



***Kodak DirectView PACS Query/Retrieve User
(QRU) 4.2.1 Systems***

DICOM V 3.0 Conformance Statement

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Revision History

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1 Introduction

This document is the DICOM conformance statement for Kodak DirectView PACS Query/Retrieve User 4.2.1. This document serves as a statement of requirements for connecting Query/Retrieve User with other DICOM implementations (e.g. products from other vendors). Other vendors should review this document before connecting their products with Query/Retrieve User. This implementation of DICOM has been carefully tested to assure adherence to the DICOM Standard. However this Conformance Statement and the DICOM standard do not guarantee interoperability with other vendors. The user must compare the relevant Conformance Statements and if a successful interconnection should be possible, the user is responsible to specify an appropriate test suite and to validate the interoperability, which is required.

This section gives a description of the DICOM V3.0 services supported by Query/Retrieve User.

Query/Retrieve User is a product manufactured by **Kodak Health Imaging**. Its purpose is to provide image management in a medical imaging environment that communicates using DICOM V3.0 protocols. Query/Retrieve User provides the following functions:

- Initiate verification of DICOM communication.
- Retrieve medical images from the local database and send them to requesting devices.
- Respond to query and retrieve requests for information stored in the database.

Query/Retrieve User provides the following DICOM V3.0 services:

- Verification service class as a service class user (SCU).
- Query/retrieve (Q/R) service class as an SCU. The following SOP classes are supported:
 - Patient Root Query/Retrieve Information Model — FIND
 - Patient Root Query/Retrieve Information Model — MOVE
 - Study Root Query/Retrieve Information Model — FIND
 - Study Root Query/Retrieve Information Model — MOVE
 - Patient/Study Only Query/Retrieve Information Model — FIND
 - Patient/Study Only Query/Retrieve Information Model — MOVE

- Kodak Private Series Root Query/Retrieve Information Model — FIND
- Kodak Private Series Root Query/Retrieve Information Model — MOVE

2 Implementation Model

2.1 Application Data Flow Diagram

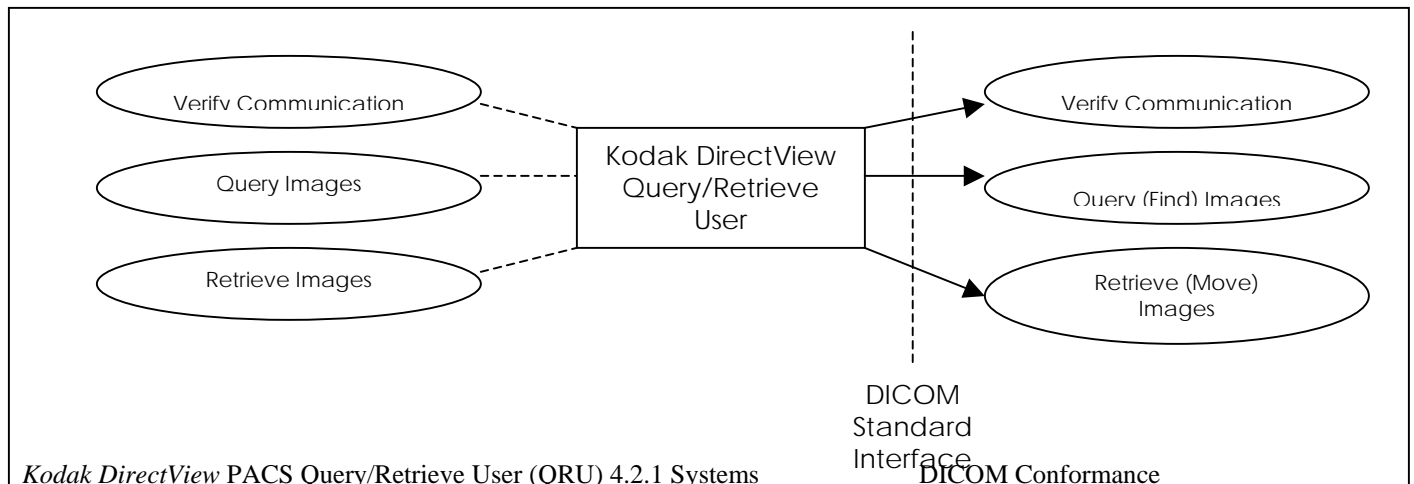
This section discusses the flow of data to and from the Query/Retrieve User. Figure 1 depicts the DICOM Implementation Model that illustrates the flow of DICOM data.

In the local real-world activity labeled “Verify Communication”, the Query/Retrieve User initiates a DICOM association and requests verification from the recipient (DIMSE C-ECHO operation). When the Query/Retrieve User receives the response, then communication between the two AE’s has been verified.

In the local real-world activity “Query Images”, the Query/Retrieve User initiates an association with an AE and invokes the DIMSE C-FIND operation. This causes the remote real-world activity “Query (Find) Images” to occur. During this activity, the remote AE performs the necessary actions to return matches with composite SOP instances (e.g. images). The results of the query are returned to the Query/Retrieve User (i.e. C-FIND-RSP messages with a pending status) on the same association.

In the remote local-world activity “Retrieve Images”, the Query/Retrieve User initiates an association with an AE and requests some composite SOP instances (e.g. images) to be retrieved. This causes the local real-world activity “Retrieve (Move) Images” to occur. During this activity, the remote AE transfers images (i.e. the C-STORE operation is invoked) to the AE specified in the C-MOVE request.

