

DICOM Correction Item

Correction Number		CP-99 (Final Text)
Log Summary: Extended Query Retrieve Model		
Type of Modification	Name of Standard	
Enhancement	PS 3.3, 3.4, 3.6 - 1998	
Rationale for Correction		
<p>The Query/Retrieve model defined in the 1993 version of PS 3.4 Annex C provided a framework for the retrieval of any kind of stored composite object instance contained within a study/series/object or patient/study/series/object hierarchy, yet failed to define the necessary keys at the lowest level to allow standalone objects such as Curves, Lookup Tables and Overlays to be retrieved. The need to enhance the definition has been exacerbated by the proposal of new composite objects that could potentially be retrieved by existing users of the Query/Retrieve Service Class without having to define a new set of SOP Classes.</p> <p>Accordingly, this proposal suggests that the semantics of the SCU and SCP be generalized to allow retrieval of stored composite object instances rather than images.</p> <p>The Attribute Image Number (0020,0013), the only Required Key at the Image/Instance level, will be renamed Instance Number throughout the DICOM Standard to reflect this new role. This does not affect the meaning or implementation of the existing standard. Instance Number (0020,0013) will be added as an optional attribute in those Composite non-image objects that do not already contain it.</p> <p>Existing annotative instance numbering attributes (such as Curve Number, LUT Number and Overlay Number) in existing Composite non-image objects will be added to the query models as Optional keys at the Image/Instance level. This use of the keys as optional rather than required will avoid changing the expectations of existing implementations of SCPs and allow the existing SOP Class UIDs to be retained.</p> <p>Future Composite non-image objects will be identified using Instance Number (0020,0013) in its new role, rather than adding new "My Object Number" style attributes (eg. Report Number). It is added to the SOP Common Module as an optional Attribute.</p> <p>Existing SCUs will not know to ask for the new keys, and hence should not be affected in this regard. It may be a surprise to some SCUs that don't filter the identifiers returned by a new SCP to encounter objects of standalone object SOP Classes rather than image storage SOP Classes. It is anticipated that they will have been faced with the problem of filtering out unsupported modality specific image storage SOP Classes already, and should not be adversely affected.</p>		
Sections of document affected		
PS 3.3 - Annex C, Annex F, PS 3.4 - Annex C, PS 3.6		
Correction Wording:		

Item: Amend PS 3.3 C.7.6.1

C.7.6.1 General Image Module

Table C.7-7 specifies the Attributes which identify and describe an image within a particular series.

**Table C.7-7
GENERAL IMAGE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
<u>InstanceImage</u> Number	(0020,0013)	2	A number that identifies this image. <u>Note:</u> This Attribute was named <u>Image Number</u> in earlier versions of this Standard.

Item: Amend PS 3.3 C.8.6.2 below Table C.8-25:

C.8.6.2 SC Image Module

Note: The Attributes specified in the General Image Module (see Table C.7-7) describe this image (ie. the secondary capture image). For example, InstanceImage Number (0020,0013) is the image number of the secondary capture image. Source Image Sequence (0008,2112) may reference the DICOM image from which this image was generated.

Item: Amend PS 3.3 C.12.1 to add Instance Number (0020,0013) as an optional Attribute - this ensures that Instance Number is present in all existing and future Composite objects.:

C.12.1 SOP Common Module

**Table C.12-1
SOP COMMON MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
<u>Instance Number</u>	<u>(0020,0013)</u>	<u>3</u>	A number that identifies this Composite object instance.

Item: Amend PS 3.3 F.5.4:

F.5.4 Image directory record definition

**Table F.5-4
IMAGE KEYS**

Key	Tag	Type	Attribute Description
<u>Instance</u> Image Number	(0020,0013)	1	

Item: Amend PS 3.4 Annex C to replace Image with Instance:

Annex C QUERY/RETRIEVE SERVICE CLASS (Normative)

C.1 OVERVIEW

C.1.1 Scope

The Query/Retrieve Service Class defines an application-level class-of-service which facilitates the simple management of [imagescomposite object instances](#) in a manner functionally similar to ACR-NEMA 300-1988. The types of queries which are allowed are not complex. This Service Class is not intended to provide a comprehensive generalized database query mechanism such as SQL. Instead, the Query/Retrieve Service Class is focused towards basic [imagecomposite object instance](#) information queries using a small set of common Key Attributes.

In addition, the Query/Retrieve Service Class provides the ability to retrieve/transfer a well-identified set of [imagescomposite object instances](#). The retrieve/transfer capability allows a DICOM AE to retrieve [imagescomposite object instances](#) from a remote DICOM AE or request the remote DICOM AE to initiate a transfer of [imagescomposite object instances](#) to another DICOM AE.

Note: Functional similarity to ACR-NEMA 300-1988 facilitates the migration to DICOM.

C.1.2 Conventions

The following conventions are used to define the types of keys used in Query/Retrieve Information Models.

Symbol	Description
U	Unique Key Attribute
R	Required Key Attribute
O	Optional Key Attribute

C.1.3 Query/retrieve Information Model

In order to serve as an SCP of the Query/Retrieve Service Class, a DICOM AE possesses information about the Attributes of a number of stored [imagecomposite object](#)-SOP Instances. This information is organized into a well defined Query/Retrieve Information Model. The Query/Retrieve Information Model may be a standard Query/Retrieve Information Model, as defined in this Annex of the DICOM Standard, or a private Query/Retrieve Information Model, which is defined in the Conformance Statement of the implementor.

Queries and Retrievals are implemented against well defined Information Models. A specific SOP Class of the Query/Retrieve Service Class consists of an Information Model Definition and a DIMSE-C Service Group. In this Service Class, the Information Model plays a role similar to an Information Object Definition (IOD) of most other DICOM Service Classes.

C.1.4 Service Definition

Two peer DICOM AEs implement a SOP Class of the Query/Retrieve Service Class with one serving in the SCU role and one serving in the SCP role. SOP Classes of the Query/Retrieve Service Class are implemented using the DIMSE-C C-FIND, C-MOVE, and C-GET services as defined in PS 3.7.

Both a baseline and extended behavior is defined for the DIMSE-C C-FIND, C-MOVE, and C-GET services. Baseline behavior specifies a minimum level of conformance for all implementations to facilitate interoperability. Extended behavior enhances the baseline behavior to provide additional features which may be negotiated independently at Association establishment time.

The following descriptions of the DIMSE-C C-FIND, C-MOVE, and C-GET services provide a brief overview of the SCU/SCP semantics:

a) A C-FIND service conveys the following semantics:

- The SCU requests that the SCP perform a match of all the keys specified in the Identifier of the request, against the information it possesses, to the level (E.g. Patient, Study, Series, or [ImageComposite object instance](#)) specified in the request.

Note: In this Annex, the term "Identifier" refers to the Identifier service parameter of the C-FIND, C-MOVE, or C-GET service as defined in PS 3.7.

- The SCP generates a C-FIND response for each match with an Identifier containing the values of all key fields and all known Attributes requested. All such responses will contain a status of Pending. A status of Pending indicates that the process of matching is not complete.
- When the process of matching is complete a C-FIND response is sent with a status of Success and no Identifier.
- A Refused or Failed response to a C-FIND request indicates that the SCP is unable to process the request.
- The SCU may cancel the C-FIND service by issuing a C-FIND-CANCEL request at any time during the processing of the C-FIND service. The SCP will interrupt all matching and return a status of Canceled.

b) A C-MOVE service conveys the following semantics:

- The SCU supplies Unique Key values to identify an entity at the level of the retrieval. The SCP of the C-MOVE initiates C-STORE sub-operations for the corresponding storage SOP Instances identified by Unique Key values. These C-STORE sub-operations occur on a different Association than the C-MOVE service. The SCP of the Query/Retrieve SOP Class serves as the SCU of the Storage SOP Class.
- The SCP may optionally generate responses to the C-MOVE with status equal to Pending during the processing of the C-STORE sub-operations. These C-MOVE responses indicate the number of Remaining C-STORE sub-operations and the number of C-STORE sub-operations returning the status of Success, Warning, and Failed.
- When the number of Remaining C-STORE sub-operations reaches zero, the SCP generates a final response with a status equal to Success, Warning, Failed, or Refused. This response may indicate the number of C-STORE sub-operations

returning the status of Success, Warning, and Failed. If the status of a C-STORE sub-operation was Failed a UID List will be returned.

- The SCU may cancel the C-MOVE service by issuing a C-MOVE-CANCEL request at any time during the processing of the C-MOVE. The SCP terminates all incomplete C-STORE sub-operations and returns a status of Canceled.

c) A C-GET service conveys the following semantics:

- The SCU supplies Unique Key values to identify an entity at the level of the retrieval. The SCP generates C-STORE sub-operations for the corresponding storage SOP Instances identified by the Unique Key values. These C-STORE sub-operations occur on the same Association as the C-GET service and the SCU/SCP roles will be reversed for the C-STORE.
- The SCP may optionally generate responses to the C-GET with status equal to Pending during the processing of the C-STORE sub-operations. These C-GET responses indicate the number of Remaining C-STORE sub-operations and the number of C-STORE sub-operations returning the status of Success, Warning, and Failed.
- When the number of Remaining C-STORE sub-operations reaches zero, the SCP generates a final response with a status equal to Success, Warning, Failed, or Refused. This response may indicate the number of C-STORE sub-operations returning the status of Success, Warning, and Failed. If the status of a C-STORE sub-operation was Failed a UID List will be returned.
- The SCU may cancel the C-GET service by issuing a C-GET-CANCEL request at any time during the processing of the C-GET. The SCP terminates all incomplete C-STORE sub-operations and returns a status of Canceled.

C.2 QUERY/RETRIEVE INFORMATION MODEL DEFINITION

The Query/Retrieve Information Model is identified by the SOP Class negotiated at Association establishment time. The SOP Class is composed of both an Information Model and a DIMSE-C Service Group.

Note: This SOP Class identifies the class of the Query/Retrieve Information Model (i.e. not the SOP Class of the stored SOP Instances for which the SCP has information)

A Query/Retrieve Information Model may be either a standard Query/Retrieve Information Model or a private Query/Retrieve Information Model. Information Model Definitions for standard SOP Classes of the Query/Retrieve Service Class are defined in this Annex. In order to use a private Query/Retrieve Information Model, a private Query/Retrieve Information Model Definition shall be provided. A Query/Retrieve Information Model Definition contains:

- Entity-Relationship Model Definition
- Key Attributes Definition

C.2.1 Entity-Relationship Model Definition

For any Query/Retrieve Information Model, an Entity-Relationship Model defines a hierarchy of entities, with Attributes defined for each level in the hierarchy (e.g. Patient, Study, Series, [ImageComposite object instance](#))

C.2.2 Attributes Definition

Attributes shall be defined at each level in the Entity-Relationship Model. An Identifier in a C-FIND, C-MOVE, or C-GET command shall contain values to be matched against the Attributes of the Entities in a Query/Retrieve Information Model. For any query, the set of entities for which Attributes are returned, shall be determined by the set of Key Attributes specified in the Identifier which have corresponding matches on entities managed by the SCP associated with the query.

C.2.2.1 Attribute Types

All Attributes of entities in a Query/Retrieve Information Model shall be either a Unique Key, Required Key, or Optional Key. The term Key Attributes refers to Unique, Required, and Optional Key Attributes.

C.2.2.1.1 Unique Keys

At each level in the Entity-Relationship Model, one Attribute shall be defined as a Unique Key. A single value in a Unique Key Attribute shall uniquely identify a single entity at a given level. That is, two entities at the same level may not have the same Unique Key value.

