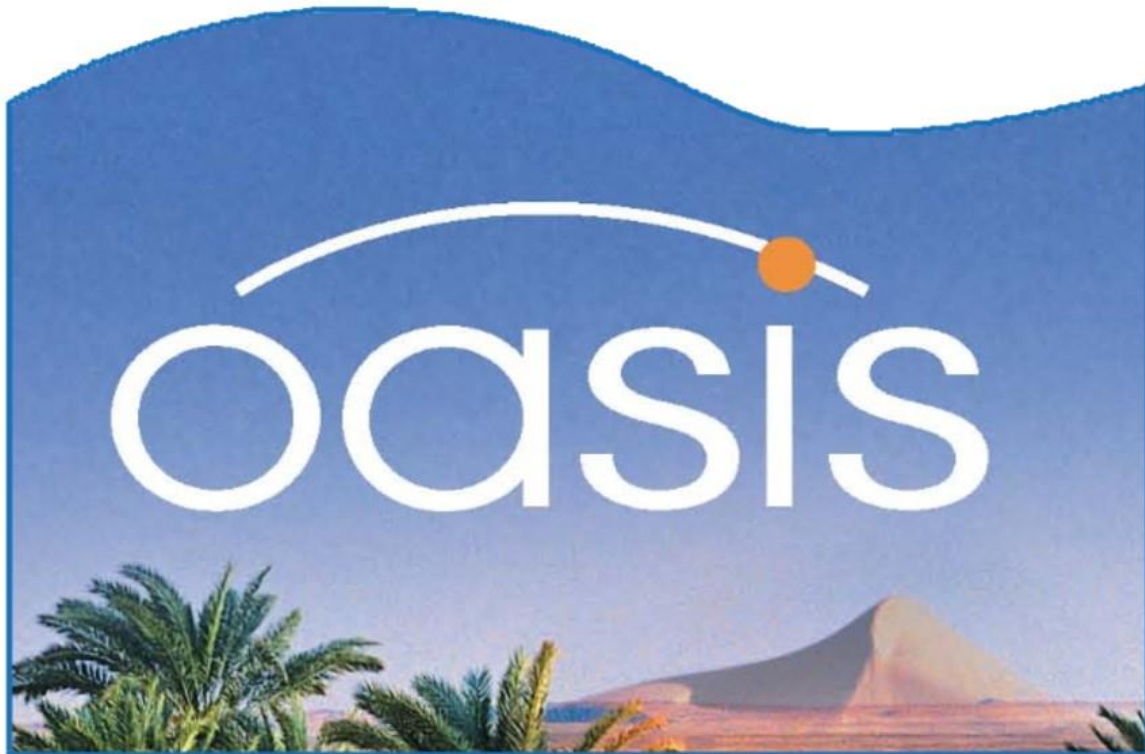




segami

**DICOM CONFORMANCE STATEMENT**

**DICOM CONFORMANCE STATEMENT**



**REV 3.0**

**2019-10-31**

## TABLE OF CONTENTS

|          |  |           |
|----------|--|-----------|
| <b>1</b> | <b>INTRODUCTION</b>                              | <b>5</b>  |
| 1.1      | Intended Audience                                | 5         |
| 1.2      | Abbreviations                                    | 5         |
| 1.3      | References                                       | 6         |
| <b>2</b> | <b>IMPLEMENTATION MODEL OVERVIEW</b>             | <b>7</b>  |
| 2.1      | Application Entity Architecture                  | 7         |
| 2.2      | Application Data Flow Overview                   | 9         |
| 2.2.1    | Verification Data Flow                           | 11        |
| 2.2.2    | Store Data Flow                                  | 11        |
| 2.2.3    | Media Services Data Flow                         | 11        |
| 2.2.4    | Query Data Flow                                  | 12        |
| 2.2.5    | Retrieve Data Flow                               | 12        |
| 2.2.6    | Print Data Flow                                  | 12        |
| 2.3      | The Oasis Multi-User Environment                 | 12        |
| <b>3</b> | <b>APPLICATION ENTITY SPECIFICATION OVERVIEW</b> | <b>13</b> |
| 3.1      | Oasis Server Application Entity (AE) Title       | 13        |
| 3.2      | Implementation Identifying Information           | 13        |
| 3.3      | Oasis Server UID Generation                      | 13        |
| 3.4      | Association Management Policies                  | 13        |
| 3.4.1    | Asynchronous Nature                              | 13        |
| 3.4.2    | Association Establishment (Initiation) Policy    | 13        |
| 3.4.3    | Association Acceptance Policy                    | 15        |
| 3.4.4    | Presentation Contexts                            | 16        |
| 3.4.5    | Transfer Syntax Selection Policies               | 16        |
| 3.4.6    | Timeout Handling                                 | 16        |
| 3.4.7    | Response Status                                  | 16        |
| 3.4.8    | Logging  | 16        |
| 3.4.9    | Privacy and Security                             | 16        |
| <b>4</b> | <b>VERIFICATION</b>                              | <b>17</b> |
| 4.1      | Verification AE Specifications                   | 17        |
| 4.1.1    | Verification SCU AE                              | 17        |
| 4.1.2    | Verification SCP AE                              | 17        |

|            |   |           |
|------------|---|-----------|
| <b>5</b>   | <b>STORAGE</b>  | <b>19</b> |
| <b>5.1</b> | <b>Storage AE Specifications (Send-Receive / SCU-SCP)</b> | <b>19</b> |
| 5.1.1      | Storage SCU AE  | 19        |
| 5.1.2      | Storage SCP AE  | 22        |
| <b>5.2</b> | <b>RTSTRUCT Support</b>                                   | <b>24</b> |
| <b>6</b>   | <b>QUERY / RETRIEVE</b>                                   | <b>25</b> |
| <b>6.1</b> | <b>Query / Retrieve AE Specifications (SCU)</b>           | <b>25</b> |
| 6.1.1      | Association Establishment (SCU & SCP)                     | 25        |
| 6.1.2      | Query Retrieve SCU AE                                     | 25        |
| 6.1.3      | Query Retrieve SCP AE                                     | 30        |
| 6.1.4      | Modality Worklist SCU                                     | 34        |
| <b>7</b>   | <b>PRINT</b>  | <b>35</b> |
| <b>7.1</b> | <b>Print (SCU)</b>  | <b>35</b> |
| 7.1.1      | Print SCU AE  | 35        |
| <b>8</b>   | <b>MEDIA INTERCHANGE</b>                                  | <b>39</b> |
| <b>8.1</b> | <b>Implementation Model</b>                               | <b>39</b> |
| 8.1.1      | Data Flow   | 39        |
| 8.1.2      | Functional Definition                                     | 39        |
| <b>8.2</b> | <b>AE Specifications</b>                                  | <b>39</b> |
| 8.2.1      | Real-World Activity Import                                | 39        |
| 8.2.2      | Real-World Activity Create                                | 39        |
| <b>9</b>   | <b>SUPPORTED COMMUNICATION STACKS</b>                     | <b>40</b> |
| <b>9.1</b> | <b>Supported Communication Stacks</b>                     | <b>40</b> |
| <b>9.2</b> | <b>TCP/IP Stack</b>                                       | <b>40</b> |
| <b>9.3</b> | <b>DNS</b>  | <b>40</b> |
| <b>9.4</b> | <b>DHCP</b>   | <b>40</b> |
| <b>10</b>  | <b>CONFIGURATION</b>                                      | <b>40</b> |
| <b>11</b>  | <b>SUPPORT OF EXTENDED CHARACTER SETS</b>                 | <b>41</b> |

**12 EXTENSION/SPECIALIZATION/PRIVATIZATION .....42**

**12.1 Oasis-Specific Handling of Certain Attributes.....42**

**12.2 Oasis-Equipment Identification .....44**

**12.3 Derived Image Creation .....44**

12.3.1 Oasis-Created Private Elements .....44

12.3.2 Secondary Capture (Created by Oasis) .....44

12.3.3 Non-Gated Reconstructed Tomos (Created by Oasis) .....46

12.3.4 Gated Reconstructed Tomos (Created by Oasis).....49

## 1 INTRODUCTION

This Conformance Statement specifies the manner in which Oasis complies with the DICOM standard. This document is written in conformance with DICOM Part 2 (PS3.2). Oasis conforms to the DICOM 3.0 standard.

The Oasis architecture is that of a client-server and is thus comprised of one Oasis Server and multiple Oasis Client workstations. With the exception of Media Exchange, all DICOM network connectivity is managed by the Oasis Server. DICOM real world activities can be initiated from

- The user of an Oasis Client workstation
- The user of Oasis Administration Tools available through a standard Internet Browser
- A remote DICOM Application Entity
- Automated operations initiated by Oasis software

The Oasis employs two Application Entities (AEs). One AE is comprised of all Oasis Service Class Providers (SCPs) for Verification, Storage and Query/Retrieve Service Classes. The other Oasis AE is comprised of all Oasis Service Class Users (SCUs) for Verification, Storage, Storage Commitment, Query/Retrieve and Print Management Service Classes.

File based media (CD, DVD, USB drives, etc) are supported by the Oasis for FSC and FSR services.

### 1.1 INTENDED AUDIENCE

It is assumed that readers of this document are familiar with the DICOM standard and with the terminology and concepts used in that standard. The reader of this document is typically concerned with systems, integration or design engineering as it pertains to interfacing with Oasis using the DICOM protocol in a networked environment.

### 1.2 ABBREVIATIONS

|        |   |
|--------|---|
| AE     | DICOM Application Entity                          |
| AET    | DICOM Application Entity Title                    |
| DB     | Database  |
| FSC    | DICOM File Set Creator                            |
| FSR    | DICOM File Set Reader                             |
| FSU    | DICOM File Set Updater                            |
| IOD    | DICOM Information Object Definition               |
| PDU    | DICOM Protocol Data Unit                          |
| SCU    | DICOM Service Class User (DICOM client)           |
| SCP    | DICOM Service Class Provider (DICOM server)       |
| SOP    | DICOM Service-Object Pair                         |
| TCP/IP | Transmission Control Protocol / Internet Protocol |
| UID    | Unique Identifier                                 |

### **1.3 REFERENCES**

- ACR-NEMA Digital Imaging and Communications in Medicine (DICOM) V3.0. 2003.

## 2 IMPLEMENTATION MODEL OVERVIEW

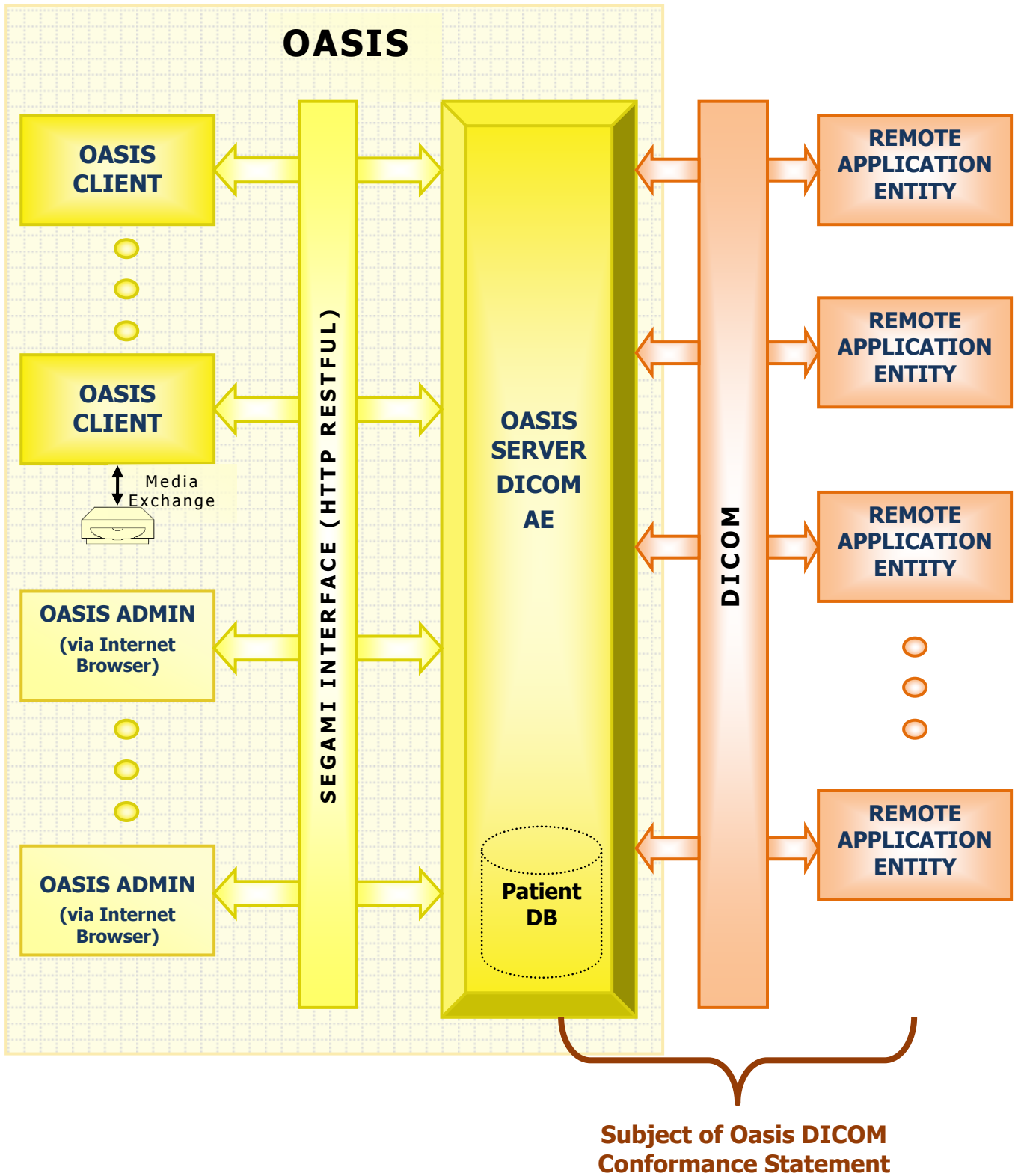
### 2.1 APPLICATION ENTITY ARCHITECTURE

Figure I depicts the main components of Oasis and how they interface to the outside world. The Oasis Server is the central cog in the architecture, interfacing with Oasis users and with remote AEs. All patient data are stored centrally on the Oasis Server in the Oasis Patient Database.

Oasis users run the Oasis application on PCs that are networked with the Oasis Server. Oasis Client components interface with the Oasis Server via an HTTP-based private interface. Oasis users browse the Oasis database from the clients and retrieve data for use by Oasis processing software. Oasis processing software can create data objects that are sent back to the Oasis server and stored on the patient database.

Oasis Administrators access server-resident administrative functions via a standard Internet Browser. No special software, including the Oasis client application, need be installed on a computer to access administration functionality.

The subject of this document - communication with remote DICOM Application Entities - is managed by the Oasis Server. Oasis AEs run solely on the Oasis Server. Verification, Storage, Query-Retrieve and Print SCUs run on the Oasis Server. Verification, Storage and Query-Retrieve SCPs also run on the Oasis Server. Media Interchange is based on the Oasis Client.



