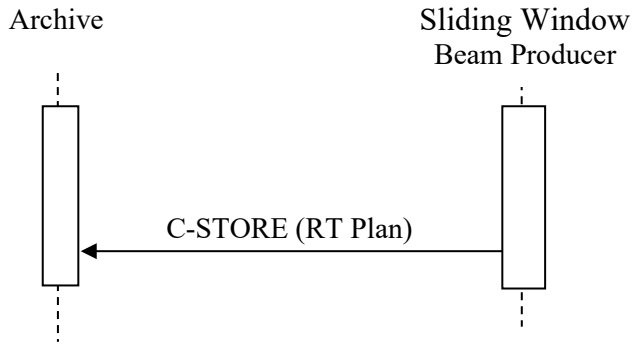



**Figure 3.39.4-1: Interaction Diagram**

#### 3.39.4.1 Sliding Window Beam Storage

##### 3.39.4.1.1 Trigger Events

The Sliding Window Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

##### 3.39.4.1.2 Message Semantics

The Sliding Window Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Sliding Window Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Sliding Window Beam Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

###### 3.39.4.1.2.1 Storage of RT Plan containing a Sliding Window Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.39.4.1.2.2 Optional Modifiers

The Sliding Window Beam Producer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Hard Wedge Beam Modifier | RO TF-3: 7.4.4.3.4 |
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.39.4.1.3 Expected Actions

The Archive stores the RT Plan.

### 3.39.5 Security Considerations

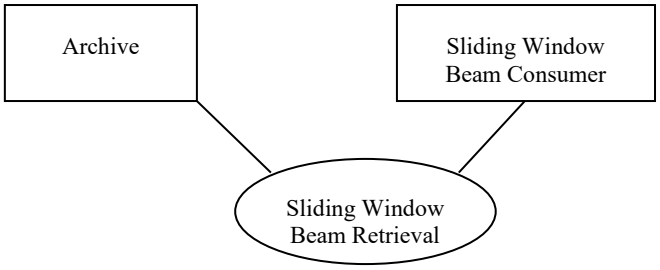
There are no specific security considerations.

## 3.40 Sliding Window Beam Retrieval [RO-TPPC-22]

### 3.40.1 Scope

In the Sliding Window Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-21: Sliding Window Beam Storage, retrieves the plan from the Archive.

### 3.40.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Sliding Window Beam Consumer |
| **Role:** | Stores plan transmitted from Archive |
| **Actor:** | Archive |
| **Role:** | Transmits Plan to Sliding Window Beam Consumer |

### 3.40.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

## 3.40.4 Messages

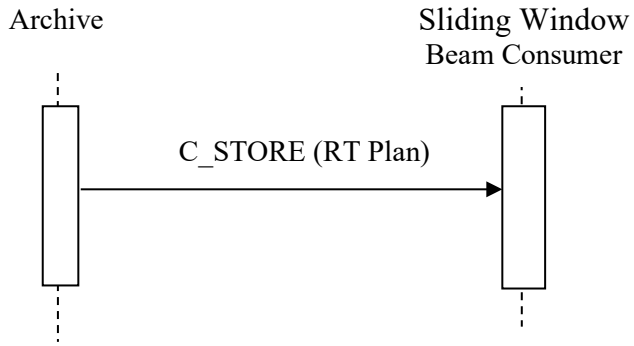



**Figure 3.40.4-1: Interaction Diagram**

### 3.40.4.1 Sliding Window Beam Retrieval

#### 3.40.4.1.1 Trigger Events

The Archive transfers the plan to the Sliding Window Beam Consumer.

#### 3.40.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Sliding Window Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

##### 3.40.4.1.2.1 Storage of RT Plan containing a Sliding Window Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

##### 3.40.4.1.2.2 Optional Modifiers

The Sliding Window Beam Consumer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Hard Wedge Beam Modifier | RO TF-3: 7.4.4.3.4 |
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |

| Optional Modifiers | Section |
|---|---|
| Block Beam Modifier | RO TF-3: 7.4.4.3.2 |

#### 3.40.4.1.3 Expected Actions

The Sliding Window Beam Consumer stores the RT Plan.

