

DICOM Conformance Statement

Vivascope DICOM Proxy

1.1.0

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1 Conformance Statement Overview

This DICOM conformance statement provides technical information concerning the software known as the "Vivascope DICOM proxy". The "Vivascope DICOM proxy" is a software capable of running on any operating system and is an intermediate layer (proxy) between a VivaScan Application and a medical institution's PACS (Picture archiving and communication system) and HIS (Hospital information system). It is written in several languages including Kotlin and Java. It is delivered to the final system as Docker Image and run there as a Docker Container. It is a separate application from VivaScan Application. "Vivascope DICOM proxy" provides following features:

- transformation of images from format used internally by VivaScan into DICOM WSI (whole slide imaging) and/or DICOM files images with non-pyramid structure
- automated transfer of these images from VivaScope 2500M-G4 device to PACS or any other DICOM node (SCU)
- serving as a SCP with querying capabilities for retrieval of image instances on Study, Series and Patient level (C-FIND SCU)
- serving as SCP with move (C-MOVE) capabilities allowing copying image instances from VivaScope 2500M-G4 to any DICOM node
- scheduling node capable of periodic querying of PACS (or any MWL compatible DICOM node) for modality worklists and scheduling studies in VivaScan Application
- HL7 node capable of querying HIS for patient data and passing patient data further to VivaScan Application
- providing an easy-to-use web interface for configuration and status of jobs run by "Vivascope DICOM proxy"

*The primary DICOM role of the "Vivascope DICOM proxy" is **as an SCU** and optionally as SCP that uses DICOM DIMSE services to perform the features mentioned above. The DICOM 2021 version of the standard was used during the development of the "Vivascope DICOM proxy" software as well as the DICOM supplement 145 for Whole Slide Imaging (WSI).*

In current version "Vivascope DICOM proxy" does not include functionality connected with hospital workflow - back notification to HIS and PACS about finished work are not implemented. Only querying for modality work list and scheduling of studies is implemented. Future versions of "Vivascope DICOM proxy" may address this functionality.

The following table provides an overview of the network services supported by VivaScope 2500M-G4

SOP Classes	SOP UID	User of Service (SCU)	Provider of Service (SCP)
Verification	1.2.840.10008.1.1	yes	yes
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6	yes	no
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	yes	no
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	yes	no
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	yes	no
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	yes	no
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	yes	no
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	no	yes
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	no	yes
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	no	Yes
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	yes	no

Table 1-1 Network Services

Conceptually the network services may be modeled as the following separate AEs, though in fact all the AEs share a single (configurable with file or web interface) AE Title:

- Vivascope DICOM Proxy Image Storage SCU Application Entity Specification - (STORE SCU AE)
- Query/Retrieve Application SCP Entity Specification - (QUERY/RETRIEVE SCP AE)
- Vivascope DICOM Proxy MWL SCU Application Entity Specification - (MWL-FIND SCU AE)

The following table provides an overview of the storage media services supported by VivaScope 2500M-G4

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Hard Drive		
Local hard drive inside VivaScope's connected PC	yes	yes
PACS		
Hospital's PACS system	yes	no

Table 1-2 Media Services

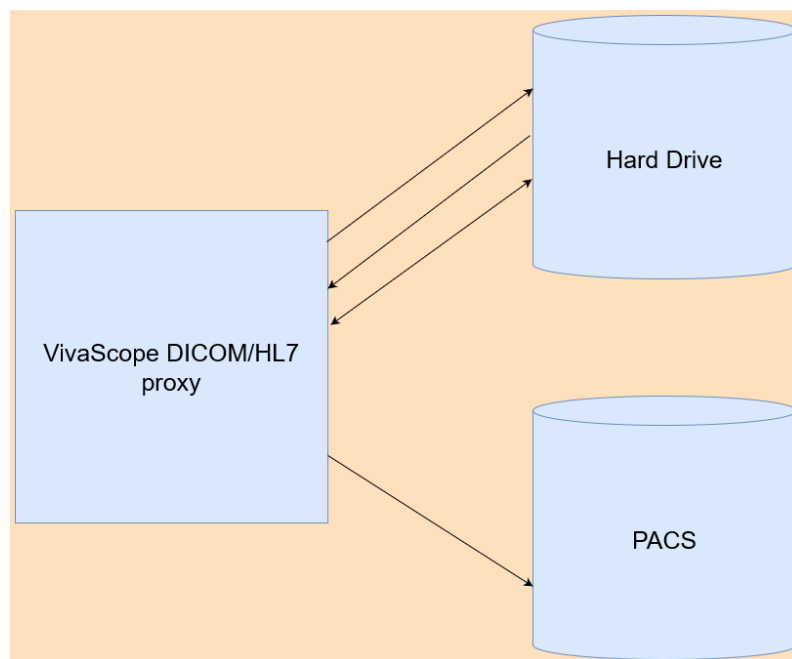


Figure 1-1 Storage media

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3 Introduction

3.1 Revision History

Version	Date Published	Changes
0.1	23-02-2022	initial draft
1.0	17-03-2022	first version
1.0.2	07-04-2022	final document candidate NO 1
1.0.3	29-04-2022	Review of Version 1.0.2
1.1.0	16-05-2022	Polishing layout

Table 3.1-1 Revision History

3.2 Audience

This document is written for the technical and non-technical personnel that need to understand how VivaScope 2500M-G4 will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

3.3 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between VivaScope's 2500M-G4 and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM by itself does not guarantee interoperability. The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

This Conformance Statement is not supposed to replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, the user should be aware of the following important issues:

- The comparison of different Conformance Statements is just the first step towards assessing inter-connectivity and interoperability between the product and other DICOM conformant equipment.
- Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

- An extensive effort was made to follow the DICOM standard and if the software has an issue with the standard then VivaScope GmbH reserves the right to make any necessary changes to the software to ensure it complies with the standard.

3.4 Terms and Definitions

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

Term	Definition
Abstract Syntax	The information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.
Application Entity (AE)	An end point of a DICOM information exchange, including the DICOM network or media interface software, i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.
Application Entity Title (AET)	The externally known name of an Application Entity, used to identify a DICOM application to other DICOM applications on the network.
Application Context	The specification of the type of communication used between Application Entities. Example: DICOM network protocol.
Association	A network communication channel set up between Application Entities.
Attribute	A unit of information in an object definition; a data element identified by a tag. The information may be a complex data structure (Sequence), itself composed of lower-level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).
Information Object Definition (IOD)	The specified set of Attributes that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The Attributes may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.
Joint Photographic Experts Group (JPEG)	A set of standardized image compression techniques, available for use by DICOM applications.
Media Application Profile	The specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs).

Module	A set of Attributes within an Information Object Definition that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.
Negotiation	First phase of Association establishment that allows Application Entities to agree on the types of data to be exchanged and how that data will be encoded.
Presentation Context	The set of DICOM network services used over an Association, as negotiated between Application Entities; includes Abstract Syntaxes and Transfer Syntaxes.
Protocol Data Unit (PDU)	A packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.
Security Profile	A set of mechanisms, such as encryption, user authentication, or digital signatures, used by an Application Entity to ensure confidentiality, integrity, and/or availability of exchanged DICOM data.
Service Class Provider (SCP)	Role of an Application Entity that provides a DICOM network service; typically, a server that performs operations requested by another Application Entity (Service Class User). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).
Service Class User (SCU)	Role of an Application Entity that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU).
Service/Object Pair Class (SOP Class)	The specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.
Service/Object Pair Instance (SOP Instance)	An information object: a specific occurrence of information exchanged in a SOP Class. Examples: a specific x-ray image.
Tag	A 32-bit identifier for a data element, represented as a pair of four-digit hexadecimal numbers, the "group" and the "element". If the "group" number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element].
Transfer Syntax	The encoding used for exchange of DICOM information objects and messages. Examples: JPEG compressed (images), little endian explicit value representation.

Unique Identifier (UID)	A globally unique "dotted decimal" string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.
Value Representation (VR)	The format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.
VivaScope 2500M-G4	The device made by VivaScope GmbH capable of making confocal images of human tissue.
VivaScan Application	Application that is responsible for image acquisition on VivaScope 2500M-G4 device.
Vivascope DICOM proxy	Proxy application that helps VivaScan Application and DICOM nodes to communicate.

Table 3.4-1 Terms and Definitions

3.5 Basics of DICOM Communication

This section describes terminology used in this Conformance Statement for the non-specialist. The key terms used in the Conformance Statement are highlighted in italics below. This section is not a substitute for training about DICOM, and it makes many simplifications about the meanings of DICOM terms.

Two Application Entities (devices) that want to communicate with each other over a network using DICOM protocol must first agree on several things during an initial network "handshake". One of the two devices must initiate an Association (a connection to the other device), and ask if specific services, information, and encoding can be supported by the other device (Negotiation).

DICOM specifies several network services and types of information objects, each of which is called an Abstract Syntax for the Negotiation. DICOM also specifies a variety of methods for encoding data, denoted Transfer Syntaxes. The Negotiation allows the initiating Application Entity to propose combinations of Abstract Syntax and Transfer Syntax to be used on the association these combinations are called Presentation Contexts. The receiving Application Entity accepts the Presentation Contexts it supports.