**FIGURE I – OASIS APPLICATION ENTITY ARCHITECTURE**



## 2.2 APPLICATION DATA FLOW OVERVIEW

The Application Data Flow Diagram (Figure II) depicts the major interface components between the Oasis Server and Remote AEs. Figure II also depicts the interface between the Oasis Server the Oasis users. Communication between the Oasis users and the Oasis Server (left side of Figure II) traverses an HTTP based *Private Interface* (non-DICOM). Oasis users can either be users running the Oasis application on a networked PC or an administrator accessing administration functions via an Internet browser.

The Oasis AE communicates via DICOM to/from remote AEs (right side of the diagram labelled *DICOM Interface*.) The Oasis AE automatically become active upon boot of the Oasis Server. The Oasis AE remains active until the system is shutdown.

For SCP operations the AE listens indefinitely on a configurable port. The Oasis AE is able to accept DICOM associations from any remote host that supports the DICOM Verify, Storage, Query-Retrieve or Print Management Service Classes as a Service Class User (SCU). If the Oasis *Enforce AE Title* system parameter is enabled, Oasis will reject associations that are unknown AEs; i.e., associations from remote AEs that have not been setup and configured in Oasis.

The Oasis AE is able to establish a DICOM Association with any remote AE that supports the DICOM Verify, Storage, Query-Retrieve or Print Management Service Classes as a Service Class Provider. The Oasis Server AE is able to accept requests to establish DICOM associations by a remote AEs for DICOM Verify, Storage and Query Retrieve Services.

All image (or, more generally, composite SOP objects) received by the Oasis AE, either by way of DICOM Query-Retrieve Service ("pulling" images from a remote AE) or by way of an independent storage requests (remote AEs "pushing" images to Oasis), are stored in the Oasis database located on the server. No images are stored on Oasis clients.

Real world activities are initiated by Oasis users and users of remote AEs or automated functions within remote AEs. In Figure II, the direction of the arrows across the *DICOM Interface* indicate which AE initiates associations.

Oasis supports multiple users and multiple remote AEs. Thus, all real world communication shown in Figure II can occur in multiple concurrent instances or concurrently with each other.

Other than DICOM media exchange, user-initiated real world activity from Oasis Clients do not spawn DICOM activity with remote AEs. The Oasis client software provides application processing functionality, requesting image data from the server as needed.

The Oasis Administration functions are solely responsible for providing the user with access to DICOM SCU functions (verify, store / push, query, retrieve / pull).

Further details regarding real world activity are describe below (follow Figure II from left to right, top to bottom):

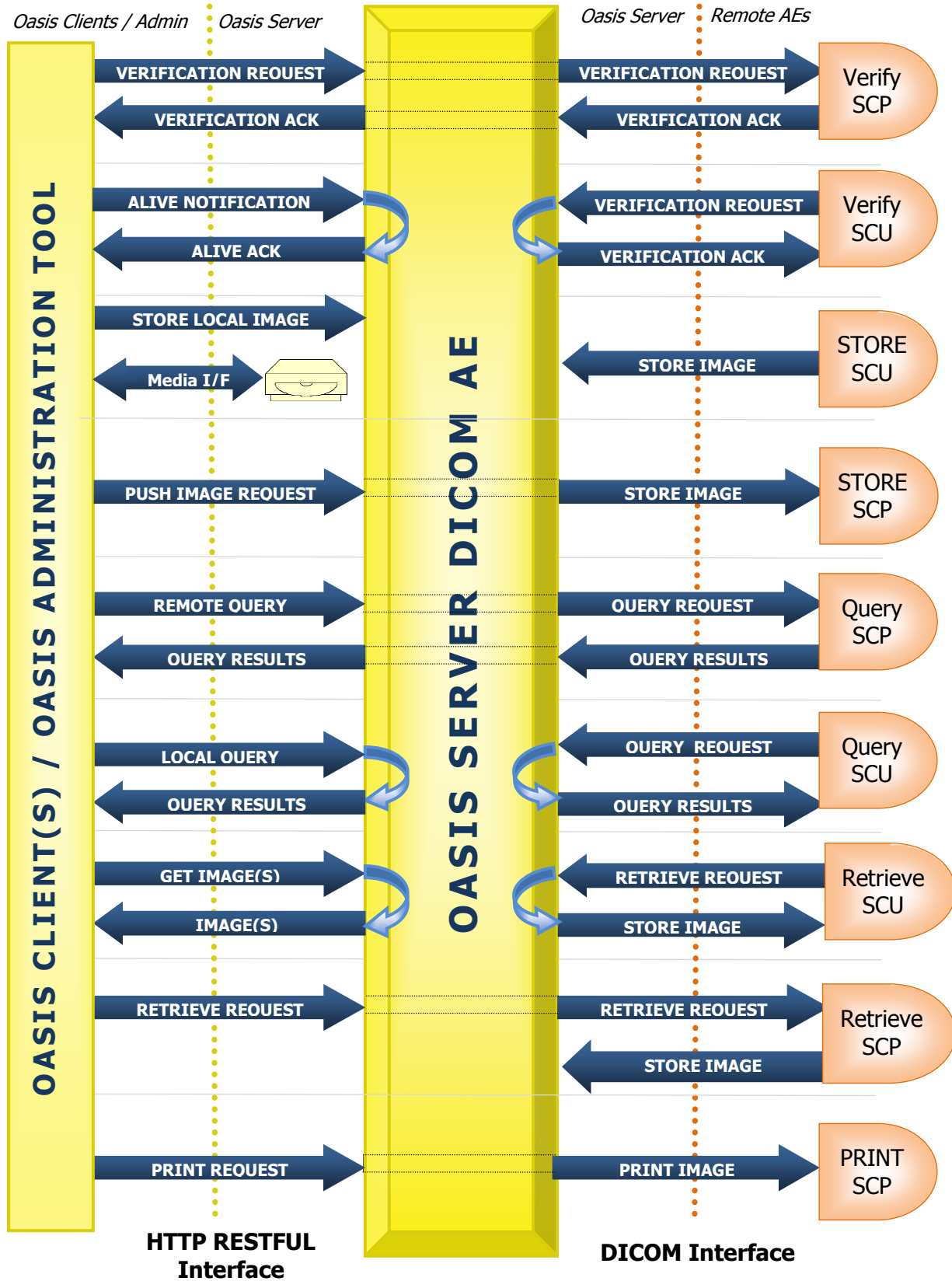


FIGURE II – APPLICATION ENTITY DATA FLOW

### 2.2.1 Verification Data Flow

#### 2.2.1.1 Oasis Initiates Verification to Remote AE (C-ECHO SCU)

The Oasis AE is a Verification SCU. An Oasis user can initiate verification requests by explicitly requesting it. Typically, such requests are made while configuring remote AEs. The Oasis AE acts upon the user request by initiating an association with a remote AE and requesting verification from the remote AE. The remote AE responds (or not) and the results (or lack thereof) are passed back the user.

#### 2.2.1.2 Oasis Client ↔ Server Verification (HTTP/RESTFUL)

Oasis implements a HTTP/RESTFUL protocol that provides a mechanism whereby the Oasis Client and Server can know if each other is "alive".

#### 2.2.1.3 Oasis responds to Verification Request from Remote AE (C-ECHO SCP)

The Oasis AE is a Verification SCP. It listens indefinitely for remote AEs that wish to establish associations to send C-ECHO requests. Remote AEs initiate associations and request verification acknowledgement from the Oasis AE (C-ECHO). The server responds to the remote AEs by acknowledging the verification request.

### 2.2.2 Store Data Flow

#### 2.2.2.1 Storage of Images Created by the Oasis Client Application

Oasis users store images created by Oasis processing software on the Oasis Server. The communication protocol is an HTTP RESTFUL protocol.

#### 2.2.2.2 Storage of Images Sent by Remote AEs (C-STORE SCP)

The Oasis AE is a Storage Class SCP. It listens indefinitely for remote AEs that wish to establish associations to send C-STORE requests. Remote AEs send unsolicited composite SOP objects to the Oasis AE. When Oasis receives objects, it stores them in the database and makes them available to Oasis clients or other DICOM remote AEs. Oasis can be configured to reject associations from unknown AEs.

#### 2.2.2.3 Store Requests Generated by Oasis (STORE SCU)

The Oasis AE is a Storage Class SCU. Oasis users initiate pushes of objects from the Oasis Database to remote AEs. Oasis users select and push single or multiple studies or single or multiple series. Acting on users' requests, the Oasis AE initiates associations with remote AEs for the purpose of sending C-STORE requests.

Oasis users may edit certain DICOM header (demographic) data. In constructing DICOM objects for export, the Oasis AE uses the altered or original data. The choice is specified via a configurable Oasis parameter.

### 2.2.3 Media Services Data Flow

Oasis users read DICOM File Sets from CD-R, CDROM, DVD-R, DVD+R, DVD-RW, DVD+RW, DVDROM or file storage devices such as USB drives or hard disk drives. Oasis users save DICOM File Sets to CD-R, DVD-RW, DVD+RW or file storage devices such as USB or hard disk drives.

## 2.2.4 Query Data Flow

### 2.2.4.1 Local Query Requests Initiated by Oasis Users

Oasis users query the Oasis Server database and the Oasis Server send lists of objects to the Oasis Client. Oasis users specify query filters to the Oasis Server. This communication is not DICOM.

### 2.2.4.2 Query Requests Initiated by Remote AEs (C-FIND SCP)

The Oasis AE is a Query Retrieve SCP. It listens indefinitely for remote AEs that wish to establish associations to send C-FIND requests. Remote AEs send query requests (C-FIND) to Oasis. The Oasis AE searches the database for matches. The results of the queries are returned to the remote AE.

### 2.2.4.3 Query Requests to Remote AE (C-FIND SCU)

The Oasis AE is a Query Retrieve SCU. Oasis users real world activity causes the Oasis AE to send query requests (C-FIND) to Remote AE. The results of the queries are returned to the Oasis AE and passed back to the Oasis Browser.

## 2.2.5 Retrieve Data Flow

### 2.2.5.1 Oasis Applications Retrieving Images from Oasis Database

Using the Oasis Client, the Oasis user implicitly requests images from the Oasis Server by selecting studies/series in the browser to process. The communication protocol to implement this communication is HTTP-RESTFUL based.

### 2.2.5.2 Remote AEs Retrieving Images from Oasis Database (C-MOVE SCP)

Remote AEs "pull" data objects from the Oasis Data; i.e., Remote AEs initiate retrieve (C-MOVE) requests to the Oasis AE. The Oasis AE listens indefinitely for remote AEs that wish to establish associations to send C-MOVE requests. The Oasis AE responds to C-MOVE requests by initiating the opening of associations and pushing data (C-STORE) to the AE specified in the C-MOVE command.

Oasis users may edit certain DICOM header (demographic) data. In constructing DICOM objects as a result of a C-MOVE request, the Oasis AE uses the altered or original data. The choice is specified via a configurable Oasis parameter.

### 2.2.5.3 Oasis Retrieving Images from Remote AEs (C-MOVE SCU)

Oasis users request that images be retrieved from remote AEs. The Oasis AE initiates retrieves (C-MOVE) to remote AEs.

## 2.2.6 Print Data Flow

The Oasis AE is a DICOM Print SCU. Oasis users format images for film / hardcopy and, initiates print requests to remote DICOM Print AEs.

## 2.3 THE OASIS MULTI-USER ENVIRONMENT

Multiple Oasis users perform concurrent real world activities that require the Oasis AE resource. Oasis AE runs as multiple-instances as needed to handle concurrent Oasis user real world activities.

Multiple Oasis users perform concurrent real world activities that require the Oasis AE resource. Oasis AE runs as multiple-instances as needed to handle concurrent remote AE real world activities.

### 3 APPLICATION ENTITY SPECIFICATION OVERVIEW

This section describes AE specifications for Oasis that are common to all SOP Classes supported by the Oasis AE. Details specific to each SOP Class and SOP specific conformance are found in subsequent sections.

#### 3.1 OASIS SERVER APPLICATION ENTITY (AE) TITLE

Oasis uses two AE Titles and Port Numbers to identify all implemented DICOM Services. One AE Title identifies all SCU services; the other identifies all SCP services. The local Oasis AE Title and Port Number are configurable system parameters.

#### 3.2 IMPLEMENTATION IDENTIFYING INFORMATION

Oasis uses a single Implementation UID to identify itself for supported DICOM SOP Classes.

##### IMPLEMENTATION CLASS UID

1.2.840.114080.1.0.3

#### 3.3 OASIS UID GENERATION

The UID root for the Oasis is 1.2.840.114080.4

The Implementation Version Name for Oasis V1.9.4.x is "tkId\_OS\_1".

The Implementation Version Name for Oasis V2.x.x.x is "tkId\_OS\_1".

The Implementation Version Name for Oasis V3.x.x.x is "OC\_1\_MD\_5.0.0.1".

#### 3.4 ASSOCIATION MANAGEMENT POLICIES

The AE can initiate and/or accept DICOM associations only under the standard DICOM Application Context Name (ACN):

##### APPLICATION CONTEXT NAME

1.2.840.10008.3.1.1.1

The configuration of the Oasis system define such parameters as Application Entity title, host name, and port number. Oasis allows maximum PDU size of 64 KB (65536 bytes) upon association initiation and accepts maximum PDU sizes up to 64 KB (65536 bytes) on associations initiated by remote applications. The default PDU size is 16KB. (See *Section 10, Configuration*)

##### 3.4.1 Asynchronous Nature

DICOM Asynchronous Mode - i.e., multiple concurrent operations on one association - is not supported. All association requests must be completed and acknowledged before a new operation can be initiated.

##### 3.4.2 Association Establishment (Initiation) Policy

The Oasis Server initiates the establishment of DICOM associations to issue the following DICOM requests:

- Verification (C-ECHO)

- Storage (C-STORE)
- Query (C-FIND)
- Retrieve (C-MOVE)

#### 3.4.2.1 Associated Real-world Activity

Oasis initiates the establishment the associations to remote AEs as a result of the following real world activities:

- An Oasis user wants to verify the DICOM communication with a remote system
- An Oasis user wants to send object from the Oasis database to a remote system
- An Oasis user wants to query the contents of a remote database
- An Oasis user wants to retrieve images from a remote database to the Oasis Server's database
- An Oasis software module verifies the DICOM communication with a remote system before initiating a DICOM service
- An Oasis software module queries a remote AE to automatically to determine if there is historical data residing on the remote AE for a specific patient
- An Oasis software module request that a remote AE to automatically retrieve historical data residing on the remote AE for a specific patient
- An Oasis user wants to import images from media
- An Oasis user wants to export images to media

#### 3.4.2.2 Number of Concurrent Associations (Initiated by the Oasis AE)

As a result of real world activity, Oasis establishes multiple concurrent associations to remote AEs. The number of concurrent associations that can be established by Oasis is configurable.

Oasis initiates the establishment of multiple association when

- Multiple Oasis users initiate operations concurrently (verify, push, query, retrieve, move, print)
- The same Oasis user initiates concurrent operations concurrently
- Multiple users on multiple remote AEs initiate operations concurrently that cause the Oasis AE to initiate associations with remote AEs
- A single user on a remote AE initiates concurrent operations that cause the Oasis AE to initiate associations with remote AEs
- Software residing on remote AEs that automatically initiate operations that cause the Oasis AE to initiate associations with remote AEs
- Any combination of the above.

