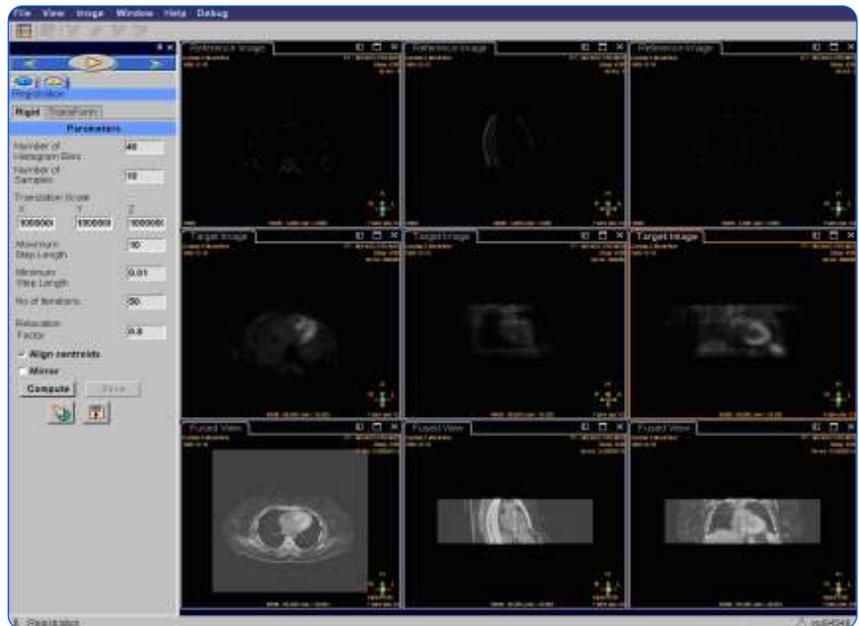

DICOM

Conformance Statement

IMALYTICS 1.0.1



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1. DICOM CONFORMANCE STATEMENT OVERVIEW

IMALYTICS 1.0.1 is a pre-clinical workspace to aid in pharmaceutical research, which includes drug discovery and tracer development. The translation from the hypothesis-driven experiments to statistically significant results is realized through IMALYTICS workspace, which constitutes three phases namely applications, devices and informatics. It provides means to view, analyze, process, and print the images stored in the database. The hardware consists of a PC Windows workstation.

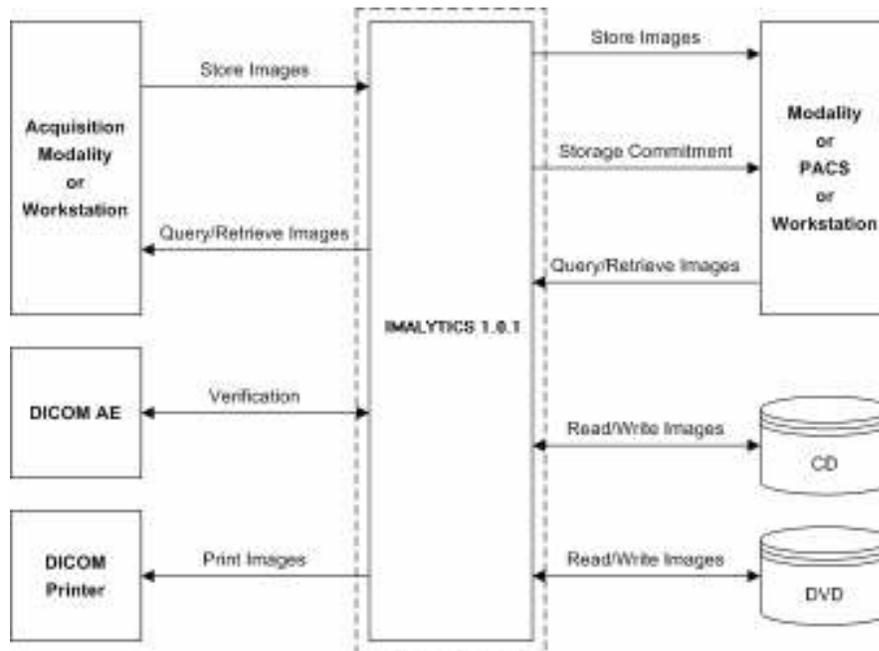


Figure 1: IMALYTICS 1.0.1 in a DICOM network

The IMALYTICS 1.0.1 provides the following DICOM data exchange features:

- It receives images sent to it by remote systems (e.g. workstations or imaging modalities) and stores them in a database.
- It allows the operator to copy images from the database to remote databases and vice versa. For this purpose the operator is able to query remote databases.
- It allows a remote system to query the IMALYTICS 1.0.1 and to retrieve images from it.
- It allows the operator to print images stored in the database on a DICOM printer.
- It is able to read and write DICOM CD (+/-R(W)) disks.
- It is able to read and write DICOM DVD (+/-R(W)) disks.

Table 1: Network Services

SOP Class		User of Service (SCU)	Provider of Service (SCP)
Name	UID		
Transfer			
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Yes	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes
PET Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
Specialized PMS Grayscale Softcopy Presentation State Storage	1.3.46.670589.2.2.1.1	Yes	Yes
Query/Retrieve			
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	Yes
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	Yes
Study Root Query/Retrieve Information Mode – FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes
Study Root Query/Retrieve Information Mode – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	Yes
Patient Study Only Query/Retrieve Information Mode – FIND	1.2.840.10008.5.1.4.1.2.3.1	Yes	Yes
Patient Study Only Query/Retrieve Information Mode – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Yes	Yes
Workflow Management			
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	No
Print Management			
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes	No
> Basic Film Session	1.2.840.10008.5.1.1.1	Yes	No
> Basic Film Box	1.2.840.10008.5.1.1.2	Yes	No
> Basic Grayscale Image Box	1.2.840.10008.5.1.1.4	Yes	No
> Printer	1.2.840.10008.5.1.1.16	Yes	No
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Yes	No
> Basic Film Session	1.2.840.10008.5.1.1.1	Yes	No
> Basic Film Box	1.2.840.10008.5.1.1.2	Yes	No
> Basic Color Image Box	1.2.840.10008.5.1.1.4.1	Yes	No
> Printer	1.2.840.10008.5.1.1.16	Yes	No
Presentation LUT	1.2.840.10008.5.1.1.23	Yes	No

* Note that IMALYTICS WORKSPACE does not implement the Curve variant of the US SOP classes.

Table 2: Media Services

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Compact Disk – Recordable		
General Purpose CD-R Interchange	Yes	Yes
DVD		
General Purpose DVD Interchange with JPEG	Yes	Yes
General Purpose DVD Interchange with JPEG 2000	Yes	Yes

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3. INTRODUCTION

3.1. Revision History

The revision history provides dates and differences of the different releases.

Table 3: Revision History

Document Version	Date of Issue	Author	Description
1.0	23 November 2007	IMALYTICS group	Final version of the DICOM Confidence Claim for the IMALYTICS 1.0.1.

3.2. Audience

This DICOM Confidence Claim is intended for:

- (potential) customers
- system integrators of medical equipment
- marketing staff interested in system functionality
- software designers implementing DICOM interfaces

It is assumed that the reader is familiar with the DICOM standard.

3.3. Remarks

The DICOM Confidence Claim is contained in chapter 4 through 8 and follows the contents and structuring requirements of DICOM PS 3.2.

This DICOM Confidence Claim by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) should be aware of the following issues:

- **Interoperability**
Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into an IT environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this DICOM Confidence Claim does not guarantee interoperability. It is the user's responsibility to analyze the application requirements thoroughly and to specify a solution that integrates Philips equipment with non-Philips equipment.
- **Validation**
Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this DICOM Confidence Claim. Where Philips equipment is linked, the first step is to consult this DICOM Confidence Claim. If the DICOM Confidence Claim indicates that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

- **New versions of the DICOM Standard**

The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue its delivery.

The user should ensure that any non-Philips provider linking to Philips equipment also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

3.4. Definitions, Terms and Abbreviations

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see NEMA PS 3.3 and PS 3.4.

The word Philips in this document refers to Philips Medical Systems.

An examination – as part of a study – is a collection of direct related series of images (originating from the same modality/SOP class, incl. SC and PR). Thus a study may contain one or more examinations.

The following acronyms and abbreviations are used in this document.

ACC	American College of Cardiology
ACR	American College of Radiology
AE	Application Entity
ANSI	American National Standard Institute
AP	Application Profile
BOT	Basic Offset Table
CD	Compact Disc
CD-R	CD-Recordable
CD-M	CD-Medical
CR	Computed Radiography
CT	Computed Tomography
DCR	Dynamic Cardio Review
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DIMSE-Composite
DIMSE-N	DIMSE-Normalized
DX	Digital X-Ray
EBE	DICOM Explicit VR Big Endian
ELE	DICOM Explicit VR Little Endian
FSC	File-set Creator
FSR	File-set Reader
FSU	File-set Updater
GUI	Graphic User Interface
HIS	Hospital Information System
HL7	Health Level Seven
ILE	DICOM Implicit VR Little Endian
IOD	Information Object Definition
ISIS	Information System – Imaging System
IMALYTICS WORKSPACE	IMALYTICS 1.0.1
MR	Magnetic Resonance
Na	Not applicable
NEMA	National Electrical Manufacturers Association
NM	Nuclear Medicine

PDU	Protocol Data Unit
RF	X-Ray Radiofluoroscopic
RIS	Radiology Information System
RT	Radiotherapy
RWA	Real-World Activity
SC	Secondary Capture
SCM	Study Component Management
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier
US	Ultrasound
USMF	Ultrasound Multi-frame
WLM	Worklist Management
XA	X-Ray Angiographic

3.5. References

- [DICOM] Digital Imaging and Communications in Medicine (DICOM),
Part 1 – 18 (NEMA PS 3.1 – PS 3.18),
National Electrical Manufacturers Association (NEMA)
Publication Sales 1300 N. 17th Street, Suite 1847
Rosslyn, Virginia. 22209, United States of America

4. NETWORKING

4.1. Implementation model

The implementation model consists of three sections:

- the application data flow diagram, specifying the relationship between the Application Entities and the “external world” or Real-World Activities,
- a functional description of each Application Entity, and
- the sequencing constraints among them.

4.1.1. Application Data Flow

The IMALYTICS WORKSPACE implements one network application entity: the IMALYTICS WORKSPACE Network AE.

The following figure shows the networking application data flow as a functional overview of the application entity. On the left the local Real-World Activities are presented, whereas on the right the remote Real-World Activities are presented.

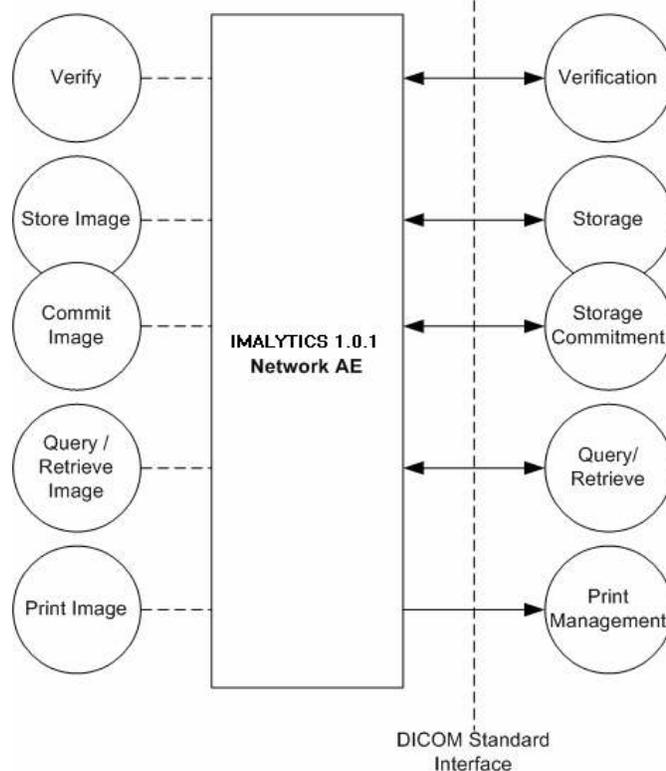


Figure 2: Application Data Flow Diagram

The IMALYTICS WORKSPACE Network AE incorporates the following functionality:

- Import images to a local database;
- Export (and commit) images from the local database to a network DICOM node;
- Query and retrieve images from a remote DICOM node;
- Query and retrieve images from the local database;
- Print grayscale and color images from the local database on a DICOM printer.

4.1.2. Functional Definition of AE's

4.1.2.1. Functional Definition of IMALYTICS WORKSPACE Network AE

IMALYTICS WORKSPACE incorporates the following functionality.

- The IMALYTICS WORKSPACE Network AE can verify application level communication by using the Verification service both as SCU and SCP (Verify).
- The IMALYTICS WORKSPACE Network AE can store images by using the Storage service both as SCU and SCP (Store Image).
- The IMALYTICS WORKSPACE Network AE can commit images by using the Storage Commitment service as SCU (Commit Image).
- The IMALYTICS WORKSPACE Network AE can find and move images by using the Query/Retrieve service both as SCU and SCP (Query/Retrieve Image).
- The IMALYTICS WORKSPACE Network AE can print images by using the Print Management service as SCU (Print Image).

4.1.3. Sequencing of Real-World Activities

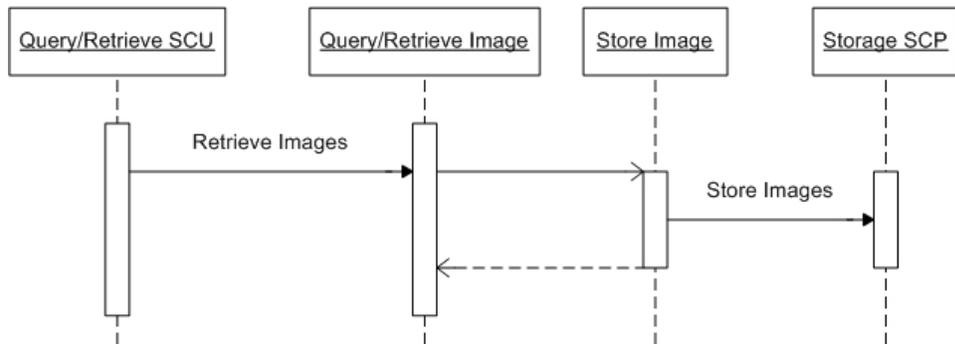


Figure 3: Sequencing of Retrieve

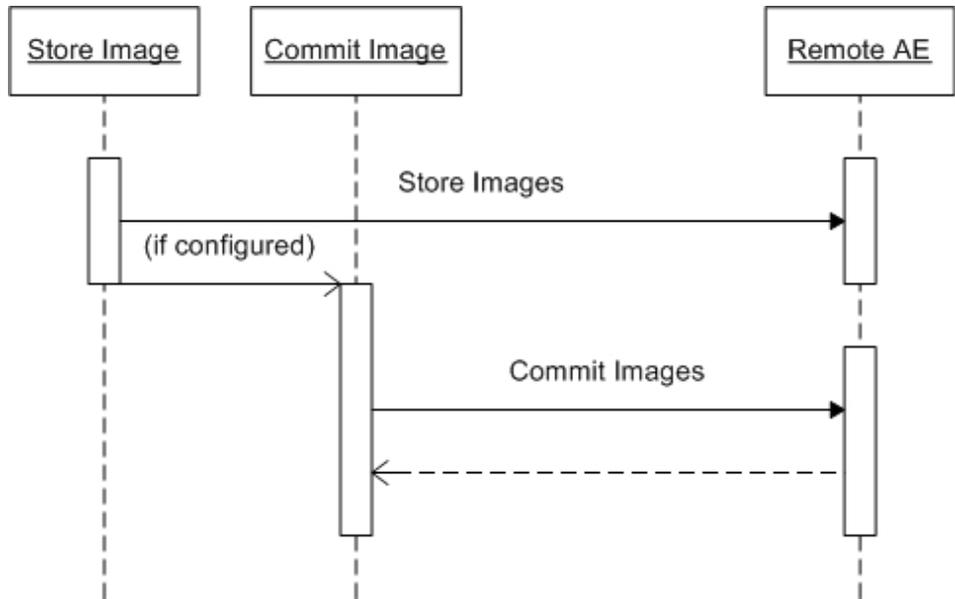


Figure 4: Sequencing of Storage Commitment

4.2. AE Specifications

4.2.1. IMALYTICS WORKSPACE Network AE

Every detail of this specific Application Entity shall be completely specified under this section.

4.2.1.1. SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 4: SOP Classes for IMALYTICS WORKSPACE Network AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	Yes
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	No
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes	No
> Basic Film Session	1.2.840.10008.5.1.1.1	Yes	No
> Basic Film Box	1.2.840.10008.5.1.1.2	Yes	No
> Basic Grayscale Image Box	1.2.840.10008.5.1.1.4	Yes	No
> Printer	1.2.840.10008.5.1.1.16	Yes	No
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Yes	No
> Basic Film Session	1.2.840.10008.5.1.1.1	Yes	No
> Basic Film Box	1.2.840.10008.5.1.1.2	Yes	No
> Basic Color Image Box	1.2.840.10008.5.1.1.4.1	Yes	No
> Printer	1.2.840.10008.5.1.1.16	Yes	No
Presentation LUT	1.2.840.10008.5.1.1.23	Yes	No
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Yes	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	Yes
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	Yes
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
Patient Study Only Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.3.1	Yes	Yes
Patient Study Only Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Yes	Yes
Specialized PMS Grayscale Softcopy Presentation State Storage	1.3.46.670589.2.2.1.1	Yes	Yes

4.2.1.2. Association Policies

4.2.1.2.1. General

The DICOM standard application context is specified in Table 5.

Table 5: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

4.2.1.2.2. Number of Associations

The number of simultaneous associations that an Application Entity may support as an Initiator or Acceptor is as specified below.

Table 6: Number of Associations as Association Initiator for IMALYTICS WORKSPACE Network AE

Maximum number of simultaneous associations	2
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Typical maximum of one association for Q/R and one association for storage simultaneously.

Table 7: Number of Associations as Association Acceptor for IMALYTICS WORKSPACE Network AE

Maximum number of simultaneous associations	10
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4.2.1.2.3. Asynchronous Nature

The IMALYTICS WORKSPACE Network AE does not support asynchronous operations and will not perform asynchronous window negotiation. The only exceptions are for reports from Storage Commitment and Print Management operations.

4.2.1.2.4. Implementation Identifying Information

The Implementation Class UID and Version Name are as specified in the following table.

Table 8: DICOM Implementation Class and Version for IMALYTICS WORKSPACE Network AE

Implementation Class UID	1.3.46.670589.40
Implementation Version Name	IMALYTICS

4.2.1.2.5. Communication Failure Handling

The behavior of the AE during communication failure is summarized in Table 9.

Table 9: Communication Failure Behavior

Exception	Behavior
ARTIM Timeout	The association setup fails, the reason is logged and reported to the user.

4.2.1.3. Association Initiation Policy

This describes the conditions under which the AE will initiate an association.

The behavior of the AE during association rejection is summarized in Table 10.