C-FIND, C-MOVE, and C-GET SCPs shall support existence and matching of all Unique Keys defined by a Query/Retrieve Information Model. All entities managed by C-FIND, C-MOVE, and C-GET SCPs shall have a specific non-zero length Unique Key value.

Unique Keys may be contained in the Identifier of a C-FIND request. Unique Keys shall be contained in the Identifier of C-MOVE and C-GET requests.

C.2.2.1.2 Required Keys

At each level in the Entity-Relationship Model, a set of Attributes shall be defined as Required Keys. Required Keys imply the SCP of a C-FIND shall support matching based on a value contained in a Required Key of the C-FIND request. Multiple entities may have the same value for Required Keys. That is, a distinct value in a Required Key shall not necessarily identify a single entity at the level of the key.

C-FIND SCPs shall support existence and matching of all Required Keys defined by a Query/Retrieve Information Model. If a C-FIND SCP manages an entity with a Required Key of zero length, the value is considered unknown and all matching against the zero length Required Key shall be considered a successful match.

Required Keys may be contained in the Identifier of a C-FIND request. Required Keys shall not be contained in the Identifier of C-MOVE and C-GET requests.

C.2.2.1.3 Optional Keys

At each level in the Entity-Relationship Model, a set of Attributes shall be defined as Optional Keys.

Optional Keys contained in the Identifier of a C-FIND request may have three different types of behavior depending on support for existence and/or matching by the C-FIND SCP. If the C-FIND SCP:

- does not support the existence of the Optional Key, then the Attribute shall not be returned in C-FIND responses
- supports the existence of the Optional Key but does not support matching on the Optional Key, then the Optional Key shall be processed in the same manner as a zero

length Required Key. That is, the value specified to be matched for the Optional Key is ignored but a value may be returned by the SCP for this Optional Key.

- supports the existence and matching of the Optional Key, then the Optional Key shall be processed in the same manner as a Required Key.

- Notes:
1. C-FIND SCU may not assume an Optional Key with non-zero length will be processed in the same manner as a Required Key. The Conformance Statement of the C-FIND SCP shall list the Optional Keys which are supported.
 2. Optional Keys are differentiated from Required Keys in that Optional Keys may or may not be supported for existence and/or matching by C-FIND SCPs. Whereas, Required Keys must always be supported by C-FIND SCPs.

Optional Keys may be contained in the Identifier of a C-FIND request. Optional Keys shall not be contained in the Identifier of C-MOVE and C-GET requests.

C.2.2.2 Attribute Matching

The following types of matching may be performed on Key Attributes in the Query/Retrieve Service Class:

- Single Value Matching
- List of UID Matching
- Universal Matching
- Wild Card Matching
- Range Matching
- Sequence Matching

C.2.2.2.1 Single Value Matching

If the value specified for a Key Attribute in a request is non-zero length and if it is:

- a) not a date or time, contains no wild card characters
- b) a date or time, contains a single date or time with no "-"

then single value matching shall be performed. Only entities with values which match exactly the value specified in the request shall match. This matching is case-sensitive.

C.2.2.2.2 List of UID Matching

A List of UIDs is encoded by using the value multiplicity operator, backslash ("\"), as a delimiter between UIDs. Each item in the list shall contain a single UID value. Each UID in the list contained in the Identifier of the request may generate a match.

Note: A list of single values is encoded exactly as a VR of UI and a VM of Multiple (see PS 3.5).

C.2.2.2.3 Universal Matching

If the value specified for a Key Attribute in a request is zero length, then all entities shall match this Attribute. An Attribute which contains a Universal Match specification in a C-FIND request provides a mechanism to request the selected Attribute value be returned in corresponding C-FIND responses.

C.2.2.2.4 Wild Card Matching

If the Attribute is not a date, time, signed long, signed short, unsigned long, floating point single, floating point double, other byte string, other word string, attribute tag, decimal string, integer string or UID and the value specified in the request contains any occurrence of an "*" or a "?", then "*" shall match any sequence of characters (including a zero length value) and "?" shall match any single character. This matching is case sensitive. See PS 3.5 for Value Representations.

- Notes:
1. Wild card matching on a value of "*" is equivalent to universal matching.
 2. The wild card matching method specified by DICOM might not be supported by some non-DICOM multi-byte character text processors.

C.2.2.2.5 Range Matching

If the Attribute is a date, then:

- a) A string of the form "<date1> - <date2>" shall match all occurrences of dates which fall between <date1> and <date2> inclusive
- b) A string of the form "- <date1>" shall match all occurrences of dates prior to and including <date1>
- c) A string of the form "<date1> -" shall match all occurrences of <date1> and subsequent dates

If the Attribute is a time, then:

- a) A string of the form "<time1> - <time2>" shall match all occurrences of times which fall between <time1> and <time2> inclusive
- b) A string of the form "- <time1>" shall match all occurrences of times prior to and including <time1>
- c) A string of the form "<time1> -" shall match all occurrences of <time1> and subsequent times

Range matching is not defined for types of Attributes other than dates and times.

C.2.2.2.6 Sequence Matching

If a Key Attribute in the Identifier of a C-FIND request needs to be matched against an Attribute structured as a Sequence of Items (Value Representation of Type SQ), the Key Attribute shall be structured as a Sequence of Items with a single Item. This Item may contain zero or more Item Key Attributes. Each Item Key Attribute matching shall be performed on an Item by Item basis. The types of matching defined in Section C.2.2.2 shall be used: Single Value Matching, List of UID Matching, Universal Matching, Wild Card Matching, Range Matching and Sequence Matching (recursive Sequence matching)

If all the Item Key Attributes match, for at least one of the Items of the Attribute against which the match is performed, a successful match is generated. A sequence of matching Items containing only the requested attributes is returned in the corresponding C-FIND responses.

If the Key Attribute in the Identifier of a C-FIND request contains no Key Item Attribute (zero-length Item Tag), then all entities shall match this Attribute. This provides a universal matching like mechanism to request that the selected Key Attribute value (the entire Sequence of Items) be returned in corresponding C-FIND responses.

C.2.2.3 Matching Multiple Values

When matching an Attribute which has a value multiplicity of greater than one, if any of the values match, then all values shall be returned.

C.3 STANDARD QUERY/RETRIEVE INFORMATION MODELS

Three standard Query/Retrieve Information Models are defined in this Annex. Each Query/Retrieve Information Model is associated with a number of SOP Classes. The following three hierarchical Query/Retrieve Information Models are defined:

- Patient Root
- Study Root
- Patient/Study Only

C.3.1 Patient Root Query/Retrieve Information Model

The Patient Root Query/Retrieve Information Model is based upon a four level hierarchy:

- Patient
- Study
- Series
- [ImageComposite object instance](#)

The patient level is the top level and contains Attributes associated with the Patient Information Entity (IE) of the [ImageComposite](#) IODs as defined in PS 3.3. Patients IEs are modality independent.

The study level is below the patient level and contains Attributes associated with the Study IE of the [ImageComposite](#) IODs as defined in PS 3.3. A study belongs to a single patient. A single patient may have multiple studies. Study IEs are modality independent.

The series level is below the study level and contains Attributes associated with the Series, Frame of Reference and Equipment IEs of the [ImageComposite](#) IODs as defined in PS 3.3. A series belongs to a single study. A single study may have multiple series. Series IEs are modality dependent. To accommodate this modality dependence, the set of Optional Keys at the series level includes all Attributes defined at the series level from any [ImageComposite](#) IOD defined in PS 3.3.

The lowest level is the [imagecomposite object instance](#) level and contains Attributes associated with the [Image IE of the ImageComposite object IE of the Composite](#) IODs as defined in PS 3.3. An [imagecomposite object instance](#) belongs to a single series. A single series may contain multiple [images-composite object instances](#). Most [composite object Image](#) IEs are modality dependent. To accommodate this [potential](#) modality dependence, the set of Optional Keys at the [imagecomposite object instance](#) level includes all Attributes defined at the [imagecomposite object instance](#) level from any [ImageComposite](#) IOD defined in PS 3.3.

C.3.2 Study Root Query/Retrieve Information Model

The Study Root Query/Retrieve Information Model is identical to the Patient Root Query/Retrieve Information Model except the top level is the study level. Attributes of patients are considered to be Attributes of studies.

C.3.3 Patient/Study Only Query/Retrieve Information Model

The Patient/Study Only Query/Retrieve Information Model is identical to the Patient Root except the series and imagecomposite object instance levels are not supported.

Note: Even though this model does not include the image-level, imagescomposite object instance level, composite object instances may be retrieved at the patient and study level (i.e., retrieve all imagescomposite object instances for a Patient or Study).

C.3.4 Additional Query/Retrieve Attributes

Some optional attributes which may be used in Query/Retrieve Information Models that are not Attributes of an Information Object Definition and, therefore, are not defined in PS 3.3. These attributes are defined in Table C.3-1.

**Table C.3-1
 ADDITIONAL QUERY/RETRIEVE ATTRIBUTES**

Attribute Name	Tag	Attribute Description
Number of Patient Related Studies	(0020,1200)	The number of studies that match the Patient level Query/Retrieve search criteria
Number of Patient Related Series	(0020,1202)	The number of series that match the Patient level Query/Retrieve search criteria
Number of Patient Related <u>InstancesImages</u>	(0020,1204)	The number of <u>composite object instances images</u> that match the Patient level Query/Retrieve search criteria
Number of Study Related Series	(0020,1206)	The number of series that match the Study level Query/Retrieve search criteria
Number of Series Related <u>InstancesImages</u>	(0020,1209)	The number of <u>composite object instances images</u> in a Series that match the Series level Query/Retrieve search criteria
Number of Study Related <u>InstancesImages</u>	(0020,1208)	The number of <u>composite object instances images</u> that match the Study level Query/Retrieve search criteria

Note: The use of the word "Images" rather than "composite object instances" is historical, and should not be taken to mean that composite object instances of other than image type are not included in the number.

C.4 DIMSE-C SERVICE GROUPS

Three DIMSE-C Services are used in the construction of SOP Classes of the Query/Retrieve Service Class. The following DIMSE-C operations are used:

- C-FIND
- C-MOVE
- C-GET

C.4.1 C-FIND Operation

SCPs of some SOP Classes of the Query/Retrieve Service Class may be capable of processing queries using the C-FIND operation as described in PS 3.7. The C-FIND operation is the mechanism by which queries are performed. Matches against the keys present in the Identifier are returned in C-FIND responses.

C.4.1.1 C-FIND Service Parameters

C.4.1.1.1 SOP Class UID

The SOP Class UID identifies the Query/Retrieve Information Model against which the C-FIND is to be performed. Support for the SOP Class UID is implied by the Abstract Syntax UID of the Presentation Context used by this C-FIND operation.

C.4.1.1.2 Priority

The Priority Attribute defines the requested priority of the C-FIND operation with respect to other DIMSE operations being performed by the same SCP.

Processing of priority requests is not required of SCPs. Whether or not an SCP supports priority processing and the meaning of the different priority levels shall be stated in the Conformance Statement of the SCP.

C.4.1.1.3 Identifier

Both the C-FIND request and response contain an Identifier encoded as a Data Set (see PS 3.5).

C.4.1.1.3.1 Request Identifier Structure

An Identifier in a C-FIND request shall contain:

- Key Attributes values to be matched against the values of storage SOP Instances managed by the SCP.
- Query/Retrieve Level, element (0008,0052) which defines the level of the query.
- Conditionally, the Attribute Specific Character Set (0008,0005). This Attribute is required if expanded or replacement character sets are used.

The Key Attributes and values allowable for the level of the query shall be defined in the SOP Class definition for the Query/Retrieve Information Model.