### 3.4.3 Association Acceptance Policy

The Oasis Server accepts the request to establish DICOM associations in response to the following DICOM requests from a remote AE:

- Verification (C-ECHO)
- Storage (C-STORE)
- Query (C-FIND)
- Retrieve (C-MOVE)

#### 3.4.3.1 Associated Real-World Activity

The Oasis Server will acknowledge and establish an association(s) whenever:

- A user on a remote AE wants to verify the DICOM communication with a Oasis
- A user on a remote AE wants to send object to the Oasis database
- A user on a remote AE wants to query the contents of the Oasis database
- A user on a remote AE wants to retrieve images from the Oasis database
- A user on a remote AE wants to transmit images from one remote AE to another
- Remote AE software automatically verifies the DICOM communication with a Oasis (e.g., before initiating a DICOM service)
- Remote AE software automatically queries a Oasis (e.g., to automatically determine if there is historical data residing on the Oasis AE for a specific patient)
- Remote AE software automatically requests that Oasis send data to the Remote AE (e.g., to automatically obtain historical data residing on Oasis for a specific patient)
- A user on a remote AE wants to print images to DICOM printer connected to Oasis

#### 3.4.3.2 Number of Concurrent Associations (Accepted by Oasis AE)

The number of concurrent associations accepted by Oasis is configurable. Activity on each association will occur concurrently in the Oasis Server's multi-tasking environment.

Oasis establishes multiple association when:

- Multiple remote AE users initiate operations concurrently that request DICOM services from Oasis (verify, push, query, retrieve, move, print)
- A single remote AE user initiates operations concurrently that request DICOM services from Oasis
- Multiple Oasis users initiate operations concurrently that cause remote AEs to initiate associations with Oasis
- A single user on a remote AE initiate operations concurrently that cause the Oasis AE to initiate associations with remote AEs
- Software residing on Oasis that automatically initiate operations that cause the remote AEs to initiate associations with Oasis

- Any combination of the above.

#### **3.4.4 Presentation Contexts**

Proposed and accepted Presentation Contexts are detailed in the individual SOP sections in this document.

#### **3.4.5 Transfer Syntax Selection Policies**

Proposed and accepted Transfer Syntaxes are detailed in the individual SOP sections in this document.

#### **3.4.6 Timeout Handling**

Oasis manages three levels of timeouts:

- The Association level
- The DIMSE level
- The TCP/IP level.

At the initiation of and during DICOM activity, timeouts can occur if wait time exceeds timeout values. In such cases, Oasis aborts all activity and logs the error. Oasis also send Association Abort requests when activity across and active association times out.

Timeouts can occur when attempting a connections (either a DICOM Association or low-level TCP/IP connection) and no response is received from the remote AE. Timeouts can also occur while an association is active, both at the DIMSE and TCP/IP level.

#### **3.4.7 Response Status**

Response status, error codes and warnings are described in each individual SOP section and in Appendix B.

#### **3.4.8 Logging**

Oasis supports logging for errors, warnings, audit trails and debugging. The level of detail for each log is specified as a configurable parameter.

#### **3.4.9 Privacy and Security**

To ensure privacy and security, Oasis must only be used in a secure network environment. Provided as another layer of protection, Oasis encrypts all communication between Oasis Clients and the Oasis Server. Oasis can enforce AE verification where Oasis reject association requests from unknown AEs. Also, Oasis implements automatic SSL protection at the TCP socket level.



## 4 VERIFICATION

The Oasis AE verifies the operability of remote DICOM AEs by initiating associations with remote AEs and sending C-ECHO requests. Conversely, Oasis responds to C-ECHO requests over associations initiated by remote AEs.

### 4.1 VERIFICATION AE SPECIFICATIONS

The Oasis DICOM Server AE provides standard conformance to the following DICOM V3.0 SOP Class:

| SOP CLASS NAME | SOP CLASS UID     | SCU | SCP |
|----------------|-------------------|-----|-----|
| VERIFICATION   |                   |     |     |
| Verification   | 1.2.840.10008.1.1 | Yes | Yes |

#### 4.1.1 Verification SCU AE

##### 4.1.1.1 Verification SCU Associated Real-World Activity

An Oasis administrator has the capability to configure remote AEs. As a part of this activity, the administrator can manually initiate verification requests to remote AEs. Also, before initiating certain DICOM activities, Oasis will automatically request verification from a remote AE. This is done as a preventive measure to avoid delays in user interactivity (timeouts) when remote AEs are not online or operable.

##### 4.1.1.2 Verification Association Initiation Policy

Oasis initiates associations for the purpose of initiating C-ECHO requests.

##### 4.1.1.3 Number of Associations

Oasis can initiate multiple concurrent associations for the purpose of initiating C-ECHO requests. Multiple associations initiated by the Oasis AE are a result of the multi-user Oasis architecture; i.e., several users and/or instances of Oasis server modules can concurrently, explicitly or implicitly, request the verification of a remote AE.

##### 4.1.1.4 Timeout Handling

See *Section 3.4.6, Timeout Handling*.

##### 4.1.1.5 Verification SCU Presentation Contexts

The Oasis Verification SCU proposes a Presentation Context as shown in the following table:

| PRESENTATION CONTEXT TABLE (SCU ROLE) |                   |                           |                   |      |         |
|---------------------------------------|-------------------|---------------------------|-------------------|------|---------|
| ABSTRACT SYNTAX                       |                   | TRANSFER SYNTAX           |                   | ROLE | EXT NEG |
| NAME                                  | UID               | NAME                      | UID               |      |         |
| VERIFICATION                          |                   |                           |                   |      |         |
| Verification                          | 1.2.840.10008.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU  | None    |

#### 4.1.2 Verification SCP AE

##### 4.1.2.1 Verification SCP Associated Real-World Activity

Oasis responds to C-ECHO requests that are received from remote AEs.

4.1.2.2 Verification SCP Association Management

Oasis accepts associations from AEs that wish to send a verification request to Oasis. Multiple concurrent associations are managed. The number of maximum permissible concurrent associations to support concurrent verification requests from multiple AE is a configurable parameter.

4.1.2.3 Number of Associations

Multiple concurrent associations are managed; i.e., Oasis can accept concurrent verification request.

4.1.2.4 Timeout Handling

See *Section 3.4.6, Timeout Handling*.

4.1.2.5 Status Response and Error Behavior

Codes for error and status response and associated AE behavior are described in Appendix B.

4.1.2.6 Verification SCP Presentation Contexts

The Oasis Verification SCP proposes a Presentation Contexts as shown in the following table:

| PRESENTATION CONTEXT TABLE (SCP ROLE) |                   |                           |                   |      |         |
|---------------------------------------|-------------------|---------------------------|-------------------|------|---------|
| ABSTRACT SYNTAX                       |                   | TRANSFER SYNTAX           |                   | ROLE | EXT NEG |
| NAME                                  | UID               | NAME                      | UID               |      |         |
| VERIFICATION                          |                   |                           |                   |      |         |
| Verification                          | 1.2.840.10008.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP  | None    |

## 5 STORAGE

### 5.1 STORAGE AE SPECIFICATIONS (SEND-RECEIVE / SCU-SCP)

The Oasis DICOM Server AE provides standard conformance to the following DICOM V3.0 SOP Classes in both SCU and SCP capacities:

| SOP CLASS NAME   | SOP CLASS UID                 | SCU | SCP | DISP |
|--|-------------------------------|-----|-----|------|
| STORAGE VS. STORAGE & DISPLAY                              |                               |     |     |      |
| Computed Tomography Image Storage                          | 1.2.840.10008.5.1.4.1.1.2     | Yes | Yes | √    |
| Enhanced Magnetic Resonance Image Storage                  | 1.2.840.10008.5.1.4.1.1.4.1   | Yes | Yes | √    |
| Magnetic Resonance Image Storage                           | 1.2.840.10008.5.1.4.1.1.4     | Yes | Yes | √    |
| Multi-Frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2   | Yes | Yes | √    |
| Multi-Frame Grayscale Word Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.3   | Yes | Yes | √    |
| Multi-Frame Single bit Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.1   | Yes | Yes | √    |
| Multi-Frame True Color Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.4   | Yes | Yes | √    |
| Nuclear Medicine Image Storage                             | 1.2.840.10008.5.1.4.1.1.20    | Yes | Yes | √    |
| Nuclear Medicine Image Storage (Retired)                   | 1.2.840.10008.5.1.4.1.1.5     | Yes | Yes | √    |
| Positron Emission Tomography Image Storage                 | 1.2.840.10008.5.1.4.1.1.128   | Yes | Yes | √    |
| Radiotherapy Image   | 1.2.840.10008.5.1.4.1.1.481.1 | Yes | Yes | √    |
| Secondary Capture Image Storage                            | 1.2.840.10008.5.1.4.1.1.7     | Yes | Yes | √    |

#### 5.1.1 Storage SCU AE

The Oasis AE is a Storage Service Class SCU. It can transmit composite SOP instances that have been received from prior external DICOM transmissions. It can also transmit images that have been created as a result of Oasis processing software. As an SCU, Oasis initiates pushes of SOP instances to remote AEs by initiating associations and sending DICOM C-STORE requests.

##### 5.1.1.1 Storage SCU Associated Real-World Activity

An Oasis user has the ability pushes one or more studies and/or series to a remote DICOM AE. Individual images cannot be selected/transmitted (unless a series happens to contain one image). Pushes are not initiated from the Oasis client application. Pushes are initiated by a user of the Oasis Administration Tool.

Real world activity by one or more users can result in concurrent push activity. One user or multiple users can concurrently initiates pushes of the same or different studies/series to the same or different remote AEs.

Oasis manages output queues that result from concurrent push requests. The granularity of a push transfer request is at the "job" level. Refer to *Section 5.1.1.5, SOP Specific Conformance*, for details of job management. The user has the capability to cancel active; i.e., Oasis can abort jobs and can abort the active association associated with a job.

5.1.1.2 Association Initiation Policy

Oasis initiates a new association when the user requests the transmission of a set of images (either a set of study or series, or any part thereof). Oasis transmits each job (or any part thereof) in a single association (refer to Section 5.1.1.5, SOP Specific Conformance, for details of what constitutes a 'job').

The Oasis AE releases the association when either all the images belonging to the job have been sent, when the job has been cancelled or when an error occurs. Oasis does not implement an auto-retry mechanism. If the association is broken (for whatever reason) no automatic retries are attempted to transmit the remaining images associated with the job.

The Oasis Storage SCU AE has a configurable timeout value that defines how long the SCU will wait for the remote AE to respond to commands sent by Oasis on the association. Before initiating an association for C-STORE requests, Oasis initiates a verification request to the target remote AE and, if verification fails, the job is aborted.

5.1.1.3 Number of Associations

Oasis can open multiple associations in support of multiple concurrent pushes. Concurrent associations for C-STORE requests results when one or more users request one or more pushes. Refer to *Section 5.1.1.5, SOP Specific Conformance*, for details concerning concurrent associations initiated by the C-STORE SCU.

5.1.1.4 Storage SCU Presentation Contexts

The Oasis Storage SCU can propose Presentation Contexts as shown in the following table. However, the list of Transfer Syntaxes proposed can be limited by configuration parameters (see Section 10).

| PRESENTATION CONTEXT TABLE (SCU ROLE)   |     |  |   |      |         |
|---|-----|--|---|------|---------|
| ABSTRACT SYNTAX   |     | TRANSFER SYNTAX  |   | ROLE | EXT NEG |
| NAME  | UID | NAME   | UID   |      |         |
| STORAGE SCU   |     |  |   |      |         |
| All SOP Classes listed under the <b>STORAGE AND DISPLAY</b> section in <b>Table I</b> |     | o Explicit VR Little Endian<br>o Explicit VR Big Endian<br>o Implicit VR Little Endian | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2 | SCU  | None    |

5.1.1.5 SOP Specific Conformance

5.1.1.5.1 Available Destination Remote AEs

Only those Remote AEs which have been configured in Oasis and have the STORE SCP capability enabled are available as destination AEs.

5.1.1.5.2 Abstract Syntax Negotiation

The Oasis AE will propose its presentation context and negotiate accordingly. Negotiation proceeds in the order that the Transfer Syntaxes are listed in the Presentation Context table. The list of transfer syntaxes in the table can be overridden by configuration parameters. Also, if the destination remote AE is configured such that compression is disabled (regardless of whether the remote AE proposes compression), Oasis will not propose transfer syntaxes that require compression.

#### 5.1.1.5.3 Definition of a Transmittal "Job"

The Oasis user creates transmittal jobs when initiating pushes to remote AEs. One job is created when the user initiates the transmission regardless of the number of studies or series that have been selected for transmission. Thus, a job is comprised of all SOP instances of the objects that belong to the studies and/or series that the user has selected for transmission to the destination remote node. Regardless of how many studies/series/images the user is pushing, one push request constitutes one job.

#### 5.1.1.5.4 Multiple Instances of the C-STORE SCU

In the Oasis system, "pushing" images is an asynchronous operation. That is to say, when a user initiates a push to a remote AE (a 'job'), control is immediately passed back to the user. The actual transmission of SOP instances that comprise the job occurs in the background. Consequently, in that a user can initiate another push while active push job(s) are still pending, there is a question as to the simultaneity of the push operations.

The rule is as follows: Oasis will open one association per job per user. For each job, Oasis processes the transmission of each SOP instance in a single threaded manner. However, all jobs, whether they are initiated by one user or by many, are processed concurrently. And, as the Oasis C-STORE SCU transmits one SOP instance at a time per job, the number of concurrent associations opened by the C-STORE SCU is equal to the number of concurrent jobs.

Notwithstanding the above, the number of total simultaneous associations (and thus the number of concurrent jobs) is limited by a configurable parameter.

#### 5.1.1.5.5 Job Management

Oasis maintains a list of active jobs. The list of active jobs is made available to the user so that status/progress can be viewed. The user also may abort a job.

There is one instance of the C-STORE SCU AE per job and each one acts independently of one another. A C-STORE SCU job is associated with one and only one remote AE destination. However, multiple instances of the SCU can send to the same remote AE or different remote AEs.

Within each job, Oasis maintains a list of SOP UIDs to be transferred. As such, Oasis transfers one object at a time while the job is active. Oasis does not establish multiple-associations within a job.

If the initiating of a push would cause the number of concurrent open associations to exceed the configured maximum, the users request is rejected.

#### 5.1.1.5.6 Cancelling Jobs

The user has the ability to cancel active job. Upon cancellation, Oasis sends an Association Abort request to the remote AE. Oasis will not wait for the current C-STORE request to be complete for the abort request is made to the remote AE. The cancelled job is left in the job list for status purposes.

#### 5.1.1.5.7 Timeout Handling

See *Section 3.4.6, Timeout Handling*.

#### 5.1.1.5.8 Use of Altered DICOM Elements

When an images are received and stored in the Oasis database the entire set of elements associated with the objects are saved as well. When an object is selected for transmission to a remote AE, the content of the object will be as it was originally received *unless* patient demographic information and/or other DICOM header information has been altered. In such

cases, the latest values in the database will replace the original information. The SOP Instance UID of the object is not changed even if attribute data has been altered.