For each Presentation Context, the Association Negotiation also allows the devices to agree on Roles - which one is the Service Class User (SCU - client) and which is the Service Class Provider (SCP - server). Normally the device initiating the connection is the SCU, i.e., the client system calls the server, but not always.

The Association Negotiation finally enables exchange of maximum network packet (PDU) size, security information, and network service options (called Extended Negotiation information).

The Application Entities, having negotiated the Association parameters, may now commence exchanging data. Common data exchanges include queries for worklists and lists of stored images, transfer of image objects and analyses (structured reports) and sending images to film printers. Each exchangeable unit of data is formatted by the sender in accordance with the appropriate Information Object Definition and sent using the negotiated Transfer Syntax. There is a Default Transfer Syntax that all systems must accept, but it may not be the most efficient for some use cases. Each transfer is explicitly acknowledged by the receiver with a Response Status indicating success, failure, or that query or retrieve operations are still in process.

Two Application Entities may also communicate with each other by exchanging media (such as a CD-R). Since there is no Association Negotiation possible, they both use a Media Application Profile that specifies "pre-negotiated" exchange media format, Abstract Syntax, and Transfer Syntax.

3.6 Abbreviations

Abbreviation	Description
AE	Application Entity
AET	Application Entity Title
CT	Computed Tomography
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communications in Medicine
DNS	Domain Name System
HIS	Hospital Information System
HL7	Health Level 7 Standard
IOD	Information Object Definition
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
JPEG	Joint Photographic Experts Group
MPPS	Modality Performed Procedure Step
MR	Magnetic Resonance Imaging
MSPS	Modality Scheduled Procedure Step
MTU	Maximum Transmission Unit (IP)
MWL	Modality Worklist

O	Optional (Key Attribute)
OSI	Open Systems Interconnection
PACS	Picture Archiving and Communication System
R	Required (Key Attribute)
RIS	Radiology Information System
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
SPS	Scheduled Procedure Step
TCP/IP	Transmission Control Protocol/Internet Protocol
U	Unique (Key Attribute)
VL	Visible Light
VR	Value Representation
VSDS	Vivascope DICOM Service

Table 3.6-1 Abbreviations

3.7 References

- NEMA PS3 Digital Imaging and Communications in Medicine (DICOM) Standard, available free at <http://medical.nema.org/>
- DICOM Supplement 145 -Whole Slide Imaging
- Vivascope DICOM Proxy Manual

4 Networking

4.1 Implementation Model

The "Vivascope DICOM proxy" is a standalone application running inside a docker container using docker base image specifically prepared by VivaScope GmbH (imagemanipulation) that contains all the tools necessary for "Vivascope DICOM proxy" to perform its image manipulation tasks. "Vivascope DICOM proxy" serves as a proxy between VivaScan Application and the medical institution's PACS. It contains a build in web interface that allows medical staff and hospital IT-specialists to configure, monitor and change the behavior of "Vivascope DICOM proxy". "Vivascope DICOM proxy" even though consists of multiple AEs works under one common AET.

Conceptually the network services may be modeled as the following separate AEs, though in fact all the AEs share a single (configurable with file or web interface) AE Title:

- Vivascope DICOM Proxy Image Storage SCU Application Entity Specification - (STORE SCU AE)
- Vivascope DICOM Proxy Query/Retrieve Application SCP Entity Specification - (QUERY/RETRIEVE SCP AE)
- Vivascope DICOM Proxy MWL SCU Application Entity Specification - (MWL-FIND SCU AE)

4.1.1 Application Data Flow

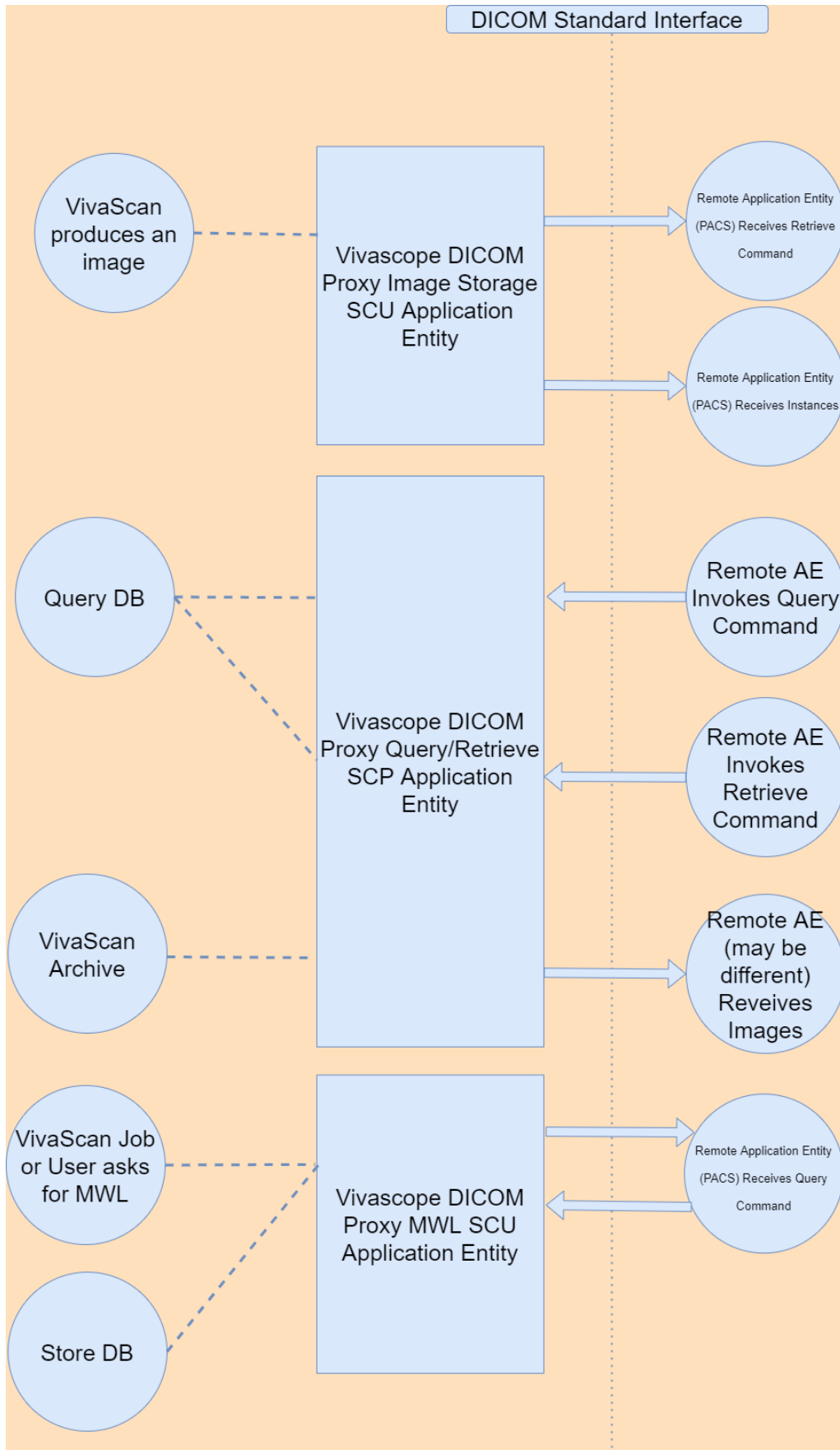


Figure 4.1.1-1 Application Data Flow

4.1.2 Functional Definition of AEs

4.1.2.1 Functional Definition of Vivascope DICOM Proxy Image Storage SCU Application Entity

- is responsible for conversion of images produced by VivaScan Application into DCM files in WSI or Standard DICOM format
- Is responsible for automated sending of converted files to remote entity

4.1.2.2 Functional Definition of Vivascope DICOM Proxy Query/Retrieve SCP Application Entity

- is responsible for sending pictures to Remote Application Entity (it may be PACS but also any other DICOM storage SCP)
- enables search of Image Instances on the Study and Series level from external Application Entity
- Sending instances on remote demand
- enables to copy Image Instances on the Study and Series level to any DICOM node (not only the invoking node)
- standard validation Application Entity

4.1.2.3 Functional Definition of Vivascope DICOM Proxy MWL SCU Application Entity

- is responsible for periodic or user demanded requests for modality work list assigned to this instance of VivaScope 2500M-G4
- is responsible for updating and creating entries and studies in the worklist of the VivaScan database when fetched to the modality. Detailed key usage may be found in chapter 4.1.2.2.