C.4.1.1.3.2 Response Identifier Structure

An Identifier in a C-FIND response shall contain:

- Key Attributes with values corresponding to Key Attributes contained in the Identifier of the request.
- Query/Retrieve Level, element (0008,0052) which defines the level of the query. The Query/Retrieve level shall be equal to the level specified in the request.
- Conditionally, the Attribute Specific Character Set (0008,0005). This Attribute is required if expanded or replacement character sets are used.

The C-FIND SCP is required to support either the Retrieve AE Title Data Element or the Storage Media File-Set ID/Storage Media File Set UID Data Elements. An Identifier in a C-FIND response shall contain:

- Storage Media File-Set ID (0088,0130) which defines a user or implementation specific human readable Identifier that identifies the Storage Media on which the [imagecomposite object instance\(s\)](#) reside. This element pertains to the set of [imagescomposite object instances](#) available at the Query/Retrieve Level specified in the Identifier of the C-FIND request (e.g. Patient, Study, Series, [ImageComposite object instance](#)). This Attribute shall be present if the Retrieve AE Title Data Element is not present. A null value (Data Element length of 0) is valid for all levels except the lowest level in the Information Model as defined by the SOP Class.
- Storage Media File-Set UID (0088,0140) which uniquely identifies the Storage Media on which the [imagecomposite object instance\(s\)](#) reside. This element pertains to the set of [imagescomposite object instances](#) available at the Query/Retrieve Level specified in the Identifier of the C-FIND request (e.g. Patient, Study, Series, [Composite object instance Image](#)). This Attribute shall be present if the Retrieve AE Title Data Element is not present. A null value (Data Element length of 0) is valid for all levels except the lowest level in the Information Model as defined by the SOP Class.

Note: The File-Set concepts are used in PS 3.10.

- Retrieve AE Title (0008,0054) which defines a list of DICOM Application Entity Title(s) that identify the location from which the [imagecomposite object instance\(s\)](#) may be retrieved on the network. This element pertains to the set of [imagescomposite object instances](#) available at the Query/Retrieve Level specified in the Identifier of the C-FIND request (e.g. Patient, Study, Series, [ImageComposite object instance](#)). This Attribute shall be present if the Storage Media File-Set ID and Storage Media File-Set UID elements are not present. The Application Entity named in this field shall support either the C-GET or C-MOVE SOP Class of the Query/Retrieve Service Class. A null value (Data Element length of 0) is valid for all levels except the lowest level in the Information Model as defined by the SOP Class.

- Notes:
1. For example, a DICOM AE with the AE Title of "A" performs a C-FIND request to a DICOM AE with the AE Title of "B" with the Query/Retrieve level set to "STUDY". DICOM AE "B" determines that the [imagescomposite object instances](#) for each matching study may be retrieved by itself and sets the Data Element Retrieve AE Title to "B".
 2. File-Sets may not be defined at every Query/Retrieve Level. If the SCP supports the File-Set ID/File-Set UID option but does not define these Attributes at the Query/Retrieve Level specified in the C-FIND request it may return these Data Elements with a length of 0 to signify that the value is unknown. An SCU should reissue a C-FIND at a Query/Retrieve Level lower in the hierarchy.
 3. The fact that the value of the Key Attribute is unknown to the SCP of the Query/Retrieve Service Class does not imply that it is not present in the underlying Information Object. Thus, a subsequent retrieval may cause a Storage of a SOP Instance which contains the value of the Attribute.

C.4.1.1.4 Status

Table C.4-1 defines the specific status code values which might be returned in a C-FIND response. General status code values and fields related to status code values are defined in PS 3.7.

**Table C.4-1
 C-FIND RESPONSE STATUS VALUES**

Service Status	Further Meaning	Status Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied.	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier.	FF01	Identifier

C.4.1.2 C-FIND SCU Behavior

This Section discusses both the baseline and extended behavior of the C-FIND SCU.

C.4.1.2.1 Baseline Behavior of SCU

All C-FIND SCUs shall be capable of generating query requests which meet the requirements of the Hierarchical Search.

The Identifier contained in a C-FIND request shall contain a single value in the Unique Key Attribute for each level above the Query/Retrieve level. No Required or Optional Keys shall be specified which are associated with levels above the Query/Retrieve level.

The Unique Key Attribute associated with the Query/Retrieve level shall be contained in the C-FIND request and may specify Single Value Matching, Universal Value Matching, or List of UID Matching. In addition, Required and Optional Keys associated with the Query/Retrieve level may be contained in the Identifier.

An SCU conveys the following semantics using the C-FIND request:

- The SCU requests that the SCP perform a match of all keys specified in the Identifier of the request against the information it possesses down to the Query/Retrieve level specified in the request.

Notes: 1. The SCU may not assume the SCP supports any Optional Keys. Hence, Optional Keys serve only to reduce network related overhead when they are supported by the SCP.

2. The SCU must be prepared to filter C-FIND responses when the SCP fails to support an Optional Key specified in the C-FIND request.
 - The SCU shall interpret Pending responses to convey the Attributes of a match of an Entity at the level of the query.
 - The SCU shall interpret a response with a status equal to Success, Failed or Refused to convey the end of Pending responses.
 - The SCU shall interpret a Refused or Failed response to a C-FIND request as an indication that the SCP is unable to process the request.
 - The SCU may cancel the C-FIND service by issuing a C-FIND-CANCEL request at any time during the processing of the C-FIND. The SCU shall recognize a status of Canceled to indicate that the C-FIND-CANCEL was successful.

C.4.1.2.2 Extended Behavior of SCU

Extended SCU behavior shall be negotiated at Association establishment time. If an option within the extended behavior is not agreed upon in the negotiation, then only baseline SCU behavior shall be performed with respect to that option. Extended SCU behavior includes all baseline behavior with the following option:

- Relational-queries

C.4.1.2.2.1 Relational-Queries

The C-FIND Service with relational-queries allows any combination of keys at any level in the hierarchy. The Unique Key Attribute associated with the Query/Retrieve level shall be contained in the C-FIND request and may specify Single Value Matching, Universal Value Matching, or List of UID Matching. Support for relational-queries removes the baseline restriction that a Unique Key shall be specified for all levels above the Query/Retrieve level in the C-FIND request.

C.4.1.3 C-FIND SCP Behavior

This Section discusses both the baseline and extended behavior of the C-FIND SCP.

C.4.1.3.1 Baseline behavior of SCP

All C-FIND SCPs shall be capable of processing queries which meet the requirements of the Hierarchical Search.

An SCP conveys the following semantics with a C-FIND response:

- The SCP is requested to perform a match of all the keys specified in the Identifier of the request, against the information it possesses, to the level specified in the request. Attribute matching is performed using the key values specified in the Identifier of the C-FIND request as defined in Section C.2.
- The SCP generates a C-FIND response for each match using the Hierarchical Search method. All such responses shall contain an Identifier whose Attributes contain values from a single match. All such responses shall contain a status of Pending.
- When all matches have been sent, the SCP generates a C-FIND response which contains a status of Success. A status of Success shall indicate that a response has been sent for each match known to the SCP.
- The SCP shall generate a response with a status of Refused or Failed if it is unable to process the request. A Refused or Failed response shall contain no Identifier.

- If the SCP receives C-FIND-CANCEL indication before it has completed the processing of the matches it shall interrupt the matching process and return a status of Canceled.

C.4.1.3.1.1 Hierarchical Search Method

Starting at the top level in the Query/Retrieve Information Model, continuing until the level specified in the C-FIND request is reached, the following procedures are used to generate matches:

- a) If the current level is the level specified in the C-FIND request, then the key match strings contained in the Identifier of the C-FIND request are matched against the values of the Key Attributes for each entity at the current level. For each entity for which the Attributes match all of the specified match strings, construct an Identifier. This Identifier shall contain all of the Unique Keys at higher levels and all of the values of the Attributes for this entity which match those in the C-FIND request. Return a response for each such Identifier. If there are no matching keys, then there are no matches, return a response with a status equal to Success and with no Identifier.
- b) Otherwise, if the current level is not the level specified in the C-FIND request and there is an entity matching the Unique Key Attribute value for this level specified in the C-FIND request, perform this procedure at the next level down in the hierarchy.
- c) Otherwise there are no matches; return a response with a status equal to Success.

Note: The above description specifies a recursive procedure. It may recur upon itself multiple times as it goes down the hierarchical levels, but at each level it recurs only once.

C.4.1.3.2 Extended Behavior of SCP

Extended SCP behavior shall be negotiated at Association establishment time. If an option within the extended behavior is not agreed upon in the negotiation, then only baseline SCP behavior shall be performed with respect to that option. Extended SCP behavior includes all baseline behavior with the following option:

- Relational-queries

C.4.1.3.2.1 Relational-Queries

The C-FIND Service with relational-queries allows any combination of keys at any level in the hierarchy. At the lowest level, a query using the relational-queries shall contain the Unique Key for that level with either a single value match, a wild card match, or a universal match. Support for relational-queries removes the baseline restriction that a Unique Key shall be specified for all levels above the Query/Retrieve level in the C-FIND request.

The C-FIND SCP shall perform matching based on all keys specified in the C-FIND request regardless of the Query/Retrieve level.

C.4.1.3.2.2 Relational Search Method

A query using the relational method may contain any combination of keys at any level in the hierarchy. Starting at the top level in the Query/Retrieve Information Model, continuing until the Query/Retrieve level specified in the C-FIND request is reached, the following procedures are used to generate matches:

- a) The key match strings contained in the Identifier of the C-FIND request are matched against the values of the Key Attributes for each entity at the current level.
- b) If no Key Attribute is specified at the current level and the current level is not the level specified in the C-FIND request, the match shall be performed as if a wild card were specified for the Unique Key Attribute for the current level (i.e. all entities at the current level shall match).
- c) If the current level is the level specified in the C-FIND request, then for each matching entity (a matching entity is one for which the Attributes match all of the specified match strings in the Key Attributes), construct an Identifier. This Identifier shall contain all of the Attributes generated by this procedure at higher levels on this recursion path and all of the values of the Key Attributes for this entity which match those in the C-FIND request.
- d) Otherwise, if the current level is not the level specified in the C-FIND request, then for each matching entity construct a list of Attributes containing all of the matching Key Attributes and all Attributes which were prepared at the previous level for this entity. Then perform this procedure at the next level down in the hierarchy for each matching entity.
- e) Otherwise, if there are no matches, return a response with status equal to Success and no Identifier.

- Notes:
1. The above description specifies a recursive procedure. It may recur upon itself multiple times as it goes down the hierarchical levels, and at each level, it may recur multiple times (one for each matching entity). This may result in a large number of Identifiers being generated.
 2. It is not required that the above defined procedure be used to generate matches. It is expected that implementations will incorporate different algorithms for performing searches of the databases. For a given query, the set of matches shall be equivalent to that which would be generated by the above procedure.

C.4.2 C-MOVE Operation

SCUs of some SOP Classes of the Query/Retrieve Service Class may generate retrievals using the C-MOVE operation as described in PS 3.7. The C-MOVE operation allows an application entity to instruct another application entity to transfer stored SOP Instances to another application entity using the C-STORE operation. Support for the C-MOVE service shall be agreed upon at Association establishment time by both the SCU and SCP of the C-MOVE in order for a C-MOVE operation to occur over the Association. The C-STORE sub-operations shall always be accomplished over an Association different from the Association which accomplishes the C-MOVE operation. Hence, the SCP of the Query/Retrieve Service Class serves as the SCU of the Storage Service Class.

Note: The application entity which receives the stored SOP Instances may or may not be the originator of the C-MOVE operation.