Table 10: DICOM Association Rejection Handling

Result	Source	Reason/Diagnosis	Behavior
1 – rejected-permanent	1 – DICOM UL service-user	1 – no-reason-given	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT _permanent, 1: REJECT_SOURCE_dul_user, 1: REJECT_REASON _no_reason_given)
		2 – application-context-name-not-supported	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT _permanent, 1: REJECT_SOURCE_dul_user, 2: REJECT_REASON _application_context_not_support)
		3 – calling-AE-title-not-recognized	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT _permanent, 1: REJECT_SOURCE_dul_user, 3: REJECT_REASON _calling_aetitle_not_recognized)
		7 – called-AE-title-not-recognized	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT _permanent, 1: REJECT_SOURCE_dul_user, 7: REJECT_REASON _called_aetitle_not_recognized)
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Association is not established. The following error is logged. Error: UserRecoverable: impl.dicom.access.PEER: Associationrejected by peer (1: REJECT_RESULT _permanent, 2: REJECT_SOURCE _dul_provider (acse), 1: REJECT_REASON _no_reason_given)

Result	Source	Reason/Diagnosis	Behavior
		2 – protocol-version-not-supported	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT _permanent, 2: REJECT_SOURCE _dul_provider (acse), 2: REJECT_REASON _application_context_not_support)
		3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT _permanent, 3: REJECT_SOURCE _dul_provider (presentation), 1: REJECT_REASON _no_reason_given)
		2 – local-limit-exceeded	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT _permanent, 3: REJECT_SOURCE _dul_provider (presentation), 2: REJECT_REASON _application_context_not_support)
2 – rejected-transient	1 – DICOM UL service-user	1 – no-reason-given	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 1: REJECT_REASON _no_reason_given)
		2 – application-context-name-not-supported	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 2: REJECT_REASON _application_context_not_support)
		3 – calling-AE-title-not-recognized	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 3: REJECT_REASON _calling_aetitle_not_recognized)

Result	Source	Reason/Diagnosis	Behavior
		7 – called-AE-title-not-recognized	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 7: REJECT_REASON_called_aetitle_not_recognized)
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 2: REJECT_SOURCE_dul_provider (acse), 1: REJECT_REASON_no_reason_given)
		2 – protocol-version-not-supported	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 2: REJECT_SOURCE_dul_provider (acse), 2: REJECT_REASON_application_context_not_support)
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 3: REJECT_SOURCE_dul_provider (presentation), 1: REJECT_REASON_no_reason_given)
		2 – local-limit-exceeded	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 3: REJECT_SOURCE_dul_provider (presentation), 2: REJECT_REASON_application_context_not_support)

The behavior of the AE during association abort is summarized in Table 11.

Table 11: DICOM Association Abort Handling

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	<p>When received, the IMALYTICS WORKSPACE Network AE terminates the connection with the following log: Association ABORTED by peer (0: ABORT_SOURCE_dul_user, 0: ABORT_REASON_not_specified).</p> <p>Sent when: N-EVENT-REPORT for printing received with status FAILURE. Abort is issued to an executing job that utilizes this network connection (ExportNetwork/ ArchiveNetwork/ DICOMCopy/ DICOMMove) Any other problem than ones specified for IMALYTICS WORKSPACE SCU in the rows below. (Examples: Problem while decoding the DICOM stream, SCU was unable to send the Response to SCP, Error writing to SCU stream).</p>
2 – DICOM UL service-provider	0 – reason-not-specified	<p>When received, the IMALYTICS WORKSPACE Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 0: ABORT_REASON_not_specified)</p> <p>Sent when: There are problems in SCU/SCP role negotiation. Any other problem than ones specified for IMALYTICS WORKSPACE SCU in the rows below. (Example: Problem while decoding the DICOM stream).</p>
	1 – unrecognized-PDU	<p>When received, the IMALYTICS WORKSPACE Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 1: ABORT_REASON_unrecognized_pdu).</p> <p>Sent when: An unrecognized PDU type is received⁴.</p>

Source	Reason/Diagnosis	Behavior
	2 – unexpected-PDU	<p>When received, the IMALYTICS WORKSPACE Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 2: ABORT_REASON_unexpected_pdu).</p> <p>Sent when: The received PDU type is not expected in the current state of connection⁵.</p>
	4 – unrecognized-PDU parameter	<p>When received, the IMALYTICS WORKSPACE Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 4: ABORT_REASON_unrecognized_pdu_parameter).</p> <p>Sent when: An unrecognized Associate PDU item is received¹.</p>
	5 – unexpected-PDU parameter	<p>When received, the IMALYTICS WORKSPACE Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 5: ABORT_REASON_unexpected_pdu_parameter).</p> <p>Sent when: One of the Associate PDU items is received more than once². One of the Associate PDU items is received unexpectedly².</p>

Source	Reason/Diagnosis	Behavior
	6 – invalid-PDU-parameter value	<p>When received, the IMALYTICS WORKSPACE Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 6: ABORT_REASON _invalid_pdu_parameter).</p> <p>Sent when: One of the Associate PDU items is received more than once³. One of the Associate PDU items is not received³. There is mismatch in the application context names between the SCU and the SCP. Illegal Asynchronous Operations Window invoke value is received. Illegal Asynchronous Operations Window perform value is received. Unknown presentation context id is received. Unknown abstract syntax is received. The length or the format of a received PDU item is invalid.</p>

Table 12: Notes concerning Abort Behavior

Reference	PDU and (Sub-) Item Types
1	Associate PDU items that are recognized: 0x10 APPLICATION CONTEXT 0x20 PRESENTATION CONTEXT (RQ) 0x21 PRESENTATION CONTEXT (AC) 0x30 ABSTRACT SYNTAX 0x40 TRANSFER SYNTAX 0x50 USER INFO 0x51 MAXIMUM LENGTH 0x52 IMPLEMENTATION CLASS UID 0x53 ASYNCHRONOUS OPERATIONS WINDOW 0x54 SCP/SCU ROLE SELECTION 0x55 IMPLEMENTATION VERSION NAME 0x56 SOP CLASS EXTENDED NEGOTIATION
2	Associate PDU items for Unexpected-PDU parameterReceived more than once: 0x10 APPLICATION CONTEXT (SCU, SCP) 0x30 ABSTRACT SYNTAX (SCU, SCP) 0x40 TRANSFER SYNTAX (SCU) Received unexpectedly: 0x20 PRESENTATION CONTEXT (RQ) (SCU)
3	Associate PDU items for Invalid-PDU parameter value Received more than once (SCU, SCP): 0x50 USER INFO 0x51 MAXIMUM LENGTH 0x52 IMPLEMENTATION CLASS UID 0x53 ASYNCHRONOUS OPERATIONS WINDOW 0x55 IMPLEMENTATION VERSION NAME Received illegally: 0x21 PRESENTATION CONTEXT (AC) (SCP) PDU items not received: 0x10 APPLICATION CONTEXT (SCU, SCP) 0x20 PRESENTATION CONTEXT (RQ) (SCP) 0x21 PRESENTATION CONTEXT (AC) (SCU) 0x50 USER INFO (SCU, SCP) 0x30 ABSTRACT SYNTAX (SCU) 0x40 TRANSFER SYNTAX (SCU) 0x51 MAXIMUM LENGTH (SCU, SCP) 0x52 IMPLEMENTATION CLASS UID (SCU)
4	PDU types that are recognized: 0x01 A-ASSOCIATE-RQ 0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ 0x04 P-DATA-TF 0x05 A-RELEASE-RQ 0x06 A-RELEASE-RP 0x07 A-ABORT

Reference	PDU and (Sub-) Item Types
5	<p>STATE_IDLE:</p> <ul style="list-style-type: none"> 0x01 A-ASSOCIATE-RQ 0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ 0x05 A-RELEASE-RQ 0x06 A-RELEASE-RP <p>STATE_ASSOCIATED:</p> <ul style="list-style-type: none"> 0x01 A-ASSOCIATE-RQ 0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ 0x06 A-RELEASE-RP <p>STATE_ASSOCIATING (SCU):</p> <ul style="list-style-type: none"> 0x01 A-ASSOCIATE-RQ 0x04 P-DATA-TF 0x05 A-RELEASE-RQ 0x06 A-RELEASE-RP <p>STATE_RELEASING:</p> <ul style="list-style-type: none"> 0x01 A-ASSOCIATE-RQ 0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ <p>STATE_WAIT_FOR_ASSOCIATE (SCP):</p> <ul style="list-style-type: none"> 0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ 0x04 P-DATA-TF 0x05 A-RELEASE-RQ 0x06 A-RELEASE-RP 0x07 A-ABORT <p>STATE_WAIT_FOR_FINISH:</p> <ul style="list-style-type: none"> 0x01 A-ASSOCIATE-RQ 0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ 0x04 P-DATA-TF 0x05 A-RELEASE-RQ 0x06 A-RELEASE-RP <p>STATE_WAIT_FOR_DISCONNECT:</p> <ul style="list-style-type: none"> 0x01 A-ASSOCIATE-RQ 0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ <p>STATE_TIMED_OUT:</p> <ul style="list-style-type: none"> 0x01 A-ASSOCIATE-RQ 0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ 0x04 P-DATA-TF 0x05 A-RELEASE-RQ 0x06 A-RELEASE-RP 0x07 A-ABORT

The behavior of the AE during DICOM communication failure is summarized in Table 13.

Table 13: DICOM Command Communication Failure Behavior

Exception	Behavior
Reply Time-out	The association is aborted using A-ABORT and command marked as failed. The reason is logged and reported to the user.

4.2.1.3.1. Real-World Activity – Archiving and Connectivity

4.2.1.3.1.1. Description and Sequencing of Activities

The IMALYTICS WORKSPACE Network AE implements the Verification service class / Verification SOP class to verify application level communication.

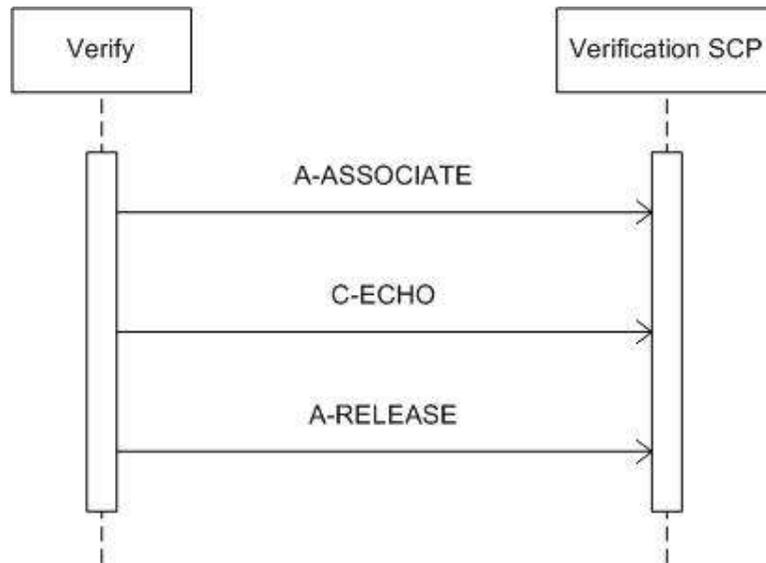


Figure 5: Data Flow Diagram – Verify

The IMALYTICS WORKSPACE Network AE implements the Storage and Storage Commitment service class as part of the Real-World Activity – Archiving and Connectivity to store and commit selected images at an archive or other storage SCP. All actual selected images are exported using one and the same association. Both synchronous and asynchronous storage commitment are supported; the IMALYTICS WORKSPACE Network AE waits for synchronous report until, after a configurable time passed, it will release the association – the Storage Commitment SCP must then request a new association to report the storage commitment asynchronously. The storage commitment AE title may or may not be the same AE title as the one used for the Storage service. If the AE title is configured the same then the storage and storage commitment action will be handled in the same association.

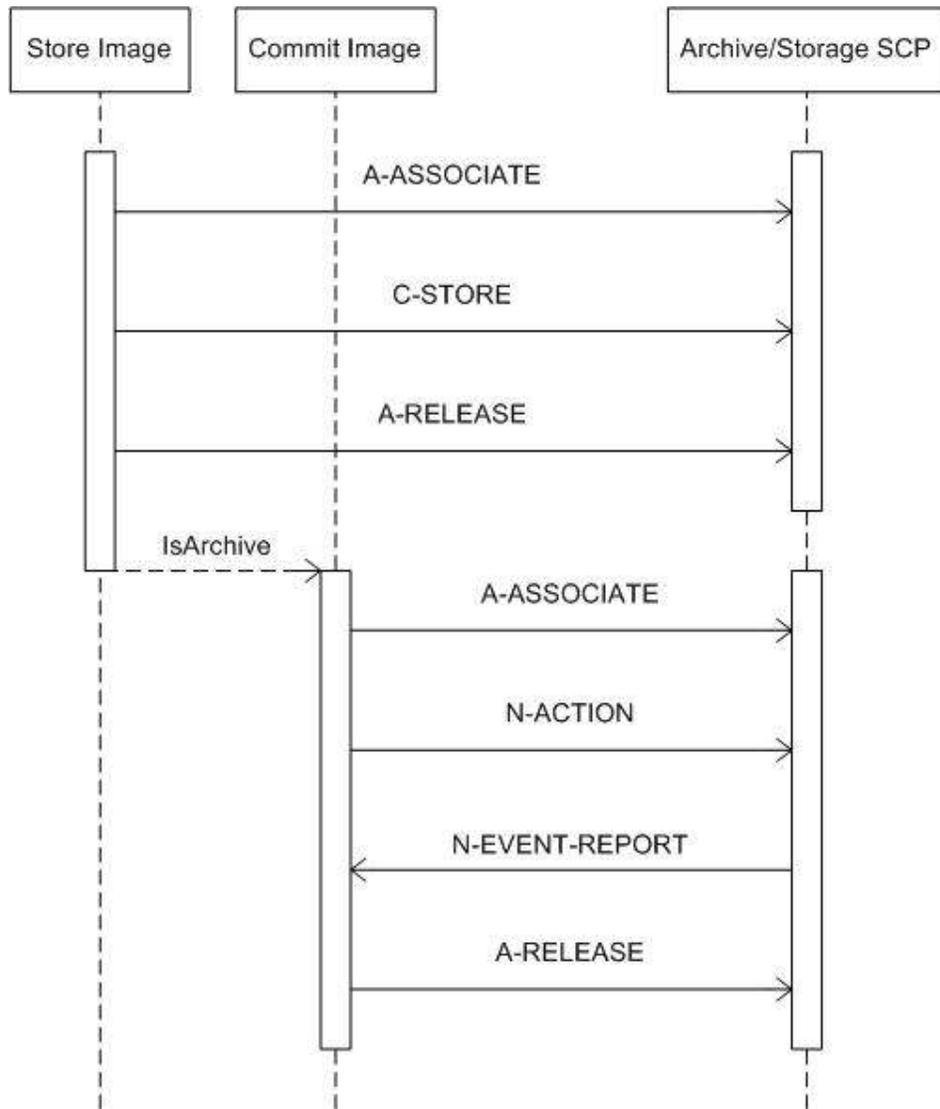


Figure 6: Data Flow Diagram – Store Image / Synchronous Commitment

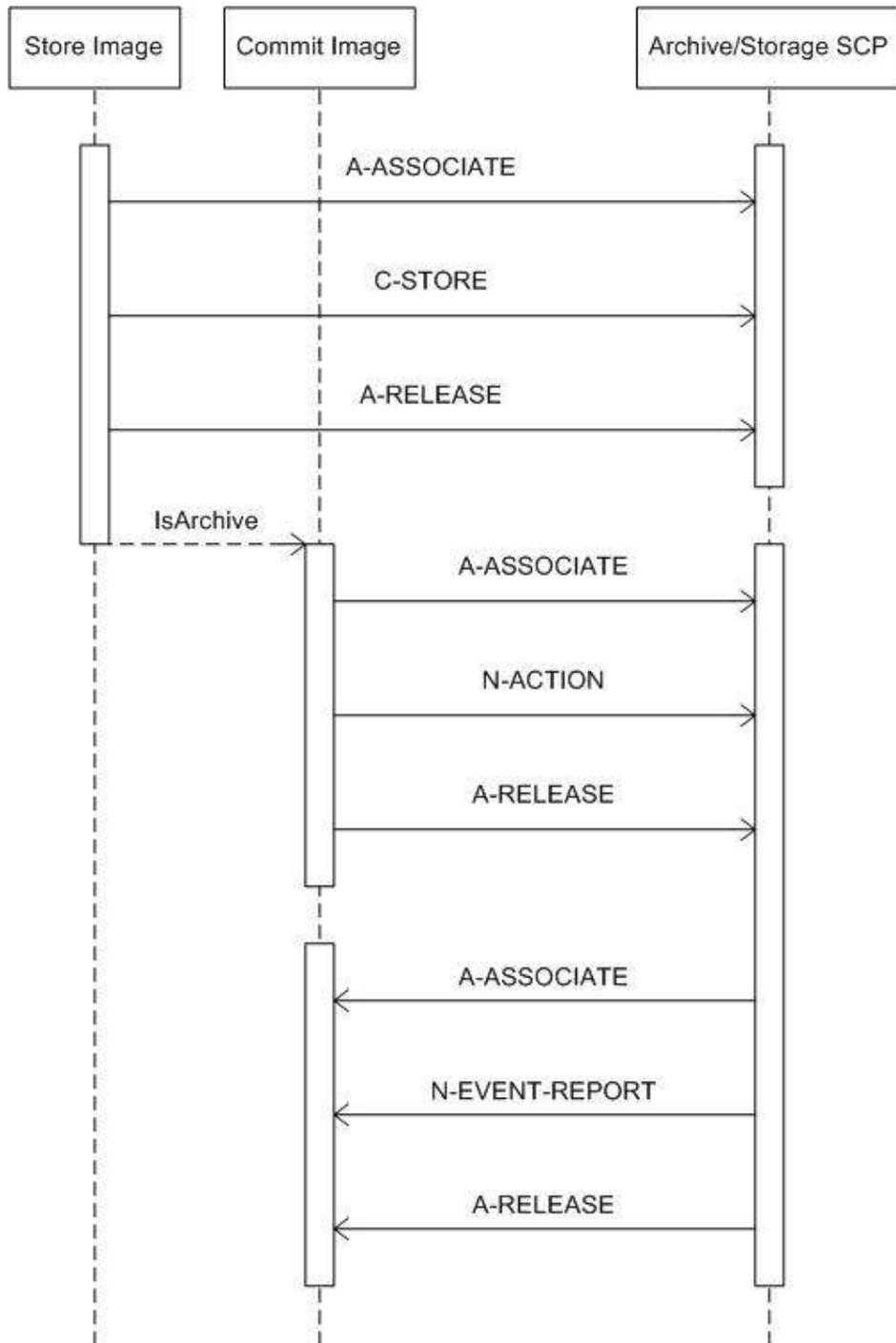


Figure 7: Data Flow Diagram – Store Image / Asynchronous Commitment

The IMALYTICS WORKSPACE Network AE implements the Query/Retrieve service class as part of the Real-World Activity – Archiving and Connectivity to find and move selected images per Query/Retrieve SCP. When querying a remote database the IMALYTICS WORKSPACE Network AE initiates an association to the selected peer

entity, sends a C-FIND request and receives the related C-FIND responses. The association is released after specific time-out. After receiving the C-FIND responses one is able to copy all or selected images in a patient folder from a remote database to the local database. The IMALYTICS WORKSPACE Network AE initiates an association to the selected peer entity, sends a C-MOVE request and receives the related C-MOVE responses. The association is released after the final C-MOVE response (when all selected images have been transmitted).