#### 5.1.1.5.9 Element Mapping

Oasis uses certain DICOM elements to display patient/study/series related information in its GUI. Due to inconsistencies in the way manufacturers choose which elements to use, Oasis institutes a "tag" mapping mechanism to ensure that useful information is provided to the user. (e.g., the "series description" displayed to the user may or may not come from the "series description" element provided by the manufacturer.)

The mapping is provided such that Oasis can convey a consistent interface to the user.

Oasis does *not* use this mapping when sending the original object to a remote AE.

#### 5.1.1.5.10 Objects Created by Oasis

Using Oasis processing software the user can create new objects (e.g., Secondary Capture images, reconstructed volumes.) When Oasis sends created to remote AEs, the manufacture/mode elements in the DICOM header are set to "Segami" / "Oasis". Details of that attributes that Oasis uses when creating an object are describing in *Section 12.4, Derived Image Creation*.

### 5.1.2 Storage SCP AE

The Oasis AE is a Storage Server Class SCP. As an SCP, Oasis accepts unsolicited associations from remote AEs for purposes of receiving for DICOM Store requests. Oasis receives composite SOP objects and stores then in the Oasis Server data base.

Oasis does *not* store the DICOM Composite SOP Instances either as full DICOM messages (.dcm files) or as DICOM Part 10 compliant files. Oasis stores the information needed to *recreate* DICOM messages or DICOM Part 10 compliant files.

Oasis stores images using the Transfer Syntax with which they were received.

The Oasis Storage SCP conforms to the full (level 2) conformance of the Storage SOP class. All Type 1, Type 2 and Type 3 attributes are retained.

#### 5.1.2.1 Storage SCP Associated Real-World Activity

Oasis accepts associations and receives images from remote AEs. Real world activity includes remote users pushing data to Oasis or remote AEs "auto-forwarding" images to Oasis.

#### 5.1.2.2 Association Acceptance Policy

The Oasis AE accepts association requests only if they propose one or more presentation contexts that it supports. If none of the requested presentation contexts are accepted, then the association request itself is rejected. The Oasis C-Store SCP AE can be configured to only accept associations requested by hosts "known" to Oasis.

#### 5.1.2.3 Number of Associations

Oasis accepts more than one associations at a time. Real world activity that will result in Oasis' acceptance of multiple concurrent associations is when multiple pushes and/or auto-forwards are initiated from remote AEs (C-STOREs).

#### 5.1.2.4 Storage SCP Presentation Contexts

The Oasis Storage SCP will propose Presentation Contexts as shown in the following table:

| PRESENTATION CONTEXT TABLE (SCP ROLE)   |     |  |   |      |         |
|---|-----|--|---|------|---------|
| ABSTRACT SYNTAX   |     | TRANSFER SYNTAX  |   | ROLE | EXT NEG |
| NAME  | UID | NAME   | UID   |      |         |
| STORAGE SCP   |     |  |   |      |         |
| All SOP Classes listed under the <b>STORAGE AND DISPLAY</b> section in <b>Table I</b> |     | <ul style="list-style-type: none"> <li>o Explicit VR Little Endian</li> <li>o Explicit VR Big Endian</li> <li>o Implicit VR Little Endian</li> </ul> | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2 | SCP  | None    |

Oasis accepts the transfer syntax in the order they are proposed. By default the DICOM default Transfer Syntax is accepted.

#### 5.1.2.5 SOP Specific Conformance

##### 5.1.2.5.1 Available Destination Remote AEs

If the Enforce AE Title configuration parameter is enabled, only associations requested by Remote AEs which have been configured in Oasis and which have the STORE SCU capability are accepted.

##### 5.1.2.5.2 SCP Start-up

The Storage SCP component of Oasis runs as background server process, automatically starting when the system is booted. Upon accepting an association with a negotiated presentation context it receives objects and imports them to the Oasis Server database.

##### 5.1.2.5.3 Data storage

Oasis will store images that are successfully parsed and contain all the necessary information to add the image to the database. Images that fail to be correctly imported are written to a configurable directory and an error is logged in the service log.

Oasis does *not* store the DICOM Composite SOP Instances either as full DICOM messages (.dcm files) or as DICOM Part 10 compliant files. Oasis stores the information needed to *recreate* DICOM Part 10 compliant files. To obtain full DICOM messages or Part 10 DICOM files from Oasis, Oasis Media Creation services must be used.

##### 5.1.2.5.4 Grouping

Oasis logically groups composite SOP instances by patient, study and images. Oasis used the Study UID as the primary grouping key. In the Oasis Browser, this grouping is a part of the GUI.

Theoretically, for whatever reason, a group of SOP instances could have the same Study UID but with different patient identification characteristics (Patient Name, Patient ID, etc). When Oasis encounters such an inconsistency, it will override the grouping algorithm and split the patient, study or series based on the inconsistent element. To fix such inconsistencies Oasis permits the user to modify demographic information and/or merge studies.

##### 5.1.2.5.5 Disk Full Warning / Error

If enabled, the Oasis C-STORE SCP will send a warning to the remote AE when disk space has reached the Disk Warning Level (value is configurable). Also, if enabled, the Oasis C-STORE SCP will send an error to the remote AE when disk space has reached the Disk Full

Level (value is configurable). When the Disk Full Level is reached no further C-STORE requests are accepted.

#### 5.1.2.5.6 Auto Query (Historical)

If the Auto Historical Query parameter is enabled, Oasis automatically issues C-FINDs and C-MOVEs to fetch historical studies that are associated with new studies. The coordinates of the remote AE to Auto-Query/Retrieve are configurable.

#### 5.1.2.5.7 Element Mapping

Oasis uses certain DICOM elements to display patient/study/series related information in its GUI. Due to inconsistencies in the way manufacturers choose which elements to use, Oasis institutes a "tag" mapping mechanism to ensure that useful information is provided to the user. (e.g., the "series description" displayed to the user may or may not come from the "series description" element provided by the manufacturer.)

The mapping algorithms are configurable. The Oasis database includes a manufacturer "tag mapping" table that specifies the mapping of elements on a manufacture/model basis.

#### 5.1.2.5.8 Duplication SOP Instances

The Oasis Server does not overwrite SOP instances that have the same SOP Instance UID as a received image. In any case, the reception of a composite SOP object that already exists on the database is logged.

#### 5.1.2.5.9 Timeout Handling

See *Section 3.4.6, Timeout Handling*.

#### 5.1.2.5.10 Auto-Retry

The Oasis AE does not perform automatic retries for failed C-STORE requests.

#### 5.1.2.5.11 Status Responses and Error Behavior

Codes for error and status response and associated AE behavior are described in Appendix B.

## 5.2 RTSTRUCT SUPPORT

The Oasis Server supports the following Radiotherapy Storage SOP Classes:

RT Dose: 1.2.840.10008.5.1.4.1.1.481.2

RT Structured Set: 1.2.840.10008.5.1.4.1.1.481.3

RT Beams Treatment Record: 1.2.840.10008.5.1.4.1.1.481.4

RT Plan: 1.2.840.10008.5.1.4.1.1.481.5

RT Ion Plan: 1.2.840.10008.5.1.4.1.1.481.8

RT Brachy Treatment Record: 1.2.840.10008.5.1.4.1.1.481.6

RT Treatment Summary Record: 1.2.840.10008.5.1.4.1.1.481.7

RT Beams Delivery Instruction (Trial): 1.2.840.10008.5.1.4.34.1

RT Beams Delivery Instruction: 1.2.840.10008.5.1.4.34.4



## 6 QUERY / RETRIEVE

### 6.1 QUERY / RETRIEVE AE SPECIFICATIONS (SCU)

The Oasis DICOM Server AE provides standard conformance to the following DICOM V3.0 SOP Class:

| SOP CLASS NAME                                     | SOP CLASS UID               | SCU | SCP |
|--|-----------------------------|-----|-----|
| QUERY – RETRIEVE                                   |                             |     |     |
| Study Root Query/Retrieve Information Model – FIND | 1.2.840.10008.5.1.4.1.2.2.1 | Yes | Yes |
| Study Root Query/Retrieve Information Model – MOVE | 1.2.840.10008.5.1.4.1.2.2.2 | Yes | Yes |
| Study Root Query/Retrieve Information Model – GET  | 1.2.840.10008.5.1.4.1.2.2.3 | Yes | Yes |

#### 6.1.1 Association Establishment (SCU & SCP)

The Oasis Query Retrieve AE initiates associations to send query requests to remote AEs to obtain a list of studies, series and composite SOP instances that reside on the remote AE.

The Oasis AE initiates associations to send move requests to remote AEs to retrieve images to the Oasis database.

The Oasis AE accepts associations to respond to query requests sent from remote AEs.

The Oasis AE accepts associations to respond to move requests sent from remote AEs.

The Oasis AE initiates associations to send composite SOP instances to remote AEs as a result of move requests made by remote AEs.

#### 6.1.2 Query Retrieve SCU AE

Oasis is a Query/Retrieve SCU. The Oasis AE initiates C-FIND Query requests and C-MOVE Retrieve requests. As an SCU, Oasis queries remote AEs using a matching criteria to obtain a list of studies, series and related information that matches the query.

As an SCU, Oasis initiates C-MOVE requests, requesting that the remote AE transfer data to another AE. The user and thus the Oasis AE can specify AE Titles other than Oasis as the C-MOVE destination.

##### 6.1.2.1 Association Establishment Policy

The Oasis Query Retrieve SCU initiates associations to send query requests to remote AEs.

The Oasis Query Retrieve SCU initiates association to send move requests to remote AEs to retrieve images to the Oasis database. It opens new associations for C-MOVE requests using the C-MOVE destination AE specified by the user.

As a result of the remote AE processing the Oasis C-MOVE request, the remote AE initiates, and Oasis accepts, associations for the resultant C-STORE requests.

##### 6.1.2.2 Query Retrieve SCU Associated Real-World Activity

Real world activities associated with the Oasis Query Retrieve SCU AE are:

- An Oasis user initiates a query to a remote AE
- An Oasis user initiates a retrieve from a remote AE
- Oasis software internally generates a query to a remote AE (e.g., to automatically detect if there is historical data for a patient on a PACS)

6.1.2.3 Number of Concurrent Associations

Multiple concurrent associations initiated by the Query Retrieve SCU can come as a result of simultaneous query requests, move requests or both.

6.1.2.4 Query Retrieve SCU Presentation Contexts

The Oasis Query Retrieve SCU will propose Presentation Contexts as shown in the following table:

| PRESENTATION CONTEXT TABLE (SCU ROLE) |                             |                           |                   |      |         |
|---------------------------------------|-----------------------------|---------------------------|-------------------|------|---------|
| ABSTRACT SYNTAX                       |                             | TRANSFER SYNTAX           |                   | ROLE | EXT NEG |
| NAME                                  | UID                         | NAME                      | UID               |      |         |
| QUERY RETRIEVE                        |                             |                           |                   |      |         |
| Study Root FIND                       | 1.2.840.10008.5.1.4.1.2.2.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU  | None    |
| Study Root MOVE                       | 1.2.840.10008.5.1.4.1.2.2.2 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU  | None    |

6.1.2.5 SOP Specific Conformance (C-FIND SCU)

6.1.2.5.1 Study Root Level

The Oasis AE provides standard conformance to the supported C-FIND SOP Classes. The AE does not support relational queries. Only the Study Root information model is supported by Oasis. All queries are initiated at the study level. As the user browses or “drills down” a given study, Oasis queries at the series level for the selected study.

6.1.2.5.2 Available Destination Remote AEs

Only those Remote AEs which have been configured in Oasis and have the FIND SCP capability enabled are available as query-able AEs.

6.1.2.5.3 Optional and Unsupported Matching Attributes

Attributes returned in a C-FIND response that were not requested are not ignored by Oasis. Oasis ignores cases where requested optional attributes are not returned by the SCP (for whatever reason). Non-matching responses returned by the SCP due to unsupported matching keys are not filtered by Oasis and thus are presented to the Oasis user as a part of the query results. Oasis does not filter out duplicate responses that may be sent from the C-FIND SCP.

6.1.2.5.4 Asynchronous Nature of Oasis C-FIND SCU

The Oasis implementation of Query (C-FIND) on Oasis is asynchronous. That is, the Oasis user may initiate multiple concurrent query requests. Thus, one user can perform a query-related real world activity that would cause Oasis to initiate multiple C-FIND associations. Also, in that Oasis is a multiple user system, multiple users can initiate queries at the same time. Oasis supports concurrent query operations that come as a result of multiple users initiating queries at the same time.

The Oasis AE C-FIND SCU implements a timeout mechanism. Based on a configurable timeout parameter, Oasis aborts the C-FIND association if the remote AE has not respond within the timeout period.

#### 6.1.2.5.5 Auto Query (Historical)

If the Auto Historical Query parameter is enabled, Oasis automatically issues C-FINDs and C-MOVEs to fetch historical studies that are associated with new studies. The coordinates of the remote AE to Auto-Query/Retrieve are configurable. To retrieve studies, Oasis uses a set of matching parameters derived from the newly acquired study's attributes. Based on configurable parameters, Oasis uses "Loose", "Medium" or "Tight" constraints when retrieving historical data.

#### 6.1.2.5.6 Timeout Handling

See *Section 3.4.6, Timeout Handling*.

Oasis includes the following elements in a C-FIND Study Request based on the Study Root Information Model:

| C-FIND SCU REQUESTED ELEMENTS |                            |          |    |
|-------------------------------|----------------------------|----------|----|
| Tag                           | Description                | Matching | VR |
| Study Level                   |                            |          |    |
| (0010,0010)                   | Patient Name               | S,*U     | PN |
| (0010,0020)                   | Patient ID                 | S,*U     | LO |
| (0010,0030)                   | Patient Date of Birth      | S,*U     | DA |
| (0010,0040)                   | Patient Sex                | S,*U     | CS |
| (0008,0020)                   | Study Date                 | S,R,U    | DA |
| (0008,0030)                   | Study Time                 | NONE     | TM |
| (0080,0050)                   | Accession Number           | S,*U     | SH |
| (0008,0010)                   | Study ID                   | S,*U     | SH |
| (0008,000D)                   | Study Instance UID         | UNIQUE,L | UI |
| (0008,0090)                   | Referring Physician's Name | S,*U     | PN |
| (0008,1030)                   | Study Description          | S,*U     | LO |
| (0008,0061)                   | Modalities in Study        | S,*U     | CS |
| Series Level                  |                            |          |    |
| (0008,0060)                   | Modality                   | S,U      | CS |
| (0020,0011)                   | Series Number              | S,*U     | IS |
| (0020,000E)                   | Series Instance UID        | UNIQUE,L | UI |
| Image Level                   |                            |          |    |
| (0020,0013)                   | Instance Number            | S,*U     | IS |
| (0008,0018)                   | SOP Instance UID           | UNIQUE,L | UI |
| (0028,0010)                   | Rows                       | NONE     | US |
| (0028,0011)                   | Columns                    | NONE     | US |
| (0028,0100)                   | Bits Allocated             | NONE     | US |
| (0028,0008)                   | Number of Frames           | NONE     | IS |

Matching Legend\*:

- S** - indicates the identifier attribute can specify Single Value Matching.
- R** - indicates Range Matching.
- \*** - indicates Wildcard Matching.
- U** - indicates Universal Matching.
- L** - indicates that UID lists can be sent.
- NONE** - indicates that no matching can be requested, but that values for this Element are requested to be returned.
- UNIQUE** - indicates a single unique key value can be sent

\*Legend used for subsequent tables in this section as well

### 6.1.2.6 SOP Specific Conformance (C-MOVE SCU)

#### 6.1.2.6.1 Study Root Level

The Oasis Query/Retrieve SCU AE provides standard conformance to the supported C-MOVE SOP Classes.