A C-MOVE request may be performed to any level of the Query/Retrieve Information Model. However, the transfer of stored SOP Instances may not be performed at this level. The level at which the transfer is performed depends upon the SOP Class (See Section C.6).

C.4.2.1 C-MOVE Service Parameters

C.4.2.1.1 SOP Class UID

The SOP Class UID identifies the Query/Retrieve Information Model against which the C-MOVE is to be performed. Support for the SOP Class UID is implied by the Abstract Syntax UID of the Presentation Context used by this C-MOVE operation.

C.4.2.1.2 Priority

The Priority Attribute defines the requested priority of the C-MOVE operation and corresponding C-STORE sub-operations with respect to other DIMSE operations being performed by the same SCP.

Processing of priority requests is not required of SCPs. Whether or not an SCP supports priority processing, and the meaning of the different priority levels shall be stated in the Conformance Statement of the SCP. The same priority shall be used for all C-STORE sub-operations.

C.4.2.1.3 Move Destination

Move Destination specifies the Application Entity Title of the performer of the C-STORE sub-operations.

C.4.2.1.4 Identifier

Both the C-MOVE request and response contain an Identifier.

C.4.2.1.4.1 Request Identifier Structure

An Identifier in a C-MOVE request shall contain:

- the Query/Retrieve Level (0008,0052) which defines the level of the retrieval
- Unique Key Attributes which may include Patient ID (0010,0020), Study Instance UID (0020,000D), Series Instance UID (0020,000E), and the SOP Instance UIDs (0008,0018)

The Unique Keys at each level of the hierarchy and the values allowable for the level of the retrieval shall be defined in the SOP Class definition for the Query/Retrieve Information Model.

C.4.2.1.4.2 Response Identifier Structure

The Failed SOP Instance UID List (0008,0058) specifies a list of UIDs of the C-STORE sub-operation SOP Instances for which this C-MOVE operation has failed. An Identifier in a C-MOVE response shall conditionally contain the Failed SOP Instance UID List (0008,0058) based on the C-MOVE response status value. If no C-STORE sub-operation failed, Failed SOP Instance UID List (0008,0058) is absent and therefore no Data Set shall be sent in the C-MOVE response.

The Identifier in a C-MOVE response with a status of:

- Canceled, Failed, Refused, or Warning shall contain the Failed SOP Instance UID List Attribute
- Pending shall not contain the Failed SOP Instance UID List Attribute (no Data Set)

C.4.2.1.5 Status

Table C.4-2 defines the specific status code values which might be returned in a C-MOVE response. General status code values and fields related to status code values are defined in PS 3.7.

**Table C.4-2
 C-MOVE RESPONSE STATUS VALUES**

Service Status	Further Meaning	Status Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform sub-operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
	Move Destination unknown	A801	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to Process	Cxxx	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures	B000	(0000,1020) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

C.4.2.1.6 Number of Remaining Sub-Operations

Inclusion of the Number of Remaining Sub-operations is conditional based upon the status in the C-MOVE response. The Number of Remaining Sub-operations specifies the number of Remaining C-STORE sub-operations necessary to complete the C-MOVE operation.

The Identifier in a C-MOVE response with a status of:

- Pending shall contain the Number of Remaining Sub-operations Attribute
- Canceled may contain the Number of Remaining Sub-operations Attribute
- Warning, Failed, Refused, or Successful shall not contain the Number of Remaining Sub-operations Attribute

C.4.2.1.7 Number of Successful Sub-Operations

Inclusion of the Number of Successful Sub-operations is conditional based upon the status in the C-MOVE response. The Number of Successful sub-operations specifies the number of C-STORE sub-operations generated by the requested transfer which have completed successfully.

The Identifier in a C-MOVE response with a status of:

- Pending shall contain the Number of Successful Sub-operations Attribute
- Canceled, Warning, Failed, Refused, or Successful may contain the Number of Successful Sub-operations Attribute

C.4.2.1.8 Number of Failed Sub-Operations

Inclusion of the Number of Failed Sub-operations is conditional based upon the status in the C-MOVE response. The Number of Failed sub-operations specifies the number of C-STORE sub-operations generated by the requested transfer which have Failed.

The Identifier in a C-MOVE response with a status of:

- Pending shall contain the Number of Failed Sub-operations Attribute
- Canceled, Warning, Failed, Refused, or Successful may contain the Number of Failed Sub-operations Attribute

C.4.2.1.9 Number of Warning Sub-Operations

Inclusion of the Number of Warning Sub-operations is conditional based upon the status in the C-MOVE response. The Number of Warning sub-operations specifies the number of C-STORE sub-operations generated by the requested transfer which had a status of warning.

The Identifier in a C-MOVE response with a status of:

- Pending shall contain the Number of Warnings Sub-operations Attribute
- Canceled, Warning, Failed, Refused, or Successful may contain the Number of Warning Sub-operations Attribute

C.4.2.2 C-MOVE SCU Behavior

This Section discusses both the baseline and extended behavior of the C-MOVE SCU.

C.4.2.2.1 Baseline Behavior of SCU

An SCU conveys the following semantics with a C-MOVE request:

- The SCU shall supply a single value in the Unique Key Attribute for each level above the Query/Retrieve level. For the level of retrieve, the SCU shall supply at least one UID and may supply a list of UIDs if a retrieval of several items is desired. The SCU shall also supply a move destination. The move destination shall be the DICOM Application Entity Title of a DICOM Application Entity capable of serving as the SCP of the Storage Service Class.
- The SCU shall interpret responses to the C-MOVE with status equal to Pending during the processing of the C-STORE sub-operations. These responses shall indicate the number of Remaining, Successful, Failed, and Warning C-STORE sub-operations.
- The SCU shall interpret responses with a status equal to Success, Warning, Failed, or Refused as final responses. The final response shall indicate the number of

Successful C-STORE sub-operations and the number of Failed C-STORE sub-operations resulting from the C-MOVE operation. The SCU shall interpret a status of:

- Success to indicate that all sub-operations were successful
- Warning to indicate one or more sub-operations were successful and one or more sub-operations were unsuccessful or had a status of warning, or all sub-operations had a status of warning
- Failed or Refused to indicate all sub-operations were unsuccessful.
- The SCU may cancel the C-MOVE service by issuing a C-MOVE-CANCEL request at any time during the processing of the C-MOVE. The SCU shall interpret a C-MOVE response with a status of Canceled to indicate the transfer was canceled. The C-MOVE response with a status of Canceled shall contain the number of Successful, Failed, and Warning C-STORE sub-operations. If present, the Remaining sub-operations count shall contain the number of C-STORE sub-operations which were not initiated due to the C-MOVE-CANCEL request.

C.4.2.2.2 Extended Behavior of SCU

Extended SCU behavior shall be negotiated at Association establishment time. If an option within the extended behavior is not agreed upon in the negotiation, then only baseline SCU behavior shall be performed with respect to that option. Extended SCU behavior includes all baseline behavior with the following option:

- Relational-retrieve

C.4.2.2.2.1 Relational-Retrieve

The C-MOVE Service with relational-retrieve removes the restriction that the SCU supply Unique Key values for levels above the Query/Retrieve level to identify an entity at the level of the retrieval. Hence, the Identifier of a C-MOVE request may transfer:

- all [imagescomposite object instances](#) related to a study by only providing a Study Instance UID (0020,000D)
- all [imagescomposite object instances](#) related to a series by only providing a Series Instance UID (0020,000E)
- individual [imagescomposite object instances](#) by only providing a list of SOP Instance UIDs (0008,0018)

C.4.2.3 C-MOVE SCP Behavior

This section discusses both the baseline and extended behavior of the C-MOVE SCP.

C.4.2.3.1 Baseline Behavior of SCP

An SCP conveys the following semantics with a C-MOVE response:

- The SCP shall identify a set of Entities at the level of the transfer based upon the values in the Unique Keys in the Identifier of the C-MOVE request. The SCP shall initiate C-STORE sub-operations for the corresponding storage SOP Instances. These C-STORE sub-operations shall occur on a different Association from the C-MOVE operation. The SCP of the Query/Retrieve Service Class shall serve as an SCU of the Storage Service Class.

- The SCP shall establish a new Association for the C-STORE sub-operations. A sub-operation is considered Failed if the SCP is unable to negotiate an appropriate presentation context for a given stored SOP Instance.
- The SCP shall initiate C-STORE sub-operations over the new Association for all stored SOP Instances related to the Patient ID, Study Instance UID, Series Instance UID, or List of SOP Instance UIDs depending on the Query/Retrieve level specified in the C-MOVE request.
- Optionally, the SCP may generate responses to the C-MOVE with status equal to Pending during the processing of the C-STORE sub-operations. These responses shall indicate the Remaining, Successful, Failed, and Warning C-STORE sub-operations.
- When the number of Remaining sub-operations reaches zero, the SCP shall generate a final response with a status equal to Success, Warning, Failed, or Refused. This response shall indicate the number of Successful sub-operations, the number of Failed sub-operations, and the number of sub-operations with Warning Status. The status contained in the C-MOVE response shall contain:
 - Successful if all sub-operations were successful
 - Warning if one or more sub-operations were successful and one or more sub-operations were unsuccessful or had a warning status
 - Warning if all sub-operations had a warning status
 - Failed or Refused if all sub-operations were unsuccessful
- The SCP may receive a C-MOVE-CANCEL request at any time during the processing of the C-MOVE. The SCP shall interrupt all C-STORE sub-operation processing and return a status of Canceled in the C-MOVE response. The C-MOVE response with a status of Canceled shall contain the number of Successful, Failed, and Warning C-STORE sub-operations. If present, the Remaining sub-operations count shall contain the number of C-STORE sub-operations which were not initiated due to the C-MOVE-CANCEL request.

C.4.2.3.2 Extended Behavior of SCP

Extended SCP behavior shall be negotiated at Association establishment time. If an option within the extended behavior is not agreed upon in the negotiation, then only baseline SCP behavior shall be performed with respect to that option. Extended SCP behavior includes all baseline behavior with the following option:

- Relational-retrieve

C.4.2.3.2.1 Relational-Retrieve

The C-MOVE Service with relational-retrieve removes the restriction that the SCU supply Unique Key values for levels above the Query/Retrieve level to help identify an entity at the level of the retrieval. Hence, the Identifier of a C-MOVE request may specify the transfer of:

- all [imagescomposite object instances](#) related to a study by only providing a Study Instance UID (0020,000D)
- all [imagescomposite object instances](#) related to a series by only providing a Series Instance UID (0020,000E)

- individual imagescomposite object instances by only providing a list of SOP Instance UIDs (0008,0018)

C.4.3 C-GET Operation

SCUs of some SOP Classes of the Query/Retrieve Service Class may generate retrievals using the C-GET operation as described in PS 3.7. The C-GET operation allows an application entity to instruct another application entity to transfer stored SOP Instances to the initiating application entity using the C-STORE operation. Support for the C-GET service shall be agreed upon at Association establishment time by both the SCU and SCP of the C-GET in order for a C-GET operation to occur over the Association. The C-STORE Sub-operations shall be accomplished on the same Association as the C-GET operation. Hence, the SCP of the Query/Retrieve Service Class serves as the SCU of the Storage Service Class.

Note: The application entity which receives the stored SOP Instances is always the originator of the C-GET operation.

A C-GET request may be performed to any level of the Query/Retrieve Information Model. However, the transfer of stored SOP Instances may not be performed at this level. The level at which the transfer is performed depends upon the SOP Class.

C.4.3.1 C-GET Service Parameters

C.4.3.1.1 SOP Class UID

The SOP Class UID identifies the Query/Retrieve Information Model against which the C-GET is to be performed. Support for the SOP Class UID is implied by the Abstract Syntax UID of the Presentation Context used by this C-GET operation.