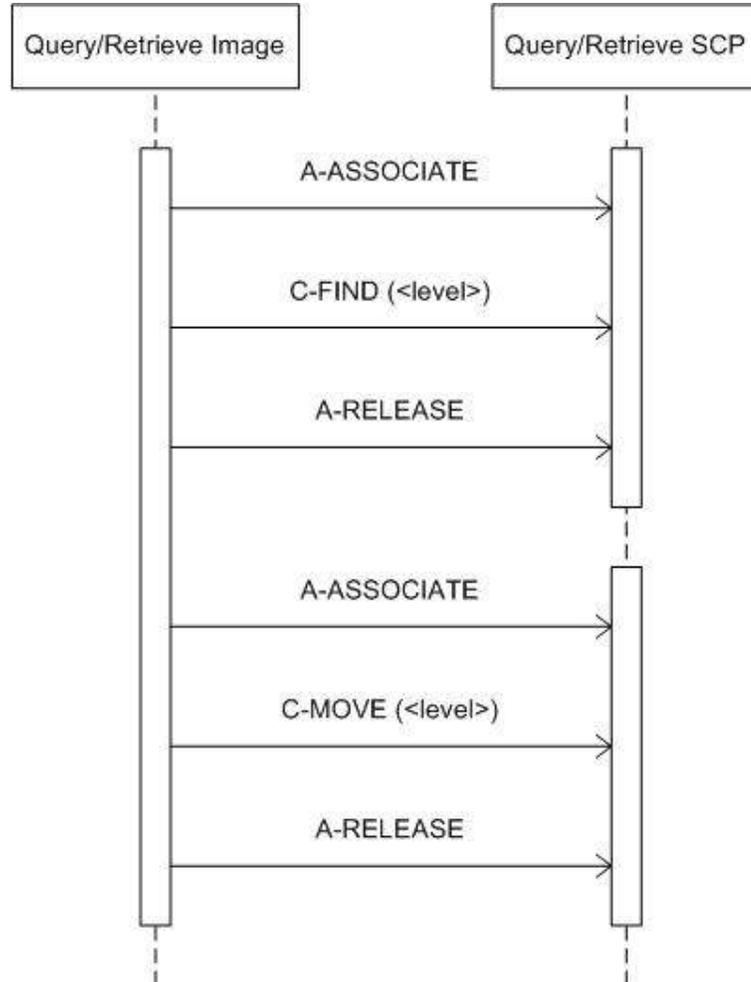


Figure 8: Data Flow Diagram – Query/Retrieve Image

4.2.1.3.1.2. Proposed Presentation Contexts

The presentation context proposed by IMALYTICS WORKSPACE Network AE for the Real-World Activity – Archiving and Connectivity are defined in Table 14.

Table 14: Proposed Presentation Contexts for the Real-World Activity – Archiving and Connectivity

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Explicit VR Big Endian	1.2.840.10008.1. 2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1. 2.1		
		Implicit VR Little Endian	1.2.840.10008.1. 2		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Explicit VR Big Endian	1.2.840.10008.1. 2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1. 2.1		
		Implicit VR Little Endian	1.2.840.10008.1. 2		
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Explicit VR Big Endian	1.2.840.10008.1. 2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1. 2.1		
		Implicit VR Little Endian	1.2.840.10008.1. 2		
		JPEG Baseline	1.2.840.10008.1. 2.4.50		
		JPEG Extended	1.2.840.10008.1. 2.4.51		
		JPEG Lossless (NH-FOP)	1.2.840.10008.1. 2.4.70		
		JPEG 2000 (Lossless Only)	1.2.840.10008.1. 2.4.90		
		JPEG 2000	1.2.840.10008.1. 2.4.91		
		RLE	1.2.840.10008.1. 2.5		
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Explicit VR Big Endian	1.2.840.10008.1. 2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1. 2.1		
		Implicit VR Little Endian	1.2.840.10008.1. 2		
		JPEG Baseline	1.2.840.10008.1. 2.4.50		
		JPEG Extended	1.2.840.10008.1. 2.4.51		

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
		JPEG Lossless (NH-FOP)	1.2.840.10008.1.2.4.70		
		JPEG 2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG 2000	1.2.840.10008.1.2.4.91		
		RLE	1.2.840.10008.1.2.5		
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Extended	1.2.840.10008.1.2.4.51		
		JPEG Lossless (NH-FOP)	1.2.840.10008.1.2.4.70		
		JPEG 2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG 2000	1.2.840.10008.1.2.4.91		
		RLE	1.2.840.10008.1.2.5		
		JPEG 2000	1.2.840.10008.1.2.4.91		
		RLE	1.2.840.10008.1.2.5		
Multi-frame True Color SC Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Extended	1.2.840.10008.1.2.4.51		

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
		JPEG Lossless (NH-FOP)	1.2.840.10008.1.2.4.70		
		JPEG 2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG 2000	1.2.840.10008.1.2.4.91		
		RLE	1.2.840.10008.1.2.5		
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Extended	1.2.840.10008.1.2.4.51		
		JPEG Lossless (NH-FOP)	1.2.840.10008.1.2.4.70		
		JPEG 2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG 2000	1.2.840.10008.1.2.4.91		
		RLE	1.2.840.10008.1.2.5		
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Extended	1.2.840.10008.1.2.4.51		
		JPEG Lossless (NH-FOP)	1.2.840.10008.1.2.4.70		

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
		JPEG 2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG 2000	1.2.840.10008.1.2.4.91		
		RLE	1.2.840.10008.1.2.5		
PET Image Storage	1.2.840.10008.5.1.4.1.1.128	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Extended	1.2.840.10008.1.2.4.51		
		JPEG Lossless (NH-FOP)	1.2.840.10008.1.2.4.70		
		JPEG 2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG 2000	1.2.840.10008.1.2.4.91		
		RLE	1.2.840.10008.1.2.5		
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
		Implicit VR Little Endian	1.2.840.10008.1. 2		
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Explicit VR Big Endian	1.2.840.10008.1. 2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1. 2.1		
		Implicit VR Little Endian	1.2.840.10008.1. 2		
Patient Study Only Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.3.1	Explicit VR Big Endian	1.2.840.10008.1. 2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1. 2.1		
		Implicit VR Little Endian	1.2.840.10008.1. 2		
Patient Study Only Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Explicit VR Big Endian	1.2.840.10008.1. 2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1. 2.1		
		Implicit VR Little Endian	1.2.840.10008.1. 2		
Specialized PMS Grayscale Softcopy Presentation State Storage	1.3.46.670589.2.2.1.1	Explicit VR Big Endian	1.2.840.10008.1. 2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1. 2.1		
		Implicit VR Little Endian	1.2.840.10008.1. 2		
		JPEG Baseline	1.2.840.10008.1. 2.4.50		
		JPEG Extended	1.2.840.10008.1. 2.4.51		
		JPEG Lossless (NH-FOP)	1.2.840.10008.1. 2.4.70		
		JPEG 2000 (Lossless Only)	1.2.840.10008.1. 2.4.90		
		JPEG 2000	1.2.840.10008.1. 2.4.91		
		RLE	1.2.840.10008.1. 2.5		

The order of the specified transfer syntaxes for a SOP class or AE in the configuration determines the preference order of accepted transfer syntaxes.

4.2.1.3.1.3. SOP Specific Conformance for SOP Classes

4.2.1.3.1.3.1. Verification

The IMALYTICS WORKSPACE Network AE provides standard conformance to the DICOM Verification service class.

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 15.

Table 15: C-ECHO Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Confirmation	The SCP has successfully returned a verification response.

4.2.1.3.1.3.2. Storage

The IMALYTICS WORKSPACE will transmit all optional or private image attributes.

Also the IMALYTICS WORKSPACE can create attributes that are not in the image: these new attributes are exported along with the image (e.g. when the SCP does not support presentation state objects).

On the export of an imported image the IMALYTICS WORKSPACE adds private attributes to the image.

The exported IMALYTICS WORKSPACE images do not contain Instance Number if the original images received from modalities do not contain this attribute or provide information in other attributes for IMALYTICS to generate it.

Following remarks hold for the standard DICOM SOP Classes:

- The IMALYTICS WORKSPACE Network AE supports the following Photometric Interpretations for non-compressed images:
 - MONOCHROME1;
 - MONOCHROME2;
 - PALETTE COLOR;
 - RGB;
 - YBR_FULL;
 - YBR_FULL_422;
 - YBR_PARTIAL_422;
 - YBR_ICT;
 - YBR_RCT.
- The IMALYTICS WORKSPACE Network AE can convert Transfer Syntaxes from internal to external values. So IMALYTICS WORKSPACE can convert from internally JPEG compressed/uncompressed pixel data to external JPEG compressed/uncompressed pixel data.
- JPEG Lossless (NH-FOP) compresses all bits denoted by the attribute DICOM_BITS_ALLOCATED. Therefore, any overlays encoded in the pixel data are also encoded and decoded.
- In case of both source (internal) and target compressed pixel data, decompression of the source pixel data and compression to the target pixel data only takes place in the following cases:

- The source and target compression formats are different; or:
 - The source pixel data is multi-frame without a BOT.
- The BOT in compressed pixel data is filled if:
 - this is explicitly configured; or:
 - group length attributes are configured.

IMALYTICS WORKSPACE Network AE allows import of mixed series: a series containing a maximum of 2 Secondary Capture images in addition to images from another SOP class.

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 16.

Table 16: C-STORE Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Storage is complete	Progress of the export job is updated and connection is retained for the next store. If the store of all the SOP instances is completed then the connection is released.
Failure	A7xx	Refused – Out of resources	Error is logged and the export job fails. Connection is released.
	A9xx	Error – Data set does not match SOP class	Error is logged and the export job fails. Connection is released.
	Cxxx	Error – Cannot understand	Error is logged and the export job fails. Connection is released.
Warning	B000	Coercion of data elements	Warning is logged and the export job continues. Connection is not released.
	B006	Elements discarded	Warning is logged and the export job continues. Connection is not released.
	B007	Data set does not match SOP class	Warning is logged and the export job continues. Connection is not released.

4.2.1.3.1.3.3. Storage Commitment Push Model

Storage Commitment Push Model N-ACTION

The IMALYTICS WORKSPACE Network AE provides standard conformance to the DICOM Storage Commitment Push Model SOP Class.

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 17.

Table 17: N-ACTION Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Confirmation	The SCU waits for MaxReplyWaitingTime to receive the N-EVENT-REPORT. After the timeout the association is released.
Failure	xxxx	(any failure)	The reason is logged and the association is released.

Storage Commitment Push Model N-EVENT-REPORT

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 18.

Table 18: N-EVENT-REPORT Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Description
Success	0000	-	Successful completion of the N-ACTION request.

4.2.1.3.1.3.4. Query/Retrieve Information Model – FIND

All standard and private attributes can be configured as matching key or return attribute (ref. Section 8.1.1.9). The IMALYTICS WORKSPACE Network AE supports matching per:

- Single Value;
- Wild Card;
- Range;
- Sequence;
- List of UID;
- Universal (i.e. for return attributes).

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 19.

Table 19: C-FIND Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Matching is complete	Query results are sent to the client and connection is kept open.
Failure	A700	Refused – Out of resources – unable to calculate number of matches	Error is logged and connection is kept open.
	A900	Failed – Identifier does not match SOP class	Error is logged and connection is kept open.
	Cxxx	Failed – Unable to process	Error is logged and connection is kept open.
Cancel	FE00	Sub-operations terminated due to Cancel indication	Cancel is logged and connection is kept open.
Pending	FF00	Matches are continuing – Current match is supplied and any optional keys were supported in the same manner as required keys	Query results are accumulated.
	FF01	Matches are continuing – Warning that one or more optional keys were not supported for existence and/or matching for this identifier	Query results are accumulated and a warning is logged once indicating no support for optional attributes.

4.2.1.3.1.3.5. Query/Retrieve Information Model – MOVE

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 20.

Table 20: C-MOVE Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Sub-operations complete – no failures	Move job completed successfully and the association is released.
Failure	A701	Refused – Out of resources – unable to calculate number of matches	Move job failed and the association is released.
	A702	Refused – Out of resources – unable to perform sub- operations	Move job failed and the association is released.
	A801	Refused – Destination unknown	Move job failed and the association is released.
	A900	Failed – Identifier does not match SOP class	Move job failed and the association is released.
	Cxxx	Failed – Unable to process	Move job failed and the association is released.
Warning	B000	Sub-operations complete – One or more failures	Move job failed and the association is released.
Cancel	FE00	Sub-operations terminated due to Cancel indication	Cancel is logged and connection is kept open.
Pending	FF00	Sub-operations are continuing	Move job progress is updated.

4.2.1.3.2. RWA Print

4.2.1.3.2.1. Description and Sequencing of Activities

The IMALYTICS WORKSPACE Network AE implements the Print Management service class as part of the Print component to send selected images to a printer (SCP).

As a result, the IMALYTICS WORKSPACE Network AE will initiate an association to the selected printer and use it to send the Print Service Elements of the Print SOP Classes. If the association could not be established, the IMALYTICS WORKSPACE Network AE will retry to establish an association every 20 seconds during the next hour.

IMALYTICS WORKSPACE Network AE allows having a print preview first.

In case of a print job association the printer status is requested in that association. The received printer status is displayed in the Printer Status Tool. On a failure printer status the IMALYTICS WORKSPACE Network AE will retry and request the printer status every 20 seconds during the next hour.

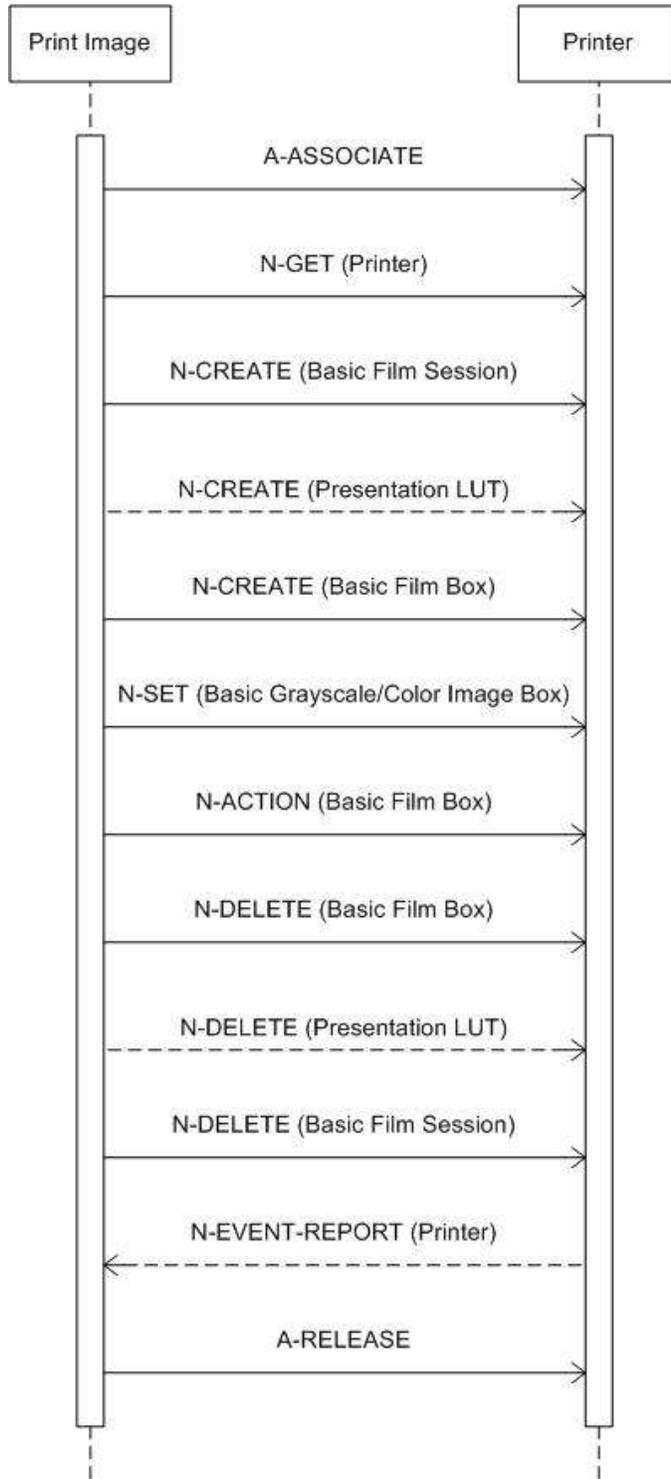


Figure 9: Data Flow Diagram – Print Image

4.2.1.3.2.2. Proposed Presentation Contexts

The presentation context proposed by IMALYTICS WORKSPACE Network AE for the RWA Print is defined in Table 21.

Table 21: Proposed Presentation Contexts for the RWA Print

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Presentation LUT	1.2.840.10008.5.1.1.23	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

The order of the specified transfer syntaxes for a SOP class or AE in the configuration determines the preference order of accepted transfer syntaxes.

4.2.1.3.2.3. SOP Specific Conformance for SOP Classes

The IMALYTICS WORKSPACE provides standard conformance to the Basic Grayscale Print Management Meta SOP Class and the Basic Color Print Management Meta SOP Class. Note that associations shall be proposed for either color or grayscale printing, not for both.

The following optional SOP classes from these Meta SOP classes are not supported:

- Print Job SOP class (can be used to get a notification that a job is ready);
- Basic Annotations Box SOP class;
- Reference Image Box SOP class.

The grayscale standard display function adjusts the brightness such that equal changes in P-Values will result in the same level of perceptibility. DICOM color print is supported as Planar Interleaved method as well as Pixel Interleaved. The Planar Interleaved method is mandatory according to DICOM standard and means that each color plane (R, G, B) is rendered separately. So each image must be rendered three times. This means that Planar Interleaved will be time consuming. For this reason the default method for DICOM color print will be set to Pixel Interleaved, where as the printer supports this.

The applied order of Print Service Elements (DIMSE's) is specified in Figure 9. Refer to section 8.1.1 for a description of the applied optional attributes in these Service Elements (i.e. non-mandatory attributes as Print SCU). Note that the Service Elements order is not specified by the DICOM standard.

Overlay, Annotation (showing the values of some major identifying attributes) and Shutter information is processed in the images sent to the printer (i.e. burnt-in into the image).

The Status Codes of DIMSE Responses (Success, Warning, Failure) as returned by the printer will also be logged (for service purposes) and are mapped onto general print job status messages towards the operator. These User Interface messages indicate:

- “Job Completed” and has the meaning that the print job is accepted by the printer; the actual printing will be done afterwards.
- “Print Error” indicating that a failure occurred during the DICOM Print. Also, most warning cases (like default printer values applied on optional print attributes) are interpreted as a print error because this will mostly result in a different print quality or print layout than expected.

The following implementation remarks are important to achieve successful printing:

- The number of Film Boxes per Film Session is one.
- The number of images per Film Box is one.
- The images to be printed on one film are rendered by the IMALYTICS WORKSPACE into one logical image. This logical image is very large, depending on the pixel matrix size (pixels per line, lines per image), use of color or not. A rough indication is 20 Mbytes for grayscale and 80 Mbytes for color. One should take this into account when selecting the DICOM printer and the printer configuration (e.g. the amount of memory).

The IMALYTICS WORKSPACE does not send an attribute list to the printer. Therefore the mandatory attributes listed in section 8.1.1 are the only attributes that are required to be supported by the printer.

4.2.1.3.2.3.1. Basic Grayscale Print Management

Basic Film Session N-CREATE

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 22.