Figure 1. Kodak DirectView PACS Query/Retrieve User Implementation Model



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2.2 Functional Definition of AE's

The Query/Retrieve User operates as a single DICOM Application Entity. This Application Entity and its function with respect to DICOM is as follows:

DICOM Application Entity	Functional Definition	DICOM Services
Query/Retrieve User	<p>The Query/Retrieve User is sole DICOM Application Entity. It provides management of DICOM Images (and other Composite SOP Instances) using the DICOM Query/Retrieve service.</p> <p>At the DIMSE service level, the Query/Retrieve User invokes the C-ECHO, C-FIND, and C-MOVE operations.</p> <p>Note: The Query/Retrieve User is implemented as a multi-threaded, single-process application. All threads are created at the time of initialization. There is no relationship between the number of threads and the number of associations.</p>	<ul style="list-style-type: none"> • VERIFICATION • QUERY/RETRIEVE (C-FIND AND C-MOVE ONLY)

Table 2. Functional Definition of AE's

2.3 Sequencing of Real-World Activities

Not available.

3 AE Specification

3.1 Query/Retrieve User — Specification

The Query/Retrieve User provides standard conformance to the following DICOM V3.0 SOP classes as an SCU:

SOP Class UID Name	SOP Class UID Value
Patient Root Query/Retrieve Information Model — FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Information Model — MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Information	1.2.840.10008.5.1.4.1.2.2.1

Model — FIND	
Study Root Query/Retrieve Information Model — MOVE	1.2.840.10008.5.1.4.1.2.2.2
Patient/Study Only Query/Retrieve Information Model — FIND	1.2.840.10008.5.1.4.1.2.3.1
Patient/Study Only Query/Retrieve Information Model — MOVE	1.2.840.10008.5.1.4.1.2.3.2
Kodak Private Series Root Query/Retrieve Information Model — FIND	1.2.840.113674.5.1.4.1.2.4.1
Kodak Private Series Root Query/Retrieve Information Model — MOVE	1.2.840.113674.5.1.4.1.2.4.2

Table 3. Query/Retrieve User — Supported SOP Classes as an SCU

3.1.1 Association Establishment Policies

3.1.1.1 General

The Query/Retrieve User recognizes the following Application Context Names:

Standard DICOM Application Context Name	1.2.840.10008.3.1.1.1
Kodak Private DICOM Application Context Name	1.2.840.113674.3.1.1.1

Table 4. Query/Retrieve User — Application Context Names

The maximum PDU size that is offered and accepted by the Query/Retrieve User is configurable.

3.1.1.2 Number of Associations

The Query/Retrieve User is not limited to any particular number of associations. The number of simultaneous associations at any given point in time is dictated by the configuration and the workflow.

It should be noted that response time for an association degrades with increasing simultaneous associations. This slow response may trigger timers in remote systems.

3.1.1.3 Asynchronous Nature

The Query/Retrieve User does not require asynchronous communications. The Query/Retrieve User does not support asynchronous message transfer; it only initiates one outstanding message.

3.1.1.4 Implementation Identifying Information

The Query/Retrieve User provides the following implementation identifying information:

Implementation Class UID	1.2.840.113674.6.15.95
Implementation Version Name	QRU421YYYYMMDDW <p style="text-align: center;">where</p> <p style="text-align: center;">▪</p> <p style="text-align: center;">is the date on which the application was built</p> <p style="text-align: right;">YYYYMMDD</p>

Table 5. Query/Retrieve User — Implementation Identifying Information

3.1.2 Association Initiation by Real-World Activity

The Query/Retrieve User only initiates an association under the following real-world activities:

- Verify Communication for a Source (QRP) Application configured with the Patient Root Information Model
- Verify Communication for a Source (QRP) Application configured with the Study Root Information Model
- Verify Communication for a Source (QRP) Application configured with the Patient/Study Only Information Model
- Verify Communication for a Source (QRP) Application configured with the Kodak Private Series Root Information Model
- Query Images
- Retrieve Images

3.1.2.1 Real-World Activity — Verify Communication for a Source (QRP) Application configured with the Patient Root Information Model

3.1.2.1.1 Associated Real-World Activity

In this real-world activity, the user initiates verification of communication with a source DICOM Application that has its Information Model set by the QRU to be the Patient Root Information Model. The user does this by highlighting a remote DICOM Application and selecting a button labeled “Test” on the Configuration Window. A dialog box appears displaying the results.

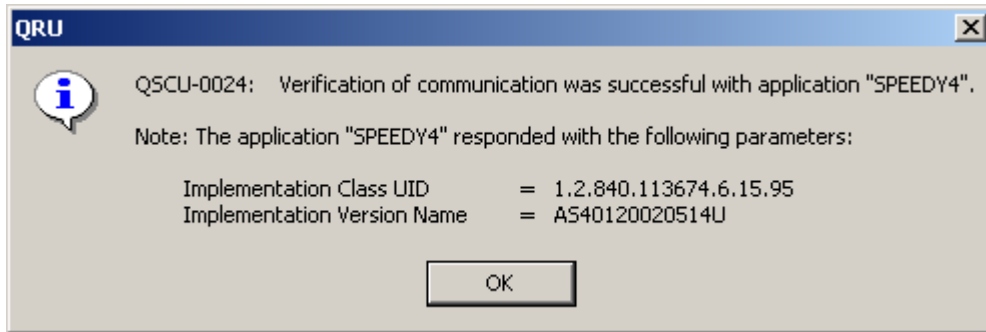


Figure 1. Dialog Box Indicating Successful Verification of Communication

Note: In addition to the proposal of the Verification SOP Class, a C-FIND SOP Class and two C-MOVE SOP Classes are also proposed. These SOP Classes are proposed in order to determine if the Source (QRP) Application is capable of accepting these SOP Classes and thus capable of performing all Query and Retrieve operations that may be invoked by the QRU.