4.1.3 Sequencing of Real-World Activities

4.1.3.1 Sequencing of storage of acquired images to remote storage SCP

1. "VivaScan application" produces an image or series of images
2. "Vivascope DICOM proxy" scheduler checks periodically (governed by application properties) for new images. Images are transformed into DICOM (DCM) format
3. After "Vivascope DICOM proxy" scheduler detects new images created by "VivaScan application" it requests the "Vivascope DICOM proxy" Storage SCU to store newly transformed DCM images
4. "Vivascope DICOM proxy" Storage SCU requests Remote Storage SCP to store images
5. Remote Storage SCP responds if the images were stored successfully

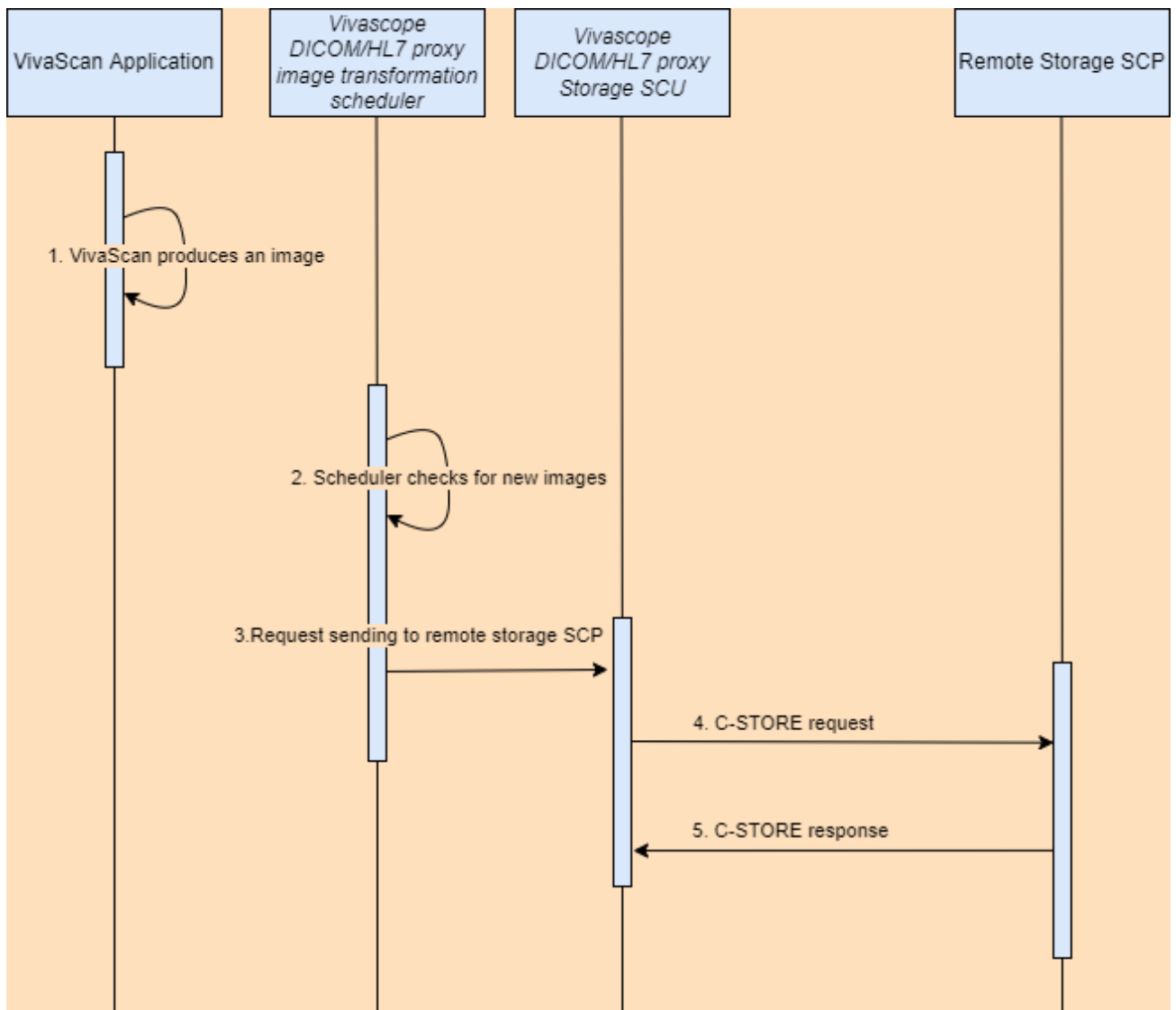


Figure 4.1.3.1-1 Sequencing of storage of acquired images to remote storage SCP

4.1.3.2 Sequencing of VivaScope DICOM proxy Query/Retrieve as SCP

1. Remote Query/Retrieve SCU (e.g., PACS) sends C-FIND Request to "Vivascope DICOM proxy" Query/Retrieve SCP
2. "Vivascope DICOM proxy" Query/Retrieve SCP responds with the matching results
3. Remote Query/Retrieve SCU sends C-MOVE Request
4. "Vivascope DICOM proxy" Query/Retrieve SCP sends a C-STORE Request to Remote Storage SCP defined in "(0000,0600) VR=AE VM=1 Move Destination" parameter sent in the C-MOVE Request
5. Remote Storage SCP (might be the same PACS system as the Remote/Retrieve SCU) sends C-STORE Response
6. "Vivascope DICOM proxy" Query/Retrieve SCP sends C-MOVE Response

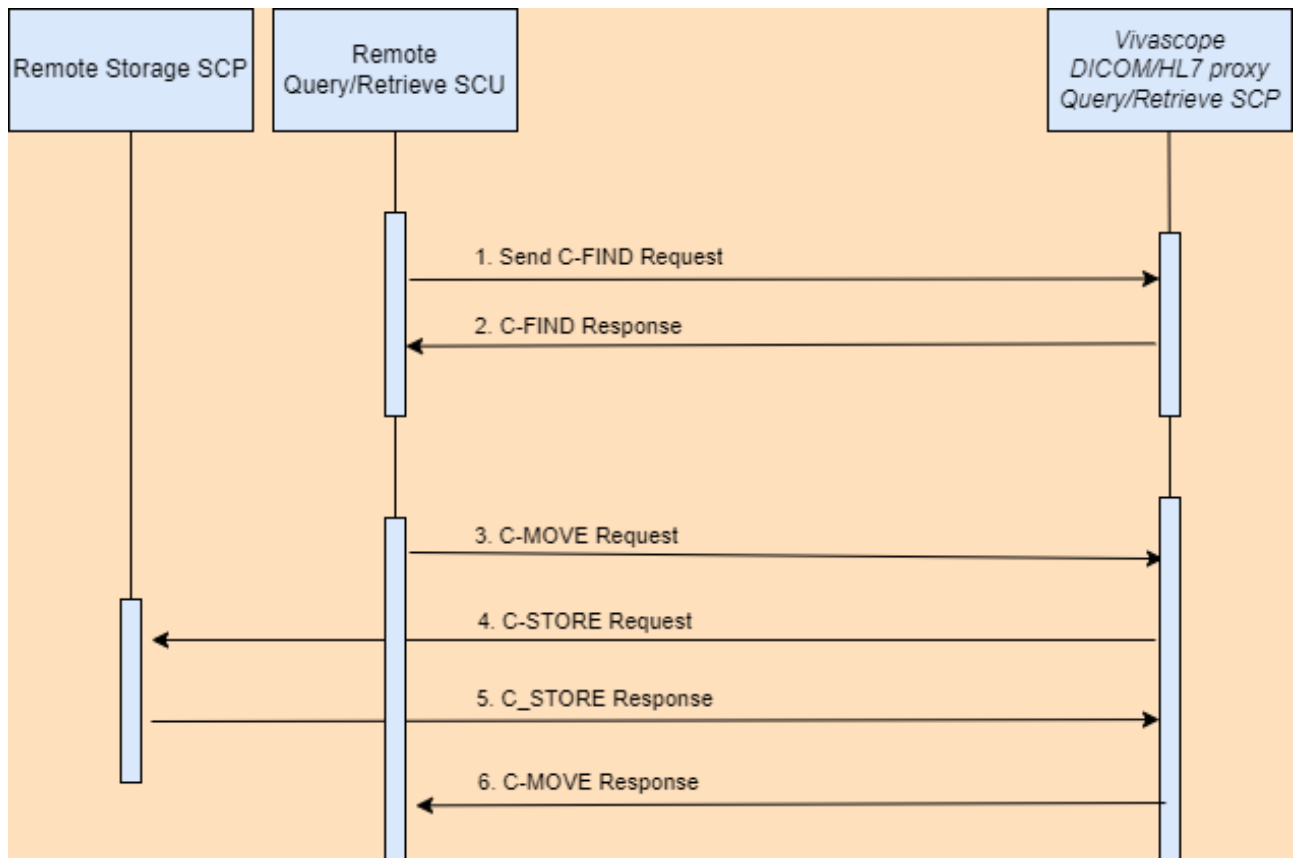


Figure 4.1.3.2-1 Sequencing of VivaScope DICOM proxy Query/Retrieve as SCP

4.1.3.3 Sequencing of VivaScope DICOM proxy MWL SCU

“Vivascope DICOM proxy” expects the remote node to work in conformance with 2021 DICOM MWL FIND SOP Class “1.2.840.10008.5.1.4.31”.