Table 22: N-CREATE Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Film session successfully created.	The print job continues and completes.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	B600	Memory allocation not supported.	The print job continues and the warning is logged.
	0107	(not defined)	The print job continues and the warning is logged.
	0116		
	B601		
	B602		
	B603		
	B604		
	B605		
	B606		
	B608		
B609			
B60A			
	xxxx	(any other warning)	Print job fails, the warning is logged, and the association is released.

Basic Film Session N-DELETE

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 23.

Table 23: N-DELETE Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	-	Continue with print job.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	xxxx	(any warning)	Print job fails, the warning is logged, and the association is released.

Basic Film Box N-CREATE

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 24.

Table 24: N-CREATE Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Film Box successfully created.	The print job continues and completes.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	B605	Requested Min Density or Max Density outside of printer's operating range. The printer will use its respective minimum or maximum density value instead.	The print job continues and the warning is logged.
	0107	(not defined)	The print job continues and the warning is logged.
	0116		
	B600		
	B601		
	B602		
	B603		
	B604		
	B606		
	B608		
	B609		
B60A			
	xxxx	(any other warning)	Print job fails, the warning is logged, and the association is released.

Basic Film Box N-ACTION

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 25.

Table 25: N-ACTION Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Film accepted for printing.	The print job continues and completes.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	B603	Film Box SOP Instance hierarchy does not contain Image Box SOP Instances (empty page).	The print job continues and the warning is logged.
	B604	Image size is larger than image box size, the image has been de-magnified.	The print job continues and the warning is logged.
	B609	Image size is larger than the image box size. The image has been cropped to fit.	The print job continues and the warning is logged.
	B60A	Image size or combined print image size is larger than the image box size. Image or combined print image has been decimated to fit.	The print job continues and the warning is logged.
	0107	(not defined)	The print job continues and the warning is logged.
	0116		
	B600		
	B601		
	B602		
	B605		
B606			
B608			
xxxx	(any other warning)	Print job fails, the warning is logged, and the association is released.	

Basic Film Box N-DELETE

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 26.

Table 26: N-DELETE Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	-	Continue with print job.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	xxxx	(any warning)	Print job fails, the warning is logged, and the association is released.

Basic Grayscale Image Box N-SET

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 27.

Table 27: N-SET Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Image successfully stored in image box.	The print job continues and completes.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	B604	Image size is larger than image box size, the image has been de-magnified.	The print job continues and the warning is logged.
	B605	Requested Min Density or Max Density outside of printer's operating range. The printer will use its respective minimum or maximum density value instead.	The print job continues and the warning is logged.
	B609	Image size is larger than the image box size. The image has been cropped to fit.	The print job continues and the warning is logged.
	B60A	Image size or combined print image size is larger than the image box size. Image or combined print image has been decimated to fit.	The print job continues and the warning is logged.
	0107	(not defined)	The print job continues and the warning is logged.
	0116		
	B600		
	B601		
	B602		
	B603		
	B606		
B608			
xxxx	(any other warning)	Print job fails, the warning is logged, and the association is released.	

Printer N-GET

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 28.

Table 28: N-GET Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Successful command	The print job continues and completes.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	0001	Requested optional attributes are not supported.	The print job continues and the warning is logged.
	xxxx	(any other warning)	Print job fails, the warning is logged, and the association is released.

Printer N-EVENT-REPORT**Table 29: N-EVENT-REPORT Status Handling Behavior**

Event Type Name	Event Type ID	Behavior
Normal	1	The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0 Event Type ID = 1 Information is logged: N-EVENT-REPORT received, type: NORMAL
Warning	2	The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0 Event Type ID = 2 Warning is logged: N-EVENT-REPORT received, type: WARNING Status info: <Status info>
Failure	3	The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0 Event Type ID = 3 Error is Logged: N-EVENT-REPORT received, type: FAILURE Status info: <Status info> Printer status is set to DICOM_PRINTER_STATUS_FAILURE The print job retries the print operation.

All possible status responses are provided in Table 30.

Table 30: N-EVENT-REPORT Status Response

Service Status	Code	Further Meaning	Description
Success	0000	-	The result is logged.

4.2.1.3.2.3.2. Basic Color Print Management

Basic Film Session N-CREATE

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 31.

Table 31: N-CREATE Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Film session successfully created.	The print job continues and completes.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	B600	Memory allocation not supported.	The print job continues and the warning is logged.
	0107	(not defined)	The print job continues and the warning is logged.
	0116		
	B601		
	B602		
	B603		
	B604		
	B605		
	B606		
	B608		
	B609		
B60A			
	xxxx	(any other warning)	Print job fails, the warning is logged, and the association is released.

Basic Film Session N-DELETE

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 32.

Table 32: N-DELETE Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	-	Continue with print job.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	xxxx	(any warning)	Print job fails, the warning is logged, and the association is released.

Basic Film Box N-CREATE

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 33.

Table 33: N-CREATE Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Film Box successfully created.	The print job continues and completes.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	B605	Requested Min Density or Max Density outside of printer's operating range. The printer will use its respective minimum or maximum density value instead.	The print job continues and the warning is logged.
	0107	(not defined)	The print job continues and the warning is logged.
	0116		
	B600		
	B601		
	B602		
	B603		
	B604		
	B606		
	B608		
	B609		
B60A			
	xxxx	(any other warning)	Print job fails, the warning is logged, and the association is released.

Basic Film Box N-ACTION

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 34.

Table 34: N-ACTION Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Film accepted for printing.	The print job continues and completes.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	B603	Film Box SOP Instance hierarchy does not contain Image Box SOP Instances (empty page).	The print job continues and the warning is logged.
	B604	Image size is larger than image box size, the image has been de-magnified.	The print job continues and the warning is logged.
	B609	Image size is larger than the image box size. The image has been cropped to fit.	The print job continues and the warning is logged.
	B60A	Image size or combined print image size is larger than the image box size. Image or combined print image has been decimated to fit.	The print job continues and the warning is logged.
	0107	(not defined)	The print job continues and the warning is logged.
	0116		
	B600		
	B601		
	B602		
	B605		
	B606		
B608			
xxxx	(any other warning)	Print job fails, the warning is logged, and the association is released.	

Basic Film Box N-DELETE

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 35.

Table 35: N-DELETE Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Successful command	The print job continues and completes.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	xxxx	(any warning)	Print job fails, the warning is logged, and the association is released.

Basic Color Image Box N-SET

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 36.

Table 36: N-SET Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Successful command	The print job continues and completes.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	B604	Image size is larger than image box size, the image has been de-magnified.	The print job continues and the warning is logged.
	B609	Image size is larger than the image box size. The image has been cropped to fit.	The print job continues and the warning is logged.
	B60A	Image size or combined print image size is larger than the image box size. Image or combined print image has been decimated to fit.	The print job continues and the warning is logged.
	0107	(not defined)	The print job continues and the warning is logged.
	0116		
	B600		
	B601		
	B602		
	B603		
	B605		
	B606		
B608			
xxxx	(any other warning)	Print job fails, the warning is logged, and the association is released.	

Printer N-GET

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 37.

Table 37: N-GET Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Successful command	The print job continues and completes.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	xxxx	(any warning)	Print job fails, the warning is logged, and the association is released.

Printer N-EVENT-REPORT

Table 38: N-EVENT-REPORT Status Handling Behavior

Event Type Name	Event Type ID	Behavior
Normal	1	The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0 Event Type ID = 1 Information is logged: N-EVENT-REPORT received, type: NORMAL
Warning	2	The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0 Event Type ID = 2 Warning is logged: N-EVENT-REPORT received, type: WARNING Status info: <Status info>
Failure	3	The N-EVENT-REPORT-RSP is sent to the SCP with: Status = 0 Event Type ID = 3 Error is Logged: N-EVENT-REPORT received, type: FAILURE Status info: <Status info> Printer status is set to DICOM_PRINTER_STATUS_FAILURE The print job retries the print operation.

All possible status responses are provided in Table 39.

Table 39: N-EVENT-REPORT Status Response

Service Status	Code	Further Meaning	Description
Success	0000	-	The result is logged.

4.2.1.3.2.3.3. Presentation LUT

Presentation LUT N-CREATE

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 40.

Table 40: N-CREATE Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Presentation LUT successfully created.	The print job continues and completes.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	B605	Requested Min Density or Max Density outside of printer's operating range. The printer will use its respective minimum or maximum density value instead.	The print job continues and the warning is logged.
	0107	(not defined)	The print job continues and the warning is logged.
	0116		
	B600		
	B601		
	B602		
	B603		
	B604		
	B606		
	B608		
B609			
B60A			
	xxxx	(any other warning)	Print job fails, the warning is logged, and the association is released.

Presentation LUT N-DELETE

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in Table 41.

Table 41: N-DELETE Command Response Status Handling Behavior

Service Status	Code	Further Meaning	Behavior
Success	0000	Successful command	The print job continues and completes.
Failure	xxxx	(any failure)	Print job fails, the error is logged, and the association is released.
Warning	xxxx	(any warning)	Print job fails, the warning is logged, and the association is released.

4.2.1.4. Association Acceptance Policy

The IMALYTICS WORKSPACE Network AE accepts associations for the following purposes:

- To allow remote applications to verify application level communication.
- To allow remote applications to store images in the IMALYTICS WORKSPACE database.
- To allow remote applications to query the IMALYTICS WORKSPACE database.
- To allow remote applications to retrieve images from the IMALYTICS WORKSPACE database.
- To allow remote applications to send storage commit reports to IMALYTICS WORKSPACE as SCU.

The IMALYTICS WORKSPACE Network AE rejects association requests from unknown applications, i.e. applications that offer an unknown “calling AE title”. An application is known if and only if it is defined per configuration of the IMALYTICS WORKSPACE system.

The IMALYTICS WORKSPACE Network AE rejects association requests from applications that do not address the IMALYTICS WORKSPACE Network AE, i.e. that offer a wrong “called AE title”. The IMALYTICS WORKSPACE AE title is defined during configuration of IMALYTICS WORKSPACE.

The AE association rejection policies are summarized in Table 42.

Table 42: DICOM Association Rejection Policies

Result	Source	Reason/Diagnosis	Explanation	
1 – rejected- permanent	1 – DICOM UL service-user	1 – no-reason-given	Association is not established due to any problem other than that specified for IMALYTICS WORKSPACE SCP in the rows below. (Example: Problem while decoding the DICOM stream).	
		2 – application-context-name-not-supported	An application context name other than 1.2.840.10008.3.1.1.1 is requested by the SCU during association.	
		3 – calling-AE-title-not-recognized	- The configuration does not contain a repository having the Calling AE Title as per the association request. - There is a problem in configuration (related to composing the configuration from the SCU and the SCP configuration).	
		7 – called-AE-title-not-recognized	The called AE Title in the association request does not match the AE Title as per the configuration.	
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Not used.	
		2 – protocol-version-not-supported	Not used.	
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	Not used.	
		2 – local-limit-exceeded	Not used.	
	2 – rejected- transient	1 – DICOM UL service-user	1 – no-reason-given	Not used.
			2 – application-context-name-not-supported	Not used.
3 – calling-AE-title-not-recognized			Not used.	
7 – called-AE-title-not-recognized			Not used.	
2 – DICOM UL service-provider (ACSE related function)		1 – no-reason-given	Maximum number of associations is exceeded and an association request is received.	
		2 – protocol-version-not-supported	Not used.	
3 – DICOM UL service-provider (presentation related function)		1 – temporary-congestion	Not used.	

Result	Source	Reason/Diagnosis	Explanation
		2 – local-limit-exceeded	Not used.

The behavior of the AE during association abort is summarized in Table 43.

Table 43: DICOM Association Abort Handling

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	<p>When received, the IMALYTICS WORKSPACE Network AE terminates the connection with the following log: Association ABORTED by peer (0: ABORT_SOURCE_dul_user, 0: ABORT_REASON_not_specified).</p> <p>Sent when: Association times out due to inactivity Any other problem than ones specified for IMALYTICS WORKSPACE SCP in the rows below. (Examples: Problem while decoding the DICOM stream, Invalid request, Echo/Find/Move/N-Action SCP was unable to send the Response to SCU, Error writing to SCU stream).</p>
2 – DICOM UL service-provider	0 – reason-not-specified	<p>When received, the IMALYTICS WORKSPACE Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 0: ABORT_REASON_not_specified)</p> <p>Sent when: Import fails (Import SCP job returns fail status)</p>
	1 – unrecognized-PDU	<p>When received, the IMALYTICS WORKSPACE Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 1: ABORT_REASON_unrecognized_pdu).</p> <p>Sent when: An unrecognized PDU type is received⁴.</p>
	2 – unexpected-PDU	<p>When received, the IMALYTICS WORKSPACE Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 2: ABORT_REASON_unexpected_pdu).</p> <p>Sent when: The received PDU type is not expected in the current state of connection⁵.</p>

Source	Reason/Diagnosis	Behavior
	4 – unrecognized-PDU parameter	<p>When received, the IMALYTICS WORKSPACE Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 4: ABORT_REASON _unrecognized_pdu_parameter).</p> <p>Sent when: An unrecognized Associate PDU item is received¹.</p>
	5 – unexpected-PDU parameter	<p>When received, the IMALYTICS WORKSPACE Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 5: ABORT_REASON _unexpected_pdu_parameter).</p> <p>Sent when: One of the Associate PDU items is received more than once². One of the Associate PDU items is received unexpectedly².</p>
	6 – invalid-PDU-parameter value	<p>When received, the IMALYTICS WORKSPACE Network AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 6: ABORT_REASON _invalid_pdu_parameter).</p> <p>Sent when: One of the Associate PDU items is received more than once³. One of the Associate PDU items is not received³. Empty Called AE Title String (space-only) is received. Empty Calling AE Title String (space-only) is received. Unknown abstract syntax is received The length or the format of the received PDU item is invalid.</p>

Table 44: Notes concerning Abort Behavior

Reference	PDU and (Sub-) Item Types
1	Associate PDU items that are recognized: 0x10 APPLICATION CONTEXT 0x20 PRESENTATION CONTEXT (RQ) 0x21 PRESENTATION CONTEXT (AC) 0x30 ABSTRACT SYNTAX 0x40 TRANSFER SYNTAX 0x50 USER INFO 0x51 MAXIMUM LENGTH 0x52 IMPLEMENTATION CLASS UID 0x53 ASYNCHRONOUS OPERATIONS WINDOW 0x54 SCP/SCU ROLE SELECTION 0x55 IMPLEMENTATION VERSION NAME 0x56 SOP CLASS EXTENDED NEGOTIATION
2	Associate PDU items for Unexpected-PDU parameterReceived more than once: 0x10 APPLICATION CONTEXT (SCU, SCP) 0x30 ABSTRACT SYNTAX (SCU, SCP) 0x40 TRANSFER SYNTAX (SCU) Received unexpectedly: 0x20 PRESENTATION CONTEXT (RQ) (SCU)
3	Associate PDU items for Invalid-PDU parameter value Received more than once (SCU, SCP): 0x50 USER INFO 0x51 MAXIMUM LENGTH 0x52 IMPLEMENTATION CLASS UID 0x53 ASYNCHRONOUS OPERATIONS WINDOW 0x55 IMPLEMENTATION VERSION NAME Received illegally: 0x21 PRESENTATION CONTEXT (AC) (SCP) PDU items not received: 0x10 APPLICATION CONTEXT (SCU, SCP) 0x20 PRESENTATION CONTEXT (RQ) (SCP) 0x21 PRESENTATION CONTEXT (AC) (SCU) 0x50 USER INFO (SCU, SCP) 0x30 ABSTRACT SYNTAX (SCU) 0x40 TRANSFER SYNTAX (SCU) 0x51 MAXIMUM LENGTH (SCU, SCP) 0x52 IMPLEMENTATION CLASS UID (SCU)
4	PDU types that are recognized: 0x01 A-ASSOCIATE-RQ 0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ 0x04 P-DATA-TF 0x05 A-RELEASE-RQ 0x06 A-RELEASE-RP 0x07 A-ABORT

Reference	PDU and (Sub-) Item Types
5	<p>STATE_IDLE:</p> <p>0x01 A-ASSOCIATE-RQ 0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ 0x05 A-RELEASE-RQ 0x06 A-RELEASE-RP</p> <p>STATE_ASSOCIATED:</p> <p>0x01 A-ASSOCIATE-RQ 0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ 0x06 A-RELEASE-RP</p> <p>STATE_ASSOCIATING (SCU):</p> <p>0x01 A-ASSOCIATE-RQ 0x04 P-DATA-TF 0x05 A-RELEASE-RQ 0x06 A-RELEASE-RP</p> <p>STATE_RELEASING:</p> <p>0x01 A-ASSOCIATE-RQ 0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ</p> <p>STATE_WAIT_FOR_ASSOCIATE (SCP):</p> <p>0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ 0x04 P-DATA-TF 0x05 A-RELEASE-RQ 0x06 A-RELEASE-RP 0x07 A-ABORT</p> <p>STATE_WAIT_FOR_FINISH:</p> <p>0x01 A-ASSOCIATE-RQ 0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ 0x04 P-DATA-TF 0x05 A-RELEASE-RQ 0x06 A-RELEASE-RP</p> <p>STATE_WAIT_FOR_DISCONNECT:</p> <p>0x01 A-ASSOCIATE-RQ 0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ</p> <p>STATE_TIMED_OUT:</p> <p>0x01 A-ASSOCIATE-RQ 0x02 A-ASSOCIATE-AC 0x03 A-ASSOCIATE-RJ 0x04 P-DATA-TF 0x05 A-RELEASE-RQ 0x06 A-RELEASE-RP 0x07 A-ABORT</p>

4.2.1.4.1. Real-World Activity – Verify

4.2.1.4.1.1. Description and Sequencing of Activities

The IMALYTICS WORKSPACE Network AE accepts Associations from configured systems that wish to verify application level communication using the C-ECHO command.

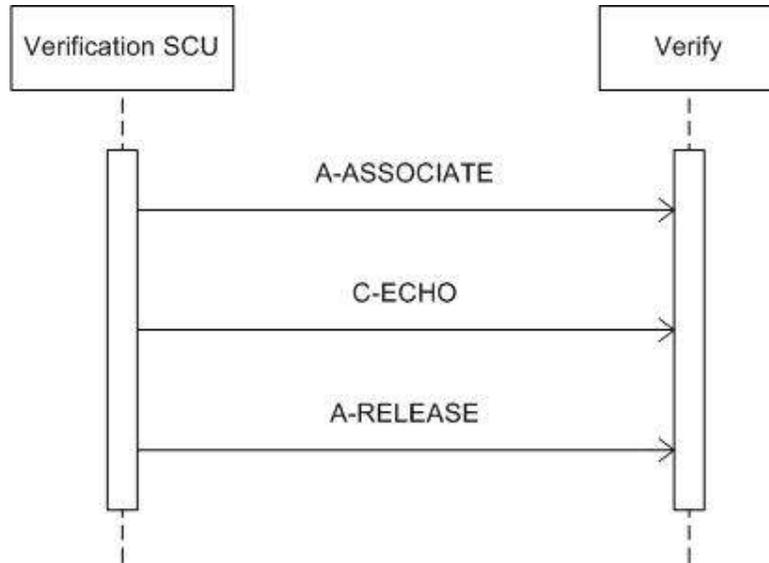


Figure 10: Data Flow Diagram – Verify

4.2.1.4.1.2. Accepted Presentation Contexts

The IMALYTICS WORKSPACE Network AE accepts all contexts in the intersection of the proposed and acceptable Presentation Contexts. This means that multiple proposed presentation contexts with the same SOP class but different transfer syntaxes are accepted by the IMALYTICS WORKSPACE as far as those transfer syntaxes are part of the acceptable transfer syntaxes. There is no check for duplicate contexts and these are therefore accepted.