The following dialog box illustrates an example of a Source (QRP) Application that performs the Verification SOP Class successfully however the Query and Retrieve operations are not supported:

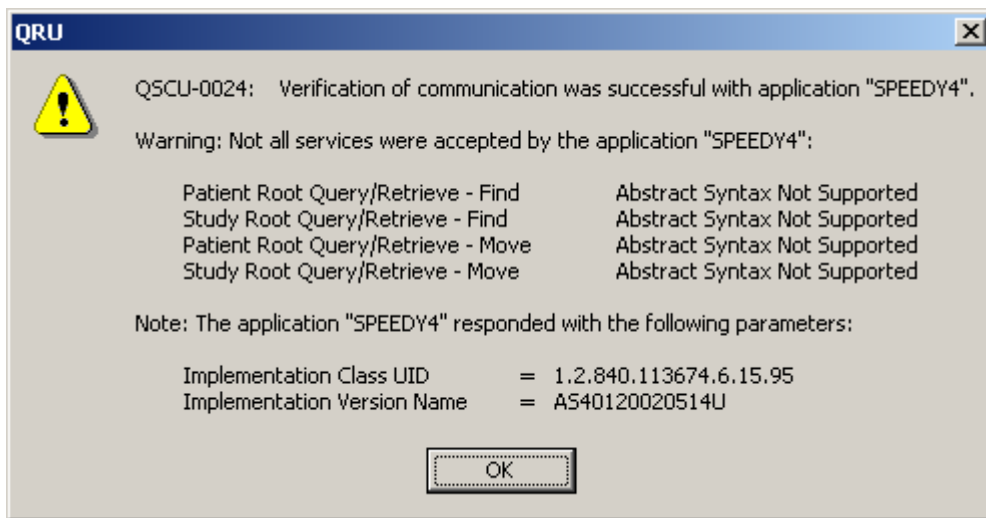


Figure 2. Dialog Box Indicating Successful Verification of Communication

3.1.2.1.2 Proposed Presentation Contexts

The Query/Retrieve User will propose the following presentation context items:

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification SOP class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	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	SCU	None
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	SCU	None
Patient Root Query/Retrieve Information Model — MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
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	SCU	None

Table 6. Query/Retrieve User — Proposed Presentation Contexts, Verify Communication (Patient Root Information Model)

3.1.2.2 Real-World Activity — Verify Communication for a Source (QRP) Application configured with the Study Root Information Model

3.1.2.2.1 Associated Real-World Activity

In this real-world activity, the user initiates verification of communication with a source DICOM Application that has its Information Model set by the QRU to be the Study Root Information Model. The user does this by highlighting a remote DICOM Application and selecting a button labeled “Test” on the Configuration Window. A dialog box appears displaying the results.

Note: In addition to the proposal of the Verification SOP Class, a C-FIND SOP Class and two C-MOVE SOP Classes are also proposed. These SOP Classes are proposed in order to determine if

the Source (QRP) Application is capable of accepting these SOP Classes and thus capable of performing all Query and Retrieve operations that may be invoked by the QRU.

3.1.2.2.2 Proposed Presentation Contexts

The Query/Retrieve User will propose the following presentation context items:

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification SOP class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
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	SCU	None
Patient Root Query/Retrieve Information Model — MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
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	SCU	None

Table 7. Query/Retrieve User — Proposed Presentation Contexts, Verify Communication (Study Root Information Model)

3.1.2.3 Real-World Activity — Verify Communication for a Source (QRP) Application configured with the Patient/Study Only Information Model

3.1.2.3.1 Associated Real-World Activity

In this real-world activity, the user initiates verification of communication with a source DICOM Application that has its Information Model set by the QRU to be the Patient/Study Only Information Model. The user does this by highlighting a remote DICOM Application and selecting a button labeled “Test” on the Configuration Window. A dialog box appears displaying the results.

Note: In addition to the proposal of the Verification SOP Class, two C-FIND SOP Classes and two C-MOVE SOP Classes are also proposed. These SOP Classes are proposed in order to

determine if the Source (QRP) Application is capable of accepting these SOP Classes and thus capable of performing all Query and Retrieve operations that may be invoked by the QRU.

3.1.2.3.2 Proposed Presentation Contexts

The Query/Retrieve User will propose the following presentation context items:

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification SOP class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Patient/Study Only Query/Retrieve Information Model — FIND	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
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	SCU	None
Patient Root Query/Retrieve Information Model — MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
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	SCU	None

Table 8. Query/Retrieve User — Proposed Presentation Contexts, Verify Communication (Patient/Study Only Information Model)

3.1.2.4 Real-World Activity — Verify Communication for a Source (QRP) Application configured with the Kodak Private Series Root Information Model

3.1.2.4.1 Associated Real-World Activity

In this real-world activity, the user initiates verification of communication with a source DICOM Application that has its Information Model set by the QRU to be the Kodak Private Series Root Information Model. The user does this by highlighting a remote DICOM Application and selecting a button labeled “Test” on the Configuration Window. A dialog box appears displaying the results.