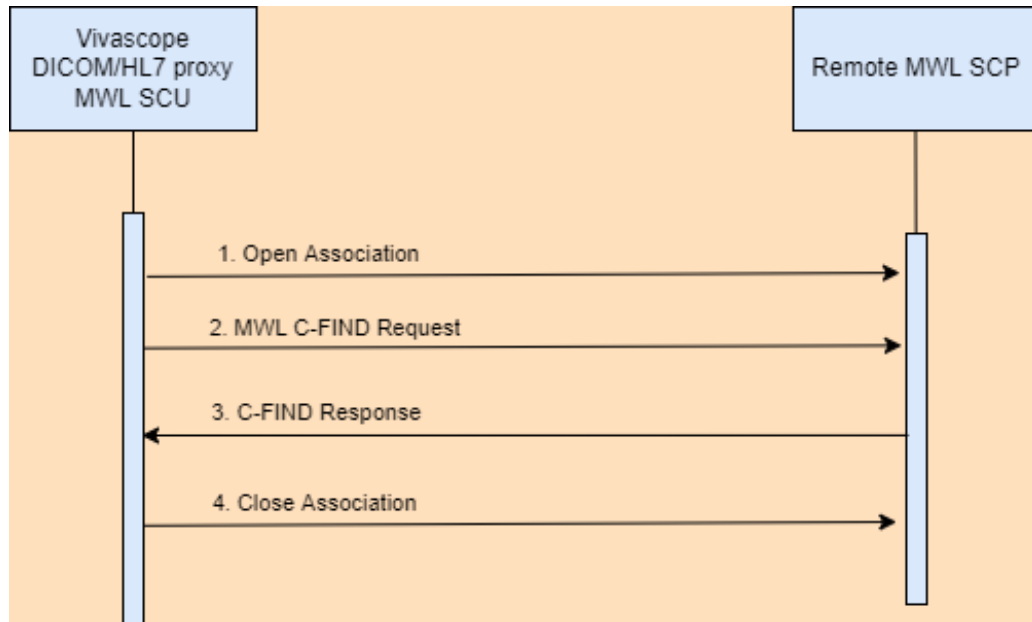


Figure 4.1.3.3-1 Sequencing of VivaScope DICOM proxy MWL SCU

4.2 AE Specifications:

The following table describes the general behavior of the Vivascope DICOM Proxy:

Service Status	Further Meaning	Error Code	Behaviour
Success	Success	0000	The SCP has successfully stored the exported SOP Instance. A message is sent to the QUERY-RETRIEVE-SCP AE indicating successful export. The QUERY-RETRIEVE-SCP AE will send the appropriate PENDING or SUCCESS Status in the C-MOVE Response. Success indication message is output to the Service Logs. No message is posted to the User Interface.
Refused	Out of Resources	A700 - A7FF	This is treated as a permanent Failure. A message is sent to the QUERY-RETRIEVE-SCP AE indicating an export failure and the Association is released. The QUERY-RETRIEVE-SCP AE will send an appropriate Status in the C-MOVE Response. Error indication message is output to the Service Logs. No message is posted to the User Interface.
Error	Data Set does not match SOP Class	A900 - A9FF	This is treated as a permanent Failure. A message is sent to the QUERY-RETRIEVE-SCP AE indicating an export failure and the Association is released. The QUERY-RETRIEVE-SCP AE will send an appropriate Status in the C-MOVE Response. Error indication message is output to the Service Logs. No message is posted to the User Interface.
Error	Cannot Understand	C000 - CFFF	This is treated as a permanent Failure. A message is sent to the QUERY-RETRIEVE-SCP AE indicating an export failure and the Association is released. The QUERY-RETRIEVE-SCP AE will send an appropriate Status in the C-MOVE Response. Error indication message is output to the Service Logs. No message is posted to the User Interface.
Warning	Coercion of Data Elements	B000	Image transmission is considered successful. A message is sent to the QUERY-RETRIEVE-SCP AE indicating successful export. The QUERY-RETRIEVE-SCP AE will send the appropriate PENDING or SUCCESS Status in the C-MOVE Response. Warning indication message is output to the Service Logs. No message is posted to the User Interface.

Warning	Data Set does not match SOP Class	B007	Image transmission is considered successful. A message is sent to the QUERY-RETRIEVE-SCP AE indicating successful export. The QUERY-RETRIEVE-SCP AE will send the appropriate PENDING or SUCCESS Status in the C-MOVE Response. Warning indication message is output to the Service Logs. No message is posted to the User Interface.
Warning	Elements Discarded	B006	Image transmission is considered successful. A message is sent to the QUERY-RETRIEVE-SCP AE indicating successful export. The QUERY-RETRIEVE-SCP AE will send the appropriate PENDING or SUCCESS Status in the C-MOVE Response. Warning indication message is output to the Service Logs. No message is posted to the User Interface.
Warning	Attribute List Error	0107	Image transmission is considered successful. A message is sent to the QUERY-RETRIEVE-SCP AE indicating successful export. The QUERY-RETRIEVE-SCP AE will send the appropriate PENDING or SUCCESS Status in the C-MOVE Response. Warning indication message is output to the Service Logs. No message is posted to the User Interface.
Warning	Attribute Value Out of Range	0116	Image transmission is considered successful. A message is sent to the QUERY-RETRIEVE-SCP AE indicating successful export. The QUERY-RETRIEVE-SCP AE will send the appropriate PENDING or SUCCESS Status in the C-MOVE Response. Warning indication message is output to the Service Logs. No message is posted to the User Interface.
•	•	Any other status code.	This is treated as a permanent Failure. A message is sent to the QUERY-RETRIEVE-SCP AE indicating an export failure and the Association is released. The QUERY-RETRIEVE-SCP AE will send an appropriate Status in the C-MOVE Response. Error indication message is output to the Service Logs. No message is posted to the User Interface.

Table 4.2-1 General behavior of the Vivascope DICOM Proxy

4.2.1 Vivascope DICOM Proxy Query/Retrieve SCP Application Entity Specification - (QUERY/RETRIEVE SCP AE)

4.2.1.1 SOP Classes

This Application Entity provides standard conformance to the following SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	Yes	Yes
Patient Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	No	Yes
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	No	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

Table 4.2.1.1-1 SOP Classes for Vivascope DICOM Proxy Query/Retrieve SCP Application Entity

4.2.1.2 Association Policies

4.2.1.2.1 General

The DICOM standard Application Context Name for DICOM 2021 is always accepted and proposed:

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

Table 4.2.1.2.1-1 DICOM Application Context

4.2.1.2.2 Number of Associations

The Vivascope DICOM Proxy Query/Retrieve SCP Application Entity can support multiple simultaneous Associations requested by peer AEs.

Maximum number of simultaneous Associations requested by peer AEs	10
Maximum number of simultaneous Associations initiated by any DICOM proxy Application Entity	10

Table 4.2.1.2.2-1 Number of associations

4.2.1.2.3 Asynchronous Nature

The Vivascope DICOM Proxy Query/Retrieve SCP Application Entity supports asynchronous communication (multiple outstanding transactions over a single Association).

Maximum number of outstanding asynchronous transactions	No Maximum Limit
--	------------------

Table 4.2.1.2.3-1 Asynchronous Nature as an Association Initiator for Vivascope DICOM Proxy Query/Retrieve SCP Application Entity

4.2.1.2.4 Implementation Identifying Information

The implementation information for the Query/Retrieve Application Entity is:

Implementation Class UID	1.2.40.0.13.1.3
Implementation Version Name	dicom-proxy

Table 4.2.1.2.4-1 DICOM Implementation Class and Version for Vivascope DICOM Proxy Query/Retrieve SCP Application Entity

4.2.1.3 Association Initiation Policy

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

4.2.1.3.1 Activity - Query (C-FIND SCP)

4.2.1.3.1.1 Description and Sequencing of Activities

- On the remote SCU (possibly PACS) user can choose to look for image instances on Patient, Study, Series or Image Instance level
- Remote SCU creates an association with VivaScope SCP
- Remote SCU invokes C-FIND operation
- Based on the query level VivaScope SCP chooses which query mode it should fall into:
 - LEVEL PATIENT: (0010,0020) VR=LO VM=1 Patient ID
 - In this mode these parameters for search are available now:
 - (0010,0010) VR=PN VM=1 Patient's Name
 - (0010,0020) VR=LO VM=1 Patient ID
 - (0010,0030) VR=DA VM=1 Patient's Birth Date
 - (0010,0040) VR=CS VM=1 Patient's Sex
 - LEVEL STUDY: (0020,000D) VR=UI VM=1 Study Instance UID
 - In this mode these parameters for search are available now:
 - (0008,0020) VR=DA VM=1 Study Date
 - (0008,0050) VR=SH VM=1 Accession Number