### 3.40.5 Security Considerations

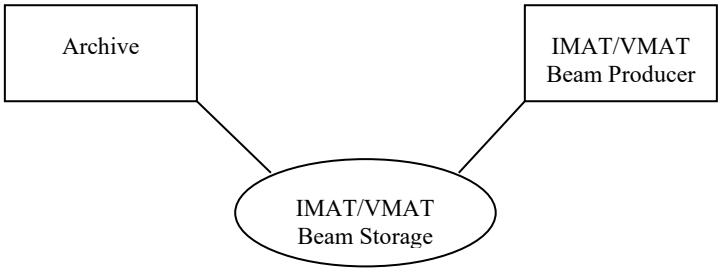
There are no specific security considerations.

## 3.41 IMAT/VMAT Beam Storage [RO-TPPC-23]

### 3.41.1 Scope

In the IMAT/VMAT Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-41: IMAT/VMAT Beam Storage stores the plan to the Archive

### 3.41.2 Use Case Roles




| | |
|---|---|
| **Actor:** | IMAT/VMAT Beam Producer |
| **Role:** | Creates IMAT/VMAT Beam RT Plan and stores plan to an RT Archive |
| **Actor:** | Archive |
| **Role:** | Accept and store RT Plan from IMAT/VMAT Beam Producer |

### 3.41.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.41.4 Messages

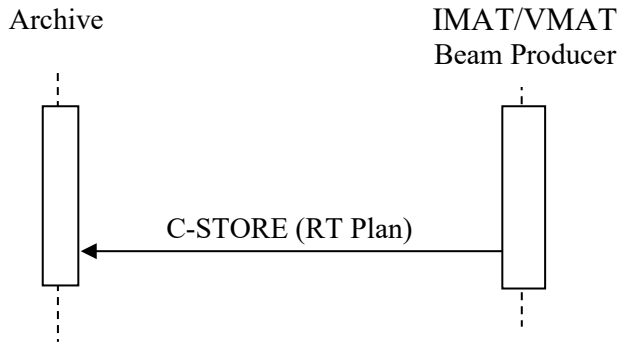



**Figure 3.41.4-1: Interaction Diagram**

#### 3.41.4.1 IMAT/VMAT Beam Storage

##### 3.41.4.1.1 Trigger Events

The IMAT/VMAT Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

##### 3.41.4.1.2 Message Semantics

The IMAT/VMAT Beam Producer uses the DICOM C-STORE message to transfer the plan.

The IMAT/VMAT Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The IMAT/VMAT Beam Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

###### 3.41.4.1.2.1 Storage of RT Plan containing a IMAT/VMAT Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

#### 3.41.4.1.2.2 Optional Modifiers

The IMAT/VMAT Beam Producer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |

#### 3.41.4.1.3 Expected Actions

The Archive stores the RT Plan.

### 3.41.5 Security Considerations

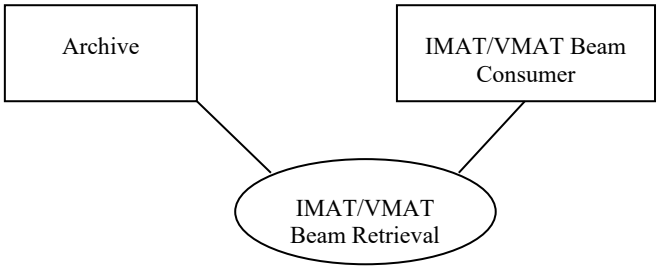
There are no specific security considerations.

## 3.42 IMAT/VMAT Beam Retrieval [RO-TPPC-24]

### 3.42.1 Scope

In the IMAT/VMAT Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-40: IMAT/VMAT Beam Storage, retrieves the plan from the Archive.