C.4.3.1.2 Priority

The Priority Attribute defines the requested priority of the C-GET operation and corresponding C-STORE sub-operations with respect to other DIMSE operations being performed by the same SCP.

Processing of priority requests is not required of SCPs. Whether or not an SCP supports priority processing, and the meaning of the different priority levels shall be stated in the Conformance Statement of the SCP. The same priority shall be used for all C-STORE sub-operations.

C.4.3.1.3 Identifier

Both the C-GET request and response contain an Identifier.

C.4.3.1.3.1 Request Identifier Structure

An Identifier in a C-GET request shall contain:

- the Query/Retrieve Level (0008,0052) which defines the level of the retrieval
- Unique Key Attributes which may include Patient ID (0010,0020), Study Instance UID (0020,000D) Series Instance UID (0020,000E), and SOP Instance UIDs (0008,0018)

The Unique Keys at each level of the hierarchy and the values allowable for the level of the retrieval shall be defined in the SOP Class definition for the Query/Retrieve Information Model.

C.4.3.1.3.2 Response Identifier Structure

The Failed SOP Instance UID List (0008,0058) specifies a list of UIDs of the C-STORE sub-operation SOP Instances for which this C-GET operation has failed. An Identifier in a C-GET response shall conditionally contain the Failed SOP Instance UID List (0008,0058) based on the C-GET response. If no C-STORE sub-operation failed, Failed SOP Instance UID List (0008,0058) is absent and therefore no Data Set shall be sent in the C-GET response.

The Identifier in a C-GET response with a status of:

- Canceled, Failed, Refused, or Warning shall contain the Failed SOP Instance UID List Attribute
- Pending shall not contain the Failed SOP Instance UID List Attribute (no Data Set).

C.4.3.1.4 Status

Table C.4-3 defines the specific status code values which might be returned in a C-GET response. General status code values and fields related to status code values are defined in PS 3.7.

**Table C.4-3
 C-GET RESPONSE STATUS VALUES**

Service Status	Further Meaning	Status Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform sub-operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures or Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warnings	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
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C.4.3.1.5 Number of Remaining Sub-Operations

Inclusion of the Number of Remaining Sub-operations is conditional based upon the status in the C-GET response. The Number of Remaining Sub-operations specifies the number of Remaining C-STORE sub-operations necessary to complete the C-GET operation.

The Identifier in a C-GET response with a status of:

- Pending shall contain the Number of Remaining Sub-operations Attribute
- Canceled may contain the Number of Remaining Sub-operations Attribute
- Warning, Failed, Refused, or Successful shall not contain the Number of Remaining Sub-operations Attribute.

C.4.3.1.6 Number of Successful Sub-Operations

Inclusion of the Number of Successful Sub-operations is conditional based upon the status in the C-GET response. The Number of Successful Sub-operations specifies the number of C-STORE sub-operations generated by the requested transfer which have completed successfully.

The Identifier in a C-GET response with a status of:

- Pending shall contain the Number of Successful Sub-operations Attribute
- Canceled, Warning, Failed, Refused, or Successful may contain the Number of Successful Sub-operations Attribute

C.4.3.1.7 Number of Failed Sub-Operations

Inclusion of the Number of Failed Sub-operations is conditional based upon the status in the C-GET response. The Number of Failed Sub-operations specifies the number of C-STORE sub-operations generated by the requested transfer which have Failed.

The Identifier in a C-GET response with a status of:

- Pending shall contain the Number of Failed Sub-operations Attribute
- Canceled, Warning, Failed, Refused, or Successful may contain the Number of Failed Sub-operations Attribute

C.4.3.1.8 Number of Warning Sub-Operations

Inclusion of the Number of Warning Sub-operations is conditional based upon the status in the C-GET response. The Number of Warning Sub-operations specifies the number of C-STORE sub-operations generated by the requested transfer which had a status of Warning.

The Identifier in a C-GET response with a status of:

- Pending shall contain the Number of Warning Sub-operations Attribute

- Canceled, Warning, Failed, Refused, or Successful may contain the Number of Warning Sub-operations Attribute

C.4.3.2 C-GET SCU Behavior

This Section discusses both the baseline and extended behavior of the C-GET SCU.

C.4.3.2.1 Baseline Behavior of SCU

An SCU conveys the following semantics with a C-GET request:

- The SCU shall have proposed sufficient presentation contexts at Association establishment time to accommodate expected C-STORE sub-operations which shall occur over the same Association. The SCU of the Query/Retrieve Service Class shall serve as the SCP of the Storage Service Class.
- The SCU shall supply a single value in the Unique Key Attribute for each level above the Query/Retrieve level. For the level of retrieve, the SCU shall supply at least one UID and may supply a list of UIDs if a retrieval of several items is desired.
- The SCU shall interpret C-GET responses with status equal to Pending during the processing of the C-STORE sub-operations. These responses shall indicate the number of Remaining, Successful, Failed, Warning C-STORE sub-operations.
- The SCU shall interpret a C-GET response with a status equal to Success, Warning, Failed, or Refused as a final response. The final response shall indicate the number of Successful sub-operations and the number of Failed C-STORE sub-operations resulting from the C-GET operation. The SCU shall interpret a status of:
 - Success to indicate that all sub-operations were successful
 - Warning to indicate one or more sub-operations were successful and one or more unsuccessful or all sub-operations had a status of warning
 - Failed or Refused to indicate all sub-operations were unsuccessful
- The SCU may cancel the C-GET operation by issuing a C-GET-CANCEL request at any time during the processing of the C-GET request. A C-GET response with a status of Canceled shall indicate to the SCU that the retrieve was canceled. Optionally, the C-GET response with a status of Canceled shall indicate the number of Successful, Failed, and Warning C-STORE sub-operations. If present, the Remaining sub-operations count shall contain the number of C-STORE sub-operations which were not initiated due to the C-GET-CANCEL request.

C.4.3.2.2 Extended Behavior of SCU

Extended SCU behavior shall be negotiated at Association establishment time. If an option within the extended behavior is not agreed upon in the negotiation, then only baseline SCU behavior shall be supported with respect to that option. Extended SCU behavior includes all baseline behavior with the following option:

- Relational-retrieve

C.4.3.2.2.1 Relational-Retrieve

The C-GET Service with relational-retrieve removes the restriction that the SCU supply Unique Key values for levels above the Query/Retrieve level to help identify an entity at the level of the retrieval. Hence, the Identifier of a C-GET request may retrieve:

- all imagescomposite object instances related to a study by providing a Study Instance UID (0020,000D)
- all imagescomposite object instances related to a series by providing a Series Instance UID (0020,000E)
- individual imagescomposite object instances by providing a list of SOP Instance UIDs (0008,0018)

C.4.3.3 C-GET SCP Behavior

This Section discusses both the baseline and extended behavior of the C-GET SCP.

C.4.3.3.1 Baseline Behavior of SCP

An SCP conveys the following semantics with a C-GET response:

- The SCP shall identify a set of Entities at the level of the retrieval based upon the values in the Unique Keys in the Identifier of the C-GET request. The SCP shall initiate C-STORE sub-operations for the corresponding storage SOP Instances. The SCP of the Query/Retrieve Service Class shall serve as an SCU of the Storage Service Class.
- The SCP shall initiate C-STORE sub-operations over the same Association for all stored SOP Instances related to the Patient ID, Study Instance UID, Series Instance UID, or List of SOP Instance UIDs depending on the Query/Retrieve level specified in the C-GET request
- A sub-operation is considered Failed if the SCP is unable to initiate a C-STORE sub-operation because the Query/Retrieve SCU did not offer an appropriate presentation context for a given stored SOP Instance.
- Optionally, the SCP may generate responses to the C-GET with status equal to Pending during the processing of the C-STORE sub-operations. These responses shall indicate the number of Remaining, Successful, Failed, and Warning C-STORE sub-operations.
- When the number of Remaining sub-operations reaches zero, the SCP shall generate a final response with a status equal to Success, Warning, Failed, or Refused. The status contained in the C-GET response shall contain:
 - Success if all sub-operations were successful
 - Warning if one or more sub-operations were successful and one or more sub-operations were unsuccessful or had a status of warning
 - Warning if all sub-operations had a status of Warning
 - Failed or Refused if all sub-operations were unsuccessful
- The SCP may receive a C-GET-CANCEL request at any time during the processing of the C-GET request. The SCP shall interrupt all C-STORE sub-operation processing and return a status of Canceled in the C-GET response. The C-GET response with a status of Canceled shall contain the number of Successful, Failed, and Warning C-STORE sub-operations. If present, the Remaining sub-operations count shall contain the number of C-STORE sub-operations which were not initiated due to the C-GET-CANCEL request.

C.4.3.3.2 Extended Behavior of SCP

Extended SCP behavior shall be negotiated at Association establishment time. If an option within the extended behavior is not agreed upon in the negotiation, then only baseline SCP behavior

shall be performed with respect to that option. Extended SCP behavior includes all baseline behavior with the following option:

- Relational-retrieve

C.4.3.3.2.1 Relational-Retrieve

The C-GET Service with relational-retrieve removes the restriction that the SCU supply Unique Key values for levels above the Query/Retrieve level to help identify an entity at the level of the retrieval. Hence, the Identifier of a C-GET request may retrieve:

- all imagescomposite object instances related to a study by providing a Study Instance UID
- all imagescomposite object instances related to a series by providing a Series Instance UID
- individual imagescomposite object instances by providing a list of SOP Instance UIDs

C.5 ASSOCIATION NEGOTIATION

Association establishment is the first phase of any instance of communication between peer DICOM AEs. AEs supporting DICOM Query/Retrieve SOP Classes utilize Association establishment negotiation by defining the use of Application Association Information. See PS 3.7 for an overview of Association negotiation.

SOP Classes of the Query/Retrieve Service Class, which include query services based on the C-FIND operation, may use SOP Class Extended Negotiation Sub-Item to negotiate options such as Relational-queries.

SOP Classes of the Query/Retrieve Service Class, which include retrieval services based on the C-MOVE and C-GET operations, may use the SOP Class Extended Negotiation Sub-Item to negotiate relational-retrieval.

SOP Classes of the Query/Retrieve Service Class, which include retrieval services based on the C-GET operation, use the SCP/SCU Role Selection Sub-Item to identify the SOP Classes which may be used for retrieval.

C.5.1 Association Negotiation for C-FIND SOP Classes

The following negotiation rules apply to DICOM SOP Classes and Specialized DICOM SOP Classes of the Query/Retrieve Service Class which include the C-FIND operation.

The Association-requester (query SCU role) shall convey in the A-ASSOCIATE request:

- one Abstract Syntax, in a Presentation Context, for each query based SOP Class supported
- optionally, one SOP Class Extended Negotiation Sub-Item, for each query based SOP Class

The Association-acceptor (query SCP role) of an A-ASSOCIATE request shall accept:

- one Abstract Syntax, in a Presentation Context, for each query based SOP Class supported

- optionally, one SOP Class Extended Negotiation Sub-Item, for each query based SOP Class

C.5.1.1 SOP Class Extended Negotiation

The SOP Class Extended Negotiation allows, at Association establishment, peer DICOM AEs to exchange application Association information defined by specific SOP Classes. This is achieved by defining the Service-class-application-information field. The Service-class-application-information field is used to define support for relational-queries.