- (0008,1030) VR=LO VM=1 Study Description
- (0010,0010) VR=PN VM=1 Patient's Name
- (0010,0020) VR=LO VM=1 Patient ID
- (0010,0030) VR=DA VM=1 Patient's Birth Date
- (0010,0040) VR=CS VM=1 Patient's Sex
- (0020,000D) VR=UI VM=1 Study Instance UID
- LEVEL SERIES: (0020,000E) VR=UI VM=1 Series Instance UID
 - In this mode these parameters for search are available now:
 - (0008,0050) VR=SH VM=1 Accession Number
 - (0008,0060) VR=CS VM=1 Modality
 - (0008,103E) VR=LO VM=1 Series Description
 - (0010,0020) VR=LO VM=1 Patient ID
 - (0018,1030) VR=LO VM=1 Protocol Name
 - (0020,000D) VR=UI VM=1 Study Instance UID
 - (0020,000E) VR=UI VM=1 Series Instance UID
 - LEVEL IMAGE: (0008,0018) VR=UI VM=1 SOP Instance UID
 - In this mode these parameters for search are available now:
 - (0008,0020) VR=DA VM=1 Study Date
- After the results are sent to the calling remote SCU VivaScope is ready for "C-MOVE" request to come with Study UID or Series UID as parameter. In response the calling SCU gets the list of matching results as an array with entries holding the same keys as found in the query.
- The association is closed by the calling SCU

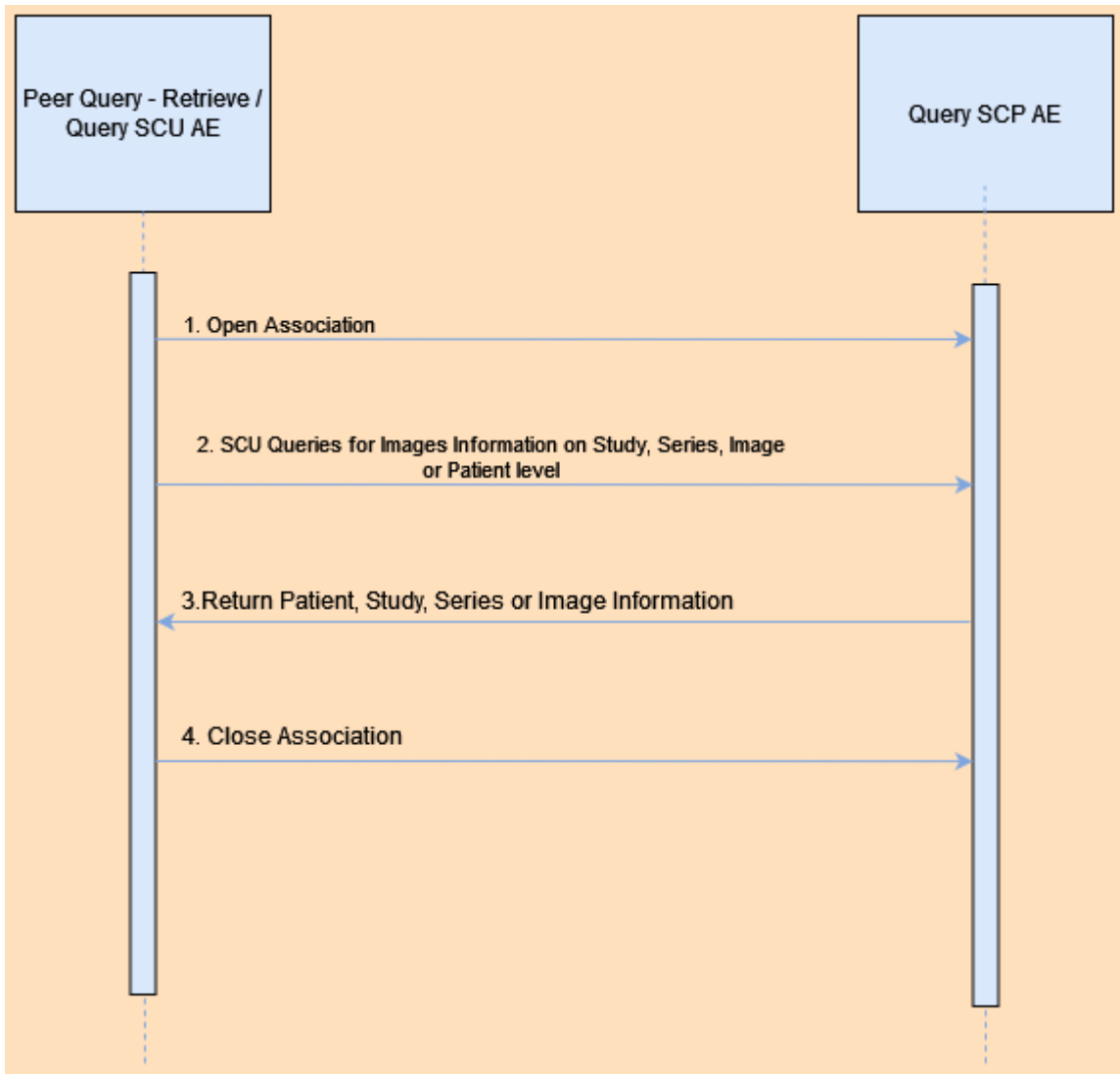


Figure 4.2.1.3.1.1-1 Activity – Query

4.2.1.3.1.2 Proposed Presentation Contexts

The Query/Retrieve Application Entity will propose Presentation Contexts for Verification, Study Root Query/Retrieve Information Model - FIND, Study Root Query/Retrieve Information Model - MOVE and of supported Storage SOP Classes.

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext Neg.
Name	UID	Name	UID		
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

Table 4.2.1.3.1.2-1 Proposed Presentation Contexts for Table Vivascope DICOM Proxy Query/Retrieve SCP Application Entity

4.2.1.3.1.3 SOP Specific Conformance for SOP Class(es)

see Table 4.2-1

4.2.1.3.2 Activity - Retrieve (C-MOVE SCP)

On the remote SCU (possibly PACS) user can choose to "C-MOVE" image instances from VivaScope SCP to another SCU. The "C-MOVE" procedure may be done on the Study or Series level. Destination SCU of the "C-MOVE" may be completely different than the calling SCU. The calling SCU is configured in VivaScope SCP and the assumption is that the calling SCU will provide the correct destination SCU IP, port and AET.

The sequence of the retrieve procedure is as follows. First 3 steps come from the QUERY part:

- Calling SCU opens association
- SCU queries for images on Patient, Study, Series, or Image level
- Results are sent back to calling SCU
- Calling SCU signals that the C-MOVE operation should be performed on the given subset of Image Instances
- VivaScope Query/Retrieve SCP opens association with the destination AE
- Images are sent in a loop to destination AE
- VivaScope Query/Retrieve SCP closes the association with the destination AE
- Calling SCU closes association with VivaScope Query/Retrieve SCP