### 3.42.2 Use Case Roles




| | |
|---|---|
| **Actor:** | IMAT/VMAT Beam Consumer |
| **Role:** | Stores plan transmitted from Archive |
| **Actor:** | Archive |
| **Role:** | Transmits Plan to IMAT/VMAT Beam Consumer |

### 3.42.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.42.4 Messages

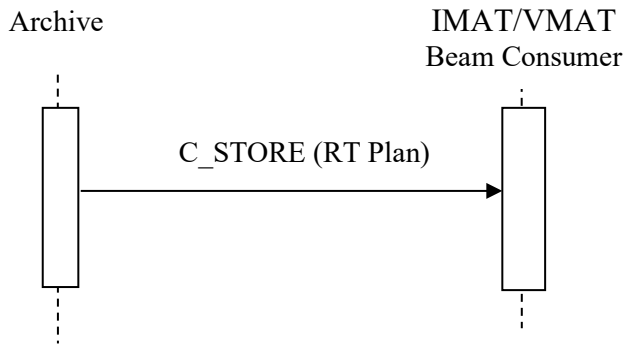



**Figure 3.42.4-1: Interaction Diagram**

#### 3.42.4.1 IMAT/VMAT Beam Retrieval

##### 3.42.4.1.1 Trigger Events

The Archive transfers the plan to the IMAT/VMAT Beam Consumer.

##### 3.42.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the IMAT/VMAT Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.42.4.1.2.1 Storage of RT Plan containing a IMAT/VMAT Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.42.4.1.2.2 Optional Modifiers

The IMAT/VMAT Beam Consumer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |

#### 3.42.4.1.3 Expected Actions

The IMAT/VMAT Beam Consumer stores the RT Plan.

### 3.42.5 Security Considerations

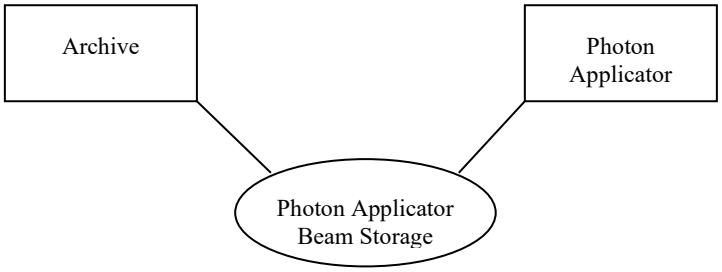
There are no specific security considerations.

## 3.43 Photon Applicator Beam Storage [RO-TPPC-25]

### 3.43.1 Scope

In the Photon Applicator Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-43: Photon Applicator Beam Storage stores the plan to the Archive

### 3.43.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Photon Applicator Beam Producer |
| **Role:** | Creates Photon Applicator Beam RT Plan and stores plan to an RT Archive |
| **Actor:** | Archive |
| **Role:** | Accept and store RT Plan from Photon Applicator Beam Producer |

### 3.43.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.43.4 Messages

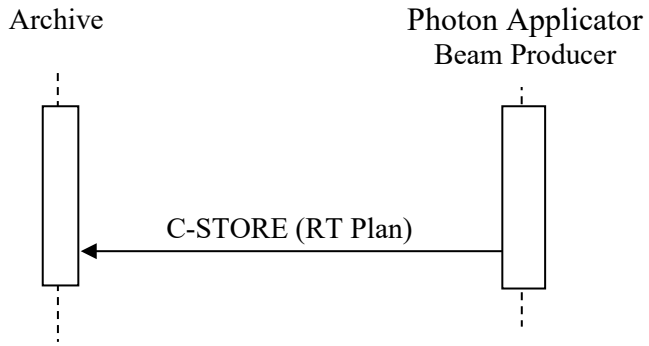



**Figure 3.43.4-1: Interaction Diagram**

#### 3.43.4.1 Photon Applicator Beam Storage

##### 3.43.4.1.1 Trigger Events

The Photon Applicator Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

##### 3.43.4.1.2 Message Semantics

The Photon Applicator Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Photon Applicator Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Photon Applicator Beam Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

###### 3.43.4.1.2.1 Storage of RT Plan containing a Photon Applicator Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

#### 3.43.4.1.2.2 Optional Modifiers

The Photon Applicator Beam Producer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |

#### 3.43.4.1.3 Expected Actions

The Archive stores the RT Plan.