Note: In addition to the proposal of the Verification SOP Class, a C-FIND SOP Class and two C-MOVE SOP Classes are also proposed. These SOP Classes are proposed in order to determine if the Source (QRP) Application is capable of accepting these SOP Classes and thus capable of performing all Query and Retrieve operations that may be invoked by the QRU.

3.1.2.4.2 Proposed Presentation Contexts

The Query/Retrieve User will propose the following presentation context items:

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification SOP class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Kodak Private Series Root Query/Retrieve Information Model — FIND	1.2.840.113674.5.1.4.1.2.4.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Patient Root Query/Retrieve Information Model — MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
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	SCU	None

Table 9. Query/Retrieve User — Proposed Presentation Contexts, Verify Communication (Kodak Private Series Root Information Model)

3.1.2.5 Real-World Activity — Query Images

3.1.2.5.1 Associated Real-World Activity

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In this real-world activity, the user initiates a query to the remote DICOM Application. The user does this by selecting a button labeled “Find...” on the main QRU Window. When this button is selected, a second window labeled “Find” is displayed. This window, called the Find Window, contains several areas or fields where information pertaining to the DICOM Key Attributes can be entered. After the desired information has been entered, the user selects the button labeled “Find” and the Query/Retrieve User invokes the DIMSE C-FIND operation on the remote DICOM Application. That is a DIMSE C-FIND-RQ message is sent to the remote DICOM Application.

As each match (i.e. DIMSE C-FIND-RSP message) arrives from the Query/Retrieve Provider, each one is displayed in the QRU main window. A dialog box appears with the words, “Query in progress. This may take a few minutes.” The user can cancel the C-FIND operation by selecting the button labeled “Cancel” on the dialog box. The QRU immediately sends a C-CANCEL-FIND-RQ message to the remote DICOM Application. The operation is not considered fully cancelled by the QRU until it receives acknowledge (i.e. a final DIMSE C-FIND-RSP message) from the remote DICOM Application.

When all matches have been received and processed, the QRU automatically releases the association. This means that the QRU never invokes more than one C-FIND operation on an association.

The following table lists the fields displayed in the Find Window and which DICOM Attribute they correspond to.

Field in Find Window (as displayed with label)		DICOM Attribute	
		Tag	Name
Patient	Last Name	(0010, 0010)	Patient’s Name
	First Name		
	ID	(0010, 0020)	Patient ID
	Sex	(0010, 0040)	Patient’s Sex
	Birth Date	(0010, 0030)	Patient’s Birth Date
Study	Modality	(0008, 0060)	Modality
	Date Acq.	(0008, 0020)	Study Date
	ID	(0020, 0010)	Study ID
	Body Part	(0018, 0015)	Body Part Examined
	Accession	(0008, 0050)	Accession Number
	Referring Physician’s Name (Last)	(0008, 0090)	Referring Physician’s Name

	Referring Physician's Name (First)		
	Reading Physician's Name (Last)	(0008, 1060)	Name of Physician(s) Reading Study
	Reading Physician's Name (First)		

Table 10. Correspondence between the fields in the Find Window and DICOM Attributes

Note: The selection of the Query/Retrieve Level is not made in the Find Window. Instead, it is based on the configuration settings for the remote DICOM Application within the Query/Retrieve User.

Note: The area labeled “Study” in the Find Window is not available for input (i.e. “grayed out”) if the Query/Retrieve Level associated with the remote DICOM Application is the “Patient Information” Query/Retrieve Level. Conversely, the “Study” area is available for input for the “Study Information” and “Series Information” Query/Retrieve Levels.

Note: The fields labeled “Modality” and “Body Part” are only available for input if the Query/Retrieve Level associated with the remote DICOM Application is the “Series Information” Query/Retrieve Level. That is they are not available for input (i.e. “grayed out”) for the “Patient Information” and “Study Information” Query/Retrieve Levels.

The following three tables list the contents of the DIMSE C-FIND-RQ message that is sent to the remote DICOM Application at each of the three Query/Retrieve Levels. Note: The “Composite Object Instance Information” (i.e. IMAGE) Query/Retrieve Level is not supported by this application.

Note: If the value is described as “[Find Window]” then the value is the information that the user entered in the corresponding field in the Find Window.

Type	Tag	Name	Value
-	(0000, 0000)	Group Length	-
-	(0000, 0002)	Affected SOP Class UID	1.2.840.10008.5.1.4.1.2.1.1 [Patient Root Query/Retrieve Information Model — FIND]
-	(0000, 0100)	Command Field	0020H [C-FIND-RQ]
-	(0000, 0110)	Message ID	0001H
-	(0000, 0700)	Priority	0000H [medium]
-	(0000, 0800)	Data Set Type	0000H [data set is present]
-	(0008, 0052)	Query/Retrieve Level	PATIENT
R	(0010, 0010)	Patient's Name	[Find Window]
U	(0010, 0020)	Patient ID	[Find Window]

O	(0010, 0030)	Patient's Birth Date	[Find Window]
O	(0010, 0032)	Patient's Birth Time	
O	(0010, 0040)	Patient's Sex	[Find Window]

Table 11. Contents of DIMSE C-FIND-RQ Message for a Patient Information Level Query