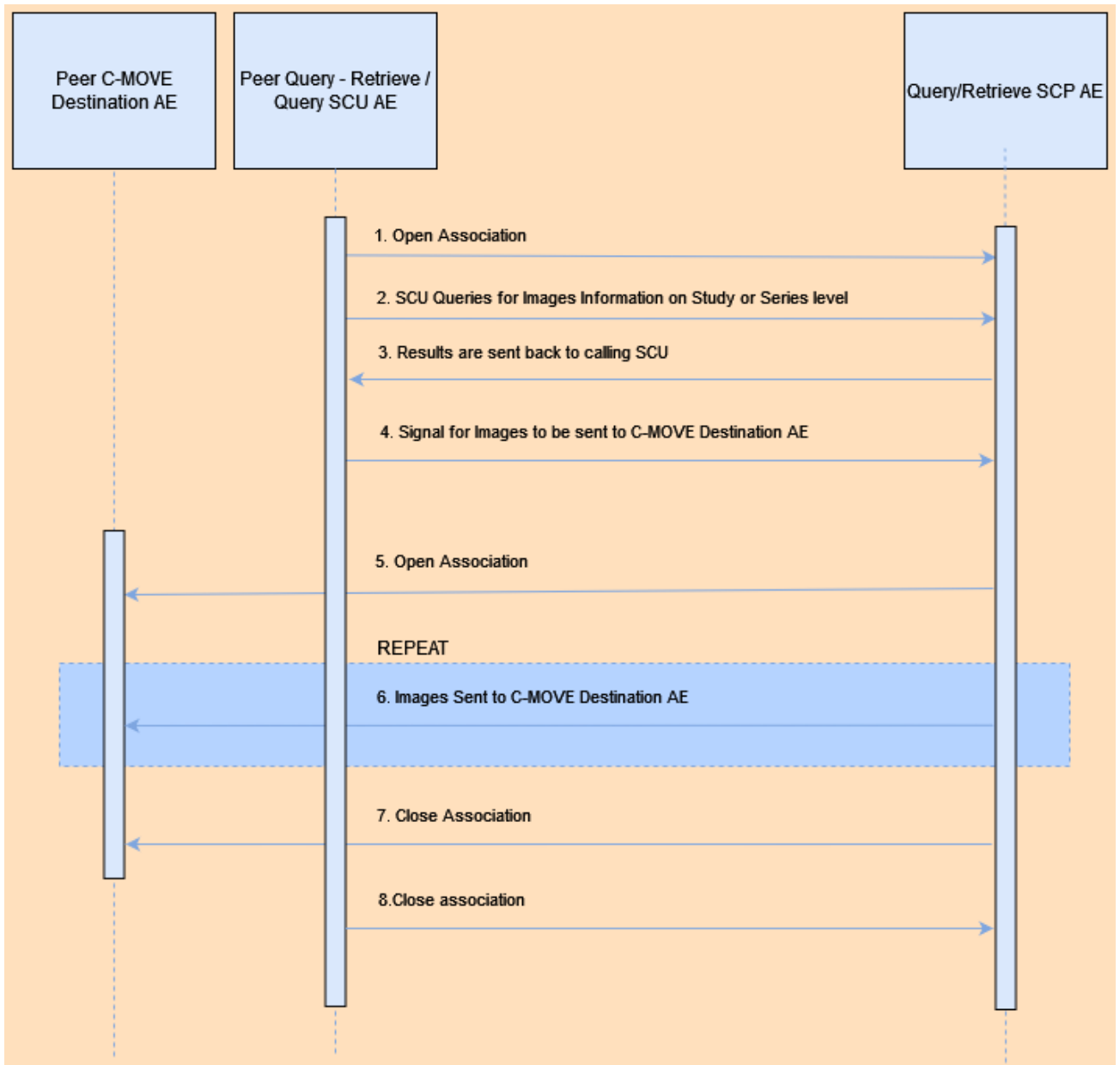


Figure 4.2.1.3.2 Activity - Retrieve

- Example for incoming keys (Series view - Study level -> move all images within study):
 - (0008,0005) CS [ISO_IR 100] SpecificCharacterSet
 - (0008,0052) CS [STUDY] QueryRetrieveLevel
 - (0020,000D) UI
[1.2.276.0.7230010.3.1.2.3428888297.3010614.1619547571.258125] -> StudyInstanceUID
- keys on Study view - Series level -> move all images within given series of a given study:
 - (0008,0005) CS [ISO_IR 100] SpecificCharacterSet
 - (0008,0052) CS [SERIES] QueryRetrieveLevel

- (0020,000D) UI
 [1.2.276.0.7230010.3.1.2.3428888297.3010614.1619547571.258125] -> StudyInstanceUID
- (0020,000E) UI
 [1.2.276.0.7230010.3.1.3.3428888297.3010614.1619547571.258126] -> SeriesInstanceUID
- Move destination is provided as (0000,0600) VR=AE VM=1 Move Destination

4.2.1.3.2.1 Proposed Presentation Contexts

The Query/Retrieve Application Entity will propose Presentation Contexts for Verification, Study Root Query/Retrieve Information Model - FIND, Study Root Query/Retrieve Information Model - MOVE and of supported Storage SOP Classes.

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext Neg.
Name	UID	Name	UID		
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

Table 4.2.1.3.2.1-1 Proposed Presentation Contexts

4.2.1.3.2.2

see Table 4.2-1

4.2.1.4 Association Acceptance Policy

"Vivascope DICOM proxy" accepts an association in case of:

1. Query/Retrieve: the "Vivascope DICOM proxy" receives C-FIND request from remote DICOM node.
2. Store: "Vivascope DICOM proxy" is SCP in this case and doesn't accept any C-MOVE requests

DIMSE services are used for verifying the local SCU. The C-ECHO request is performed by a remote DICOM node such as a PACS server. "Vivascope DICOM proxy" responds in conformance with DICOM PS3.7 9.3.5.

For the response to be sent back these conditions must be met:

- VivaScope 2500M-G4 PC must be reachable (this can be tested by a TCP ping)
- "Vivascope DICOM proxy" on the VivaScope 2500M-G4 PC must be running, accept echo requests, and be correctly configured (AE Title and port)

4.2.1.4.1 Activity - Query/Retrieve

4.2.1.4.1.1 Description and Sequencing of Activities

A Query/Retrieve request is sent by remote DICOM node (SCU). "Vivascope DICOM proxy" responds with an array of objects representing the result (Query) or set of images (Retrieve)

DIMSE services are used for querying and receiving data from a remote SCP. The C-FIND operation is performed by remote DICOM node. Additional keys are being returned for respective query levels. Query keys details are described in detail in chapter 4.2.1.3.1.1.

Standard "*" wildcard is understood when querying for data.

Application entity responsible for retrieval of WSI dicom images saved on the VivaScope 2500M-G4. It uses external's peer C-MOVE capabilities to send pictures. Peer that is requesting the C-MOVE operation might be a completely different node. So, sending pictures from VivaScope 2500M-G4 to another DICOM node from PACS UI is possible as well as saving them on request to PACS.

4.2.1.4.1.2 Accepted Presentation Contexts

The Query/Retrieve Application Entity will accept Presentation Contexts for all SOP Classes listed in Table 4.2.1.4.1.2-1 by default. The list of accepted Transfer Syntaxes for each accepted Abstract Syntax - as the list of accepted Abstract Syntaxes itself - is configurable.

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext Neg.
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	<ul style="list-style-type: none"> • Relational • Date Range • Fuzzy • Time-zone
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	<ul style="list-style-type: none"> • Relational • Date Range • Fuzzy • Time-zone
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	<ul style="list-style-type: none"> • Relational

Table 4.2.1.4.1.2-1 Acceptable Presentation Contexts for Vivascope DICOM Proxy Query/Retrieve SCP Application Entity and Query/Retrieve

4.2.1.4.1.3 SOP Specific Conformance for SOP Class(es)

Based on the query level VivaScope SCP chooses which query mode it should fall into:

- LEVEL PATIENT: (0010,0020) VR=LO VM=1 Patient ID
 - In this mode these parameters for search are available now:
 - (0010,0010) VR=PN VM=1 Patient's Name, Types of Matching S,*,U
 - (0010,0020) VR=LO VM=1 Patient ID, Types of Matching S,*,U
 - (0010,0030) VR=DA VM=1 Patient's Birth Date, Types of Matching S,U
 - (0010,0040) VR=CS VM=1 Patient's Sex, Types of Matching S,U
- LEVEL STUDY: (0020,000D) VR=UI VM=1 Study Instance UID
 - In this mode these parameters for search are available now:
 - (0008,0020) VR=DA VM=1 Study Date, Types of Matching S,*,U,R
 - (0008,0050) VR=SH VM=1 Accession Number, Types of Matching S,*,U
 - (0008,1030) VR=LO VM=1 Study Description, Types of Matching S,*,U
 - (0010,0010) VR=PN VM=1 Patient's Name, Types of Matching S,*,U
 - (0010,0020) VR=LO VM=1 Patient ID, Types of Matching S,*,U
 - (0010,0030) VR=DA VM=1 Patient's Birth Date, Types of Matching S,U
 - (0010,0040) VR=CS VM=1 Patient's Sex, Types of Matching S,U
 - (0020,000D) VR=UI VM=1 Study Instance UID, Types of Matching S,*,U
- LEVEL SERIES: (0020,000E) VR=UI VM=1 Series Instance UID
 - In this mode these parameters for search are available now:
 - (0008,0050) VR=SH VM=1 Accession Number, Types of Matching S,*,U
 - (0008,0060) VR=CS VM=1 Modality, Types of Matching S,*,U
 - (0008,103E) VR=LO VM=1 Series Description, Types of Matching S,*,U
 - (0010,0020) VR=LO VM=1 Patient ID, Types of Matching S,*,U
 - (0018,1030) VR=LO VM=1 Protocol Name, Types of Matching S,*,U
 - (0020,000D) VR=UI VM=1 Study Instance UID, Types of Matching S,*,U
 - (0020,000E) VR=UI VM=1 Series Instance UID, Types of Matching S,U,L
- LEVEL IMAGE: (0008,0018) VR=UI VM=1 SOP Instance UID
 - In this mode these parameters for search are available now:
 - (0008,0020) VR=DA VM=1 Study Date, Types of Matching S,*,U,R

Data should be read as follows:

- (XXXX,XXXX) - Attribute Name: Attributes supported for returned C-FIND Responses.
- VR: Appropriate DICOM VR for this attribute.
- Types of Matching: The types of Matching supported by the C-FIND SCP.

The values in 'Types of Matching' column mean as follows:

- "S" indicates the identifier attribute can specify Single Value Matching.
- "R" will indicate Range Matching.
- "*" will denote wild card matching.

- "U" will indicate universal matching.
- "L" will indicate that UID lists are supported for matching.
- "NONE" indicates that no matching is supported, but that values for this Element in the database can be returned.

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	Matching is complete. No final identifier is supplied.
Refused	Out of Resources	A700	System reached the limit in disk space or memory usage. Error message is output to as an alert to the User Interface, and to the Service Log.
Failed	Identifier does not match SOP Class	A900	The C-FIND query identifier contains invalid Elements or values, or is missing mandatory Elements or values for the specified SOP Class. Error message is output to the Service Log.
	Unable to process	C001	The C-FIND query identifier is valid for the specified SOP Class but cannot be used to query the database. For example, this can occur if a Patient Level query is issued but the identifier has only empty values for both the Patient ID and the Patient Name. Error message is output to the Service Log.
Cancel	Matching terminated due to Cancel Request	FE00	The C-FIND SCU sent a Cancel Request. This has been acknowledged and the search for matches has been halted.
Pending	Matches are continuing and current match is supplied.	FF00	Indicates that the search for further matches is continuing. This is returned when each successful match is returned and when further matches are forthcoming. This status code is returned if all Optional keys in the query identifier are actually supported.
	Matches are continuing but one or more Optional Keys were not supported.	FF01	Indicates that the search for further matches is continuing. This is returned when each successful match is returned and when further matches are forthcoming. This status code is returned if there are Optional keys in the query identifier that are not supported.