### 3.43.5 Security Considerations

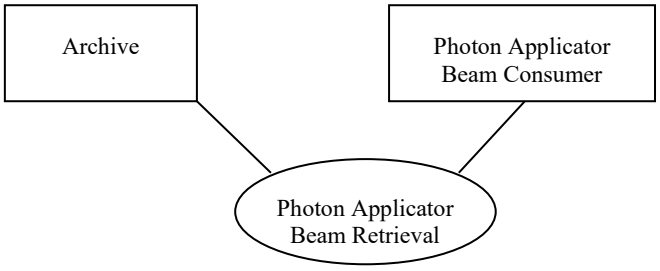
There are no specific security considerations.

## 3.44 Photon Applicator Beam Retrieval [RO-TPPC-26]

### 3.44.1 Scope

In the Photon Applicator Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-25: Photon Applicator Beam Storage, retrieves the plan from the Archive.

### 3.44.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Photon Applicator Beam Consumer |
| **Role:** | Stores plan transmitted from Archive |
| **Actor:** | Archive |
| **Role:** | Transmits Plan to Photon Applicator Beam Consumer |

### 3.44.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.44.4 Messages

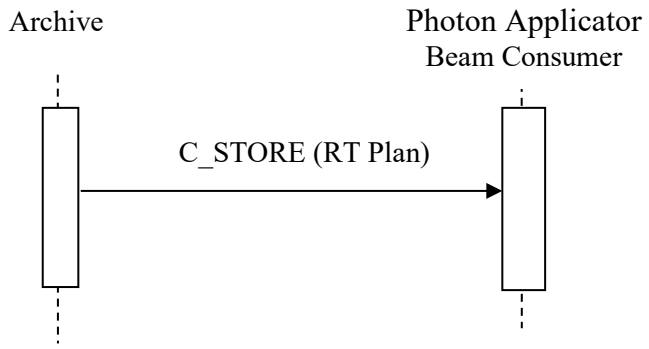



**Figure 3.44.4-1: Interaction Diagram**

#### 3.44.4.1 Photon Applicator Beam Retrieval

##### 3.44.4.1.1 Trigger Events

The Archive transfers the plan to the Photon Applicator Beam Consumer.

##### 3.44.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Photon Applicator Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.44.4.1.2.1 Storage of RT Plan containing a Photon Applicator Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.44.4.1.2.2 Optional Modifiers

The Photon Applicator Beam Consumer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |

#### 3.44.4.1.3 Expected Actions

The Photon Applicator Beam Consumer stores the RT Plan.

### 3.44.5 Security Considerations

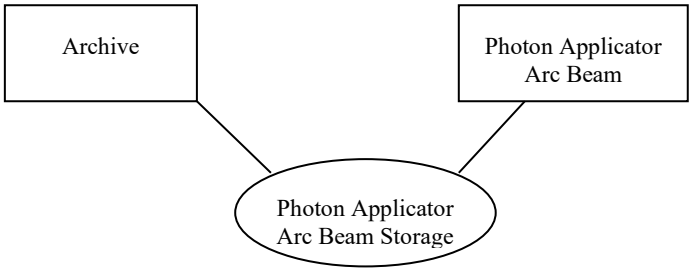
There are no specific security considerations.

## 3.45 Photon Applicator Arc Beam Storage [RO-TPPC-27]

### 3.45.1 Scope

In the Photon Applicator Arc Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-45: Photon Applicator Arc Beam Storage stores the plan to the Archive

### 3.45.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Photon Applicator Arc Beam Producer |
| **Role:** | Creates Basic Static Beam RT Plan and stores plan to an RT Archive |
| **Actor:** | Archive |
| **Role:** | Accept and store RT Plan from Photon Applicator Arc Beam Producer |