Table 45: Acceptable Transfer Syntaxes for Real-World Activity – Verify

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Explicit VR Big Endian	1.2.840.10008.1. 2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1. 2.1		
		Implicit VR Little Endian	1.2.840.10008.1. 2		

The order of the specified transfer syntaxes for a SOP class or AE in the configuration determines the preference order of proposed transfer syntaxes.

4.2.1.4.1.3. SOP Specific Conformance for SOP Classes

4.2.1.4.1.3.1. Verification

The IMALYTICS WORKSPACE Network AE provides standard conformance to the DICOM Verification service class. All possible status responses are described in Table 46.

Table 46: IMALYTICS WORKSPACE Network AE C-ECHO Status Response

Service Status	Code	Further Meaning	Description
Success	0000	Confirmation	Confirm the verification request.

4.2.1.4.2. Real-World Activity – Store Image

4.2.1.4.2.1. Description and Sequencing of Activities

The IMALYTICS WORKSPACE Network AE accepts associations from configured systems that wish to store images in the IMALYTICS WORKSPACE database using the C-STORE command.

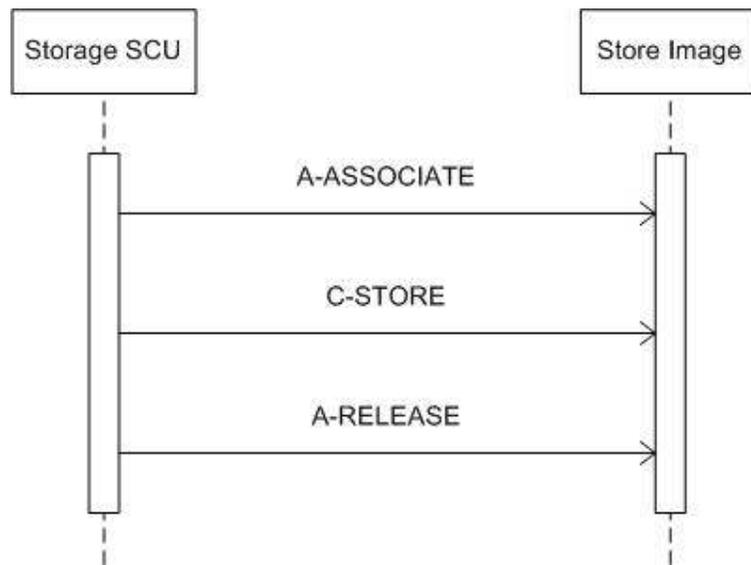


Figure 11: Data Flow Diagram – Store Image

4.2.1.4.2.2. Accepted Presentation Contexts

The IMALYTICS WORKSPACE Network AE accepts all contexts in the intersection of the proposed and acceptable Presentation Contexts. This means that multiple proposed presentation contexts with the same SOP class but different transfer syntaxes are accepted by the IMALYTICS WORKSPACE as far as those transfer syntaxes are part of the acceptable transfer syntaxes. There is no check for duplicate contexts and these are therefore accepted.

Table 47: Acceptable Transfer Syntaxes for Real-World Activity – Store Image

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Extended	1.2.840.10008.1.2.4.51		
		JPEG Lossless (NH-FOP)	1.2.840.10008.1.2.4.70		
		JPEG 2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG 2000	1.2.840.10008.1.2.4.91		
		RLE	1.2.840.10008.1.2.5		
		MR Image Storage	1.2.840.10008.5.1.4.1.1.4		
Explicit VR Little Endian	1.2.840.10008.1.2.1				
Implicit VR Little Endian	1.2.840.10008.1.2				
JPEG Baseline	1.2.840.10008.1.2.4.50				
JPEG Extended	1.2.840.10008.1.2.4.51				
JPEG Lossless (NH-FOP)	1.2.840.10008.1.2.4.70				
JPEG 2000 (Lossless Only)	1.2.840.10008.1.2.4.90				
JPEG 2000	1.2.840.10008.1.2.4.91				
RLE	1.2.840.10008.1.2.5				
SC Image Storage	1.2.840.10008.5.1.4.1.1.7			Explicit VR Big Endian	1.2.840.10008.1.2.2
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Extended	1.2.840.10008.1.2.4.51		
		JPEG Lossless (NH-FOP)	1.2.840.10008.1.2.4.70		

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
		JPEG 2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG 2000	1.2.840.10008.1.2.4.91		
		RLE	1.2.840.10008.1.2.5		
		RLE	1.2.840.10008.1.2.5		
Multi-frame True Color SC Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Extended	1.2.840.10008.1.2.4.51		
		JPEG Lossless (NH-FOP)	1.2.840.10008.1.2.4.70		
		JPEG 2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG 2000	1.2.840.10008.1.2.4.91		
		RLE	1.2.840.10008.1.2.5		
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Extended	1.2.840.10008.1.2.4.51		
		JPEG Lossless (NH-FOP)	1.2.840.10008.1.2.4.70		
		JPEG 2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG 2000	1.2.840.10008.1.2.4.91		
		RLE	1.2.840.10008.1.2.5		
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Extended	1.2.840.10008.1.2.4.51		
		JPEG Lossless (NH-FOP)	1.2.840.10008.1.2.4.70		
		JPEG 2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG 2000	1.2.840.10008.1.2.4.91		
		RLE	1.2.840.10008.1.2.5		
PET Image Storage	1.2.840.10008.5.1.4.1.1.128	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Extended	1.2.840.10008.1.2.4.51		
		JPEG Lossless (NH-FOP)	1.2.840.10008.1.2.4.70		
		JPEG 2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG 2000	1.2.840.10008.1.2.4.91		
		RLE	1.2.840.10008.1.2.5		
Specialized PMS Grayscale Softcopy Presentation State	1.3.46.670589.2.2.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
		Explicit VR Little Endian	1.2.840.10008.1. 2.1		
		Implicit VR Little Endian	1.2.840.10008.1. 2		
		JPEG Baseline	1.2.840.10008.1. 2.4.50		
		JPEG Extended	1.2.840.10008.1. 2.4.51		
		JPEG Lossless (NH-FOP)	1.2.840.10008.1. 2.4.70		
		JPEG 2000 (Lossless Only)	1.2.840.10008.1. 2.4.90		
		JPEG 2000	1.2.840.10008.1. 2.4.91		
		RLE	1.2.840.10008.1. 2.5		

The order of the specified transfer syntaxes for a SOP class or AE in the configuration determines the preference order of proposed transfer syntaxes.

4.2.1.4.2.3. SOP Specific Conformance for SOP Classes

4.2.1.4.2.3.1. Storage

The IMALYTICS WORKSPACE will only accept associations from configured systems. The IMALYTICS WORKSPACE may provide level 2 (full) conformance, depending on the implemented database. All possible status responses are described in Table 49.

Remarks:

- Pixel data will be stored in configurable transfer syntax. This implies that transfer syntax conversions might take place during import. Compressed pixel data is always decompressed and afterwards converted to the “configurable transfer syntax”.
- A non-empty BOT may be present in imported JPEG encoded pixel data.
- When importing an image a default Presentation State object may be created as specified in Table 48. In case a default Presentation State object is created (also for duplicate images), the following rules apply:
 - If a private Presentation State is present in the image the default Presentation State is always created based upon the private Presentation State.

Table 48: Conditions for creating Default Presentation State Object

Accepted association contains PR SOP class	Private PR is present in imported image	Default PR object created
Yes	Yes / No	No
No	Yes	Yes
No	No	No

- Value Representation 'UN' (Unknown) is supported, and shall be used for any attributes not known to IMALYTICS WORKSPACE and received per implicit transfer (ILE).
- Attribute values from images may be copied into related Presentation States and vice a versa.
- Images must contain the minimum set of attributes prescribed by DICOM. Otherwise the default behavior is that the image is rejected and the association aborted.

Table 49: IMALYTICS WORKSPACE Network AE C-STORE Status Response

Service Status	Code	Further Meaning	Description
Success	0000	-	Successful completion of the store request.
Failure	A700	Refused – Out of resources	Not enough resources available to do a store.
	C000	Error – Cannot understand	Any other exception generated during the store.

4.2.1.4.3. Real-World Activity – Query/Retrieve Image

4.2.1.4.3.1. Description and Sequencing of Activities

IMALYTICS WORKSPACE accepts associations from systems that wish to query the IMALYTICS WORKSPACE database using the C-FIND command.

IMALYTICS WORKSPACE accepts associations from systems that wish to retrieve images from the IMALYTICS WORKSPACE database using the C-MOVE command.

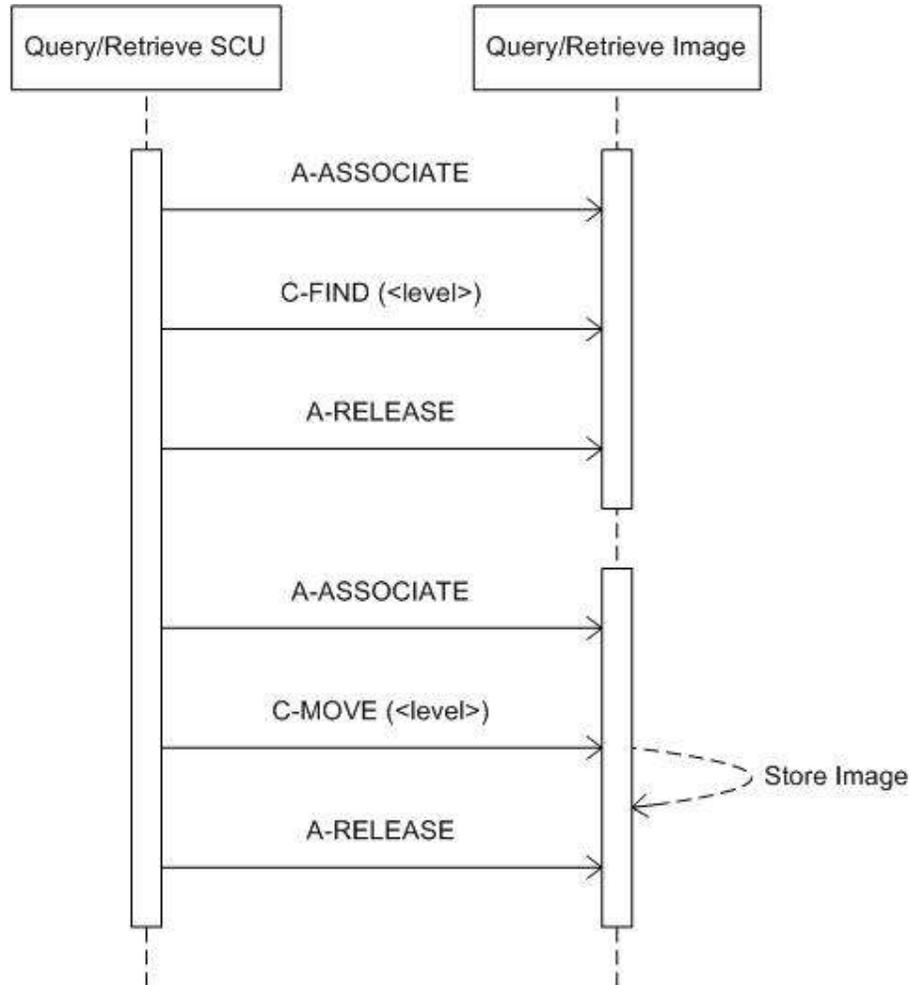


Figure 12: Data Flow Diagram – Query/Retrieve Image

4.2.1.4.3.2. Accepted Presentation Contexts

The IMALYTICS WORKSPACE Network AE accepts all contexts in the intersection of the proposed and acceptable Presentation Contexts. This means that multiple proposed presentation contexts with the same SOP class but different transfer syntaxes are accepted by the IMALYTICS WORKSPACE as far as those transfer syntaxes are part of the acceptable transfer syntaxes. There is no check for duplicate contexts and these are therefore accepted.

Table 50: Acceptable Transfer Syntaxes for Real-World Activity – Query/Retrieve Image

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Patient Root Query/Retrieve	1.2.840.10008.5.1.4.1.2.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Information Model – FIND		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Patient Study Only Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.3.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Patient Study Only Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

The order of the specified transfer syntaxes for a SOP class or AE in the configuration determines the preference order of proposed transfer syntaxes.

4.2.1.4.3.3. SOP Specific Conformance for SOP Classes

This section includes the SOP specific behavior, i.e. error codes, error and exception handling, time-outs, etc. The information shall be as described in the SOP specific Conformance Statement section of PS 3.4 (or relevant private SOP definition).

4.2.1.4.3.3.1. Query/Retrieve Information Model – FIND

The IMALYTICS WORKSPACE Network AE provides standard conformance to the DICOM Query/Retrieve service class. Optional keys are supported, depending on the data repository table that the remote system respectively the system integrator proposes. Relational queries are not supported. The IMALYTICS WORKSPACE Network AE generates a C-FIND response for each match with an identifier containing the values of all known attributes identified by the requested key fields. All such responses will have a status of Pending, indicating that the process of matching is not complete. When the process of matching is complete a C-FIND response is sent with a status of Success and no identifier. A Refused or Failed response to a C-FIND request indicates that the IMALYTICS WORKSPACE is unable to process the request.

The SCU may cancel the C-FIND service by issuing a C-FIND-CANCEL request at any time during the processing of the C-FIND service. The IMALYTICS WORKSPACE Network AE will interrupt all matching and return a status of Cancelled.

All possible status responses are described in Table 51.

Table 51: IMALYTICS WORKSPACE Network AE C-FIND Status Response

Service Status	Code	Further Meaning	Description
Success	0000	Matching is complete – No final identifier is supplied	Successful completion of the query.
Failure	A700	Refused – Out of resources	Not enough resources; exception during evaluation of query.
	C000	Failed – Unable to process	Any other exception generated while evaluating the query.
Cancel	FE00	Matching terminated due to Cancel request	Query has been cancelled.
Pending	FF00	Matches are continuing – Current match is supplied and any optional keys were supported in the same manner as required keys	Optional keys supported.
	FF01	Matches are continuing – Warning that one or more optional keys were not supported for existence and/or matching for this identifier	Optional keys not supported.

4.2.1.4.3.3.2. Query/Retrieve Information Model – MOVE

During the processing of the C-STORE sub-operations the IMALYTICS WORKSPACE Network AE optionally generates responses to the C-MOVE with status equal to pending. These C-MOVE responses indicate a number of remaining C-STORE sub-operations and the number of C-STORE sub-operations returning the status of Success, Warning, and Failed. When the number of remaining C-STORE sub-operations reaches zero, the IMALYTICS WORKSPACE Network AE generates a final response with the status of equal to Success, Warning, Failed, or Refused. This response may indicate the number of C-STORE sub-operations returning the status of Success, Warning, and Failed.

The SCU may cancel the C-MOVE service by issuing a C-MOVE-CANCEL request at any time during the processing of the C-MOVE. The IMALYTICS WORKSPACE

Network AE terminates all incomplete C-STORE sub-operations and returns a status of Cancelled.

All possible status responses are described in Table 52.

Table 52: IMALYTICS WORKSPACE Network AE C-MOVE Status Response

Service Status	Code	Further Meaning	Description
Success	0000	Sub-operations complete – No failures	Successful completion of the retrieve.
Failure	A801	Refused – Move destination unknown	Move destination is unknown.
	C000	Failed – Unable to process	Any other exception generated during the move.
Warning	B000	Sub-operations complete – One or more failures	Warning: One or more SOP instances have been successfully stored and the remaining have failed.
Cancel	FE00	Sub-operations terminated due to Cancel indication	Move request has been cancelled.
Pending	FF00	Sub-operations are continuing	Move pending.

4.2.1.4.4. Real-World Activity – Archiving and Connectivity

4.2.1.4.4.1. Description and Sequencing of Activities

The IMALYTICS WORKSPACE Network AE accepts associations from systems that wish to send a storage commitment notification (N-EVENT-REPORT).

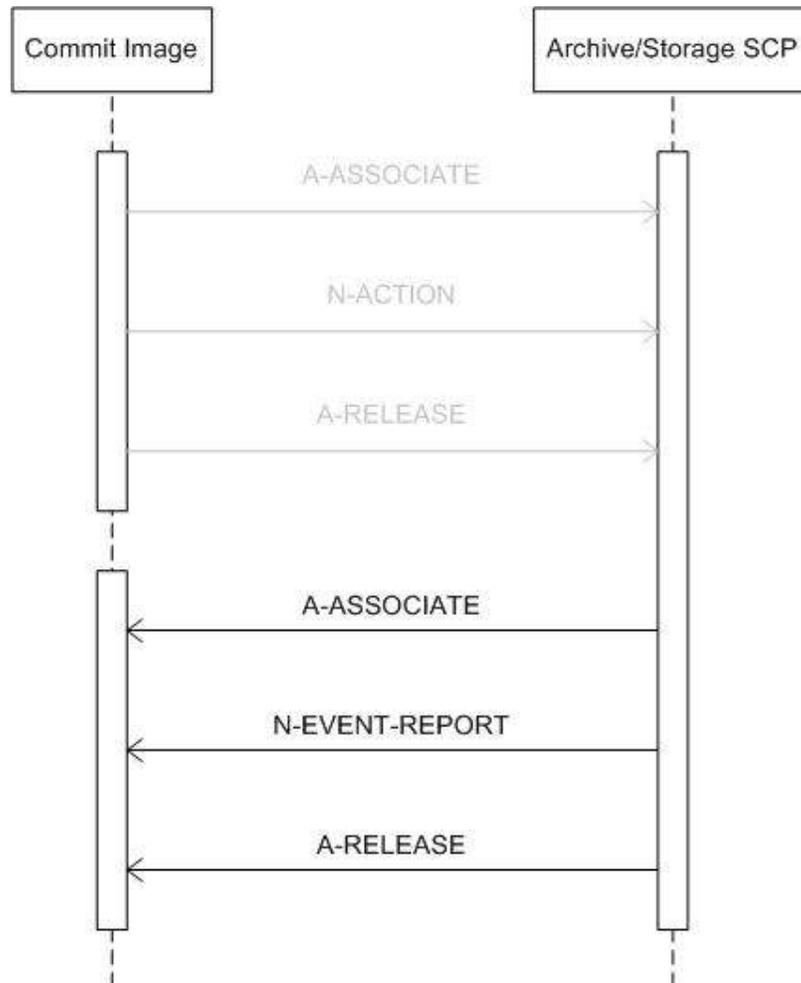


Figure 13: Data Flow Diagram – Commit Image

4.2.1.4.4.2. Accepted Presentation Contexts

The IMALYTICS WORKSPACE Network AE accepts all contexts in the intersection of the proposed and acceptable Presentation Contexts. This means that multiple proposed presentation contexts with the same SOP class but different transfer syntaxes are accepted by the IMALYTICS WORKSPACE as far as those transfer syntaxes are part of the acceptable transfer syntaxes. There is no check for duplicate contexts and these are therefore accepted.

Table 53: Acceptable Transfer Syntaxes for Real-World Activity – Archiving and Connectivity

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

The order of the specified transfer syntaxes for a SOP class or AE in the configuration determines the preference order of proposed transfer syntaxes.

4.2.1.4.4.3. SOP Specific Conformance for SOP Classes

4.2.1.4.4.3.1. Storage Commitment Push Model

The IMALYTICS WORKSPACE Network AE provides standard conformance to the DICOM Storage Commitment service class. All possible status responses are described in Table 54.