This negotiation is optional. If absent, the default conditions shall be:

- no relational-query support

The Association-requester, for each SOP Class, may use one SOP Class Extended Negotiation Sub-Item. The SOP Class is identified by the corresponding Abstract Syntax Name (as defined by PS 3.7) followed by the Service-class-application-information field. This field defines:

- relational-query support by the Association-requester

The Association-acceptor, for each SOP Class Extended Negotiation Sub-Item offered, either accepts the Association-requester proposal by returning the same value (1) or turns down the proposal by returning the value (0)

If the SOP Class Extended Negotiation Sub-Item is not returned by the Association-acceptor then relational-queries are not supported over the Association (default condition).

If the SOP Class Extended Negotiation Sub-Items do not exist in the A-ASSOCIATE indication they shall be omitted in the A-ASSOCIATE response.

C.5.1.1.1 SOP Class Extended Negotiation Sub-Item Structure (A-ASSOCIATE-RQ)

The SOP Class Extended Negotiation Sub-Item consists of a sequence of mandatory fields as defined by PS 3.7. Table C.5-1 defines the Service-class-application-information field for DICOM Query/Retrieve SOP Classes and Specialized DICOM Query/Retrieve SOP Classes which include the C-FIND operation.

Table C.5-1—SOP CLASS EXTENDED NEGOTIATION SUB-ITEM (service-class-application-information field)—A-ASSOCIATE-RQ

Item Bytes	Field Name	Description of Field
1	Relational-queries	This byte field defines relational-query support by the Association-requester. It shall be encoded as an unsigned binary integer and shall use one of the following values 0 - relational queries not supported 1 - relational queries supported

C.5.1.1.2 SOP Class Extended Negotiation Sub-Item Structure (A- ASSOCIATE-AC)

The SOP Class Extended Negotiation Sub-Item is made of a sequence of mandatory fields as defined by PS 3.7. Table C.5-2 defines the Service-class-application-information field for DICOM Query/Retrieve SOP Classes and Specialized DICOM Query/Retrieve SOP Classes which include the C-FIND operation.

**Table C.5-2—SOP CLASS EXTENDED NEGOTIATION SUB-ITEM
(service-class-application-information field)—A-ASSOCIATE-AC**

Item Bytes	Field Name	Description of Field
1	Relational-queries	This byte field defines relational-query support for the Association-acceptor. It shall be encoded as an unsigned binary integer and shall use one of the following values 0 - relational-queries not supported 1 - relational-queries supported

C.5.2 Association Negotiation for C-MOVE SOP Classes

The following negotiation rules apply to DICOM SOP Classes and Specialized DICOM SOP Classes of the Query/Retrieve Service Class which include the C-MOVE operation.

The Association-requester (retrieval SCU role) shall convey in the A-ASSOCIATE request:

- one Abstract Syntax, in a Presentation Context, for each retrieval based SOP Class supported
- optionally, one SOP Class Extended Negotiation Sub-Item, for each retrieval based SOP Class

The Association-acceptor (retrieval SCP role) of an A-ASSOCIATE request shall accept:

- one Abstract Syntax, in a Presentation Context, for each retrieval based SOP Class supported
- optionally, one SOP Class Extended Negotiation Sub-Item, for each retrieval based SOP Class

C.5.2.1 SOP Class Extended Negotiation

The SOP Class Extended Negotiation allows, at Association establishment, peer DICOM AEs to exchange application Association information defined by specific SOP Classes. This is achieved by defining the Service-class-application-information field. The Service-class-application-information field is used to define support for relational-retrievals.

This negotiation is optional. If absent, the default condition shall be:

- no relational-retrieval support

The Association-requester, for each SOP Class, may use one SOP Class Extended Negotiation Sub-Item. The SOP Class is identified by the corresponding Abstract Syntax Name (as defined by PS 3.7) followed by the Service-class-application-information field. This field defines:

— relational-retrieval support by the Association-requester

The Association-acceptor, for each SOP Class Extended Negotiation Sub-Item offered, either accepts the Association-requester proposal by returning the same value (1) or turns down the proposal by returning the value (0).

If the SOP Class Extended Negotiation Sub-Item is not returned by the Association-acceptor then relational-retrievals are not supported (default condition)

If the SOP Class Extended Negotiation Sub-Items do not exist in the A-ASSOCIATE indication they shall be omitted in the A-ASSOCIATE response.

C.5.2.1.1 SOP Class Extended Negotiation Sub-Item Structure (A-ASSOCIATE-RQ)

The SOP Class Extended Negotiation Sub-Item consists of a sequence of mandatory fields as defined by PS 3.7. Table C.5-3 defines the Service-class-application-information field for DICOM Query/Retrieve SOP Classes and Specialized DICOM Query/Retrieve SOP Classes which include the C-MOVE and C-GET operations.

Table C.5-3—SOP CLASS EXTENDED NEGOTIATION SUB-ITEM (service-class-application-information field)—A-ASSOCIATE-RQ

Item Bytes	Field Name	Description of Field
1	Relational-retrieval	This byte field defines relational-retrieval support by the Association-requester. It shall be encoded as an unsigned binary integer and shall use one of the following values 0 - relational-retrieval not supported 1 - relational-retrieval supported

C.5.2.1.2 SOP Class Extended Negotiation Sub-Item Structure (A-ASSOCIATE-AC)

The SOP Class Extended Negotiation Sub-Item consists of a sequence of mandatory fields as defined by PS 3.7. Table C.5-4 defines the Service-class-application-information field for DICOM Query/Retrieve SOP Classes and Specialized DICOM Query/Retrieve SOP Classes which include the C-MOVE and C-GET operations.

Table C.5-4—SOP CLASS EXTENDED NEGOTIATION SUB-ITEM (service-class-application-information field)—A-ASSOCIATE-AC

Item Bytes	Field Name	Description of Field
1	Relational-retrieval	This byte field defines relational-retrieval support for the Association-acceptor. It shall be encoded as an unsigned binary integer and shall use one of the following values 0 - relational-retrievals not supported 1 - relational-retrievals supported

C.5.3 Association Negotiation for C-GET SOP Classes

When an SCP performs the C-GET operation it induces a C-STORE operation for the purpose of transmitting imagecomposite -SOP Instances for Storage. This induced C-STORE operation (called a sub-operation) requires a switch from the C-GET Presentation Context to a Presentation Context that supports the specific C-STORE sub-operation. The following negotiation rules apply to retrieval based DICOM Query/Retrieve SOP Classes and Specialized DICOM Query/Retrieve SOP Classes which include the C-GET operation.

The Association-requester (retrieve SCU role) in the A-ASSOCIATE request shall convey:

- a) C-GET operation support with:
 - one Abstract Syntax, in a Presentation Context, for each SOP Class supported
 - and optionally, one SOP Class Extended Negotiation Sub-Item, for each retrieval based SOP Class

- b) Induced Storage sub-operation support where the SOP Class (in the retrieval SCU role) is acting as a Storage SOP Class in the SCP Role. See Figure C.5-1. For each supported Storage SOP Class, the A-ASSOCIATE request contains:
 - one Abstract Syntax in a Presentation Context
 - one SCP/SCU Role Selection Negotiation Sub-item with the SCP-role field set to indicate support of the SCP role. The SCP/SCU Role Selection Negotiation shall be used as defined in PS 3.7.

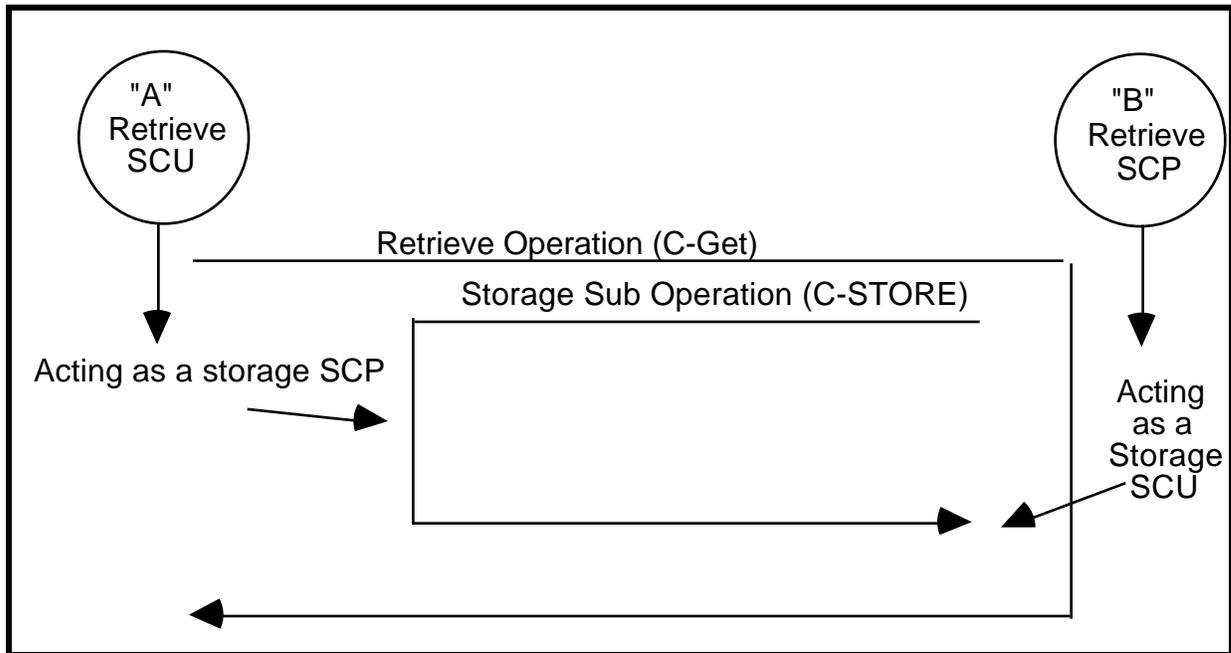


Figure C.5-1
AN EXAMPLE OF THE SUB-OPERATION SCU/SCP ROLES

Note: This negotiation does not place any requirements on the SCU-flag of the SCP/SCU Role Selection Negotiation Sub-Item. It may be set if the Association-requester supports the Storage Service Class in the SCU role.

The Association-acceptor (retrieve SCP role) in the A-ASSOCIATE response shall convey:

- a) C-GET operation support with:
 - one Abstract Syntax, in a Presentation Context, for each SOP Class supported
- b) Induced Storage sub-operation support where the SOP Class (using the retrieval SCP role) is acting as a Storage SOP Class in the SCU Role. See Figure C.5-1. For each supported Storage SOP Class, the A-ASSOCIATE response contains both:
 - one Abstract Syntax, in a Presentation Context
 - one SCP/SCU Role Selection Negotiation Sub-item with the SCP-role field set to indicate the acceptance of the Association-requester's support of the SCP role. The SCP/SCU Role Selection Negotiation shall be used as defined in PS 3.7.

Note: The negotiation does not place any requirements on the SCU-flag of the SCP/SCU Role Selection Negotiation Sub-Item. It may be set if the Association-acceptor accepts the Storage SCP role. Figure C.5-2 illustrates an example of the retrieve (C-GET) negotiation.

Figure C.5-2 illustrates an example of the retrieve (C-GET) negotiation.

C.5.3.1 SOP Class Extended Negotiation

The SOP Class Extended Negotiation allows, at Association establishment, peer DICOM AEs to exchange application Association information defined by specific SOP Classes.

This is achieved by defining the Service-class-application-information field. The Service-class-application-information field is used to define support for relational-retrievals.

C.6 SOP CLASS DEFINITIONS

C.6.1 Patient Root SOP Class Group

In the Patient Root Query/Retrieve Information Model, the information is arranged into four levels which correspond to one of the following four values in element (0008,0052):

Query/Retrieve Level	Value in (0008,0052)
Patient Information	PATIENT
Study Information	STUDY
Series Information	SERIES
<u>Composite object instance Image Information</u>	IMAGE

Note: The use of the word "Images" rather than "composite object instances" is historical to allow backward compatibility with previous versions of the standard. It should not be taken to mean that composite object instances of other than image type are not included at the level indicated by the value IMAGE.