Oasis implements the Study root Query/Retrieve Information Model. As specified in the DICOM standard, in order to retrieve information at lower levels, Oasis provides unique keys for the higher levels. These unique keys for the higher levels are obtained by first performing a C-FIND at that level. For example, Study and Series C-FIND operations are performed to obtain the unique keys for a Image level query in the Study Root model.

#### 6.1.2.6.2 Available Remote C-MOVE SCP AEs

Only those Remote AEs which have been configured in Oasis and have the MOVE SCP capability enabled are available as remote AEs.

All queries are initiated at the study level and then, for each response received, recursively repeated at the series level and then the image level.

#### 6.1.2.6.3 Destination AEs

The C-MOVE Request is sent to the AE specified by the user. The destination need not be the local AE. The remote C-MOVE SCP must be pre-configured to determine the presentation address corresponding to the destination AE. If the destination is Oasis (a "true pull"), the SOP instances are received and stored by Oasis C-STORE SCP.

#### 6.1.2.6.4 Selection Granularity

The user selects one or more studies or series to retrieve. Individual images cannot be retrieved. Oasis retrieves at the study or series level depending on what level of entity has been selected by the Oasis user.

#### 6.1.2.6.5 C-MOVE SCU / C-STORE SCP Independence

The C-MOVE SCU, the receiver of C-MOVE responses, operates independently from the C-STORE SCP that receives the retrieved images. Oasis does not enforce consistency between the two entities; e.g., Oasis does not verify that C-MOVE responses sent by the remote AE's C-MOVE SCP are consistent with the SOP instances sent by the remote AE (C-STORE requests to the Oasis AE). Oasis assumes that when the last C-MOVE response arrives, the remote AE is complete. If, however, the remote AE continues to send SOP instances after the final C-MOVE response, Oasis will not discard the images; i.e., it will place them into the Oasis database. Oasis does not differentiate between unsolicited C-STORE requests and C-STORE requests that come as a result of Oasis initiating a retrieve.

#### 6.1.2.6.6 Error / Abort by Remote AE

If the remote AE sends an error in a C-MOVE response or aborts the association, Oasis assumes that the retrieve is complete. However, again, Oasis will not discard images sent after the termination of the C-MOVE association.

#### 6.1.2.6.7 Multiple Instances of the C-MOVE SCU

In the Oasis system, retrieving images (or moving images) from a remote AE is an asynchronous operation. When a user initiates a retrieve from a remote AE, control is immediately passed back to the user. Once the retrieve is started, the instance of Oasis' C-MOVE SCU receives C-MOVE responses. Independently, the destination's C-STORE SCP (typically Oasis' C-STORE SCP) receives images and stores them in the database.

The C-MOVE SCU runs in the background. Consequently, in that a user can initiate another retrieve while active retrieves are in progress, multiple instances of the C-MOVE SCU are possible. Multiple instances of C-MOVE SCUs are also created when multiple users issue retrieve requests concurrently.

Oasis will open one association per user’s retrieve request regardless of the number of studies/series in the request. On that association, C-MOVE responses are received. Oasis uses the C-MOVE responses to give progress indications to the user. Notwithstanding the above, the number of total simultaneous associations (and thus the number of concurrent retrieve requests) is limited by a configurable parameter.

6.1.2.6.8 Retrieve Job Status

Oasis provides the user with a list of active retrieve jobs. Each job has progress information associated with it. There is one C-MOVE SCU instance per active retrieve job. Each C-MOVE instance monitor’s the progress of its retrieve job.

6.1.2.6.9 Cancellation of Retrieve Jobs

From the list of active retrieve requests, the Oasis user may select and cancel one or more retrieves. Upon cancellation, the corresponding C-MOVE SCU instance aborts the association with appropriate status.

6.1.2.6.10 Timeout Handling

See *Section 3.4.6, Timeout Handling*.

6.1.2.6.11 C-MOVE Elements

Oasis includes the following elements in a C-MOVE Study Request based on the Study Root Information Model:

| C-MOVE SCU REQUESTED ELEMENTS |                     |          |    |
|-------------------------------|---------------------|----------|----|
| Tag                           | Description         | Matching | VR |
| Study Level                   |                     |          |    |
| (0008,000D)                   | Study Instance UID  | UNIQUE   | UI |
| Series Level                  |                     |          |    |
| (0020,000E)                   | Series Instance UID | UNIQUE   | UI |
| Image Level                   |                     |          |    |
| (0008,0018)                   | SOP Instance UID    | UNIQUE   | UI |

6.1.3 Query Retrieve SCP AE

The Oasis AE is a Query/Retrieve SCP. The AE accepts C-FIND requests from remote AEs that wish to query the Oasis database for patient, study and series information. Queries requesting Modality Worklist information are not supported.

The Oasis AE also responds to C-MOVE Requests from remote AEs requesting the retrieval of SOP instances from the Oasis database. The Oasis AE also acts as the SCU of the Storage Service to transfer the requested SOP Instances to the requested destination AE.

When remote AEs send C-MOVE request to Oasis, the Oasis AE matches database objects with parameters in the submitted request. If there are composite SOP instances that match the C-MOVE request, then the Oasis AE opens an association with the C-MOVE destination AE and transfers the requested SOP Instances.

6.1.3.1 Query Retrieve SCP Associated Real-World Activity

Remote AEs querying Oasis or initiating retrieves (“pulling”) from Oasis are the real world activities that are associated with the Oasis Query/Retrieve SCP.

6.1.3.2 Association Establishment Policy

The Oasis Query/Retrieve AE accepts associations with valid presentation contexts. The Oasis AE can be configured to only accept associations requested by certain hosts “known” by Oasis.

Results for a query (C-FIND) are sent over the same association used to send the C-FIND-Request.

C-MOVE responses are sent over the same association used to receive the C-MOVE-Request. Oasis sends the requested SOP instances to the destination contained in the C-MOVE Destination attribute.

6.1.3.3 Number of Associations

Oasis sends all query results for one query across a single associations. Oasis sends all C-MOVE responses across one query for a single C-MOVE request. For one C-MOVE request received by Oasis, Oasis sends all SOP instance using C-STORE requests on one association. Multiple concurrent associations can come as a result of simultaneous query requests, move requests or both. Multiple concurrent associations are opened by Oasis when one or more remote AEs concurrently issue query requests to Oasis. Multiple concurrent associations are opened by Oasis when one or more remote AEs concurrently issue retrieve requests to Oasis. Note that one remote AE can cause multiple associations if that remote AE has the capability to initiate multiple retrieves. Unless the remote AE is a multi-user system, it is unlikely that the remote AE can initiate multiple concurrent queries.

6.1.3.4 Query Retrieve SCP Presentation Contexts

The Oasis Query Retrieve SCP will propose Presentation Contexts as shown in the following table:

| PRESENTATION CONTEXT TABLE (SCP ROLE) |                             |                           |                   |      |         |
|---------------------------------------|-----------------------------|---------------------------|-------------------|------|---------|
| ABSTRACT SYNTAX                       |                             | TRANSFER SYNTAX           |                   | ROLE | EXT NEG |
| NAME                                  | UID                         | NAME                      | UID               |      |         |
| QUERY RETRIEVE                        |                             |                           |                   |      |         |
| Study Root FIND                       | 1.2.840.10008.5.1.4.1.2.2.1 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP  | None    |
| Study Root Move                       | 1.2.840.10008.5.1.4.1.2.2.2 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP  | None    |

6.1.3.5 SOP Specific Conformance (C-FIND SCP)

6.1.3.5.1 Hierarchical vs. Relational Queries

Oasis supports hierarchical queries. Oasis does not support relational queries.

6.1.3.5.2 Default Return Attributes

Oasis does not have a set of attributes that are always returned by default; i.e., Oasis only returns those attributes that are specifically requested in the query.

6.1.3.5.3 Use of Latest (Possibly Altered) Information

The results of a query are constructed from the “latest” (possibly altered) attributes that are stored on the Oasis database. Transferred SOP instances are always updated with the latest

values in the database prior to export. That is to say, a change in DICOM header information affects both the C-FIND results provided by Oasis and the SOP instances transmitted to remote AEs.

#### 6.1.3.5.4 Timeout Handling

See *Section 3.4.6, Timeout Handling*.

#### 6.1.3.5.5 Status Responses and Error Behavior

Codes for error and status response and associated AE behavior are described in Appendix B.



Oasis only supports the Study Root Information Model. All the required search keys on each of the three levels (Study, Series, and Image) are supported.

| C-FIND SCP MATCHING ATTRIBUTES |                                    |          |    |
|--------------------------------|------------------------------------|----------|----|
| Tag                            | Description                        | Matching | VR |
| Study Level                    |                                    |          |    |
| (0008,0020)                    | Study Date                         | S,R,U    | DA |
| (0008,0030)                    | Study Time                         | NONE     | TM |
| (0080,0050)                    | Accession Number                   | S,*,U    | SH |
| (0008,0010)                    | Study ID                           | S,*,U    | SH |
| (0008,000D)                    | Study Instance UID                 | UNIQUE,L | UI |
| (0008,0090)                    | Referring Physician's Name         | S,*,U    | PN |
| (0008,1030)                    | Study Description                  | S,*,U    | LO |
| (0010,0010)                    | Patient Name                       | S,*,U    | PN |
| (0010,0020)                    | Patient ID                         | S,*,U    | LO |
| (0010,0030)                    | Patient Date of Birth              | S,*,U    | DA |
| (0010,0040)                    | Patient Sex                        | S,*,U    | CS |
| (0008,0061)                    | Modalities in Study                | S,*,U    | CS |
| (0020,1206)                    | Number of Study Related Series     | NONE     | IS |
| (0020,1208)                    | Number of Study Related Instances  | NONE     | IS |
| Series Level                   |                                    |          |    |
| (0008,0060)                    | Modality                           | S,U      | CS |
| (0020,0011)                    | Series Number                      | S,*,U    | IS |
| (0020,000E)                    | Series Instance UID                | UNIQUE,L | UI |
| (0020,1209)                    | Number of Series Related Instances | NONE     | IS |
| (0008,1050)                    | Performing Physician's Name        | S,*,U    | PN |
| (0008,103E)                    | Series Description                 | S,*,U    | LO |
| Image Level                    |                                    |          |    |
| (0020,0013)                    | Instance Number                    | S,*,U    | IS |
| (0008,0018)                    | SOP Instance UID                   | UNIQUE,L | UI |
| (0008,0016)                    | SOP Class UID                      | S,U      | IO |
| (0028,0010)                    | Rows                               | NONE     | US |
| (0028,0011)                    | Columns                            | NONE     | US |
| (0028,0100)                    | Bits Allocated                     | NONE     | US |
| (0028,0008)                    | Number of Frames                   | NONE     | IS |

### 6.1.3.6 SOP Specific Conformance (C-MOVE SCP)

#### 6.1.3.6.1 Configured Remote AEs

If the Enforce AE Title parameter is set, Oasis will reject C-MOVE requests from those remote AEs which have not been configured in Oasis or do not have the C-MOVE SCU capability enabled.

6.1.3.6.2 C-MOVE Destination Remote AE

The destination remote AE must be configured in Oasis.

6.1.3.6.3 Initiation of Abort Requests

If an error occurs during transmission over an open association then the transfer is aborted. An Association Abort request is sent over both the C-MOVE and C-STORE association. Oasis will not make an attempt to send remaining SOP instances.

6.1.3.6.4 Auto-Retry

The Oasis AE does not perform automatic retries for failed C-MOVE requests.

6.1.3.6.5 Transmission of Latest (Possibly Altered) Data

In response to a C-MOVE request, Oasis sends SOP instances as they were originally received unless attributes have been altered. In such cases the latest values in the database will replace the original information.

6.1.3.6.6 Timeout Handling

See *Section 3.4.6, Timeout Handling*.

6.1.3.6.7 Status Responses and Error Behavior

Codes for error and status response and associated AE behavior are described in Appendix B.

6.1.3.6.8 Supported C-MOVE Attributes

Oasis supports the Study Root information model for C-MOVE requests with the following elements :

| C-MOVE SCP MATCHING ATTRIBUTES |                     |          |    |
|--------------------------------|---------------------|----------|----|
| Tag                            | Description         | Matching | VR |
| Study Level                    |                     |          |    |
| (0008,000D)                    | Study Instance UID  | UNIQUE   | UI |
| Series Level                   |                     |          |    |
| (0020,000E)                    | Series Instance UID | UNIQUE   | UI |
| Image Level                    |                     |          |    |
| (0008,0018)                    | SOP Instance UID    | UNIQUE   | UI |

**6.1.4 Modality Worklist SCU**

The Oasis Server, as part of its Header Validation and Correction feature (see separate guide), performs the Modality Worklist Service Class User role. There is no other manual way to use this role.

The SCU will perform Modality Worklist Information Model C-FIND requests with the SOP Class 1.2.840.10008.5.1.4.31, at the Study (Query/Retrieve) level.

## 7 PRINT

Oasis includes standard printer SCU functionality to provide and interface to various DICOM printers.

### 7.1 PRINT (SCU)

The Oasis DICOM Server AE provides standard conformance to the following DICOM V3.0 SOP Class:

| SOP CLASS NAME                            | SOP CLASS UID           | SCU | SCP |
|---|-------------------------|-----|-----|
| DICOM PRINT                               |                         |     |     |
| Basic Grayscale Print Mgmt Meta SOP Class | 1.2.840.10008.5.1.1.9   | Yes | No  |
| Basic Color Print Mgmt Meta SOP Class     | 1.2.840.10008.5.1.1.18  | Yes | No  |
| Basic Color Image Box SOP Class           | 1.2.840.10008.5.1.1.4.1 | Yes | No  |
| Printer SOP Class                         | 1.2.840.10008.5.1.1.14  | Yes | No  |

#### 7.1.1 Print SCU AE

The Print Management AE implements the Print Management Service Class as an SCU. It supports both the Basic Greyscale Print Management and Basic Color Print Management Classes

##### 7.1.1.1 Association Initiation Policy

The Oasis AE initiates new associations when the user requests that images be sent to a DICOM printer. The user may abort the print job in which case the association is aborted. Oasis aborts the association in case of fatal errors.

##### 7.1.1.2 Number of Associations

Print jobs are queued so each printer has one active association open at a time. Although more than one user can initiate a print to the same printer, Oasis can only permit one association open at a time to a given printer. Thus print requests to the same printer are queued. Multiple Print SCU associations can exist if multiple printers are active.

##### 7.1.1.3 Print SCU Associated Real-World Activity

An Oasis user can compose film and initiate prints from the Oasis client.