Table 54: IMALYTICS WORKSPACE Network AE N-EVENT-REPORT Status Response

Service Status	Code	Further Meaning	Description
Success	0000	-	Successful completion of the N-ACTION request.

4.3. Network Interfaces

4.3.1. Physical Network Interface

Protocols used:

- The TCP/IP stack from the Windows XP operating system is used.
- DICOM V3.0 TCP/IP is supported.

4.3.2. Additional Protocols

No additional protocols are used.

4.4. Configuration

4.4.1. AE Title/Presentation Address Mapping

4.4.1.1. Local AE Titles

The FieldService User Interface only allows one AE to be configured.

The following AE specific information must be available to configure a local AE:

- AE title.
- Hostname or IP address (or both).
Use "localhost" (127.0.0.1) for the complete local system. If the AE should only be

associated with a specific network adapter, don't specify the host name and use the IP address of this network adapter.

- Port number (note that normally all local IMALYTICS WORKSPACE AE's will have a different port number).

4.4.1.2. Remote AE Title/Presentation Address Mapping

One or more remote AE's may be configured.

The following AE specific information must be available to configure a remote AE:

- AE title.
- Hostname or IP address (or both).
- Port number.

4.4.2. Parameters

In Table 55 an overview is given of some important configuration attributes related to the DICOM behaviour of IMALYTICS WORKSPACE.

Table 55: Configuration Parameters table

Parameter	Configurable	Default Value
General Parameters		
Time-out waiting for acceptance or rejection response to an association Open request. (Application level time-out / ARTIM)	Yes	60 [s] (set 0 for no time-out)
General DIMSE level time-out values	No	-
Time-out waiting for response to TCP/IP connect request. (Low-level time-out)	OS	-
Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level time-out)	OS	-
Time-out for waiting for data between TCP/IP packets. (Low-level time-out)	OS	-
Any changes to default TCP/IP settings, such as configurable stack parameters.	OS	-
AE Specific Parameters		

Parameter	Configurable	Default Value
Size constraint in maximum object size	No	-
Maximum PDU size the AE can send and receive	Yes	0
Association time-out SCP	No	0 (no time-out)
Association time-out SCU	Yes	0 (no time-out; set -1 for immediate time-out, or else value in [s])
AE specific DIMSE level time-out values	Yes	300 [s] (set 0 for no time-out)
Storage Commit Max Reply Waiting Time (after time-out the reply will be handled asynchronously)	Yes	60 [s] (set 0 for no time-out, -1 for immediate time-out)
Number of simultaneous associations by service and/or SOP class	No	1 per service/SOP class
SOP Class support	Yes	All supported SOP classes
Transfer Syntax support*	Yes	ELE 1.2.840.10008.1.2.1 EBE 1.2.840.10008.1.2.2 ILE 1.2.840.10008.1.2 JPEG Lossless (NH-FOP) 1.2.840.10008.1.2.4.70 JPEG Baseline 1.2.840.10008.1.2.4.50 JPEG Extended 1.2.840.10008.1.2.4.51 JPEG 2000 (Lossless Only) 1.2.840.10008.1.2.4.90 JPEG 2000 1.2.840.10008.1.2.4.91 RLE 1.2.840.10008.1.2.5
IsArchive	Yes	False

* Although it is possible to configure encapsulation transfer syntax for every SOP class, encapsulation transfer syntax is practically not applicable for SOP classes that contain no data to be encoded and such transfer syntax should therefore be omitted.

Also note that the order of the specified transfer syntaxes for a SOP class or AE in the configuration determines the preference order of proposed transfer syntaxes. Per default all transfer syntaxes are enabled.

5. MEDIA INTERCHANGE

5.1. Implementation Model

5.1.1. Application Data Flow Diagram

The IMALYTICS WORKSPACE implements one media application entity: the IMALYTICS WORKSPACE Media AE.

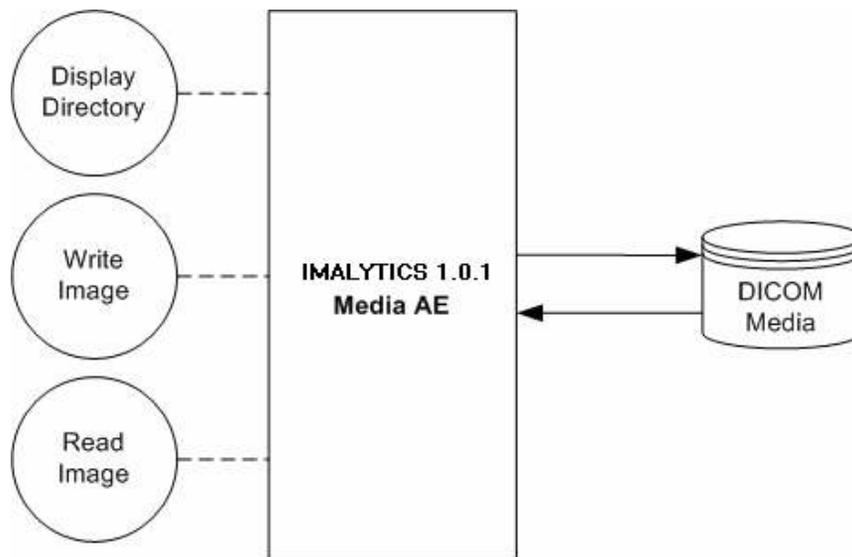


Figure 14: Application Data Flow Diagram

DICOM Media is defined per Application Profile as specified in Table 57.

5.1.2. Functional Definitions of AE's

The IMALYTICS WORKSPACE Media AE implements the following functions for DICOM media.

- Write a DICOM file-set onto the medium.
- Create a DICOMDIR file.
- Read the DICOMDIR file from the medium.
- Read selected images from the medium.

5.1.3. Sequencing of Real World Activities

Not applicable.

5.1.4. File Meta Information for Implementation Class and Version

The following values are assigned to the File Meta Information attributes (see PS 3.10) that pertain to the Implementation Class and Version.

Table 56: DICOM Implementation Class and Version for IMALYTICS WORKSPACE

File Meta Information Version	00, 01
Implementation Class UID	1.3.46.670589.40
Implementation Version Name	IMALYTICS

5.2. AE Specifications

5.2.1. IMALYTICS WORKSPACE Media AE

The IMALYTICS WORKSPACE Media AE provides standard conformance to the DICOM interchange option of the media storage service class, and follows the specifications as defined in the DICOM standard – Media Storage and File Format for Data Interchange (PS 3.10) and Media Storage Application Profiles (PS 3.11).

The IMALYTICS WORKSPACE Media AE supports multi-patient and multi-session for CD-R media (both reading and writing). Table 57 shows for each Application Profile in the first column the real-world activities in the second column, the roles required for each of these real-world activities in the third column, and the related service class option in the fourth column.

Table 57: AE Related Application Profiles, Real-World Activities, and Roles

Supported Application Profile	Real-World Activity	Roles	SC Option
STD-GEN-CD	Display Directory	FSR	Interchange
	Read Image	FSR	Interchange
	Write Image	FSC	Interchange
STD-GEN-DVD-JPEG	Display Directory	FSR	Interchange
	Read Image	FSR	Interchange
	Write Image	FSC	Interchange
STD-GEN-DVD-J2K	Display Directory	FSR	Interchange
	Read Image	FSR	Interchange
	Write Image	FSC	Interchange

5.2.1.1. File Meta Information for the IMALYTICS WORKSPACE Media AE

The IMALYTICS WORKSPACE Media AE has no specific File Meta Information.

5.2.1.2. Real-World Activities

5.2.1.2.1. Display Directory

The IMALYTICS WORKSPACE Media AE will act as a FSR when reading the directory of the medium. This allows the System Integrator to see the results in an overview of the patients, studies, series presentation states and images.

The IMALYTICS WORKSPACE Media AE will not access DICOM media when either:

- Patient ID is absent; or
- Study Instance UID has no value; or
- Series Instance UID has no value.

5.2.1.2.1.1. Media Storage Application Profile

Refer to Table 57.

5.2.1.2.2. Read Image

The IMALYTICS WORKSPACE Media AE will act as a FSR when reading all/selected images from DICOM media.

5.2.1.2.2.1. Media Storage Application Profile

Refer to Table 57.

5.2.1.2.3. Write Image

The IMALYTICS WORKSPACE Media AE acts as an FSC when writing DICOM objects onto DICOM media.

The IMALYTICS WORKSPACE Media AE can also store private attributes.

When the IMALYTICS WORKSPACE Media AE has to write objects to DICOM media, it can encounter the following situation.

The objects were previously received via C-STORE operations. Some attributes in the received images have a zero-length value (type 2 attributes). However, the Application Profile specifies some of these attributes as type 1: they must have a value. In such cases the IMALYTICS WORKSPACE Media AE supplies a value for the following attributes (if necessary):

- Patient ID;
- Study ID;
- Series Number;
- Instance number;
- Study Date;
- Study Time.

The mechanism of generating a value for Patient ID is to create a new value (i.e. Study Instance UID) for each new study written to the medium, even if this study belongs to a patient recorded earlier.

Study ID is assigned the value of the first Requested Procedure ID (0040,1001) encountered in the Request Attributes Sequence (0040,0275).

5.2.1.2.3.1. Media Storage Application Profile

Refer to Table 57.

5.3. Augmented and Private Application Profiles

5.3.1. Augmented Application Profiles

5.3.1.1. Augmented Application Profile Descriptions

5.3.1.1.1. SOP Class Augmentations

The addition of Grayscale Softcopy Presentation State SOP class objects implies augmentation of the standard AP.

5.3.1.1.2. Directory Augmentations

Instances of the private SOP classes may be written on the media. This requires a Directory Record Type (0004,1430) with the value "PRIVATE" and configuration of the required Private Record UID. This UID is used to define a non-standard type of

Directory Record by reference to its position in a private extension to the DICOM Basic Directory IOD Information Model.

5.3.1.1.3. Other Augmentations

Not applicable.

5.3.2. Private Application Profiles

Not applicable.

5.4. Media Configuration

In Table 58 an overview is given of some important configuration attributes related to the DICOM behaviour of IMALYTICS WORKSPACE.

Table 58: Configuration Parameters table

Parameter	Configurable	Default Value
AE Specific Parameters		
Transfer Syntax support	Yes	ELE 1.2.840.10008.1.2.1 (Options: EBE 1.2.840.10008.1.2.2 ILE 1.2.840.10008.1.2 JPEG Lossless (NH-FOP) 1.2.840.10008.1.2.4.70 JPEG Baseline 1.2.840.10008.1.2.4.50 JPEG Extended 1.2.840.10008.1.2.4.51 JPEG 2000 (Lossless Only) 1.2.840.10008.1.2.4.90 JPEG 2000 1.2.840.10008.1.2.4.91)
SOP Class	Yes	All transfer SOP classes in Table 1.

6. SUPPORT OF CHARACTER SETS

IMALYTICS WORKSPACE supports all character sets currently defined by DICOM except for the multi-byte character sets without code extensions. Thus IMALYTICS WORKSPACE supports the following character repertoires.

Table 59: Supported DICOM Character Sets of IMALYTICS WORKSPACE

Character Set Description	Defined Term	ESC Sequence	ISO Registration Number	Code Element	Character Set
Single-byte Character Sets without Code Extensions					
Default repertoire	-	-	ISO-IR 6	G0	ISO 646
Japanese	ISO_IR 13	-	ISO-IR 14	G0	JIS X 0201: Romaji
		-	ISO-IR 13	G1	JIS X 0201: Katakana
Latin alphabet No. 1	ISO_IR 100	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 100	G1	Supplementary set of ISO 8859
Latin alphabet No. 2	ISO_IR 101	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 101	G1	Supplementary set of ISO 8859
Latin alphabet No. 3	ISO_IR 109	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 109	G1	Supplementary set of ISO 8859
Latin alphabet No. 4	ISO_IR 110	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 110	G1	Supplementary set of ISO 8859
Greek	ISO_IR 126	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 126	G1	Supplementary set of ISO 8859
Arabic	ISO_IR 127	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 127	G1	Supplementary set of ISO 8859
Hebrew	ISO_IR 138	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 138	G1	Supplementary set of ISO 8859
Cyrillic	ISO_IR 144	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 144	G1	Supplementary set of ISO 8859
Latin alphabet No. 5	ISO_IR 148	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 148	G1	Supplementary set of ISO 8859
Thai	ISO_IR 166	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 166	G1	TIS 620-2533 (1990)
Single-byte Character Sets with Code Extensions					

Character Set Description	Defined Term	ESC Sequence	ISO Registration Number	Code Element	Character Set
Default repertoire	ISO 2022 IR 6	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
Japanese	ISO 2022 IR 13	ESC 02/08 04/10	ISO-IR 14	G0	JIS X 0201: Romaji
		ESC 02/09 04/09	ISO-IR 13	G1	JIS X 0201: Katakana
Latin alphabet No. 1	ISO 2022 IR 100	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/01	ISO-IR 100	G1	Supplementary set of ISO 8859
Latin alphabet No. 2	ISO 2022 IR 101	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/02	ISO-IR 101	G1	Supplementary set of ISO 8859
Latin alphabet No. 3	ISO 2022 IR 109	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/03	ISO-IR 109	G1	Supplementary set of ISO 8859
Latin alphabet No. 4	ISO 2022 IR 110	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/04	ISO-IR 110	G1	Supplementary set of ISO 8859
Greek	ISO 2022 IR 126	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/06	ISO-IR 126	G1	Supplementary set of ISO 8859
Arabic	ISO 2022 IR 127	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/07	ISO-IR 127	G1	Supplementary set of ISO 8859
Hebrew	ISO 2022 IR 138	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/08	ISO-IR 138	G1	Supplementary set of ISO 8859
Cyrillic	ISO 2022 IR 144	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/12	ISO-IR 144	G1	Supplementary set of ISO 8859
Latin alphabet No. 5	ISO 2022 IR 148	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/13	ISO-IR 148	G1	Supplementary set of ISO 8859
Thai	ISO 2022 IR 166	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 05/04	ISO-IR 166	G1	TIS 620-2533 (1990)

The preferred character set can be configured. If not configured, the default character set shall be ISO-IR 100.

When an unsupported character set is received it shall be tried and decoded according to the preferred character set.

Unsupported characters shall be displayed as “?”.

7. SECURITY

7.1. Security Profiles

The IMALYTICS WORKSPACE does not fully support DICOM security profiles. However, it does support security measures that will be used for secure authentication of a node and for the generation of audit records. The two IMALYTICS WORKSPACE components for security measures are:

- Audit Trail Component
- TLS Component

7.1.1. Audit Trail Component

The Audit Trail Component is a component of IMALYTICS WORKSPACE and can create messages according to the IHE defined standard. Actors are information systems or components of information systems that produce, manage, or act on categories of information required by operational activities in the enterprise. The Audit Trail Component allows security officers in an institution to audit activities, to detect non-compliant behavior in the enterprise, and to facilitate detection of improper creation, access, modification and deletion of Protected Health Information (PHI), where PHI data is considered as information records (Registration, Order, Study/Procedure, Reports and to a lesser degree Images/Presentation States), and not the flow of information between the systems. This includes information exported to and imported from every secured node in the "secured domain".

The messages will be created and sent to a syslog server according to the syslog protocol. The time that is used will be the local time of the system. This time should be maintained by implementing a NTP Timeserver daemon on the system. The timeserver and syslog server are elements of the Hospital infrastructure.

7.1.2. TLS Component

The TLS Component is a "mode of operation" of IMALYTICS WORKSPACE and will be used for nodes that can authenticate each other before they communicate over sockets. TLS can only be used using TCP. Node authentication and encryption are only possible when the node has:

- a "private and public key";
- a self-signed certificate or certificate signed by a Certificate Authority; and
- a list of certificates with which the system wants to communicate.

Furthermore the TLS component may communicate using the following Cipher Suites:

- TLS_RSA_WITH_NULL_SHA; (Node authentication without encryption)
- TLS_RSA_WITH_3DES_SHA. (Node authentication with encryption)

In case no encryption is used the data is signed and hashed: integrity is present and confidentiality is not present.

7.1.2.1. Certificates

If two systems communicate with each other, one system will be listening on a port (server node) while the other system sets up a connection (client node). The certificate this server node will send to the other client node is the server certificate. The client node initiates the communication and the certificate that the client node is sending to the server is the client certificate. (Server Client Authentication)
The following TLS Certification checks will be done (TLS Handshake).

The machine (either server or client) that will send its certificate will choose the certificate according to Common Name (CN) value in the Subject-field. This name is case-sensitive. All present certificates should have unique CN names.

The server verifies:

- that the client certificate is a valid X.509 certificate;
- that the client certificate is either signed by a CA or is self-signed;
- that the client certificate is in the list of trusted certificates;
- that the client certificate is valid (present time is between "Valid From" and "Valid To" fields of the X.509 certificate);
- that the client certificate has the correct purpose (at least the Client Authenticate purpose).

The client verifies:

- that the server certificate is a valid X.509 certificate;
- that the server certificate either is signed by a CA or is self-signed;
- that the server certificate is in the list of trusted certificates;
- that the server certificate is valid (present time is between "Valid From" and "Valid To" fields of the X.509 certificate);
- that the server certificate has the correct purpose (at least Server Authenticate purpose).

In the TLS component no verification is done on:

- revocation of certificates;
- limiting the connection to a limited set of IP-addresses.

Additional information:

The value in the Subject-field is determined in the certificate request. The CA will sign the request in case it accepts the values that are present in the request. The CN value can be: IP-number, hostname or hostname.domain. The value in the CN-field must be equal to the value that is used in making a connection to the server. In case the name is specified as hostname.domain that same value should be specified during connect. In the ideal situation the name-IP-number translation will be dealt with by the DNS in the hospital. This check is case-insensitive.

7.2. Association Level Security

IMALYTICS WORKSPACE accepts associations only from known applications or an application whose "calling AE Title" is defined in its configuration file. IMALYTICS WORKSPACE will reject association requests from unknown applications, i.e. applications that offer an unknown "calling AE title". An application entity (AE) is known if – and only if – it is defined during configuration of IMALYTICS WORKSPACE, which is done via the configuration application.

7.3. Application Level Security

IMALYTICS WORKSPACE allows the use of either conventional (non-secure) communication or secure communication based on the Transport Layer Security (TLS) protocol. If configured, IMALYTICS WORKSPACE supports security measures for:

- secure authentication of a node;
- integrity and confidentiality of transmitted data;
- generation of audit trail records;
- access control and user authentication.

8. ANNEXES

8.1. IOD Contents

8.1.1. Created SOP Instances

This section specifies each IOD created by IMALYTICS WORKSPACE, including the attribute name, tag, VR, and value (range, condition and source).