C.6.1.1 Patient Root Query/Retrieve Information Model

C.6.1.1.1 E/R Model

The Patient Root Query/Retrieve Information Model may be represented by the entity relationship diagram shown in Figure C.6-1.

Item: Change Image to Composite Object Instance in Figure C.6-1.

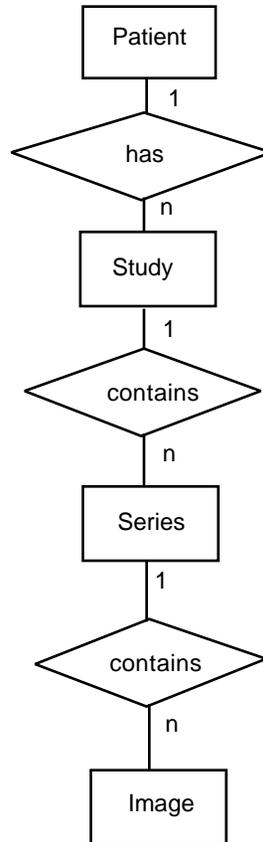


Figure C.6-1
PATIENT ROOT QUERY/RETRIEVE INFORMATION MODEL E/R DIAGRAM

C.6.1.1.2 Patient Level

Table C.6-1 defines the Attributes at the Patient Query/Retrieve level of the Patient Root Query/Retrieve Information Model.

- Notes:
1. A description of the attributes of this Information Model is contained in Section C.3 of this part.
 2. Although the Patient ID may not be globally unique, the Study Instance UID is globally unique ensuring that no two studies may be mis-identified.

**Table C.6-1
 PATIENT LEVEL ATTRIBUTES FOR THE PATIENT ROOT
 QUERY/RETRIEVE INFORMATION MODEL**

Description	Tag	Type
Patient's Name	(0010,0010)	R
Patient ID	(0010,0020)	U
Referenced Patient Sequence	(0008,1120)	O
>Referenced SOP Class UID	(0008,1150)	O
>Referenced SOP Instance UID	(0008,1155)	O
Patient's Birth Date	(0010,0030)	O
Patient's Birth Time	(0010,0032)	O
Patient's Sex	(0010,0040)	O
Other Patient IDs	(0010,1000)	O
Other Patient Names	(0010,1001)	O
Ethnic Group	(0010,2160)	O
Patient Comments	(0010,4000)	O
Number of Patient Related Studies	(0020,1200)	O
Number of Patient Related Series	(0020,1202)	O
Number of Patient Related Instances/Images	(0020,1204)	O

C.6.1.1.3 Study Level

Table C.6-2 defines the keys at the Study Information level of the Patient Root Query/Retrieve Information Model.

- Notes:
1. A description of the attributes of this Information Model is contained in Section C.3 of this Part.
 2. Although the Patient ID may not be globally unique, the Study Instance UID is globally unique ensuring that no two studies may be mis-identified.

**Table C.6-2
 STUDY LEVEL KEYS FOR THE PATIENT ROOT
 QUERY/RETRIEVE INFORMATION MODEL**

Description	Tag	Type
Study Date	(0008,0020)	R
Study Time	(0008,0030)	R
Accession Number	(0008,0050)	R
Study ID	(0020,0010)	R
Study Instance UID	(0020,000D)	U
Referring Physician's Name	(0008,0090)	O
Study Description	(0008,1030)	O

Procedure Code Sequence	(0008,1032)	O
>Code Value	(0008,0100)	O
>Coding Scheme Designator	(0008,0102)	O
>Code Meaning	(0008,0104)	O
Name of Physician(s) Reading Study	(0008,1060)	O
Admitting Diagnoses Description	(0008,1080)	O
Referenced Study Sequence	(0008,1110)	O
>Referenced SOP Class UID	(0008,1150)	O
>Referenced SOP Instance UID	(0008,1155)	O
Patient's Age	(0010,1010)	O
Patient's Size	(0010,1020)	O
Patient's Weight	(0010,1030)	O
Occupation	(0010,2180)	O
Additional Patient History	(0010,21B0)	O
Other Study Numbers	(0020,1070)	O
Number of Study Related Series	(0020,1206)	O
Number of Study Related <u>Instances</u> Images	(0020,1208)	O
Interpretation Author	(4008,010C)	O

C.6.1.1.4 Series Level

Table C.6-3 defines the keys at the Series Information level of the Patient Root Query/Retrieve Information Model.

**Table C.6-3
 SERIES LEVEL ATTRIBUTES FOR THE PATIENT ROOT
 QUERY/RETRIEVE INFORMATION MODEL**

Description	Tag	Type
Modality	(0008,0060)	R
Series Number	(0020,0011)	R
Series Instance UID	(0020,000E)	U
Number of Series Related <u>Instances</u> Images	(0020,1209)	U
All Other Attributes at Series Level		O

C.6.1.1.5 **ImageComposite object instance Level**

Table C.6-4 defines the keys at the ImageComposite object instance Information level of the Patient Root Query/Retrieve Information Model.

Table C.6-4
IMAGECOMPOSITE OBJECT INSTANCE LEVEL KEYS FOR THE PATIENT ROOT QUERY/RETRIEVE INFORMATION MODEL

Description	Tag	Type
<u>Instance</u> Image Number	(0020,0013)	R
<u>Overlay Number</u>	(0020,0022)	O
<u>Curve Number</u>	(0020,0024)	O
<u>LUT Number</u>	(0020,0026)	O
SOP Instance UID	(0008,0018)	U
All Other Attributes at <u>composite</u> <u>Imageobject instance</u> Level		O

Notes: Ideally, Overlay Number (0020,0022), Curve Number (0020,0024), LUT Number (0020,0026) and Report Number (0020,00AA) would be of Type R rather than Type O to require an SCP to match on these keys. However for backward compatibility with SCPs that are not aware of the revised model, they remain Type O. An SCP that is aware of the revised model can state in its Conformance Statement that matching on these keys IS performed. Instance Number (0020,0013), if present in non-image objects is the preferred key if present in revised objects.

C.6.1.1.6 **Scope of the GET and MOVE Commands and Sub-Operations**

A C-MOVE or C-GET request may be performed to any level of the Query/Retrieve Model. However, the transfer of Stored SOP Instances shall always take place at the ImageComposite object instance level. A C-MOVE or C-GET where the Query/Retrieve level is the:

- PATIENT level indicates that all imagescomposite object instances related to a Patient shall be transferred.
- STUDY level indicates that all imagescomposite object instances related to a Study shall be transferred.
- SERIES level indicates that all imagescomposite object instances related to a Series shall be transferred.
- IMAGE level indicates that selected individual imagescomposite object instances shall be transferred.

C.6.1.2 **Conformance Requirements**

An implementation may conform to one of the SOP Classes of the Patient Root SOP Class Group as an SCU, SCP or both. The Conformance Statement shall be in the format defined in PS 3.2.

C.6.1.2.1 SCU Conformance

C.6.1.2.1.1 C-FIND SCU Conformance

An implementation which conforms to one of the SOP Classes of the Patient Root SOP Class Group shall support queries against the Query/Retrieve Information Model described in Section C.6.1.1 using the baseline C-FIND SCU Behavior described in Section C.4.1.2.

An implementation which conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCU shall state in its Conformance Statement whether it supports Optional Keys. If it supports Optional Keys, then it shall list the Optional Keys which it supports.

An implementation which conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCU shall state in its Conformance Statement whether it may generate Relational-queries. If it supports Relational-queries, then it shall also support extended negotiation.

C.6.1.2.1.2 C-MOVE SCU Conformance

An implementation which conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCU shall support transfers against the Query/Retrieve Information Model described in Section C.6.1.1 using the C-MOVE SCU Behavior described in Section C.4.2.2.

C.6.1.2.1.3 C-GET SCU Conformance

An implementation which conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCU shall support retrievals against the Query/Retrieve Information Model described in Section C.6.1.1 using the C-GET SCU Behavior described in Section C.4.3.2.

An implementation which conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCU, which generates retrievals using the C-GET operation, shall state in its Conformance Statement the Storage Service Class SOP Classes under which it shall support the C-STORE sub-operations generated by the C-GET.

C.6.1.2.2 SCP Conformance

C.6.1.2.2.1 C-FIND SCP Conformance

An implementation which conforms to one of the SOP Classes of the Patient Root SOP Class Group shall support queries against the Query/Retrieve Information Model described in Section C.6.1.1 using the C-FIND SCP Behavior described in Section C.4.1.3.

An implementation which conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCP shall state in its Conformance Statement whether it supports Optional Keys. If it supports Optional Keys, then it shall list the Optional Keys which it supports.

An implementation which conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCP shall state in its Conformance Statement whether it supports Relational-queries. If it supports Relational-queries, then it shall also support extended negotiation.

C.6.1.2.2.2 C-MOVE SCP Conformance

An implementation which conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCP shall support transfers against the Query/Retrieve Information Model described in Section C.6.1.1 using the C-MOVE SCP Behavior described in Section C.4.2.3.

An implementation which conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCP, which generates transfers using the C-MOVE operation shall state in its

Conformance Statement the Storage Service Class SOP Classes under which it shall support the C-STORE sub-operations generated by the C-MOVE.

C.6.1.2.2.3 C-GET SCP Conformance

An implementation which conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCP shall support retrievals against the Query/Retrieve Information Model described in Section C.6.1.1 using the C-GET SCP Behavior described in Section C.4.3.3.

An implementation which conforms to one of the SOP Classes of the Patient Root SOP Class Group as an SCP, which generates retrievals using the C-GET operation, shall state in its Conformance Statement the Storage Service Class SOP Classes under which it shall support the C-STORE sub-operations generated by the C-GET.

C.6.1.3 SOP Classes

The SOP Classes in the Patient Root Query SOP Class Group of the Query/Retrieve Service Class identify the Patient Root Query/Retrieve Information Model, and the DIMSE-C operations supported. The following Standard SOP Classes are identified:

SOP Class Name	SOP Class UID
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
Patient Root Query/Retrieve Information Model - GET	1.2.840.10008.5.1.4.1.2.1.3

C.6.2 Study Root SOP Class Group

In the Study Root Query/Retrieve Information Model, the information is arranged into three levels which correspond to one of the following three values in element (0008,0052):

Query/Retrieve Level	Value in (0008,0052)
Study Information	STUDY
Series Information	SERIES
<u>Composite object instance Image</u> Information	IMAGE

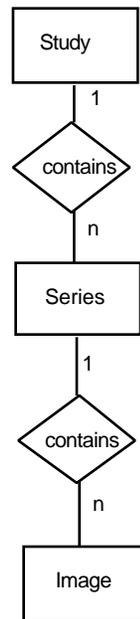
Note: The use of the word "Images" rather than "composite object instances" is historical to allow backward compatibility with previous versions of the standard. It should not be taken to mean that composite object instances of other than image type are not included at the level indicated by the value IMAGE.

C.6.2.1 Study Root Query/Retrieve Information Model

C.6.2.1.1 E/R Model

The Study Root Query/Retrieve Information Model may be represented by the entity relationship diagram shown in Figure C.6-2.

Item: Change Image to Composite Object Instance in Figure C.6-2.



**Figure C.6-2
STUDY ROOT QUERY/RETRIEVE INFORMATION MODEL E/R DIAGRAM**

C.6.2.1.2 Study level

Table C.6-5 defines the keys at the Study Information level of the Study Root Query/Retrieve Information Model.