7.1.1.4 Print SCU Presentation Contexts

The Oasis Print SCP will propose Presentation Contexts as shown in the following table:

| PRESENTATION CONTEXT TABLE (SCU ROLE) |                        |                           |                   |      |         |
|---------------------------------------|------------------------|---------------------------|-------------------|------|---------|
| ABSTRACT SYNTAX                       |                        | TRANSFER SYNTAX           |                   | ROLE | EXT NEG |
| NAME                                  | UID                    | NAME                      | UID               |      |         |
| PRINT                                 |                        |                           |                   |      |         |
| Basic Grayscale Print Management      | 1.2.840.10008.5.1.1.9  | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU  | None    |
| Basic Color Print Management          | 1.2.840.10008.5.1.1.18 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU  | None    |
| Basic Film Session SOP Class          | 1.2.840.10008.5.1.1.1  | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU  | None    |
| Basic Film Box SOP Class              | 1.2.840.10008.5.1.1.2  | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU  | None    |

7.1.1.5 DICOM Attributes

Oasis supports the following DICOM attributes. Defaults for each attribute are configurable.

| PRINT SCU ATTRIBUTES |             |                                    |
|----------------------|-------------|------------------------------------|
| ATTRIBUTE            | DICOM TAG   | VALUES                             |
| Copies               | (2000,0010) | <number entered by user>           |
| Priority             | (2000,0020) | HIGH, MED, LOW                     |
| Medium Type          | (2000,0030) | PAPER, CLEAR FILM, BLUE FILM       |
| Film Destination     | (2000,0040) | MAGAZINE, PROCESSOR                |
| Film Session Label   | (2000,0050) | <Text entered by user>             |
| Image Display Format | (2010,0010) | STANDARD                           |
| Film Orientation     | (2010,0040) | PORTRAIT, LANDSCAPE                |
| Film Size            | (2010,0050) | 8x10, 11x14, 14x11, 14x17 (inches) |
| Magnification Type   | (2010,0060) | REPLICATE, BILINEAR, CUBIC, NONE   |
| Smoothing Type       | (2010,0080) | SHARP, SMOOTH, MEDIUM              |
| Border Density       | (2010,0100) | BLACK, WHITE, 0-300                |
| Empty Image Density  | (2010,0110) | BLACK, WHITE, 0-300                |
| Min Density          | (2010,0120) | 0-300                              |
| Max Density          | (2010,0130) | 0-300                              |
| Trim                 | (2010,0140) | YES, NO                            |
| Polarity             | (2020,0020) | NORMAL, REVERSE                    |
| Bits stored          | (0028,0101) | 8                                  |
| Bits allocated       | (0028,0100) | 8                                  |

7.1.1.6 SOP Specific Conformance

Oasis attempts Basic Color Print Management SOP printing for color images and the Basic Greyscale printing for greyscale images. Oasis will convert color images if the printer does not support color. Oasis will also convert color images to greyscale if the composition of a film layout is heterogeneous.

7.1.1.6.1 Timeout Handling

See *Section 3.4.6, Timeout Handling*.



## 8 MEDIA INTERCHANGE

Oasis can import/export DICOM files from/to removable media. An Oasis user has the ability to select studies and export the composite SOP instances that comprise that study as DICOM Part 10 files. When importing DICOM files from media, the user has the ability to browse the media and select studies to import. Oasis supports the import/export of DICOM files on CD-R, CDROM, DVD -R, DVD+R, DVD-RW, DVD+RW, DVDROM, local disk folders or USB drives.

### 8.1 IMPLEMENTATION MODEL

#### 8.1.1 Data Flow

Browsing, importing or creation of media is performed on the Oasis client and managed by the Oasis client application. On import, the Oasis client application reads data from media and sends it to the Oasis server. On export, the Oasis client request data from the server and writes it to media.

#### 8.1.2 Functional Definition

Oasis Media Interchange Media Server supports the following functions:

- Browsing DICOM File Sets (FSR) on media
- Selecting studies to import
- Importing studies
- Browsing the Oasis database
- Selecting Oasis studies to write to media
- Write DICOM File Sets (FSC) to media

### 8.2 AE SPECIFICATIONS

The DICOM CD/DVD SERVER Application Entity provides standard conformance to DICOM Interchange Option of the Media Storage Service Class.

#### 8.2.1 Real-World Activity Import

Oasis is a File Set Reader (FSR). The user inserts DICOM media into the client and the Oasis Media Exchange browser lists, in a study/series hierarchy, the DICOM Part 10 format files already written to it. The user chooses one or more studies to import and initiates the import.

#### 8.2.2 Real-World Activity Create

Oasis is a File Set Creator (FSC).The user creates media from studies in the database. The Oasis Browser is used to select studies to write to media. The user is prompted to insert empty media into the system. Upon the initiation of the export, Oasis creates a DICOMDIR and writes the selected studies/series to the media in DICOM Part 10 file format

Oasis always writes files in Implicit VR LE syntax.

## 9 SUPPORTED COMMUNICATION STACKS

### 9.1 SUPPORTED COMMUNICATION STACKS

Oasis Server implementation provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM standard.

### 9.2 TCP/IP STACK

Oasis Server implementation is independent of the physical medium over which TCP/IP executes.

### 9.3 DNS

Oasis Server can be a DNS client.

### 9.4 DHCP

Oasis Server can be a DHCP client.

## 10 CONFIGURATION

Oasis, via the Oasis Administration Tool, permits the Oasis administrator to configure various network related parameters in Oasis Server. Configuration parameters are used by the Oasis AE. The following table details these settings and indicates the default value(s) for each parameter:

| CONFIGURABLE PARAMETERS |   |                 |
|-------------------------|---|-----------------|
| NAME                    | DESCRIPTION   | DEFAULT         |
| Local AE Coordinates    |   |                 |
| Oasis AE Title SCU      | AE Title of Oasis SCUs  | "AEOasisServer" |
| Oasis AE Title SCP      | AE Title of Oasis SCPs  | "AEOasisServer" |
| Oasis AE Port SCU       | Port number of Oasis SCUs   | 104             |
| Oasis AE Port SCP       | Port number of Oasis SCPs   | 104             |
| Remote AE Coordinates*  |   |                 |
| Remote AE Title         | AE Title of Remote AE   | <none>          |
| Remote AE Port          | Port Remote AE  | <none>          |
| Remote IP Address       | IP Address of Remote AE   | <none>          |
| Disk Management         |   |                 |
| Disk Warning Level      | When free space less than 20GB, warning issued.                   | 20GB            |
| Disk Full Level         | When free space less than this parameter C-STORE SCPs reject data | 5GB             |
| Database Location       | Root directory of DB  | C:\             |
| Printing                |   |                 |



| CONFIGURABLE PARAMETERS |                                    |             |
|-------------------------|------------------------------------|-------------|
| NAME                    | DESCRIPTION                        | DEFAULT     |
| Copies                  | Number of copies to print          | 1           |
| Priority                | LOW, MED, HIGH                     | MED         |
| Medium Type             | PAPER, CLEAR FILM, BLUE FILM       | PAPER       |
| Film Destination        | MAGAZINE, PROCESSOR                | MAGAZINE    |
| Film Session Label      | Descriptive Text                   | <from user> |
| Image Display Format    | Format                             | STANDARD    |
| Film Orientation        | Portrait or Landscape              | PORTRAIT    |
| Film Size               | 8x10, 11x14, 14x11, 14x17 (inches) | 14x17       |
| Magnification Type      | REPLICATE, BILINEAR, CUBIC, NONE   | NONE        |
| Smoothing Type          | SHARP, SMOOTH, MEDIUM              | MEDIUM      |
| Border Density          | BLACK, WHITE, 0-300                | WHITE       |
| Empty Image Density     | BLACK, WHITE, 0-300                | WHITE       |
| Min Density             | 0-300                              | 0           |
| Max Density             | 0-300                              | 300         |
| Trim                    | YES, NO                            | YES         |
| Polarity                | NORMAL, REVERSE                    | REVERSE     |

## 11 SUPPORT OF EXTENDED CHARACTER SETS

Extended character sets are not supported by the current implementation.

## 12 EXTENSION/SPECIALIZATION/PRIVATIZATION

### 12.1 OASIS-SPECIFIC HANDLING OF CERTAIN ATTRIBUTES

The following table provides a legend for the ensuing table which describes “Oasis-specific” handling of certain DICOM attributes:

| SPECIAL HANDLING TABLE LEGEND |   |
|-------------------------------|---|
| COLUMN LABEL                  | MEANING   |
| Group Key                     | Elements are used to hierarchically group DICOM messages under patients, studies, series and images. All elements must match across DICOM messages; otherwise, Oasis will split the study under different patients.   |
| Editable                      | The values of these DICOM attributes are editable by the Oasis user. When element values are modified, Oasis uses these altered values for display and processing. Furthermore, when SOP objects are exported, Oasis uses the altered values in place of the original values.   |
| Map Index                     | Elements that are used as a key to the element mapping table; i.e., elements that are used to determine which manufacturer-specific mapping algorithm to use to map one field to another. Mapping is necessary to maintain consistency when displaying study and series related information in the Oasis browser. Mapping is also used when processing software requires values that are stored in manufacturer-dependent elements. |
| Mapped                        | Element can be mapped to another element based on manufacturer-specific mapping algorithms.   |
| Query-able                    | Remote AEs can query Oasis using these matching elements.   |
| Query Results                 | Oasis returns these elements as query results.  |

| OASIS SPECIAL HANDLING OF CERTAIN ATTRIBUTES |             |           |           |           |        |            |              |
|--|-------------|-----------|-----------|-----------|--------|------------|--------------|
| Attribute                                    | Tag ID      | Group Key | Edit-able | Map Index | Mapped | Query-able | Query Result |
| Patients Name                                | (0010,0010) | x         | x         |           |        | x          | x            |
| Patient ID                                   | (0010,0020) | x         | x         |           |        | x          | x            |
| Study Instance UID                           | (0020,000D) | x         |           |           |        | x          | x            |
| Series Instance UID                          | (0020,000E) | x         |           |           |        | x          | x            |
| Patients Birth Date                          | (0010,0030) |           | x         |           |        | x          | x            |
| Patients Sex                                 | (0010,0040) |           | x         |           |        | x          | x            |
| Study Date                                   | (0008,0020) |           | x         |           |        | x          | x            |
| Protocol Name                                | (0018,1030) |           | x         |           | x      |            |              |
| Study Description                            | (0008,1030) |           | x         |           | x      | x          | x            |
| Series Description                           | (0008,103E) |           | x         |           | x      | x          | x            |
| Study Comments                               | (0032,4000) |           | x         |           | x      |            |              |
| Study ID                                     | (0020,0010) |           | x         |           | x      |            |              |
| Image ID                                     | (0054,0400) |           | x         |           | x      |            |              |
| Image Comments                               | (0020,4000) |           | x         |           | x      |            |              |
| Anatomic Structure                           | (0008,2208) |           | x         |           | x      |            |              |
| Body Part Examined                           | (0018,0015) |           | x         |           | x      |            |              |
| Institution Name                             | (0008,0080) |           | x         |           |        |            |              |
| Referring Physicians Name                    | (0008,0090) |           | x         |           |        | x          | x            |
| Performing Physicians Name                   | (0008,1050) |           | x         |           |        | x          | x            |
| Radionuclide                                 | (0018,0030) |           | x         |           |        |            |              |
| Radiopharmaceutical                          | (0018,0031) |           | x         |           |        |            |              |
| Manufacturer                                 | (0008,0070) |           |           | x         |        |            |              |
| Manufacturers Model Name                     | (0008,1090) |           |           | x         |        |            |              |
| Software Version                             | (0018,1020) |           |           | x         |        |            |              |
| Accession Number                             | (0008,0050) |           |           |           |        | x          | x            |
| Study Time                                   | (0008,0030) |           |           |           |        |            | x            |
| SOP Instance UID                             | (0008,0018) |           |           |           |        | x          | x            |
| SOP Class UID                                | (0008,0016) |           |           |           |        | x          | x            |
| Modality                                     | (0008,0060) |           |           |           |        | x          | x            |
| Modalities In Study                          | (0008,0061) |           |           |           |        | x          | x            |
| Series Number                                | (0020,0011) |           |           |           |        | x          | x            |
| Number of Study Related Series               | (0020,1206) |           |           |           |        |            | x            |
| Number of Study Related Instances            | (0020,1208) |           |           |           |        |            | x            |
| Number Of Frames                             | (0028,0008) |           |           |           |        |            | x            |
| Rows   | (0028,0010) |           |           |           |        |            | x            |

|         |             |  |  |  |  |  |   |
|---------|-------------|--|--|--|--|--|---|
| Columns | (0028,0011) |  |  |  |  |  | x |
|---------|-------------|--|--|--|--|--|---|

## 12.2 OASIS-EQUIPMENT IDENTIFICATION

Oasis uses the following elements / values when creating derived composite SOP Instances:

| OASIS IDENTIFICATION ATTRIBUTES |              |      |             |
|---------------------------------|--------------|------|-------------|
| Name                            | Tag          | Type | Value       |
| Manufacturer                    | (0008,0070)  | 2    | "Segami"    |
| Manufacturer's Model Name       | (0020,1090)  | 3    | "Oasis"     |
| Software Versions               | (00018,1020) | 3    | <generated> |

## 12.3 DERIVED IMAGE CREATION

### 12.3.1 Oasis-Created Private Elements

Oasis does not create any private DICOM elements.

### 12.3.2 Secondary Capture (Created by Oasis)

Oasis creates Secondary Capture Objects. The following table shows the elements and values that Oasis uses to create the Secondary Capture Object.