Defined abbreviations are:

ALWAYS	the module shall always be present
EMPTY	the (mandatory) module shall not contain any attributes
CONDITIONAL	the module may be present under specified condition
NEVER	the module shall never be present
ALWAYS	the attribute shall always be present with value
ANAP	the attribute shall be present with value under specified condition
EMPTY	the attribute shall always be present without value
ANAPEV	the attribute shall be present without value under specified condition
VNAP	the attribute shall always be present, either with or without value
ANAPCV	the attribute shall be present, either with or without value, under specified condition
AUTO	the attribute value is generated automatically
CONFIG	the attribute value source is a configurable parameter
COPY	the attribute value source is another SOP instance
FIXED	the attribute value is hard-coded in the application
IMPLICIT	the attribute value source is a user-implicit setting
USER	the attribute value source is explicit user input

8.1.1.1. Basic Directory IOD

Table 60: Modules of the Basic Directory IOD

Information Entity	Module Name	Usage
Media	File-set Identification Module	ALWAYS
	Directory Information Module	ALWAYS

Table 61: Created Basic Directory IOD Attributes

Name	Tag	VR	Definition	Comment
File-set Identification Module				
File-set ID	0004,1130	CS	ALWAYS, AUTO	-
Specific Character Set of File-set Descriptor File	0004,1142	CS	ANAP, AUTO	-
Directory Information Module				

Name	Tag	VR	Definition	Comment
Offset of the First Directory Record of the Root Directory Entity	0004,1200	UL	ALWAYS, AUTO	-
Offset of the Last Directory Record of the Root Directory Entity	0004,1202	UL	ALWAYS, AUTO	-
File-set Consistency Flag	0004,1212	US	ALWAYS, AUTO	-
Directory Record Sequence	0004,1220	SQ	ALWAYS, AUTO	-
> Offset of the Next Directory Record	0004,1400	UL	ANAP, AUTO	-
> Record In-use Flag	0004,1410	US	ANAP, AUTO	-
> Offset of Referenced Lower-Level Directory Entity	0004,1420	UL	ANAP, AUTO	-
> Directory Record Type	0004,1430	CS	ANAP, AUTO	-
> Referenced File ID	0004,1500	CS	ANAP, AUTO	-
> Referenced SOP Class UID in File	0004,1510	UI	ANAP, AUTO	-
> Referenced SOP Instance UID in File	0004,1511	UI	ANAP, AUTO	-
> Referenced Transfer Syntax UID in File	0004,1512	UI	ANAP, AUTO	-
> Patient Keys				
> Specific Character Set	0008,0005	CS	ANAP, AUTO	-
> Patient's Name	0010,0010	PN	VNAP, USER	-
> Patient ID	0010,0020	LO	ALWAYS, USER	-
> Patient's Birth Date	0010,0030	DA	VNAP, USER	-
> Patient's Sex	0010,0040	CS	VNAP, USER	-
> Study Keys				
> Specific Character Set	0008,0005	CS	ANAP, AUTO	-
> Study Date	0008,0020	DA	ALWAYS, AUTO	-
> Study Time	0008,0030	TM	ALWAYS, AUTO	-
> Accession Number	0008,0050	SH	VNAP, USER	-
> Modalities in Study	0008,0061	CS	ALWAYS, AUTO	-
> Referring Physician's Name	0008,0090	PN	VNAP, USER	-
> Study Description	0008,1030	LO	EMPTY, AUTO	-
> Study Instance UID	0020,000D	UI	ANAP, AUTO	-
> Study ID	0020,0010	SH	ALWAYS, AUTO	-
> Series Keys				

Name	Tag	VR	Definition	Comment
> Specific Character Set	0008,0005	CS	ANAP, AUTO	-
> Series Date	0008,0021	DA	ALWAYS, AUTO	-
> Series Time	0008,0031	TM	ALWAYS, AUTO	-
> Modality	0008,0060	CS	ALWAYS, AUTO	-
> Series Description	0008,103E	LO	ALWAYS, AUTO	-
> Body Part Examined	0018,0015	CS	ALWAYS, IMPLICIT	-
> Series Instance UID	0020,000E	UI	ALWAYS, AUTO	-
> Series Number	0020,0011	IS	ALWAYS, AUTO	-
> Image Keys				
> Specific Character Set	0008,0005	CS	ANAP, AUTO	-
> Image Type	0008,0008	CS	ALWAYS, AUTO	-
> SOP Instance UID	0008,0018	UI	ALWAYS, AUTO	-
> Instance Number	0020,0013	IS	ALWAYS, AUTO	-
> Presentation Keys				

Name	Tag	VR	Definition	Comment
> Specific Character Set	0008,0005	CS	ANAP, AUTO	-
> Referenced Series Sequence	0008,1115	SQ	ALWAYS, AUTO	-
>> Referenced Image Sequence	0008,1140	SQ	ANAP, AUTO	-
>>> Referenced SOP Class UID	0008,1150	UI	ALWAYS	-
>>> Referenced SOP Instance UID	0008,1155	UI	ALWAYS	-
>> Series Instance UID	0020,000E	UI	ALWAYS	-
> Instance Number	0020,0013	IS	ALWAYS, AUTO	-
> Content Label	0070,0080	CS	ALWAYS	-
> Content Description	0070,0081	LO	VNAP	-
> Presentation Creation Date	0070,0082	DA	ALWAYS	-
> Presentation Creation Time	0070,0083	TM	ALWAYS	-
> Content Creator's Name	0070,0084	PN	VNAP	-
> Private Keys				
>	-	-	-	As per configuration.

8.1.1.2. Storage Commitment IOD

Table 62: Modules of the Storage Commitment IOD

Information Entity	Module Name	Usage
Image	SOP Common Module	EMPTY
	Storage Commitment Module	ALWAYS (N-ACTION)

Table 63: Created Storage Commitment IOD Attributes

Name	Tag	VR	Definition	Comment
Storage Commitment Module				
Transaction UID	(0008,1195)	UI	ALWAYS, AUTO	-
Referenced SOP Sequence	(0008,1199)	SQ	ALWAYS, AUTO	-
> Referenced SOP Class UID	(0008,1150)	UI	ALWAYS, COPY	-
> Referenced SOP Instance UID	(0008,1155)	UI	ALWAYS, COPY	-

8.1.1.3. Basic Film Session IOD

Table 64: Modules of the Basic Film Session IOD

Information Entity	Module Name	Usage
Image	SOP Common Module	EMPTY
Film	Basic Film Session Presentation Module	ALWAYS (N-CREATE)
	Basic Film Session Relationship Module	EMPTY

Table 65: Created Basic Film Session IOD Attributes

Name	Tag	VR	Definition	Comment
Basic Film Session Presentation Module				
Number of Copies	2000,0010	IS	ALWAYS, IMPLICIT	-
Print Priority	2000,0020	CS	ALWAYS, AUTO	-
Medium Type	2000,0030	CS	ALWAYS, IMPLICIT	-
Film Destination	2000,0040	CS	ALWAYS, AUTO	-
Film Session Label	2000,0050	LO	ALWAYS, AUTO	-

8.1.1.4. Basic Film Box IOD

Table 66: Modules of the Basic Film Box IOD

Information Entity	Module Name	Usage
Image	SOP Common Module	EMPTY
Film	Basic Film Box Presentation Module	ALWAYS (N-CREATE)
	Basic Film Box Relationship Module	ALWAYS

Table 67: Created Basic Film Box IOD Attributes

Name	Tag	VR	Definition	Comment
Basic Film Box Presentation Module				
Image Display Format	(2010,0010)	ST	ALWAYS, AUTO	-
Film Orientation	(2010,0040)	CS	ALWAYS, IMPLICIT / CONFIG	-
Film Size ID	(2010,0050)	CS	ALWAYS, IMPLICIT / CONFIG	-
Magnification Type	(2010,0060)	CS	ALWAYS, AUTO	-
Max Density	(2010,0130)	US	ALWAYS, AUTO	-
Trim	(2010,0140)	CS	ALWAYS, AUTO	-
Configuration Information	(2010,0150)	ST	ALWAYS, AUTO	-
Basic Film Box Relationship Module				
Referenced Film Session Sequence	(2010,0500)	SQ	ALWAYS, AUTO	-
> Referenced SOP Class UID	(0008,1150)	UI	ALWAYS, AUTO	-
> Referenced SOP Instance UID	(0008,1155)	UI	ALWAYS, AUTO	-

8.1.1.5. Basic Grayscale Image Box IOD

Table 68: Modules of the Basic Grayscale Image Box IOD

Information Entity	Module Name	Usage
Image	SOP Common Module	EMPTY

Information Entity	Module Name	Usage
	Image Box Pixel Presentation Module	ALWAYS (N-SET)

Table 69: Created Basic Grayscale Image Box IOD Attributes

Name	Tag	VR	Definition	Comment
Image Box Pixel Presentation Module				
Image Position	(2020,0010)	US	ALWAYS, AUTO	-
Polarity	(2020,0020)	CS	ALWAYS, AUTO	-
Basic Grayscale Image Sequence	(2020,0110)	SQ	ALWAYS, AUTO	-
> Samples per Pixel	(0028,0002)	US	ALWAYS, AUTO	-
> Photometric Interpretation	(0028,0004)	CS	ALWAYS, IMPLICIT	-
> Rows	(0028,0010)	US	ALWAYS, IMPLICIT	-
> Columns	(0028,0011)	US	ALWAYS, IMPLICIT	-
> Bits Allocated	(0028,0100)	US	ALWAYS, AUTO	-
> Bits Stored	(0028,0101)	US	ALWAYS, IMPLICIT	-
> High Bit	(0028,0102)	US	ALWAYS, AUTO	-
> Pixel Representation	(0028,0103)	US	ALWAYS, AUTO	-
> Pixel Data	(7FE0,0010)	OB OW	ALWAYS, AUTO	-

8.1.1.6. Basic Color Image Box IOD**Table 70: Modules of the Basic Color Image Box IOD**

Information Entity	Module Name	Usage
Image	SOP Common Module	EMPTY
	Image Box Pixel Presentation Module	ALWAYS (N-SET)

Table 71: Created Basic Color Image Box IOD Attributes

Name	Tag	VR	Definition	Comment
Image Box Pixel Presentation Module				
Image Position	(2020,0010)	US	ALWAYS, AUTO	-
Polarity	(2020,0020)	CS	ALWAYS, AUTO	-
Basic Color Image Sequence	(2020,0111)	SQ	ALWAYS, AUTO	-
> Samples per Pixel	(0028,0002)	US	ALWAYS, AUTO	-
> Photometric Interpretation	(0028,0004)	CS	ALWAYS, IMPLICIT	-
> Rows	(0028,0010)	US	ALWAYS, IMPLICIT	-

Name	Tag	VR	Definition	Comment
> Columns	(0028,0011)	US	ALWAYS, IMPLICIT	-
> Bits Allocated	(0028,0100)	US	ALWAYS, AUTO	-
> Bits Stored	(0028,0101)	US	ALWAYS, IMPLICIT	-
> High Bit	(0028,0102)	US	ALWAYS, AUTO	-
> Pixel Representation	(0028,0103)	US	ALWAYS, AUTO	-
> Pixel Data	(7FE0,0010)	OB OW	ALWAYS, AUTO	-

8.1.1.7. Printer IOD

Table 72: Modules of the Printer IOD

Information Entity	Module Name	Usage
Image	SOP Common Module	EMPTY
Printer	Printer Module	EMPTY (N-GET)

Table 73: Created Printer IOD Attributes

Name	Tag	VR	Definition	Comment
Printer Module				
-	-	-	-	-

8.1.1.8. Grayscale Softcopy Presentation State IOD

Depending on the configuration, when the IMALYTICS WORKSPACE imports an image without presentation state object then it may extract and store presentation state object along with this image. The presentation state object will then be part of the same examination as the original image.

If private presentation state information exists then this will be used to create the presentation state object. Depending on the configuration IMALYTICS WORKSPACE may include this private presentation state information on export.

Table 75 specifies only those attributes that are created or modified to export a presentation state object. This presentation state object shall also export all relevant attributes (ref. [DICOM] on Grayscale Softcopy Presentation State IOD) as stored per original image.

Note that the Display Shutter, Overlay Plane and Softcopy VOI LUT modules are moved from the original image to the presentation state object, i.e. the original image will not have any Display Shutter, Overlay Plane and Softcopy VOI LUT data stored. If applicable (i.e. if presentation state is not supported per association/configuration) the image and removed modules may be merged again at export.

Table 74: Modules of the Grayscale Softcopy Presentation State IOD

Information Entity	Module Name	Usage
Patient	Patient	ALWAYS
Study	General Study	ALWAYS
	Patient Study	CONDITIONAL, if present in original image
Series	General Series	ALWAYS
	Presentation Series	ALWAYS
Equipment	General Equipment	ALWAYS
Presentation State	Mask	NEVER
	Display Shutter	CONDITIONAL, if present in original image
	Overlay Plane	CONDITIONAL, if present in original image
	Displayed Area	ALWAYS
	Graphic Layer	CONDITIONAL, create 1 if overlay is present
	Modality LUT	CONDITIONAL, if present in original image NEVER for XA and RF
	Softcopy Presentation LUT	ALWAYS
	Softcopy VOI LUT	CONDITIONAL, if present in original image
	Presentation State	ALWAYS
	SOP Common	ALWAYS

Table 75: Created Grayscale Softcopy Presentation State IOD Attributes

Name	Tag	VR	Definition	Comment
Patient Module				
-	-	-	-	-
General Study Module				
-	-	-	-	-
Patient Study Module				
-	-	-	-	-
General Series Module				
Series Instance UID	0020,000E	UI	ALWAYS, AUTO	Generated at the time of import.
Presentation Series Module				
Modality	0008,0060	CS	ALWAYS, AUTO	Enumerated value: PR
General Equipment Module				
-	-	-	-	-
Display Shutter Module				
-	-	-	-	-
Overlay Plane Module				

Name	Tag	VR	Definition	Comment
-	-	-	-	-
Displayed Area Module				
Displayed Area Selection Sequence	0070,005A	SQ	ALWAYS, IMPLICIT	-
>Referenced Image Sequence	0008,1140	SQ	ALWAYS, IMPLICIT	-
>>Referenced SOP Class UID	0008,1150	UI	ALWAYS, IMPLICIT	SOP Class UID of original image.
>>Referenced SOP Instance UID	0008,1155	UI	ALWAYS, IMPLICIT	SOP Instance UID of original image.
>Displayed Area Top Left Hand Corner	0070,0052	SL	ALWAYS, IMPLICIT	Enumerated value: 1/1
>Displayed Area Bottom Right Hand Corner	0070,0053	SL	ALWAYS, IMPLICIT	Set to ImageColumns / ImageRows.
>Presentation Size Mode	0070,0100	CS	ALWAYS, IMPLICIT	Enumerated value: "SCALE TO FIT"
>Presentation Pixel Spacing	0070,0101	DS	ANAP, IMPLICIT	Set to the value of Pixel Spacing (0028,0030).
Graphic Layer Module				
Graphic Layer Sequence	0070,0060	SQ	ALWAYS, IMPLICIT	-
>Graphic Layer	0070,0002	CS	ALWAYS, IMPLICIT	-
>Graphic Layer Order	0070,0062	IS	ALWAYS, IMPLICIT	-
Modality LUT Module				
-	-	-	-	-
Softcopy Presentation LUT Module				
Presentation LUT Shape	2050,0020	CS	ANAP, AUTO	"IDENTITY"
Softcopy VOI LUT Module				
-	-	-	-	-
Presentation State Module				
Referenced Series Sequence	0008,1115	SQ	ALWAYS, AUTO	-
>Referenced Image Sequence	0008,1140	SQ	ALWAYS, AUTO	These references are constructed from the composite images that are sent in the same association or belong to the same Series.
>>Referenced SOP Class UID	0008,1150	UI	ALWAYS, AUTO	-
>>Referenced SOP Instance UID	0008,1155	UI	ALWAYS, AUTO	-
>Series Instance UID	0020,000E	UI	ALWAYS, AUTO	Series Instance UID of the original image.
Shutter Presentation Value	0018,1622	US	ANAP, AUTO	If required. Enumerated value: 0000H
Instance Number	0020,0013	IS	ALWAYS, AUTO	Generated at the time of import.
Presentation Label	0070,0080	CS	ALWAYS, AUTO	Enumerated value: NEW AT IMPORT
Presentation Description	0070,0081	LO	EMPTY, AUTO	-

Name	Tag	VR	Definition	Comment
Presentation Creation Date	0070,0082	DA	ALWAYS, AUTO	Set to the date at which this presentation state is created in the IMALYTICS WORKSPACE.
Presentation Creation Time	0070,0083	TM	ALWAYS, AUTO	Set to the time at which this presentation state is created in the IMALYTICS WORKSPACE.
Presentation Creator's Name	0070,0084	PN	EMPTY, AUTO	-
SOP Common Module				
Specific Character Set	0008,0005	CS	ANAP, COPY	-
SOP Class UID	0008,0016	UI	ALWAYS, AUTO	Enumerated value: 1.2.840.10008.5.1.4.1.1. 11.1
SOP Instance UID	0008,0018	UI	ALWAYS, AUTO	Generated at the time of import.

If composite images belonging to different series are sent (imported) within one association, then a separate presentation state and series is created for each different composite image series that contains single frame images. Multi-frame images are handled in a slightly different way, as for each separate MF image a presentation state is created. All presentation states that refer to MF images belonging to the same image series are put in the same presentation state series.

In addition, for multi-frame images it can be undesirable to create a presentation state object for each separate MF image during import. For this reason it can be configured to generate a Presentation State either per image or per series.