Type	Tag	Name	Value
-	(0000, 0000)	Group Length	-
-	(0000, 0002)	Affected SOP Class UID	1.2.840.10008.5.1.4.1.2.1.1 [Patient Root Query/Retrieve Information Model — FIND]
-	(0000, 0100)	Command Field	0020H [C-FIND-RQ]
-	(0000, 0110)	Message ID	0001H
-	(0000, 0700)	Priority	0000H [medium]
-	(0000, 0800)	Data Set Type	0000H [data set is present]
R	(0008, 0020)	Study Date	[Find Window]
R	(0008, 0030)	Study Time	
R	(0008, 0050)	Accession Number	[Find Window]
-	(0008, 0052)	Query/Retrieve Level	STUDY
O	(0008, 0061)	Modalities in Study	
O	(0008, 0090)	Referring Physician's Name	[Find Window]
O	(0008, 1030)	Study Description	
O	(0008, 1060)	Name of Physician(s) Reading Study	[Find Window]
O	(0008, 1080)	Admitting Diagnoses Description	
R	(0010, 0010)	Patient's Name	[Find Window]
R	(0010, 0020)	Patient ID	[Find Window]
O	(0010, 0030)	Patient's Birth Date	[Find Window]
O	(0010, 0032)	Patient's Birth Time	
O	(0010, 0040)	Patient's Sex	[Find Window]
O	(0010, 1010)	Patient's Age	
U	(0020, 000D)	Study Instance UID	
R	(0020, 0010)	Study ID	[Find Window]
O	(0020, 1070)	Other Study Numbers	
O	(0020, 1206)	Number of Study Related Series	
O	(0020, 1208)	Number of Study Related Instances	
	(0032, 0034)	Study Read Date	

	(0032, 0035)	Study Read Time	
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Table 12. Contents of DIMSE C-FIND-RQ Message for a Study Information Level Query

Type	Tag	Name	Value
-	(0000, 0000)	Group Length	-
-	(0000, 0002)	Affected SOP Class UID	1.2.840.10008.5.1.4.1.2.1.1 [Patient Root Query/Retrieve Information Model — FIND]
-	(0000, 0100)	Command Field	0020H [C-FIND-RQ]
-	(0000, 0110)	Message ID	0001H
-	(0000, 0700)	Priority	0000H [medium]
-	(0000, 0800)	Data Set Type	0000H [data set is present]
	(0008, 0020)	Study Date	[Find Window]
	(0008, 0030)	Study Time	
	(0008, 0050)	Accession Number	[Find Window]
-	(0008, 0052)	Query/Retrieve Level	SERIES
	(0008, 0060)	Modality	[Find Window]
	(0008, 0061)	Modalities in Study	
	(0008, 0090)	Referring Physician's Name	[Find Window]
	(0008, 1030)	Study Description	
	(0008, 1060)	Name of Physician(s) Reading Study	[Find Window]
	(0008, 1080)	Admitting Diagnoses Description	
	(0010, 0010)	Patient's Name	[Find Window]
	(0010, 0020)	Patient ID	[Find Window]
	(0010, 0030)	Patient's Birth Date	[Find Window]
	(0010, 0032)	Patient's Birth Time	
	(0010, 0040)	Patient's Sex	[Find Window]
	(0010, 1010)	Patient's Age	
	(0018, 0015)	Body Part Examined	[Find Window]
	(0020, 000D)	Study Instance UID	
	(0020, 0010)	Study ID	[Find Window]
	(0020, 1070)	Other Study Numbers	
	(0020, 1206)	Number of Study Related Series	
	(0020, 1208)	Number of Study Related Instances	
	(0032, 0034)	Study Read Date	

	(0032, 0035)	Study Read Time	
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Table 13. Contents of DIMSE C-FIND-RQ Message for a Series Information Level Query

Note: None of these DIMSE C-FIND-RQ messages that are sent to the Query/Retrieve Provider require support of the following types of Attribute Matching:

- List of UID Matching
- Range Matching
- Sequence Matching

Note: The asterisk (*), question mark (?), and backslash (\) characters may be entered into the fields in the Find Window. This means that the Query/Retrieve User can send queries that require the Query/Retrieve Provider to perform Wild Card Matching and/or Matching Multiple Values of key attributes.

3.1.2.5.2 Proposed Presentation Contexts

The Query/Retrieve User will propose one of the following presentation context items:

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
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	SCU	None
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	SCU	None
Patient/Study Only Query/Retrieve Information Model — FIND	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Kodak Private Series Root Query/Retrieve Information Model — FIND	1.2.840.113674.5.1.4.1.2.4.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Table 14. Query/Retrieve User — Proposed Presentation Contexts, Query Images

Note: The only difference between these presentation context items is the abstract syntax. The default abstract syntax that is proposed is Patient Root Query/Retrieve Information Model — FIND, however this can be changed by additional configuration. Refer to the section on Configuration for more information.

3.1.2.5.2.1 SOP Specific Conformance to the Patient Root Query/Retrieve Information Model — FIND

The QRU is fully conformant to the Patient Root Query/Retrieve Information Model — FIND SOP Class when the Query/Retrieve Level is the Patient Information Query/Retrieve Level.



Warning: If the Query/Retrieve Level is either the Study Information or Series Information Level, then the QRU is in violation of this Information Model because it is only able to form relational queries. The QRU is not capable of forming strictly hierarchical queries, which is the baseline behavior for an SCU of the C-FIND service. Non-unique key identifiers at the Patient Information Level are specified if the Query/Retrieve Level is either the Study Information or Series Information Level.