Oasis Secondary capture images are a snapshot of what is on an Oasis monitor. Oasis permits images from more than one study (for the same patient) to be displayed on one monitor. When the value indicated is "<from original>" the original value comes from the most recent study.

| OASIS SECONDARY CAPTURE ATTRIBUTES |             |                                  |
|------------------------------------|-------------|----------------------------------|
| Name                               | Tag         | Value                            |
| SpecificCharacterSet               | (0008,0005) | ISO_IR 100                       |
| ImageType                          | (0008,0008) | ORIGINAL\SECONDARY               |
| SOPClassUID                        | (0008,0016) | SecondaryCaptureImageStorage     |
| SOPInstanceUID                     | (0008,0018) | 1.2.840.114080.1.0.100.xxxx      |
| StudyDate                          | (0008,0020) | <from original>                  |
| SeriesDate                         | (0008,0021) | <SC creation date>               |
| AcquisitionDate                    | (0008,0022) | <from original>                  |
| ContentDate                        | (0008,0023) | <SC creation date>               |
| StudyTime                          | (0008,0030) | <from original>                  |
| SeriesTime                         | (0008,0031) | <SC creation time>               |
| AcquisitionTime                    | (0008,0032) | <from original>                  |
| ContentTime                        | (0008,0033) | <SC creation time>               |
| AccessionNumber                    | (0008,0050) | <from original>                  |
| Modality                           | (0008,0060) | <from original>                  |
| ConversionType                     | (0008,0064) | WSD                              |
| Manufacturer                       | (0008,0070) | Segami                           |
| InstitutionName                    | (0008,0080) | <from configuration parameters>  |
| InstitutionAddress                 | (0008,0081) | <from configuration parameters > |
| ReferringPhysiciansName            | (0008,0090) | <from original>                  |
| StudyDescription                   | (0008,1030) | <from original>                  |
| SeriesDescription                  | (0008,103e) | <from user input>                |

| <b>OASIS SECONDARY CAPTURE ATTRIBUTES</b> |             |                    |
|---|-------------|--------------------|
| <b>Name</b>                               | <b>Tag</b>  | <b>Value</b>       |
| ManufacturersModelName                    | (0008,1090) | Oasis              |
| PatientsName                              | (0010,0010) | <from original>    |
| PatientID                                 | (0010,0020) | <from original>    |
| PatientsBirthDate                         | (0010,0030) | <from original>    |
| PatientsSex                               | (0010,0040) | <from original>    |
| PatientsSize                              | (0010,1020) | <from original>    |
| PatientsWeight                            | (0010,1030) | <from original>    |
| SecondaryCaptureDeviceID                  | (0018,1010) | Oasis              |
| DateOfSecondaryCapture                    | (0018,1012) | <SC creation date> |
| TimeOfSecondaryCapture                    | (0018,1014) | <SC creation time> |
| SecondaryCaptureDeviceManufacturer        | (0018,1016) | Segami             |
| SecondaryCaptureDeviceManufacturers       | (0018,1018) | Oasis              |
| SecondaryCaptureDeviceSoftwareVersions    | (0018,1019) | <generated>        |
| ProtocolName                              | (0018,1030) | <from original>    |
| StudyInstanceUID                          | (0020,000d) | <from original>    |
| SeriesInstanceUID                         | (020,000e)  | <generated>        |
| StudyID                                   | (0020,0010) | <from original>    |
| SeriesNumber                              | (0020,0011) | 1                  |
| InstanceNumber                            | (0020,0013) | 1                  |
| PatientOrientation                        | (0020,0020) | <no value>         |
| ImageComments                             | (0020,4000) | <no value>         |
| SamplesPerPixel                           | (0028,0002) | <no value>         |
| PhotometricInterpretation                 | (0028,0004) | RGB                |
| PlanarConfiguration                       | (0028,0006) | 0                  |
| NumberOfFrames                            | (0028,0008) | 1                  |
| Rows                                      | (0028,0010) | <generated>        |
| Columns                                   | (0028,0011) | <generated>        |
| PixelAspectRatio                          | (0028,0034) | 1\1                |
| BitsAllocated                             | (0028,0100) | 8                  |
| BitsStored                                | (0028,0101) | 8                  |
| HighBit                                   | (0028,0102) | 7                  |
| PixelRepresentation                       | (0028,0103) | 0                  |
| LossyImageCompression                     | (0028,2110) | 00                 |

### 12.3.3 Non-Gated Reconstructed Tomos (Created by Oasis)

Oasis processing software creates Reconstructed Tomos and stores them in the data base. These volumes can then be exported via DICOM. The following table shows the elements and values that Oasis uses to create the Reconstructed Tomo Object.

| OASIS RECONSTRUCTED TOMO ATTRIBUTES |             |                                     |
|-------------------------------------|-------------|-------------------------------------|
| Name                                | Tag         | Value                               |
| SpecificCharacterSet                | (0008,0005) | ISO_IR 100                          |
| ImageType                           | (0008,0008) | DERIVED\PRIMARY\RECON TOMO\EMISSION |
| SOPClassUID                         | (0008,0016) | NuclearMedicineImageStorage         |
| SOPInstanceUID                      | (0008,0018) | 1.2.840.114080.1.0.100.xxxx         |
| StudyDate                           | (0008,0020) | <from original>                     |
| SeriesDate                          | (0008,0021) | <creation date>                     |
| AcquisitionDate                     | (0008,0022) | <from original>                     |
| ContentDate                         | (0008,0023) | <creation date>                     |
| StudyTime                           | (0008,0030) | <from original>                     |
| SeriesTime                          | <current    | <creation time>                     |
| AcquisitionTime                     | (0008,0032) | <from original>                     |
| ContentTime                         | (0008,0033) | <creation time>                     |
| AccessionNumber                     | (0008,0050) | <from original>                     |
| Modality                            | (0008,0060) | NM                                  |
| ConversionType                      | (0008,0064) | WSD                                 |
| Manufacturer                        | (0008,0070) | Segami                              |
| InstitutionName                     | (0008,0080) | <from configuration parameters>     |
| InstitutionAddress                  | (0008,0081) | <from configuration parameters >    |
| ReferringPhysiciansName             | (0008,0090) | <from original>                     |
| StudyDescription                    | (0008,1030) | <from original>                     |
| SeriesDescription                   | (0008,103e) | [<axis>] + <original>               |
| ManufacturersModelName              | (0008,1090) | Oasis                               |
| PatientsName                        | (0010,0010) | <from original>                     |
| PatientID                           | (0010,0020) | <from original>                     |
| PatientsBirthDate                   | (0010,0030) | <from original>                     |
| PatientsSex                         | (0010,0040) | <from original>                     |
| PatientsSize                        | (0010,1020) | <from original>                     |
| PatientsWeight                      | (0010,1030) | <from original>                     |
| BodyPartExamined                    | (0018,0015) | <from original>                     |
| SliceThickness                      | (0018,0050) | <from original>                     |
| CountsAccumulated                   | (0018,0070) | <from original>                     |
| AcquisitionTerminationCondition     | (0018,0071) | <from original>                     |
| SpacingBetweenSlices                | (0018,0088) | <generated>                         |
| DeviceSerialNumber                  | (0018,1000) | <from original>                     |
| SoftwareVersions                    | (0018,1020) | <generated>                         |
| ProtocolName                        | (0018,1030) | <from original>                     |
| ProcessingFunction                  | (0018,5020) | <from original>                     |
| StudyInstanceUID                    | (0020,000d) | <from original>                     |
| SeriesInstanceUID                   | (0020,000e) | <generated>                         |
| StudyID                             | (0020,0010) | <from original>                     |

| OASIS RECONSTRUCTED TOMO ATTRIBUTES    |             |                          |
|--|-------------|--------------------------|
| Name                                   | Tag         | Value                    |
| SeriesNumber                           | (0020,0011) | [1]                      |
| InstanceNumber                         | (0020,0013) | [1]                      |
| ImageComments                          | (0020,4000) | "volume"                 |
| SamplesPerPixel                        | (0028,0002) | 1                        |
| PhotometricInterpretation              | (0028,0004) | [MONOCHROME2]            |
| NumberOfFrames                         | (0028,0008) | <generated>              |
| FrameIncrementPointer                  | (0028,0009) | (0054,0080)              |
| Rows                                   | (0028,0010) | <generated>              |
| Columns                                | (0028,0011) | <generated>              |
| PixelSpacing                           | (0028,0030) | <generated>              |
| BitsAllocated                          | (0028,0100) | 16                       |
| BitsStored                             | (0028,0101) | 16                       |
| HighBit                                | (0028,0102) | 15                       |
| PixelRepresentation                    | (0028,0103) | 0                        |
| SmallestImagePixelValue                | (0028,0106) | <generated>              |
| LargestImagePixelValue                 | (0028,0107) | <generated>              |
| LossyImageCompression                  | (0028,2110) | [0]                      |
| NumberOfEnergyWindows                  | (0054,0011) | 1                        |
| RadiopharmaceuticalInformationSequence | (0054,0300) |                          |
| RadionuclideCodeSequence               | (0054,0300) |                          |
| CodeValue                              | (0008,0100) | <from original>          |
| CodingSchemeDesignator                 | (0008,0102) | <from original>          |
| CodeMeaning                            | (0008,0104) | <from original>          |
| RadiopharmaceuticalCodeSequence        | (0054,0304) |                          |
| CodeValue                              | (0008,0100) | <from original>          |
| CodingSchemeDesignator                 | (0008,0102) | <from original>          |
| CodeMeaning                            | (0008,0104) | <from original>          |
| DetectorVector                         | (0054,0020) | <from original>          |
| NumberOfDetectors                      | (0054,0021) | <from original>          |
| DetectorInformationSequence            | (0054,0022) |                          |
| ImagePositionPatient                   | (0020,0032) | <generated>              |
| ImageOrientationPatient                | (0020,0037) | <generated>              |
| RotationVector                         | (0054,0050) | <from original>          |
| NumberOfRotations                      | (0054,0051) | <from original>          |
| RotationInformationSequence            | (0054,0052) |                          |
| RotationDirection                      | (0018,1140) | <from original>          |
| ScanArc                                | (0018,1143) | <from original>          |
| AngularStep                            | (0018,1144) | <from original>          |
| NumberOfFramesInRotation               | (0054,0053) | <from original>          |
| StartAngle                             | (0054,0200) | <from original>          |
| SliceVector                            | (054,0080)  | <generated>              |
| NumberOfSlices                         | (0054,0081) | <generated>              |
| ViewCodeSequence                       | (0054,0220) |                          |
| ImageID                                | (0054,0400) | [axis] + <from original> |
| PatientOrientationCodeSequence         | (0054,0410) |                          |
| CodeValue                              | (0008,0100) | <from original>          |
| CodingSchemeDesignator                 | (0008,0102) | <from original>          |

**OASIS RECONSTRUCTED TOMO ATTRIBUTES**

| Name                                  | Tag         | Value           |
|---------------------------------------|-------------|-----------------|
| CodeMeaning                           | (0008,0104) | <from original> |
| CodeValue                             | (0008,0100) | <from original> |
| CodingSchemeDesignator                | (0008,0102) | <from original> |
| CodeMeaning                           | (0008,0104) | <from original> |
| PatientGantryRelationshipCodeSequence | (0054,0414) |                 |
| CodeValue                             | (0008,0100) | <from original> |
| CodingSchemeDesignator                | (0008,0102) | <from original> |
| CodeMeaning                           | (0008,0104) | <from original> |



### 12.3.4 Gated Reconstructed Tomos (Created by Oasis)

Oasis processing software creates Gated Reconstructed Tomos and stores them in the data base. These gated volumes can then be exported via DICOM. The following table shows the elements and values that Oasis uses to create the Gated Reconstructed Tomo Object.

| OASIS RECONSTRUCTED GATED TOMO ATTRIBUTES |             |   |
|---|-------------|---|
| Name                                      | Tag         | Value                                     |
| SpecificCharacterSet                      | (0008,0005) | ISO_IR 100                                |
| ImageType                                 | (0008,0008) | DERIVED\PRIMARY\RECON GATED TOMO\EMISSION |
| SOPClassUID                               | (0008,0016) | NuclearMedicineImageStorage               |
| SOPInstanceUID                            | (0008,0018) | 1.2.840.114080.1.0.100.xxxx               |
| StudyDate                                 | (0008,0020) | <from original>                           |
| SeriesDate                                | (0008,0021) | <creation date>                           |
| AcquisitionDate                           | (0008,0022) | <from original>                           |
| ContentDate                               | (0008,0023) | <creation date>                           |
| StudyTime                                 | (0008,0030) | <from original>                           |
| SeriesTime                                | (0008,0031) | <creation time>                           |
| AcquisitionTime                           | (0008,0032) | <from original>                           |
| ContentTime                               | (0008,0033) | <creation time>                           |
| AccessionNumber                           | (0008,0050) | <from original>                           |
| Modality                                  | (0008,0060) | NM  |
| ConversionType                            | (0008,0064) | WSD                                       |
| Manufacturer                              | (0008,0070) | Segami                                    |
| InstitutionName                           | (0008,0080) | <from configuration parameters>           |
| InstitutionAddress                        | (0008,0081) | <from configuration parameters >          |
| ReferringPhysiciansName                   | (0008,0090) | <from original>                           |
| StudyDescription                          | (0008,1030) | <from original>                           |
| SeriesDescription                         | (0008,103e) | [<axis>] + <original>                     |
| ManufacturersModelName                    | (0008,1090) | Oasis                                     |
| PatientsName                              | (0010,0010) | <from original>                           |
| PatientID                                 | (0010,0020) | <from original>                           |
| PatientsBirthDate                         | (0010,0030) | <from original>                           |
| PatientsSex                               | (0010,0040) | <from original>                           |
| PatientsSize                              | (0010,1020) | <from original>                           |
| PatientsWeight                            | (0010,1030) | <from original>                           |
| BodyPartExamined                          | (0018,0015) | <from original>                           |
| SliceThickness                            | (0018,0050) | <from original>                           |
| CountsAccumulated                         | (0018,0070) | <no value>                                |
| AcquisitionTerminationCondition           | (0018,0071) | <no value>                                |
| SpacingBetweenSlices                      | (0018,0088) | <from original>                           |
| DeviceSerialNumber                        | (0018,1000) | <from original>                           |
| SoftwareVersions                          | (0018,1020) | <generated>                               |
| ProtocolName                              | (0018,1030) | <from original>                           |
| ProcessingFunction                        | (0018,5020) | <from original>                           |
| StudyInstanceUID                          | (0020,000d) | <from original>                           |
| SeriesInstanceUID                         | (0020,000e) | <from original>                           |
| StudyID                                   | (0020,0010) | <from original>                           |

| OASIS RECONSTRUCTED GATED TOMO ATTRIBUTES |             |                                      |
|---|-------------|--------------------------------------|
| Name                                      | Tag         | Value                                |
| SeriesNumber                              | (0020,0011) | [1]                                  |
| InstanceNumber                            | (0020,0013) | [1]                                  |
| ImageComments                             | (0020,4000) | "gated volume"                       |
| SamplesPerPixel                           | (0028,0002) | 1                                    |
| PhotometricInterpretation                 | (0028,0004) | [MONOCHROME2]                        |
| NumberOfFrames                            | (0028,0008) | [64]                                 |
| FrameIncrementPointer                     | (0028,0009) | (0054,0060), (0054,0070),(0054,0080) |
| Rows                                      | (0028,0010) | 64                                   |
| Columns                                   | (0028,0011) | 64                                   |
| PixelSpacing                              | (0028,0030) | <generated>                          |
| BitsAllocated                             | (0028,0100) | 16                                   |
| BitsStored                                | (0028,0101) | 16                                   |
| HighBit                                   | (0028,0102) | 15                                   |
| PixelRepresentation                       | (0028,0103) | 0                                    |
| SmallestImagePixelValue                   | (0028,0106) | <generated>                          |
| LargestImagePixelValue                    | (0028,0107) | <generated>                          |
| LossyImageCompression                     | (0028,2110) | [0]                                  |
| NumberOfEnergyWindows                     | (0054,0011) | 1                                    |
| RadiopharmaceuticalInformationSequence    | (0054,0300) |                                      |
| RadionuclideCodeSequence                  | (0054,0300) |                                      |
| CodeValue                                 | (0008,0100) | <from original>                      |
| CodingSchemeDesignator                    | (0008,0102) | <from original>                      |
| CodeMeaning                               | (0008,0104) | <from original>                      |
| RadiopharmaceuticalCodeSequence           | (0054,0304) |                                      |
| CodeValue                                 | (0008,0100) | <from original>                      |
| CodingSchemeDesignator                    | (0008,0102) | <from original>                      |
| CodeMeaning                               | (0008,0104) | <from original>                      |
| DetectorVector                            | (0054,0020) | <from original>                      |
| NumberOfDetectors                         | (0054,0021) | <from original>                      |
| DetectorInformationSequence               | (0054,0022) |                                      |
| ImagePositionPatient                      | (0020,0032) | <from original>                      |
| ImageOrientationPatient                   | (0020,0037) | <generated>                          |
| RotationVector                            | (0054,0050) | <generated>                          |
| NumberOfRotations                         | (0054,0051) | <from original>                      |
| RotationInformationSequence               | (0054,0052) |                                      |
| RotationDirection                         | (0018,1140) | <from original>                      |
| ScanArc                                   | (0018,1143) | <from original>                      |
| AngularStep                               | (0018,1144) | <from original>                      |
| NumberOfFramesInRotation                  | (0054,0053) | <from original>                      |
| StartAngle                                | (0054,0200) | <from original>                      |
| RRIntervalVector                          | (0054,0060) | <from original>                      |
| NumberOfRRIntervals                       | (0054,0061) | <from original>                      |
| GatedInformationSequence                  | (0054,0062) |                                      |
| FrameTime                                 | (0018,1063) | <generated>                          |
| TimeSlotVector                            | (0054,0070) | <generated>                          |
| NumberOfTimeSlots                         | (0054,0071) | <from original>                      |
| SliceVector                               | (0054,0080) | <generated>                          |