8.1.1.9. Query/Retrieve Information Model Definition

Table 76: Created Query/Retrieve Information Model Definition Attributes – Patient Root – C-FIND

Name	Tag	VR	Definition	Comment
PATIENT Level				
Specific Character Set	0008,0005	CS	ANAP, IMPLICIT	-
Query/Retrieve Level	0008,0052	CS	ALWAYS, AUTO	Enumerated value: PATIENT
Patient's Name	0010,0010	PN		-
Patient ID	0010,0020	LO	VNAP	-
Patient's Birth Date	0010,0030	DA		-
Patient's Sex	0010,0040	CS		-
Ethnic Group	0010,2160	SH		-
STUDY Level				
Specific Character Set	0008,0005	CS	ANAP, IMPLICIT	-
Study Date	0008,0020	DA		-
Study Time	0008,0030	TM		-
Accession Number	0008,0050	SH		-
Query/Retrieve Level	0008,0052	CS	ALWAYS, AUTO	Enumerated value: STUDY
Modalities in Study	0008,0061	CS		-

Name	Tag	VR	Definition	Comment
Referring Physician's Name	0008,0090	PN		-
Study Description	0008,1030	LO		-
Patient ID	0010,0020	LO	ALWAYS	-
Study Instance UID	0020,000D	UI	VNAP	-
Study ID	0020,0010	SH		-
Performed Procedure Step Start Date	0040,0244	DA		-
Performed Procedure Step Status	0040,0252	CS		-
Performed Procedure Step Description	0040,0254	LO		-
SERIES Level				
Specific Character Set	0008,0005	CS	ANAP, IMPLICIT	-
Series Date	0008,0021	DA		-
Series Time	0008,0031	TM		-
Query/Retrieve Level	0008,0052	CS	ALWAYS, AUTO	Enumerated value: SERIES
Modality	0008,0060	CS		-
Series Description	0008,103E	LO		-
Patient ID	0010,0020	LO	ALWAYS	-
Body Part Examined	0018,0015	CS		-
Protocol Name	0018,1030	LO		-
Study Instance UID	0020,000D	UI	ALWAYS	-
Series Instance UID	0020,000E	UI	VNAP	-
Series Number	0020,0011	IS		-
Number of Series Related Instances	0020,1209	IS		-
IMAGE Level				
Specific Character Set	0008,0005	CS	ANAP, IMPLICIT	-
SOP Instance UID	0008,0018	UI	VNAP	-
Query/Retrieve Level	0008,0052	CS	ALWAYS, AUTO	Enumerated value: IMAGE
Patient ID	0010,0020	LO	ALWAYS	-
Study Instance UID	0020,000D	UI	ALWAYS	-
Series Instance UID	0020,000E	UI	ALWAYS	-
Instance Number	0020,0013	IS		-

Table 77: Created Query/Retrieve Information Model Definition Attributes – Patient Root – C-MOVE

Name	Tag	VR	Definition	Comment
PATIENT Level				
Query/Retrieve Level	0008,0052	CS	ALWAYS, AUTO	Enumerated value: PATIENT
Patient ID	0010,0020	LO	ALWAYS, COPY	-
STUDY Level				
Query/Retrieve Level	0008,0052	CS	ALWAYS, AUTO	Enumerated value: STUDY
Patient ID	0010,0020	LO	ALWAYS, COPY	-
Study Instance UID	0020,000D	UI	ALWAYS, COPY	-
SERIES Level				

Name	Tag	VR	Definition	Comment
Query/Retrieve Level	0008,0052	CS	ALWAYS, AUTO	Enumerated value: SERIES
Patient ID	0010,0020	LO	ALWAYS, COPY	-
Study Instance UID	0020,000D	UI	ALWAYS, COPY	-
Series Instance UID	0020,000E	UI	ALWAYS, COPY	-
IMAGE Level				

Name	Tag	VR	Definition	Comment
SOP Instance UID	0008,0018	UI	ALWAYS, COPY	-
Query/Retrieve Level	0008,0052	CS	ALWAYS, AUTO	Enumerated value: IMAGE
Patient ID	0010,0020	LO	ALWAYS, COPY	-
Study Instance UID	0020,000D	UI	ALWAYS, COPY	-
Series Instance UID	0020,000E	UI	ALWAYS, COPY	-

Table 78: Created Query/Retrieve Information Model Definition Attributes – Study Root – C-FIND

Name	Tag	VR	Definition	Comment
STUDY Level				
Specific Character Set	0008,0005	CS	ANAP, IMPLICIT	-
Study Date	0008,0020	DA		-
Study Time	0008,0030	TM		-
Accession Number	0008,0050	SH		-
Query/Retrieve Level	0008,0052	CS	ALWAYS, AUTO	Enumerated value: STUDY
Modalities in Study	0008,0061	CS		-
Referring Physician's Name	0008,0090	PN		-
Study Description	0008,1030	LO		-
Patient's Name	0010,0010	PN		-
Patient ID	0010,0020	LO	VNAP	-
Patient's Birth Date	0010,0030	DA		-
Patient's Sex	0010,0040	CS		-
Ethnic Group	0010,2160	SH		-
Study Instance UID	0020,000D	UI	VNAP	-
Study ID	0020,0010	SH		-
Performed Procedure Step Start Date	0040,0244	DA		-
Performed Procedure Step Status	0040,0252	CS		-
Performed Procedure Step Description	0040,0254	LO		-
SERIES Level				
Specific Character Set	0008,0005	CS	ANAP, IMPLICIT	-
Series Date	0008,0021	DA		-
Series Time	0008,0031	TM		-
Query/Retrieve Level	0008,0052	CS	ALWAYS, AUTO	Enumerated value: SERIES
Modality	0008,0060	CS		-
Series Description	0008,103E	LO		-
Body Part Examined	0018,0015	CS		-
Protocol Name	0018,1030	LO		-
Study Instance UID	0020,000D	UI	ALWAYS	-

Name	Tag	VR	Definition	Comment
Series Instance UID	0020,000E	UI	VNAP	-
Series Number	0020,0011	IS		-
Number of Series Related Instances	0020,1209	IS		-
IMAGE Level				
Specific Character Set	0008,0005	CS	ANAP, IMPLICIT	-
SOP Instance UID	0008,0018	UI	VNAP	-
Query/Retrieve Level	0008,0052	CS	ALWAYS, AUTO	Enumerated value: IMAGE
Study Instance UID	0020,000D	UI	ALWAYS	-
Series Instance UID	0020,000E	UI	ALWAYS	-
Instance Number	0020,0013	IS		-

Table 79: Created Query/Retrieve Information Model Definition Attributes – Study Root – C-MOVE

Name	Tag	VR	Definition	Comment
STUDY Level				
Query/Retrieve Level	0008,0052	CS	ALWAYS, AUTO	Enumerated value: STUDY
Study Instance UID	0020,000D	UI	ALWAYS, COPY	-
SERIES Level				
Query/Retrieve Level	0008,0052	CS	ALWAYS, AUTO	Enumerated value: SERIES
Study Instance UID	0020,000D	UI	ALWAYS, COPY	-
Series Instance UID	0020,000E	UI	ALWAYS, COPY	-
IMAGE Level				
SOP Instance UID	0008,0018	UI	ALWAYS, COPY	-
Query/Retrieve Level	0008,0052	CS	ALWAYS, AUTO	Enumerated value: IMAGE
Study Instance UID	0020,000D	UI	ALWAYS, COPY	-
Series Instance UID	0020,000E	UI	ALWAYS, COPY	-

8.1.1.10. Secondary Capture Image Storage SOP Class

Table 80: IOD for Created Secondary Capture SOP Instance

Name	Tag	VR	Definition	Comments
Patient Module				
-	-	-	-	-
General Study Module				
-	-	-	-	-
Patient Study Module				
-	-	-	-	-

Name	Tag	VR	Definition	Comments
General Series Module				
Series Instance UID	0020,000E	UI	ALWAYS, AUTO	Generated at the time of creation.
General Equipment Module				
-	-	-	-	-
SC Equipment Module				
Conversion Type	0008,0064	CS	ALWAYS	WSD
Modality	(0008,0060)	CS	ALWAYS , AUTO	
Secondary Capture Device ID	(0018,1010)	LO	ALWAYS , AUTO	
Secondary Capture Device Manufacturer	(0018,1016)	LO	ALWAYS , AUTO	
Secondary Capture Device Manufacturer's Model Name	(0018,1018)	LO	ALWAYS , AUTO	
Secondary Capture Device Software Version	(0018,1019)	LO	ALWAYS, AUTO	
Video Image Format Acquired	(0018,1022)	SH	NEVER	
Digital Image Format Acquired	(0018,1023)	LO	NEVER	
General Image Module				
Instance Number	(0020,0013)	IS	ALWAYS	
Patient Orientation	(0020,0020)	CS	NEVER	
Content Date	(0008,0023)	DA	ALWAYS	
Content Time	(0008,0033)	TM	ALWAYS	
Image Type	(0008,0008)	CS	ALWAYS VNAP	
Acquisition Number	(0020,0012)	IS	NEVER VNAP	
Acquisition Date	(0008,0022)	DA	ALWAYS	
Acquisition Time	(0008,0032)	TM	ALWAYS	
Acquisition Datetime	(0008,0024)	DT	NEVER	
Referenced Image Sequence	(0008,1140)	SQ	NEVER	
>Referenced SOP Class UID	(0009,1150)	UI	NEVER	
>Referenced SOP Instance UID	(0008,1151)	UI	NEVER	
>Referenced Frame Number	(0008,1160)	IS	NEVER	
>Purpose of Reference Code Sequence	(0040,A170)	SQ	NEVER	
Derivation Description	(0008,2111)	ST	NEVER	
Derivation Code Sequence	(0008,9215)	SQ	NEVER	
Source Image Sequence	(0008,2112)	SQ	NEVER	
Referenced Waveform Sequence	(0008,113A)	SQ	NEVER	
Images in Acquisition	(0020,1002)	IS	NEVER	
Image Comments	(0020,4000)	LT	VNAP	
Quality Control Image	(0028,0300)	CS	NEVER	
Burned in Annotation	(0028,0301)	CS	NEVER VNAP	
Lossy Image Compression	(0028,2110)	DS	NEVER	
Lossy Image Compression Ratio	(0088,0200)	DS	NEVER	
Icon Image Sequence	(0088,0200)	SQ	NEVER	
Presentation LUT Shape	(2050,0020)	CS	NEVER	

Name	Tag	VR	Definition	Comments
-	-	-	-	-
Image Pixel Module				
-	-	-	-	-
Cine Module				
-	-	-	-	-
SC Image Module				
Date of Secondary Capture	(0018,1012)	DA	ALWAYS	
Time of Secondary Capture	(0018,1014)	TM	ALWAYS	
VOI LUT Module				
-	-	-	NEVER	-
Overlay Plane Module				
-	-	-	NEVER	-
Modality LUT Module				
-	-	-	NEVER	-
SOP Common				
Specific Character Set	0008,0005	CS	ANAP, COPY	-
SOP Class UID	0008,0016	UI	ALWAYS, AUTO	Enumerated value: 1.2.840.10008.5.1.4.1.1. 7
SOP Instance UID	0008,0018	UI	ALWAYS, AUTO	Generated at the time of creation.

8.1.1.11. Multi-frame True Color Secondary Capture Image Storage SOP Class

Table 81: IOD for Created Multi-frame True Color Secondary Capture SOP Instance

Name	Tag	VR	Definition	Comments
Patient Module				
-	-	-	-	-
General Study Module				
-	-	-	-	-
Patient Study Module				
-	-	-	-	-
General Series Module				
Series Instance UID	0020,000E	UI	ALWAYS, AUTO	Generated at the time of creation.
General Equipment Module				
-	-	-	-	-
SC Equipment Module				
Conversion Type	0008,0064	CS	ALWAYS	WSD
Modality	(0008,0060)	CS	ALWAYS, AUTO	
Secondary Capture Device ID	(0018,1010)	LO	ALWAYS, AUTO	
Secondary Capture Device Manufacturer	(0018,1016)	LO	ALWAYS, AUTO	

Name	Tag	VR	Definition	Comments
Secondary Capture Device Manufacturer's Model Name	(0018,1018)	LO	ALWAYS , AUTO	
Secondary Capture Device Software Version	(0018,1019)	LO	ALWAYS, AUTO	
Video Image Format Acquired	(0018,1022)	SH	NEVER	
Digital Image Format Acquired	(0018,1023)	LO	NEVER	
General Image Module				
-	-	-	-	-
Image Pixel Module				
-	-	-	-	-
Cine Module				
-	-	-	NEVER	-
VOI LUT Module				
-	-	-	NEVER	-
SC Image Module				
Date of Secondary Capture	(0018,1012)	DA	ALWAYS	
Time of Secondary Capture	(0018,1014)	TM	ALWAYS	
SC Multi-frame Image Module				
Burned in Annotation	(0028,0301)	CS	ALWAYS	
Presentation LUT Shape	(2050,0020)	CS	NEVER	
Illumination	(2010,015E)	US	NEVER	
Reflected Ambient Light	(2010,0160)	US	NEVER	
Rescale Intercept	(0028,1052)	DS	NEVER	
Rescale Slope	(0028,1053)	DS	NEVER	
Rescale Type	(0028,1054)	LO	NEVER	
Frame Increment Pointer	(0028,0009)	AT	ALWAYS	
Nominal Scanned Pixel Spacing	(0018,2010)	DS	NEVER	
Digitalizing Device Transport Direction	(0018,2020)	CS	NEVER	
Rotation of Scanned Film	(0018,2030)	DS	NEVER	
Multi-frame Image Module				
Number of Frames	(0028,0008)	IS	ALWAYS	
Frame Increment Pointer	(0028,0009)	AT	ALWAYS	
SC Multi-frame Vector Module				
Frame Time Vector	(0018,1065)	DS	NEVER	
Page Number Vector	(0018,2001)	SH	ALWAYS	
Frame Label Vector	(0018,2002)	SH	NEVER	
Frame Primary Angle Vector	(0018,2003)	DS	NEVER	
Frame Secondary Angle Vector	(0018,2004)	DS	NEVER	
Slice Location Vector	(0018,2005)	DS	NEVER	
Display Window Label Vector	(0018,2006)	SH	NEVER	
SOP Common				
Specific Character Set	0008,0005	CS	ANAP, COPY	-
SOP Class UID	0008,0016	UI	ALWAYS, AUTO	Enumerated value: 1.2.840.10008.5.1.4.1.1. 7.4
SOP Instance UID	0008,0018	UI	ALWAYS, AUTO	Generated at the time of creation.

8.1.2. Usage of Attributes from Received IOD's

The IMALYTICS WORKSPACE only accepts all valid DICOM IOD's specified in this document.

8.1.3. Attribute Mapping

8.1.3.1. Mapping Rules for Exporting IMALYTICS WORKSPACE Images According to DICOM Presentation State and DICOM Composite Images

For the case of a DICOM image export without PR, the Presentation State information is applied to the image(s) and its attributes are sent out as DICOM composite images as described in Table 82. Three different export modes are possible.

Table 82: Mapping Rules for Exporting IMALYTICS WORKSPACE Images

IMALYTICS WORKSPACE Presentation State	DICOM without PR Standard Composite Image	DICOM without PR Standard Extended Composite Image	DICOM without PR Secondary Capture Image
Presentation State (Identification)	Discard	Add attributes as part of private sequence	Discard
Spatial Transformation	Do not apply Discard	Do not apply Add attributes as part of private sequence	Apply on Image
Displayed Area	Do not apply Discard	Do not apply Add attributes as part of private sequence	Apply on Image
Modality LUT	Modality LUT Module	Modality LUT Module Add attributes as part of private sequence	Apply on Image
Presentation LUT	If linear into Presentation shape	If linear into Presentation shape Add as part of private sequence	Apply on Image
VOI LUT	Into VOI LUT	Into VOI LUT Add attributes as part of private sequence	VOI LUT Module
Display Shutter	Display Shutter Module	Display Shutter Module Add attributes as part of private sequence	Not implemented
Overlay Plane	Overlay Plane Module	Overlay Plane Module	Apply on Image
Curve	Curve Module	Curve Module	Discard
Graphic Layer	Discard	Discard Add attributes as part of private sequence	Apply on Image
Graphic Annotation	Converted into one, separate overlay Graphic Layer is discarded	Converted into one, separate overlay Add as part of private sequence	Apply on Image
Other additional or private attributes	Discard	Add as part of private sequence	Discard

8.1.3.2. Imalytics conceptual model and mapping to DICOM model

The research workflow in Imalytics is based on the model where imaging studies are done in the context of a project. Since the information model of DICOM is Patient oriented, the conceptual Imalytics model does not lend itself directly into that. So a mapping between the conceptual Imalytics model and the DICOM model is needed.

Table 83: Imalytics conceptual model and mapping to DICOM model

Pre-Clinical Attribute	DICOM Attribute	DICOM tag
------------------------	-----------------	-----------

Pre-Clinical Attribute	DICOM Attribute	DICOM tag
Subject ID	Patient ID	DICOM_PATIENT_ID (0010,0020)
Project ID	Clinical Trial Protocol ID	DICOM_CLINICAL_TRIAL_PROTOCOL_ID (0012,0020)
Project Name	Clinical Trial Protocol Name	DICOM_CLINICAL_TRIAL_PROTOCOL_NAME (0012,0021)
Principal Investigator	Clinical Trial Sponsor Name	DICOM_CLINICAL_TRIAL_SPONSOR_NAME (0012,0010)
Strain Name	Patient Name	DICOM_PATIENT_NAME (0010,0010)
Subject Sex	Patient Sex	DICOM_PATIENT_SEX (0010,0040)
Project Description	Patient Comments	DICOM_PATIENT_COMMENTS (0010,4000)
Subject's Length	Patient's Size	DICOM_PATIENTS_SIZE (0010,1020)
Subject's Weight	Patient's Weight	DICOM_PATIENTS_WEIGHT (0010,1030)

8.1.4. Coerced/Modified fields

Upon export of composite instances a de-normalization can take place by assembling data from the various entities in the hierarchy. The selection of the attributes takes place based upon what is present in the IMALYTICS WORKSPACE at the initiation of the export.

A description is given in the following subsections per instance level.

8.1.4.1. Patient

If the patient ID attribute is absent during instance import (has no value – zero-length) the following mapping will take place.

- When a Patient ID is absent and one of Patient's Name/Patient's Birth Date are absent then a new UID is generated for Patient ID.
Otherwise Patient ID is generated by appending "EMPTYPatientID_" + <Patient's Name> + "_" + <Patient's Birth Date>.
It will be ensured that all instances belonging to a particular study will get the same Patient ID.
- For Storage SCP, when two or more SOP Instances have the same Patient ID and different values for Patient's Name/Patient's Birth Date, then a new Patient ID is created by appending "!" + <UID> to the Patient ID. The original Patient ID is added to the Other Patient IDs.

8.1.4.2. Study

During import, the value of Study ID attribute is determined as follows:

- Retrieved from the composite image.
- If not present in the composite image, Study ID is assigned the value of the first Requested Procedure ID (0040,1001) encountered in the Request Attributes Sequence (0040,0275) in the composite image.
- Otherwise Study ID remains empty.

During Export, in the absence of Study attribute values, the Examination attributes will be taken as a best guess for the following Study attributes.

Table 84: Mapping of Study Attributes

Examination Attribute	Value	DICOM Attribute
Study Date (0008,0020)	Has value	Study date (0008,0020) is sent out

Examination Attribute	Value	DICOM Attribute
	Not present or has no value	Study date (0008,0020) is filled with Performed Procedure Step Start Date (0040,0244)
Study Time (0008,0030)	Has value	Study Time (0008,0030) is sent out
	Not present or has no value	Study Time (0008,0030) is filled with Performed Procedure Step Start Time (0040,0245)

This implies that upon export of each Examination, within the same Study, different values for these attributes may be sent out. The receiving station, e.g. a PACS system, will apply its own rules for guaranteeing consistency of its own database.

8.1.4.3. Examination

If all of the Performed Procedure Step attributes in Table 85 are missing from the composite image, then the mapping is as specified.

Table 85: Mapping of Examination attributes

Performed Procedure Step Attribute	Tag	Composite image Attribute	Tag
Performed Procedure Step Start Date	0040,0244	Study Date	0008,0020
Performed Procedure Step Start Time	0040,0245	Study Time	0008,0030
Performed Procedure Step ID	0040,0253	Study ID	0020,0010
Performed Procedure Step Description	0040,0254	Study Description	0008,1030

8.1.4.4. Presentation State Handling

For backward compatibility between IMALYTICS WORKSPACE and DICOM without presentation states, upon export from an IMALYTICS WORKSPACE to DICOM without presentation states, a merge of image definition and image presentation data is required. In the IMALYTICS WORKSPACE model, for one single image multiple presentation states may exist. During export IMALYTICS WORKSPACE ensures that only one image is sent out by merging the most preferred presentation state data with the image. The most preferred presentation state is selected based on the presentation state label and the time of creation.

8.2. Data Dictionary of Private Attributes

Refer to section 8.1.1.

8.3. Coded Terminology and Templates

IMALYTICS WORKSPACE does not implement any specific support for coded terminology and templates.

8.4. Grayscale Image consistency

IMALYTICS WORKSPACE does not implement any specific support for grayscale image consistency.

8.5. Standard Extended/Specialized/Private SOPs

8.5.1. Specialized SOP Classes

IMALYTICS WORKSPACE supports specialized SOP classes; for the C-STORE services these specialized SOP classes are listed in the following table.

Table 86: IMALYTICS WORKSPACE Supported Specialized SOP Classes as SCU and SCP

SOP Class Name	UID
Specialized PMS Grayscale Softcopy Presentation State Storage	1.3.46.670589.2.2.1.1

8.6. Private Transfer Syntaxes

IMALYTICS WORKSPACE does not support any private transfer syntaxes.