3.1.2.5.2.2 SOP Specific Conformance to the Study Root Query/Retrieve Information Model — FIND

The QRU is fully conformant to the Study Root Query/Retrieve Information Model — FIND SOP Class when the Query/Retrieve Level is the Study Information Query/Retrieve Level.



Warning: If the Query/Retrieve Level is the Series Information Level, then the QRU is in violation of this Information Model because it is only able to form relational queries. The QRU is not capable of forming strictly hierarchical queries, which is the baseline behavior for an SCU of the C-FIND service. Non-unique key identifiers at the Patient Information Level and the Study Information Level are specified if the Query/Retrieve Level is the Series Information Level.

3.1.2.5.2.3 SOP Specific Conformance to the Patient/Study Only Query/Retrieve Information Model — FIND

The QRU is fully conformant to the Patient/Study Only Query/Retrieve Information Model — FIND SOP Class when the Query/Retrieve Level is the Patient Information Query/Retrieve Level.



Warning: If the Query/Retrieve Level is the Study Information Level, then the QRU is in violation of this Information Model because it is only able to form relational queries. The QRU is not capable of forming strictly hierarchical queries, which is the baseline behavior for an SCU of the C-FIND service. Non-unique key identifiers at the Patient Information Level are specified if the Query/Retrieve Level is the Study Information Level.

3.1.2.6 Real-World Activity — Retrieve Images

3.1.2.6.1 Associated Real-World Activity

In this real-world activity, the user initiates one or more associations for the purpose of invoking the DIMSE C-MOVE operation on a remote DICOM Application. The user does this by highlighting one or more matches as a result of a DIMSE C-FIND operation in the main QRU window and then selecting the button labeled “Retrieve” on the main QRU Window. When this button is selected, a dialog box window labeled “Retrieve Destinations” is displayed with a list of DICOM AE Titles. These AE Titles constitute the Move Destination that is present in the DIMSE C-MOVE-RQ message. One or more Retrieve Destinations can be selected. When all of the Retrieve Destinations have been highlighted, the “OK” button is selected and the DIMSE C-MOVE operations are invoked.

One association is initiated for every DIMSE C-FIND match selected and for every Retrieve Destination selected. For example, if three matches are selected and two Retrieve Destinations are selected, then six associations are initiated. Each association is used for one and only one DIMSE C-MOVE operation.

Note: There is a limitation on the number of outstanding associations that can be managed at any given point in time. The upper limit is 64 associations¹.

The C-MOVE operation is invoked at either the Patient Information Level or the Study Information Level. The particular Query/Retrieve Level that is used is dependent upon the type of matches that are selected. If the Query/Retrieve Level of the C-FIND operation was (a) either the Study Information Level or the Series Information Level, and (b) the Study Information is shown, and (c) one or more matches are highlighted in the Study area, then the Query/Retrieve Level of the C-MOVE operation is the Study Information Level. If any of these conditions are not satisfied then the Query/Retrieve Level of the C-MOVE operation is the Patient Information Level.

The following two tables list the contents of the DIMSE C- MOVE -RQ message that is sent to the remote DICOM Application at each of the Query/Retrieve Levels.

Tag	Name	Value
(0000, 0000)	Group Length	-

¹ All DICOM associations are managed by the routine `waitForMultipleObjects` in the Microsoft Windows API. This routine limits the number of associations that can be managed at any given point in time by the Microsoft Windows constant `MAXIMUM_WAIT_OBJECTS` which is defined to be 64.

(0000, 0002)	Affected SOP Class UID	1.2.840.10008.5.1.4.1.2.1.2 [Patient Root Query/Retrieve Information Model — MOVE]
(0000, 0100)	Command Field	0021H [C-MOVE-RQ]
(0000, 0110)	Message ID	0001H
(0000, 0600)	Move Destination	[Retrieve Destination Dialog Box]
(0000, 0700)	Priority	0000H [medium]
(0000, 0800)	Data Set Type	0000H [data set is present]
(0008, 0052)	Query/Retrieve Level	PATIENT
(0010, 0010)	Patient's Name	[QRU Window]
(0010, 0020)	Patient ID	[QRU Window]

Table 15. Contents of DIMSE C-MOVE-RQ Message for a Patient Information Level Query

Tag	Name	Value
(0000, 0000)	Group Length	-
(0000, 0002)	Affected SOP Class UID	1.2.840.10008.5.1.4.1.2.1.2 [Patient Root Query/Retrieve Information Model — MOVE]
(0000, 0100)	Command Field	0021H [C-MOVE-RQ]
(0000, 0110)	Message ID	0001H
(0000, 0600)	Move Destination	[Retrieve Destination Dialog Box]
(0000, 0700)	Priority	0000H [medium]
(0000, 0800)	Data Set Type	0000H [data set is present]
(0008, 0052)	Query/Retrieve Level	STUDY
(0010, 0010)	Patient's Name	[QRU Window]
(0010, 0020)	Patient ID	[QRU Window]
(0020, 000D)	Study Instance UID	[QRU Window]

Table 16. Contents of DIMSE C-MOVE-RQ Message for a Study Information Level Query

3.1.2.6.2 Proposed Presentation Contexts

The Query/Retrieve User will propose one of the following presentation context items:

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		


Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Patient Root Query/Retrieve Information Model — MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
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	SCU	None
Patient/Study Only Query/Retrieve Information Model — MOVE	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Kodak Private Series Root Query/Retrieve Information Model — MOVE	1.2.840.113674.5.1.4.1.2.4.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Table 17. Query/Retrieve User — Proposed Presentation Contexts, Retrieve Images

Note: The only difference between these presentation context items is the abstract syntax. The default abstract syntax that is proposed is Patient Root Query/Retrieve Information Model — MOVE, however this can be changed by additional configuration. Refer to the section on Configuration for more information.