Table 4.2.1.4.1.3-1 Query/Retrieve SCP AE C-FIND Response Status Return Behavior

4.2.1.4.1.4 SOP Specific Conformance for Retrieve SOP Classes

The Query/Retrieve SCP AE will convey to the Storage SCU AE that an Association with a DICOM Application Entity named by the external C-MOVE SCU (through a MOVE Destination AE Title) should be established. It will also convey to the Storage SCU AE to perform C-STORE operations on specific images requested by the external C-MOVE SCU. One or more of the Image Storage Presentation Contexts listed in Table 4.2.2.3-1. will be negotiated. The Query/Retrieve SCP AE can support lists of UIDs in the C-MOVE Request at the Study, Series, and Image Levels. The list of UIDs must be at the Level of the C-MOVE Request, however. For example, if the C-MOVE Request is for Series Level retrieval but the identifier contains a list of Study UIDs then the C-MOVE Request will be rejected, and the A900 Failed Status Code will be returned in the C-MOVE Response. An initial C-MOVE Response is always sent after confirming that the C-MOVE Request itself can be processed. After this, the Query/Retrieve SCP AE will return a response to the C-MOVE SCU after the Storage SCU AE has attempted to send each image. This response reports the number of remaining SOP Instances to transfer, and the number transferred having a successful, failed, or warning status. If the Composite SOP Instances must be retrieved from long-term archive prior to export, there may be quite a long delay between the first C-MOVE Response and the next one after the attempt to export the first image. The maximum length of time for this delay will depend on the particular type of archive used but typically varies between 3 and 10 minutes.

Service Status	Further Meaning	Error Code	Reason
Success	Sub-operations complete - No Failures	0000	All the Composite SOP Instances have been successfully sent to the C-MOVE Destination AE.
Refused	Out of Resources - Unable to calculate number of matches	A701	Number of matches cannot be determined due to system failure. Returned if the server's database is not functioning so the search for matches to the C-MOVE Request cannot be found. Error message is output as an alert on the User Interface, and to the Service Log.
	Out of Resources - Unable to perform sub-operations	A702	C-STORE sub-operations cannot be performed due to failure to access Composite SOP Instances in archive, or failure of a C-STORE Request. For example, this Status will be returned if the required SOP Instances are determined to be off-line (i.e., the MO media has been removed from the archive jukebox). Error message is output as an alert on the User Interface, and to the Service Log.
	Move destination unknown	A801	The Destination Application Entity named in the C-MOVE Request is unknown to Query-Retrieve SCP AE. Error message is output to the Service Log.

Failed	Identifier does not match SOP Class	A900	The C-MOVE identifier contains invalid Elements or values, or is missing mandatory Elements or values for the specified SOP Class or retrieval level. Error message is output to the Service Log.
Cancel	Matching terminated due to Cancel Request	FE00	The C-MOVE SCU sent a Cancel Request. This has been acknowledged and the export of Composite SOP Instances to the C-MOVE Destination AE has been halted.
Pending	Sub-operations are continuing	FF00	A Response with this Status Code is sent every time a Composite SOP Instance has been successfully sent to the C-MOVE Destination AE.

Table 4.2.1.4.1.4-1 Query/Retrieve SCP AE C-MOVE Response Status Return Behavior

Note that the Warning Status, B000 (Sub-operations complete - One or more Failures) is never returned. If a failure occurs during export to the C-MOVE Destination AE by the STORAGE-SCU AE, then the entire task is aborted. Thus any remaining matches are not exported.

Exception	Behavior
Association aborted by the SCU or the network layers indicate communication loss (i.e., low-level TCP/IP socket closure)	Error message is output to the Service Log. If the STORAGE-SCU AE is still exporting Composite SOP Instances as a result of an earlier C-MOVE Request received on this Association, it will continue attempting to complete the entire C-MOVE Request.
Timeout expiry for an expected DICOM Message Request (DIMSE level timeout). I.e. The QUERY-RETRIEVE-SCP AE is waiting for the next C-FIND or C-MOVE Request on an open Association but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Service Log. If the STORAGE-SCU AE is still exporting Composite SOP Instances as a result of an earlier C-MOVE Request received on this Association, it will continue attempting to complete the entire C-MOVE Request.
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low-level timeout). I.e. The QUERY-RETRIEVE-SCP AE is waiting for the next message PDU but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Service Log. If the STORAGE-SCU AE is still exporting Composite SOP Instances as a result of an earlier C-MOVE Request received on this Association, it will continue attempting to complete the entire C-MOVE Request.

Table 4.2.1.4.1.4-2 Query/Retrieve SCP AE Communication Failure Behavior

4.2.2 Vivascope DICOM Proxy Image Storage SCU Application Entity Specification - (STORE SCU AE)

4.2.2.1 SOP Classes

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	Yes	No
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6	yes	no
Standard VL Microscopic	1.2.840.10008.5.1.4.1.1.77.1.2	yes	no
Standard VL Photographic	1.2.840.10008.5.1.4.1.1.77.1.4	yes	no
Standard VL Slide Microscopic	1.2.840.10008.5.1.4.1.1.77.1.3	yes	no
Standard Video Microscopic	1.2.840.10008.5.1.4.1.1.77.1.2.1	yes	no
Standard Video Photographic	1.2.840.10008.5.1.4.1.1.77.1.4.1	yes	no

Table 4.2.2.1-1 Provided Standard Conformance to the following DICOM SOP Classes

4.2.2.2 Association Policies

4.2.2.2.1 General

The DICOM standard Application Context Name for DICOM 3.0 is always accepted and proposed:

Application Context Name	1.2.840.10008.3.1.1.1

Table 4.2.2.2.1-1 DICOM Application Context

After VivaScan Application finishes image acquisition the images are converted into WSI DICOM format (DCM files). They are stored on the VivaScope 2500M-G4 PC at a location defined by window registry key:

- HKEY_CURRENT_USER\Software\Caliber Imaging & Diagnostics\RIS\vivascan\LocalImageDir

Example of location of DCM files:

- C:\vivanet\images\1.2.276.0.7230010.3.1.2.3428888297.3010614.1619547571.258125\VivaBlock#1\composites\orthancDicomVivaBlock#1

In the above example HKEY_CURRENT_USER\Software\Caliber Imaging & Diagnostics\RIS\vivascan\LocalImageDir = C:\vivanet\images

Stored DICOM WSI images are created in conformance with 1.2.840.10008.5.1.4.1.1.77.1.6 VL Whole Slide Microscopy Image IOD or any of the SOP classes listen in Table 4.2.1.1-2. Remote Storage SCP accepts an association with "Vivascope DICOM proxy" storage SCU negotiating

SOP Classes listed in Table 4.2.1.1-2. "VL Whole Slide Microscopy Image Storage" class is the default mode of operation for VivaScope 2500M-G4 appliance with "Vivascope DICOM proxy" installed. This is the only SOP class that allows big images to be stored in pyramid form capable of seamless viewing of large images. It is optional because "VL Whole Slide Microscopy Image Storage" as of now is not widely supported storage. VivaScope 2500M-G4 appliance with "Vivascope DICOM proxy" installed can therefore operate in "simple" mode in which more "standard" image storage SOP classes are being used. This on the other hand introduces a different type of access to images produced by VivaScope 2500M-G4 - standard (non pyramid) DICOM viewers and storage are possible in that mode.

4.2.2.2.2 Number of Associations

Maximum number of simultaneous Associations initiated by any DICOM proxy Application Application Entity	10
--	----

Table 4.2.2.2-1 Number of Associations

4.2.2.2.3 Asynchronous Nature

The "Vivascope DICOM Proxy Image Storage Application Entity" supports asynchronous communication (multiple outstanding transactions over a single Association).

Maximum number of outstanding asynchronous transactions	10
--	----

Table 4.2.2.2.3-1 Asynchronous Associations

4.2.2.2.4 Implementation Identifying Information

The implementation information for the "Vivascope DICOM Proxy Image Storage Application Entity" is:

Implementation Class UID	1.2.40.0.13.1.3
Implementation Version Name	dicom-proxy

Table 4.2.2.2.4-1 Implementation Identifying Information

4.2.2.3 Association Initiation Policy

4.2.2.3.1 Activity - STORE (C-STORE SCU)

4.2.2.3.1.1 Description and Sequencing of Activities

VivaScan Application produces set of images that are then transformed to DICOM (DCM) format. "Vivascope DICOM Proxy Image Storage Application Entity" then uses C-STORE request to send them to predefined remote DICOM node (see Vivascope DICOM Proxy configuration for details).