| OASIS RECONSTRUCTED GATED TOMO ATTRIBUTES |             |                             |
|---|-------------|-----------------------------|
| Name                                      | Tag         | Value                       |
| NumberOfSlices                            | (0054,0081) | <from original>             |
| ViewCodeSequence                          | (0054,0220) |                             |
| ImageID                                   | (0054,0400) | <axis> + "Raw Gated Stress" |
| PatientOrientationCodeSequence            | (0054,0410) |                             |
| CodeValue                                 | (0008,0100) | <from original>             |
| CodingSchemeDesignator                    | (0008,0102) | <from original>             |
| CodeMeaning                               | (0008,0104) | <from original>             |
| PatientOrientationModifierCodeSequence    | (0054,0412) |                             |
| CodeValue                                 | (0008,0100) | <from original>             |
| CodingSchemeDesignator                    | (0008,0102) | <from original>             |
| CodeMeaning                               | (0008,0104) | <from original>             |
| PatientGantryRelationshipCodeSequence     | (0054,0414) |                             |
| CodeValue                                 | (0008,0100) | <from original>             |
| CodingSchemeDesignator                    | (0008,0102) | <from original>             |
| CodeMeaning                               | (0008,0104) | <from original>             |

# **APPENDIX A**

## **QUICK REFERENCE**

| SOP CLASS NAME   | SOP CLASS UID                 | SCU | SCP |
|--|-------------------------------|-----|-----|
| <b>VERIFICATION</b>  |                               |     |     |
| Verification   | 1.2.840.10008.1.1             | Yes | Yes |
| <b>STORAGE AND DISPLAY</b>                                 |                               |     |     |
| Computed Tomography Image Storage                          | 1.2.840.10008.5.1.4.1.1.2     | Yes | Yes |
| Enhanced Magnetic Resonance Image Storage                  | 1.2.840.10008.5.1.4.1.1.4.1   | Yes | Yes |
| Magnetic Resonance Image Storage                           | 1.2.840.10008.5.1.4.1.1.4     | Yes | Yes |
| Multi-Frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2   | Yes | Yes |
| Multi-Frame Grayscale Word Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.3   | Yes | Yes |
| Multi-Frame Single bit Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.1   | Yes | Yes |
| Multi-Frame True Color Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.4   | Yes | Yes |
| Nuclear Medicine Image Storage                             | 1.2.840.10008.5.1.4.1.1.20    | Yes | Yes |
| Nuclear Medicine Image Storage (Retired)                   | 1.2.840.10008.5.1.4.1.1.5     | Yes | Yes |
| Positron Emission Tomography Image Storage                 | 1.2.840.10008.5.1.4.1.1.128   | Yes | Yes |
| Radiotherapy Image   | 1.2.840.10008.5.1.4.1.1.481.1 | Yes | Yes |
| Secondary Capture Image Storage                            | 1.2.840.10008.5.1.4.1.1.7     | Yes | Yes |
| <b>QUERY - RETRIEVE</b>                                    |                               |     |     |
| Study Root Query/Retrieve Information Model – FIND         | 1.2.840.10008.5.1.4.1.2.2.1   | Yes | Yes |
| Study Root Query/Retrieve Information Model – MOVE         | 1.2.840.10008.5.1.4.1.2.2.2   | Yes | Yes |
| Study Root Query/Retrieve Information Model – GET          | 1.2.840.10008.5.1.4.1.2.2.3   | Yes | Yes |
| <b>DICOM PRINT</b>   |                               |     |     |
| Basic Grayscale Print Management Meta SOP Class            | 1.2.840.10008.5.1.1.9         | Yes | No  |
| Basic Color Print Management Meta SOP Class                | 1.2.840.10008.5.1.1.18        | Yes | No  |
| Basic Color Image Box SOP Class                            | 1.2.840.10008.5.1.1.4.1       | Yes | No  |
| Printer SOP Class  | 1.2.840.10008.5.1.1.14        | Yes | No  |

**TABLE A-I – SUPPORTED SOP CLASSES**

| PRESENTATION CONTEXT TABLE (SCU ROLE)   |                             |  |   |      |         |
|---|-----------------------------|--|---|------|---------|
| ABSTRACT SYNTAX   |                             | TRANSFER SYNTAX  |   | ROLE | EXT NEG |
| NAME  | UID                         | NAME   | UID   |      |         |
| VERIFICATION  |                             |  |   |      |         |
| Verification  | 1.2.840.10008.1.1           | Implicit VR Little Endian  | 1.2.840.10008.1.2   | SCU  | None    |
| STORAGE   |                             |  |   |      |         |
| All SOP Classes listed under the <b>STORAGE AND DISPLAY</b> section in <b>Table I</b> |                             | <ul style="list-style-type: none"> <li>o Explicit VR Little Endian</li> <li>o Explicit VR Big Endian</li> <li>o Implicit VR Little Endian</li> </ul> | <ul style="list-style-type: none"> <li>1.2.840.10008.1.2.1</li> <li>1.2.840.10008.1.2.2</li> <li>1.2.840.10008.1.2</li> </ul> | SCU  | None    |
| QUERY RETRIEVE  |                             |  |   |      |         |
| Study Root FIND   | 1.2.840.10008.5.1.4.1.2.2.1 | Implicit VR Little Endian  | 1.2.840.10008.1.2   | SCU  | None    |
| Study Root Move   | 1.2.840.10008.5.1.4.1.2.2.2 | Implicit VR Little Endian  | 1.2.840.10008.1.2   | SCU  | None    |
| PRINT   |                             |  |   |      |         |
| Basic Grayscale Print Management  | 1.2.840.10008.5.1.1.9       | Implicit VR Little Endian  | 1.2.840.10008.1.2   | SCU  | None    |
| Basic Color Print Management  | 1.2.840.10008.5.1.1.18      | Implicit VR Little Endian  | 1.2.840.10008.1.2   | SCU  | None    |
| Basic Film Session SOP Class  | 1.2.840.10008.5.1.1.1       | Implicit VR Little Endian  | 1.2.840.10008.1.2   | SCU  | None    |
| Basic Film Box SOP Class  | 1.2.840.10008.5.1.1.2       | Implicit VR Little Endian  | 1.2.840.10008.1.2   | SCU  | None    |

**TABLE A-II – PRESENTATION CONTEXTS (SCU)**

| PRESENTATION CONTEXT TABLE (SCU ROLE)   |                             |  |   |      |         |
|---|-----------------------------|--|---|------|---------|
| ABSTRACT SYNTAX   |                             | TRANSFER SYNTAX  |   | ROLE | EXT NEG |
| NAME  | UID                         | NAME   | UID   |      |         |
| VERIFICATION  |                             |  |   |      |         |
| Verification  | 1.2.840.10008.1.1           | Implicit VR Little Endian  | 1.2.840.10008.1.2   | SCP  | None    |
| STORAGE   |                             |  |   |      |         |
| All SOP Classes listed under the <b>STORAGE AND DISPLAY</b> section in <b>Table I</b> |                             | <ul style="list-style-type: none"> <li>o Explicit VR Little Endian</li> <li>o Explicit VR Big Endian</li> <li>o Implicit VR Little Endian</li> </ul> | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.4.90<br>1.2.840.10008.1.2.4.91 | SCP  | None    |
| QUERY RETRIEVE  |                             |  |   |      |         |
| Study Root FIND   | 1.2.840.10008.5.1.4.1.2.2.1 | Implicit VR Little Endian  | 1.2.840.10008.1.2   | SCP  | None    |
| Study Root Move   | 1.2.840.10008.5.1.4.1.2.2.2 | Implicit VR Little Endian  | 1.2.840.10008.1.2   | SCP  | None    |

**TABLE A-III – PRESENTATION CONTEXTS (SCP)**

## **APPENDIX B**

### **STATUS RESPONSES / ERROR HANDLING BEHAVIOR BY SCPs**



| ERROR / STATUS / WARNING CODES |                   |            |  |   |
|--------------------------------|-------------------|------------|--|---|
| SERVICE STATUS                 | FURTHER MEANING   | ERROR CODE | REASON   | BEHAVIOR  |
| <b>ASSOCIATION ACCEPTANCE</b>  |                   |            |  |   |
| Refused                        | Out of Resources  | A700       | Maximum allowable associations have been reached. SCU should retry.          | Association refused, service not started. Event is logged.  |
| Refused                        | Out of Resources  | A701       | The Oasis AE has not been configured to allow the remote AE host to connect. | Association refused, service not started. Event is logged.  |
| Refused                        | Unable to Process | A702       | Invalid Application Context Name.  | Association refused, service not started. Event is logged.  |
| Refused                        | Unable to Process | A703       | Other association processing error.  | Association refused, service not started. More detailed description of error is logged.                   |
| <b>ABORT</b>                   |                   |            |  |   |
| Failed                         | Aborted           | C202       | A—ABORT received by remote AE.   | Service aborted. DICOM A-ABORT acknowledge sent to remote AE. Error is logged.                            |
| <b>TIMEOUT</b>                 |                   |            |  |   |
| Failed                         | Timeout           | C200       | Timeout while waiting for DICOM message.                                     | Service aborted. DICOM A-ABORT sent. Error is logged. Error displayed if service initiated by Oasis user. |
| Failed                         | Timeout           | C201       | Low level timeout.   | Service aborted. DICOM A-ABORT sent. Error is logged.   |

| VERIFY (C-ECHO SCP) |                                   |      |  |   |
|---------------------|-----------------------------------|------|--|---|
| Success             | Success                           | 0000 | Request processed successfully.  |   |
| STORE (C-STORE SCP) |                                   |      |  |   |
| Success             | Success                           | 0000 | Instance successfully stored on Oasis database.                                      | Each instance of successful store is logged.                |
| Refused             | Duplicate SOP Instance            | A704 | SOP Instance already in Oasis database.  | Error is logged.<br>Service continues accepting new data.   |
| Warning             | Out of Resources                  | A705 | Disk Level reached   | Warning is logged.<br>Service continues accepting new data. |
| Refused             | Out of Resources                  | A706 | Out of disk space / file system error  | Service aborted.<br>DICOM A-ABORT sent.<br>Error is logged. |
| Refused             | SOP Class not supported           | A800 | SOP Class not supported  |   |
| Error               | Data set does not match SOP Class | A900 | Missing elements are such that Oasis cannot store the instance.                      | Error is logged.<br>Service continues accepting new data.   |
| Error               | Internal format conversion error  | C100 | Oasis could not parse the C-STORE message.   | Error is logged.<br>Service continues accepting new data.   |
| Warning             | Data set does not match SOP Class | B000 | Missing mandatory elements but Oasis has stored the instance.                        | Warning is logged.<br>Service continues accepting new data. |
| Warning             | Coercion of Data Elements         | B000 | One or more elements in message have been coerced.                                   | Warning is logged.<br>Service continues accepting new data. |
| Warning             | Elements discarded                | B000 | One or more elements in message have been discarded.                                 | Warning is logged.<br>Service continues accepting new data. |
| QUERY (C-FIND SCP)  |                                   |      |  |   |
| Success             | Success                           | 0000 | The Oasis AE has successfully finished sending all results that match query request. | Transaction is logged.                                      |

| ERROR / STATUS / WARNING CODES |  |            |  |  |
|--------------------------------|--|------------|--|--|
| SERVICE STATUS                 | FURTHER MEANING                                    | ERROR CODE | REASON   | BEHAVIOR   |
| Error                          | Data Set does not match SOP Class                  | A900       | The C-FIND-RQ query is missing mandatory Elements for the specified SOP Class and Query.   | Service aborted.<br>DICOM A-ABORT sent.<br>Error is logged.                          |
| Error                          | Attribute Value Out of Range                       | A901       | The C-FIND-RQ query contains values that are invalid or out of range.                      | Service aborted.<br>DICOM A-ABORT sent.<br>Error is logged.                          |
| Failed                         | Unable to Process                                  | C001       | Internal processing error.   | Service aborted.<br>DICOM A-ABORT sent.<br>Error is logged.                          |
| Cancel                         | Sub-operations terminated due to Cancel request    | FE00       | Operation cancelled by SCU   | Service aborted.<br>Event is logged.   |
| Pending                        | Matches are continuing – current match is supplied | FF00       | The matching operation is continuing.  | Service continues  |
| Pending                        | Matches are continuing – current match is supplied | FF01       | The matching operation is continuing. Warning that one or more optional keys were ignored. | Service continues  |
| <b>RETRIEVE (C-MOVE SCP)</b>   |  |            |  |  |
| Success                        | Success  | 0000       | Oasis successfully finished sending all SOP instances to the C-MOVE remote AE destination. | Completed transaction is logged.<br>Service completed.                               |
| Refused                        | Out of Resources                                   | A707       | Destination remote AE unknown  | Service aborted.<br>DICOM A-ABORT acknowledge sent to remote AE.<br>Error is logged. |
| Error                          | Data Set does not match SOP Class                  | A900       | The C-MOVE-RQ query is missing mandatory Elements for the specified SOP Class and Move.    | Service aborted.<br>DICOM A-ABORT sent.<br>Error is logged.                          |

| ERROR / STATUS / WARNING CODES |   |            |  |  |
|--------------------------------|---|------------|--|--|
| SERVICE STATUS                 | FURTHER MEANING   | ERROR CODE | REASON   | BEHAVIOR   |
| Warning                        | Sub-operations complete – one or more failures                  | B000       | Oasis has finished sending instances to the C-MOVE Destination. Warning that one or more of the SOP instance moves failed. | Warning logged..<br>Completed transaction is logged.<br>Service completed. |
| Failed                         | Unable to Process   | C000       | Oasis could not parse C-MOVE request.  | Service aborted.<br>DICOM A-ABORT sent.<br>Error is logged.                |
| Cancel                         | Sub-operations terminated due to local or remote cancel request | FE00       | Operation cancelled by Oasis user or remote AE   | Service aborted.<br>Event is logged.                                       |
| Pending                        | Matches are continuing – current match is supplied              | FF00       | The matching operation is continuing.  |  |
| Pending                        | Matches are continuing – current match is supplied              | FF01       | The matching operation is continuing. Warning that one or more optional keys were ignored.                                 |  |