3.1.2.6.2.1

SOP Specific Conformance to the Patient Root Query/Retrieve Information Model — MOVE

 **Warning:** The QRU is in violation of the Patient Root Query/Retrieve Information Model — MOVE SOP Class. The (0010, 0010) Patient’s Name attribute is included in the Request Identifier, which is not a unique key at the Patient Information Level.

3.1.2.6.2.2

SOP Specific Conformance to the Study Root Query/Retrieve Information Model — MOVE



Warning: The QRU is in violation of the Study Root Query/Retrieve Information Model — MOVE SOP Class. The (0010, 0010) Patient’s Name attribute is included in the Request Identifier, which is not a unique key at the Patient Information Level.

3.1.2.6.2.3

SOP Specific Conformance to the Patient/Study Only Query/Retrieve Information Model — MOVE



Warning: The QRU is in violation of the Patient/Study Only Query/Retrieve Information Model — MOVE SOP Class. The (0010, 0010) Patient’s Name attribute is included in the Request Identifier, which is not a unique key at the Patient Information Level.

3.1.3 Association Acceptance Policy

The Query/Retrieve User never accepts associations. It only initiates associations. That is the Query/Retrieve User does not listen on a TCP Port for incoming transport connections.

4 Communication Profiles

The Query/Retrieve User provides the DICOM V3.0 TCP/IP network communication support as defined in Part 8 of the DICOM Standard.

4.1 TCP/IP Stack

The Query/Retrieve User uses the TCP/IP stack from the operating system on which it executes: Microsoft Windows 2000 Professional.

4.1.1 Physical Media Support

The Query/Retrieve User is indifferent to the physical medium over which TCP/IP executes, for example, Ethernet, IEEE 802.3, ATM, or FDDI.

5 Extensions / Specializations / Privatizations

5.1 Data Dictionary

In addition to the unique identifiers defined in the DICOM V3.0 Standard, the Query/Retrieve User also supports the following private unique identifiers. These unique identifiers are of private domain and defined for and used solely by **Kodak Health Imaging (PARIS)** products.

UID Value	UID Name	UID Type
1.2.840.113674.3.1.1.1	Kodak Private DICOM Application	Application Context Name

	Context Name	
1.2.840.113674.5.1.4.1.2.4.1	Kodak Private Series Root Query/Retrieve Information Model — FIND	SOP Class
1.2.840.113674.5.1.4.1.2.4.2	Kodak Private Series Root Query/Retrieve Information Model — MOVE	SOP Class

Table 18. Registry of Private DICOM Unique Identifiers (UID)

5.2 Kodak Private Application Context Name

All Application Entities are capable of accepting associations with the Kodak Private Application Context UID of “1.2.840.113674.3.1.1.1”. The behavior of Application Entities operating under this private application context is identical to their behavior under the standard application context (“1.2.840.10008.3.1.1.1”) with the exception of the following real-world activities:

5.2.1 Move Images In Any Supported Query/Retrieve Information Model

C-MOVE-RSP messages with a status of ‘pending’ include an optional data set that is not allowed under the standard application context. This data set (Table 19) contains information about the composite SOP Instance that is stored at the Move Destination (destination AE).

Tag	Attribute Name
(0008, 0018)	SOP Instance UID
(0010, 0010)	Patient’s Name
(0010, 0020)	Patient ID
(0020, 000D)	Study Instance UID
(0020, 000E)	Series Instance UID

Table 19. Pending C-MOVE-RSP Data Set

The motivation for sending this additional information is so that the Move Originator (i.e. Q/R SCU) has detailed information regarding the progress of the Move operation. This enables certain DICOM Applications with user interfaces to report the progress to the end-user in specialized graphical user-interface(s).

5.3 Private SOP Classes

5.3.1 Kodak Private Series Root Query/Retrieve Information Model — FIND

The behavior of Archive Server for C-FIND operations is identical for all Query/Retrieve — FIND values of the Affected SOP Class UID attribute.

A Private Series Root Query/Retrieve Information Model — FIND SOP Class is also included in this list of Query/Retrieve — FIND values by Archive Server. This is necessary for legacy Kodak Health Imaging products that are only capable of proposing this SOP Class UID as an Abstract Syntax UID for C-FIND operations.

The Kodak Private Series Root Query/Retrieve Information Model — FIND SOP Class shall be uniquely identified by the Kodak Private Series Root Query/Retrieve Information Model — FIND SOP Class UID and shall have a value of “1.2.840.113674.5.1.4.1.2.4.1”.

5.3.2 Kodak Private Series Root Query/Retrieve Information Model — MOVE

The behavior of Archive Server for C-MOVE operations is identical for all Query/Retrieve — MOVE values of the Affected SOP Class UID attribute.

A Private Series Root Query/Retrieve Information Model — MOVE SOP Class is also included in this list of Query/Retrieve — MOVE values by Archive Server. This is necessary for legacy Kodak Health Imaging products that are only capable of proposing this SOP Class UID as an Abstract Syntax UID for C- MOVE operations.