4.2.2.3.1.2 Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax		Role	Ext Neg.
Name	UID	Name	UID		
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
Standard VL Microscopic	1.2.840.10008.5.1.4.1.1.77.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Standard VL Microscopic	1.2.840.10008.5.1.4.1.1.77.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
Standard VL Photographic	1.2.840.10008.5.1.4.1.1.77.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Standard VL Photographic	1.2.840.10008.5.1.4.1.1.77.1.4	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
Standard VL Slide Microscopic	1.2.840.10008.5.1.4.1.1.77.1.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Standard VL Slide Microscopic	1.2.840.10008.5.1.4.1.1.77.1.3	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
Standard Video Microscopic	1.2.840.10008.5.1.4.1.1.77.1.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Standard Video Microscopic	1.2.840.10008.5.1.4.1.1.77.1.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
Standard Video Photographic	1.2.840.10008.5.1.4.1.1.77.1.4.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Standard Video Photographic	1.2.840.10008.5.1.4.1.1.77.1.4.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
VL Whole Slide Microscopy Image Storage	1.2.840.10008.5.1.4.1.1.77.1.6	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

Table 4.2.2.3.1.2-1 Proposed Presentation Context

4.2.2.3.1.3 SOP Specific Conformance

Doesn't apply

4.2.3 Vivascope DICOM Proxy MWL SCU Application Entity Specification - (MWL-FIND SCU AE)

4.2.3.1 SOP Classes

SOP Class Name	SOP Class UID	SCU	SCP
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	yes	no

Table 4.2.3.1-1 MWL-FIND SOP Classes

4.2.3.2 Association Policies

4.2.3.2.1 General

The DICOM standard Application Context Name for DICOM 2021 is always accepted and proposed:

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

Table 4.2.3.2.1-1 DICOM Application Context

4.2.3.2.2 Number of Associations

Maximum number of simultaneous Associations initiated by any DICOM proxy Application Application Entity	3
--	---

Table 4.2.3.2.2-1 Number MWL-FIND SCU Number of Associations

4.2.3.2.3 Asynchronous Nature

Asynchronous communication (multiple outstanding transactions over a single association) is not supported.

4.2.3.2.4 Implementation Identifying Information

The implementation information for the "Vivascope DICOM Proxy Image Storage Application Entity" is:

Implementation Class UID	1.2.40.0.13.1.3
Implementation Version Name	dicom-proxy-x-y

Table 4-1 Table 4.2.3.2.4-1 Implementation Identifying Information

4.2.3.3 Association Initiation Policy

4.2.3.3.1 Activity - Modality Worklist FIND (MWL-FIND)

4.2.3.3.1.1 Description and Sequencing of Activities

Standard SCU usage of MWL-FIND SOP. "Vivascope DICOM Proxy" performs MWL-FIND on remote DICOM node capable of SOP classes defined in Table 4.2.3.3.1.2-1.

4.2.3.3.1.2 Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

Table 4.2.3.3.1.2-1 MWL-FIND Proposed Presentation Context

4.2.3.3.1.3 SOP Specific Conformance

Does not apply

4.3 Network Interfaces

4.3.1 Physical Network Interface

The application is indifferent to the physical medium over which TCP/IP executes, which is dependent on the underlying operating system and hardware

4.3.2 Additional Protocols

When host names rather than IP addresses are used in the configuration properties to specify presentation addresses for remote AEs, the application is dependent on the name resolution mechanism of the underlying operating system.

4.3.3 IPv4 and IPv6 Support

This product supports both IPv4 and IPv6. It does not utilize any of the optional configuration identification or security features of IPv6.

4.4 Configuration

4.4.1 AE Title/Presentation Address Mapping

4.4.1.1 Local AE titles

The mapping from AE Title to TCP/IP addresses and ports is configurable and set at the time of installation, by installation personnel. It may be changed at any time by Installation Personal via web browser configuration page.

Application Entity	Role	Default AE Title	Default TCP/IP Port
STORAGE-SCU	SCU	VivaScope	None
QUERY-RETRIEVE-SCP	SCP	VivaScope	12003

Table 4.4.1.1-1 Default Application Entity Characteristics

4.4.1.2 Remote AE Title/Presentation Address Mapping

The mapping of external AE Titles to TCP/IP addresses and ports is configurable and set at the time of installation by installation personnel. This mapping is necessary for resolving the IP address and port of Remote Destination Application Entities (PACS) and must be correctly configured for the VivaScope STORAGE-SCU AE.

4.4.2 Parameters

All parameters reside in src/main/resources/config/application-xxx.yml file. Where xxx is the name of the special configuration made for specific customer.

Name	Type	Description
application.dicom.pacsIp	string	Port of the remote PACS system or DICOM node that is capable of storing images.
application.dicom.pacsPort	integer	IP of the remote PACS system or DICOM node that is capable of storing images.
application.dicom.pacsAet	string	AET of the remote PACS system or DICOM node that is capable of storing images.
application.dicom.thisModalityIP	string	IP of this VivaScope modality
application.dicom.thisModalityPort	integer	port of this VivaScope modality
application.dicom.thisModalityAet	string	AET of this VivaScope modality
application.dicom.thisModalityName	string	Name of this VivaScope modality (usually the same as AET)

application.dicom.acceptedAetTitles	string[]	AET titles that this VivaScope modality should accept
application.dicom.useDicomInstanceFromDB	boolean	weather to find image instances based on the database data or search them directly in the file system
application.dicom.pyramidImageTransformationSchedulerActive	boolean	weather to transform images produced by VivaScope to DICOM format automatically into pyramid files
application.dicom.pyramidImageTransformationSchedulerRate	integer	rate in milliseconds in which the pyramid image transformer should check for new images
application.dicom.pyramidTileWidth	integer	Width of pyramid tile
application.dicom.pyramidTileHeight	integer	Height of pyramid tile
application.dicom.pyramidCompressionRate	integer	Pyramid image compression rate
application.dicom.modalityWorklistSchedulerActive	boolean	weather the scheduler that checks for new modality work list entries should be active
application.dicom.flatImageTransformationSchedulerActive	boolean	weather to transform images produced by VivaScope to DICOM format automatically into flat files
application.dicom.flatImageTransformationSchedulerRate	boolean	rate in milliseconds in which the flat image transformer should check for new images
application.dicom.flatGridImageShrinkFactor	integer	How much should the image showing coordinates (
application.dicom.flatGridImageGridCellWidth	integer	
application.dicom.flatGridImageGridCellHeight	integer	
application.dicom.flatGridImageCompressionRate	integer	
application.dicom.modalityWorklistSchedulerRate	integer	rate in milliseconds in which the modality work list scheduler checks for new entries
hl7.hisUrl	string	URL of HIS to connect to

Table 4.4.2-1 Application Properties

5 Media Interchange

Vivascope DICOM proxy does not support Media Storage

6 Transformation of DICOM to CDA

Not applicable

7 Support of Character Sets

Vivascope DICOM proxy supports all extended character sets defined in the DICOM 2017 standard, including single-byte and multi-byte character sets as well as code extension techniques using ISO 2022 escapes in DICOM messages.

Support extends to correctly decoding and displaying the correct symbol for all names and strings found in storage instances received over the network, and in the local database.

In addition to the default character repertoire, the Defined Terms for Specific Character Set in Table 7-1 are supported:

Character Set Description	DICOM attribute: Specific Character Set (0008,0005)	HL7 field: Character Set MSH 18
Latin alphabet No. 1	ISO_IR 100	8859/1
Latin alphabet No. 2	ISO_IR 101	8859/2
Latin alphabet No. 3	ISO_IR 109	8859/3
Latin alphabet No. 4	ISO_IR 110	8859/4
Cyrillic	ISO_IR 144	8859/5
Arabic	ISO_IR 127	8859/6
Greek	ISO_IR 126	8859/7
Hebrew	ISO_IR 138	8859/8
Latin alphabet No. 5	ISO_IR 148	8859/9
Japanese	ISO_IR 13	ISO IR14
Thai	ISO_IR 166	CNS 11643-1992
Default repertoire	ISO 2022 IR 6	not supported 1
Latin alphabet No. 1	ISO 2022 IR 100	not supported 1
Latin alphabet No. 2	ISO 2022 IR 101	not supported 1
Latin alphabet No. 3	ISO 2022 IR 109	not supported 1
Latin alphabet No. 4	ISO 2022 IR 110	not supported 1
Cyrillic	ISO 2022 IR 144	not supported 1
Arabic	ISO 2022 IR 127	not supported 1
Greek	ISO 2022 IR 126	not supported 1

Hebrew	ISO 2022 IR 138	not supported 1
Latin alphabet No. 5	ISO 2022 IR 148	not supported 1
Japanese	ISO 2022 IR 13	not supported 1
Thai	ISO 2022 IR 166	not supported 1
Japanese	ISO 2022 IR 87	not supported 1
Japanese	ISO 2022 IR 159	not supported 1
Korean	ISO 2022 IR 149	not supported 1
Simplified Chinese	ISO 2022 IR 58	not supported 1
Unicode in UTF-8	ISO_IR 192	UNICODE UTF-8
GB18030	GB18030	GB 18030-2000
GBK	GBK	GB 18030-2000

Table 7-1 Character Sets

Escape sequences supporting multiple character sets in HL7 v2 messages are not supported.

8 Security

No security profiles are supported.