### 3.45.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.45.4 Messages

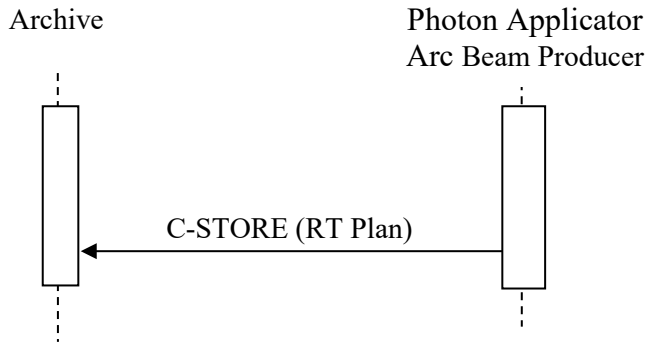



**Figure 3.45.4-1: Interaction Diagram**

#### 3.45.4.1 Photon Applicator Arc Beam Storage

##### 3.45.4.1.1 Trigger Events

The Photon Applicator Arc Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

##### 3.45.4.1.2 Message Semantics

The Photon Applicator Arc Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Photon Applicator Arc Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Photon Applicator Arc Beam Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

###### 3.45.4.1.2.1 Storage of RT Plan containing a Photon Applicator Arc Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

#### 3.45.4.1.2.2 Optional Modifiers

The Photon Applicator Arc Beam Producer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |

#### 3.45.4.1.3 Expected Actions

The Archive stores the RT Plan.

### 3.45.5 Security Considerations

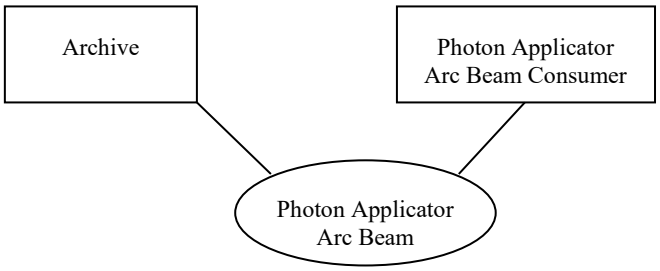
There are no specific security considerations.

## 3.46 Photon Applicator Arc Beam Retrieval [RO-TPPC-28]

### 3.46.1 Scope

In the Photon Applicator Arc Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-27: Photon Applicator Arc Beam Storage, retrieves the plan from the Archive.

### 3.46.2 Use Case Roles




| | |
|---|---|
| **Actor:** | Photon Applicator Arc Beam Consumer |
| **Role:** | Stores plan transmitted from Archive |
| **Actor:** | Archive |
| **Role:** | Transmits Plan to Photon Applicator Arc Beam Consumer |

### 3.46.3 Referenced Standards

DICOM 2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

### 3.46.4 Messages

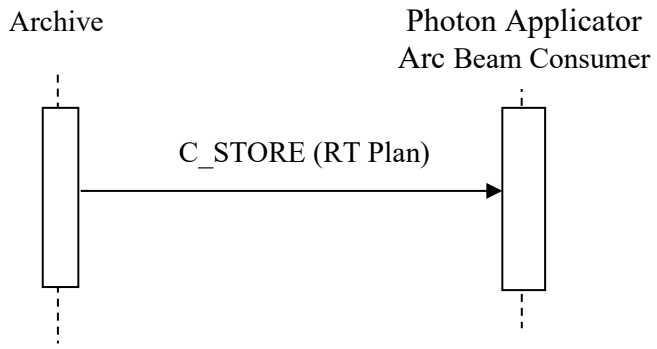



**Figure 3.46.4-1: Interaction Diagram**

#### 3.46.4.1 Photon Applicator Arc Beam Retrieval

##### 3.46.4.1.1 Trigger Events

The Archive transfers the plan to the Photon Applicator Arc Beam Consumer.

##### 3.46.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Photon Applicator Arc Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.46.4.1.2.1 Storage of RT Plan containing a Photon Applicator Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in RO TF-3: 7.3.2.1.

###### 3.46.4.1.2.2 Optional Modifiers

The Photon Applicator Arc Beam Consumer may support the following optional modifications:

| Optional Modifiers | Section |
|---|---|
| Bolus Beam Modifier | RO TF-3: 7.4.4.3.1 |

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#### 3.46.4.1.3 Expected Actions

The Photon Applicator Arc Beam Consumer stores the RT Plan.

### 3.46.5 Security Considerations

There are no specific security considerations.

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# Appendices

None

 