The Kodak Private Series Root Query/Retrieve Information Model — MOVE SOP Class shall be uniquely identified by the Kodak Private Series Root Query/Retrieve Information Model — MOVE SOP Class UID and shall have a value of “1.2.840.113674.5.1.4.1.2.4.2”.

6 Configuration

The Query/Retrieve User is a highly configurable product, especially the portion that deals with DICOM communications. This section highlights the parameters that are configurable. Details on the implementation and specification of these configuration parameters are provided in the “Archive Server Service and Training Manual”.

6.1 AE Title/Presentation Address Mapping

The translation from AE Title to Presentation Address is primarily achieved using persistent configuration data that is accessible using the Service Tool.

However certain default settings are present at the time of installation. These are:

Application Entity	Role	Default AE Title	Default TCP/IP Port
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Query/Retrieve User	SCU	QRU	N/A
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Table 20. Default AE Title/Presentation Address Mapping

6.2 Configurable Parameters

Parameter Specify (e.g. PDU Size)	Configurable Yes/No	Default Value Specify (e.g. 64 kB)
General Parameters		
Time-out waiting for an Association Open Request. (Application Level timeout)	Yes ^{2,A}	2 minutes
Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout)	Yes ^{2,B}	2 minutes
General DIMSE level time-out values	Yes ^{2,C}	Not set; no time-out.
Time-out waiting for response to TCP/IP connect() request. (Low-level timeout)	Yes ¹	See note.
Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout)	Yes ¹	See note.
Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	Yes ¹	See note.
Any changes to default TCP/IP settings, such as configurable stack parameters.	Yes ^{1,2,D}	See notes.
AE Specific Parameters		
Size constraint in maximum object size	No	
Maximum PDU size the AE can receive	Yes ^{2,E}	8192 bytes
Maximum PDU size the AE can send	Yes ^{2,E}	8192 bytes
AE specific DIMSE level time-out values	Yes ²	Defaults to the general parameter value.
Number of simultaneous Associations by Service and/or SOP Class	No	
Presentation Context Acceptance Criterion	Yes ^{2,F}	
Transfer Syntax Selection Policy	Yes ^{2,G}	The first transfer syntax in the list of proposed

		transfer syntaxes that matches one of the configured transfer syntaxes for the abstract syntax is accepted.
General Parameters		
SOP Class support (e.g. Multiframe vs. single frame vs SC support), when configurable	No	
Transfer syntax support, e.g. JPEG, Explicit VR, when configurable	No	
Other configurable parameters		
General number of simultaneous associations	Yes ^{2,H}	
DICOM logging information	Yes ^{2,K}	None
Notes		
<p>1. The parameter is configurable by the operating system. See the documentation for the operating system for the affected system-level parameters. The values of all TCP parameters are located in the Windows registry in the subkey My Computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters</p> <p>2. The parameter is configurable by the application.</p> <p>A. This is the initial value of the ARTIM (Association Request, Reject, Release) Timer in PS 3.8.</p> <p>B. This is referred to as the “Association Response Timeout” in the service and training manual. The consequence of this timeout is an automatic abort of the association.</p> <p>C. This is referred to as the “DIMSE Timeout” in the service and training manual. The consequence of this timeout is an automatic abort of the association.</p> <p>D. The default TCP/IP settings are specified by the operating system. However, some of the settings can be over-ridden by the application. This includes the maximum number of pending connections that is used as the backlog parameter of the TCP/IP socket <code>listen</code> call. This also includes the TCP/IP socket options <code>debug</code>, <code>local address reuse</code>, <code>keep connections alive</code>, <code>routing bypass for outgoing messages</code>, <code>output buffer size</code>, and <code>input buffer size</code>.</p> <p>E. The maximum length of P-DATA PDUs that is configurable must be greater than six bytes. The value zero which indicates no maximum length cannot be specified as it is not supported by this implementation. The values one through six are not supported because some implementations get confused between the maximum length of the entire P-DATA PDU and the maximum length of the value of the P-DATA PDU.</p> <p>F. A set of presentation context items can be specified. When an A-ASSOCIATE-RQ PDU is received, the presentation context items contained</p>		

within it are compared to the configured set of presentation context items. The response (A-ASSOCIATE-AC PDU or A-ASSOCIATE-RJ PDU) and its exact contents is based on the outcome of this comparison. No prioritization rules are imposed upon the acceptance of presentation contexts.

G. An upper limit on the number of simultaneous associations may be imposed or the number of simultaneous associations may be unlimited. If an upper limit is imposed and that limit is reached by a peer DICOM Application negotiating an association with Archive Server, then an A-ASSOCIATE-RJ PDU is sent in response with the following parameters: Result = 2 — rejected-transient, Source = 3 — DICOM UL service-provider (presentation related function), Reason/Diag. = 1 — temporary congestion.

I. The following strategies are available for handling incoming associations: (i) single process, single thread, (ii) multi-process, single-thread — process-per-association, and (iii) single-process, multi-thread — thread pool.

J. An initial number of processing threads can be specified which are dispatched to handling association establishment and DIMSE messages on a first come first serve basis. Note: There is no relationship between the number of threads and the number of simultaneous associations.

K. Certain messages can be logged based upon their severity (e.g. informational, warning, error) and type (e.g. message exchange, compression operations).

Table 21. Configurable Parameters

7 Support of Extended Character Sets

Extended character sets are not supported.