- Notes:
1. A description of the attributes of this Information Model is contained in Section C.3.
 2. Although the Patient ID may not be globally unique, the Study Instance UID is globally unique ensuring that no two studies may be mis-identified.

**Table C.6-5
STUDY LEVEL KEYS FOR THE STUDY
ROOT QUERY/RETRIEVE INFORMATION MODEL**

Description	Tag	Type
Study Date	(0008,0020)	R
Study Time	(0008,0030)	R
Accession Number	(0008,0050)	R

Patient's Name	(0010,0010)	R
Patient ID	(0010,0020)	R
Study ID	(0020,0010)	R
Study Instance UID	(0020,000D)	U
Referring Physician's Name	(0008,0090)	O
Study Description	(0008,1030)	O
Procedure Code Sequence	(0008,1032)	O
>Code Value	(0008,0100)	O
>Coding Scheme Designator	(0008,0102)	O
>Code Meaning	(0008,0104)	O
Name of Physician(s) Reading Study	(0008,1060)	O
Admitting Diagnoses Description	(0008,1080)	O
Referenced Study Sequence	(0008,1110)	O
>Referenced SOP Class UID	(0008,1150)	O
>Referenced SOP Instance UID	(0008,1155)	O
Referenced Patient Sequence	(0008,1120)	O
>Referenced SOP Class UID	(0008,1150)	O
Referenced SOP Instance UID	(0008,1155)	O
Patient's Birth Date	(0010,0030)	O
Patient's Birth Time	(0010,0032)	O
Patient's Sex	(0010,0040)	O
Other Patient IDs	(0010,1000)	O
Other Patient Names	(0010,1001)	O
Patient's Age	(0010,1010)	O
Patient's Size	(0010,1020)	O
Patient's Weight	(0010,1030)	O
Ethnic Group	(0010,2160)	O
Occupation	(0010,2180)	O
Additional Patient History	(0010,21B0)	O
Patient Comments	(0010,4000)	O
Other Study Numbers	(0020,1070)	O
Number of Patient Related Studies	(0020,1200)	O
Number of Patient Related Series	(0020,1202)	O
Number of Patient Related Instances+images	(0020,1204)	O
Number of Study Related Series	(0020,1206)	O

Number of Study Related <u>InstancesImages</u>	(0020,1208)	O
Interpretation Author	(4008,010C)	O

Note: The use of the word “Images” rather than “composite object instances” is historical, and should not be taken to mean that composite object instances of other than image type are not included in the number.

C.6.2.1.3 Series Level

Attributes for the Series Level of the Study Root Query/Retrieve Information Model are the same as the Attributes for the Series Level of the Patient Root Query/Retrieve Information Model described in Section C.6.1.1.4.

C.6.2.1.4 ImageComposite object instance Level

Attributes for the ImageComposite object instance Level of the Study Root Query/Retrieve Information Model are the same as the Attributes for the ImageComposite object instance Level of the Patient Root Query/Retrieve Information Model described in Section C.6.1.1.5.

C.6.2.1.5 Scope of The GET and MOVE Commands and Sub-Operations

A C-MOVE or C-GET request may be performed to any level of the Query/Retrieve Model. However, the transfer of Stored SOP Instances shall always take place at the ImageComposite object instance level. A C-MOVE or C-GET where the Query/Retrieve level is the:

- STUDY level indicates that all imagescomposite object instances related to a Study shall be transferred
- SERIES level indicates that all imagescomposite object instances related to a Series shall be transferred
- IMAGE level indicates that selected individual imagescomposite object instances shall be transferred

C.6.2.2 Conformance Requirements

An implementation may conform to one of the SOP Classes of the Study Hierarchy SOP Class Group as an SCU, SCP or both. The Conformance Statement shall be in the format defined in PS 3.2.

C.6.2.2.1 SCU Conformance

C.6.2.2.1.1 C-FIND SCU Conformance

An implementation which conforms to one of the SOP Classes of the Study Root SOP Class Group shall support queries against the Query/Retrieve Information Model described in Section C.6.2.1 using the C-FIND SCU behavior described in Section C.4.1.2.

An implementation which conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCU shall state in its Conformance Statement whether it supports Optional Keys. If it supports Optional Keys, then it shall list the Optional Keys which it supports.

An implementation which conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCU shall be capable of generating queries using the Hierarchical Search. It shall not generate queries using Relational-queries unless the Relational-queries option has been successfully negotiated.

An implementation which conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCU shall state in its Conformance Statement whether it may generate Relational-queries. If it supports Relational Search, then it shall also support extended negotiation.

C.6.2.2.1.2 C-MOVE SCU Conformance

An implementation which conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCU shall support transfers against the Query/Retrieve Information Model described in Section C.6.2.1 using the C-MOVE SCU Behavior described in Section C.4.2.2.

C.6.2.2.1.3 C-GET SCU Conformance

An implementation which conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCU shall support retrievals against the Query/Retrieve Information Model described in Section C.6.2.1 using the C-GET SCU Behavior described in Section C.4.3.2.

An implementation which conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCU, which generates retrievals using the C-GET operation shall state in its Conformance Statement the Storage Service Class SOP Classes under which it shall support the C-STORE sub-operations generated by the C-GET.

C.6.2.2.2 SCP Conformance

C.6.2.2.2.1 C-FIND SCP Conformance

An implementation which conforms to one of the SOP Classes of the Study Root SOP Class Group shall support queries against the Query/Retrieve Information Model described in Section C.6.2.1 using the C-FIND SCP behavior described in Section C.4.1.3.

An implementation which conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCP shall state in its Conformance Statement whether it supports Optional Keys. If it supports Optional Keys, then it shall list the Optional Keys which it supports.

An implementation which conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCP shall state in its Conformance Statement whether it supports Relational Search. If it supports Relational Search, then it shall also support extended negotiation.

C.6.2.2.2.2 C-MOVE SCP Conformance

An implementation which conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCP shall support transfers against the Query/Retrieve Information Model described in Section C.6.2.1 using the C-MOVE SCP Behavior described in Section C.4.2.3.

An implementation which conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCP, which generates transfers using the C-MOVE operation shall state in its Conformance Statement the Storage Service Class SOP Classes under which it shall support the C-STORE sub-operations generated by the C-MOVE.

C.6.2.2.2.3 C-GET SCP Conformance

An implementation which conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCP shall support retrievals against the Query/Retrieve Information Model described in Section C.6.2.1 using the C-GET SCP Behavior described in Section C.4.3.3.

An implementation which conforms to one of the SOP Classes of the Study Root SOP Class Group as an SCP, which generates retrievals using the C-GET operation shall state in its Conformance Statement the Storage Service Class SOP Classes under which it shall support the C-STORE sub-operations generated by the C-GET.

C.6.2.3 SOP Classes

The SOP Classes in the Study Root SOP Class Group of the Query/Retrieve Service Class identify the Study Root Query/Retrieve Information Model, and the DIMSE-C operations supported. The following Standard SOP Classes are identified:

SOP Class Name	SOP Class UID
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
Study Root Query/Retrieve Information Model - GET	1.2.840.10008.5.1.4.1.2.2.3

C.6.3 Patient/Study Only SOP Class Group

In the Patient/Study Only Query/Retrieve Information Model the information is arranged into two levels, which correspond to one of the following values in element (0008,0052):

Query/retrieve level	Value in (0008,0052)
Patient Information	PATIENT
Study Information	STUDY

C.6.3.1 Patient/Study Only Query/Retrieve Information Model

C.6.3.1.1 E/R model

The Patient/Study Only Query/Retrieve Information Model is represented by the entity relationship diagram shown in Figure C.6-3.

C.6.3.1.2 Patient level

Attributes for the Patient Level of the Patient/Study Only Query/Retrieve Information Model are the same as the Attributes for the Patient Level of the Patient Root Query/Retrieve Information Model described in Section C.6.1.1.2.

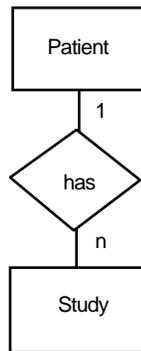


Figure C.6-3
PATIENT/STUDY ONLY QUERY/RETRIEVE INFORMATION MODEL E/R
DIAGRAM

C.6.3.1.3 Study Level

Attributes for the Study Level of the Patient/Study Only Query/Retrieve Information Model are the same as the Attributes for the Study Level of the Patient Root Query/Retrieve Information Model described in Section C.6.1.1.3.

C.6.3.1.4 Scope of GET and MOVE Commands and Sub-Operations

A C-MOVE or C-GET request may be performed to any level of the Query/Retrieve Model. However, the transfer of Stored SOP Instances shall always take place at the [ImageComposite object instance](#) level. A C-MOVE or C-GET where the Query/Retrieve level is the:

- PATIENT level indicates that all [imagescomposite object instances](#) related to a Patient shall be transferred.
- STUDY level indicates that all [imagescomposite object instances](#) related to a Study shall be transferred.

C.6.3.2 Conformance Requirements

An implementation may conform to one of the SOP Classes of the Patient/Study Only SOP Class Group as an SCU, SCP or both. The Conformance Statement shall be in the format defined in PS 3.2.

C.6.3.2.1 SCU Conformance

C.6.3.2.1.1 C-FIND SCU Conformance

An implementation which conforms to one of the SOP Classes of the Patient/Study Only SOP Class Group shall support queries against the Query/Retrieve Information Model described in Section C.6.3.1 using the C-FIND SCU behavior described in Section C.4.1.2.

An implementation which conforms to one of the SOP Classes of the Patient/Study Only SOP Class Group as an SCU shall state in its Conformance Statement whether it supports Optional Keys. If it supports Optional Keys, then it shall list the Optional Keys which are supported.

An implementation which conforms to one of the SOP Classes of the Patient/Study Only SOP Class Group as an SCU shall be capable of generating queries using the Hierarchical Search. It

shall not generate queries using Relational Search unless the Relation Option has been successfully negotiated.

An implementation which conforms to one of the SOP Classes of the Patient/Study Only SOP Class Group as an SCU shall state in its Conformance Statement whether it may generate Relational Search queries. If it supports Relational Search, then it shall also support extended negotiation.

C.6.3.2.1.2 C-MOVE SCU Conformance

An implementation which conforms to one of the SOP Classes of the Patient/Study Only SOP Class Group as an SCU shall support transfers against the Query/Retrieve Information Model described in Section C.6.3.1 using the C-MOVE SCU Behavior described in Section C.4.2.2.

C.6.3.2.1.3 C-GET SCU Conformance

An implementation which conforms to one of the SOP Classes of the Patient/Study Only SOP Class Group as an SCU shall support retrievals against the Query/Retrieve Information Model described in Section C.6.3.1 using the C-GET SCU Behavior described in Section C.4.3.2.

An implementation which conforms to one of the SOP Classes of the Patient/Study Only SOP Class Group as an SCU, which generates retrievals using the C-GET operation shall state in its Conformance Statement the Storage Service Class SOP Classes under which it shall support the C-STORE sub-operations generated by the C-GET.

C.6.3.2.2 SCP Conformance

C.6.3.2.2.1 C-FIND SCP Conformance

An implementation which conforms to one of the SOP Classes of the Patient/Study Only SOP Class Group shall support queries against the Query/Retrieve Information Model described in Section C.6.3.1 using the C-FIND Behavior described in Section C.4.1.3.

An implementation which conforms to one of the SOP Classes of the Patient/Study Only SOP Class Group as an SCP shall state in its Conformance Statement whether it supports Optional Keys. If it supports Optional Keys, then it shall list the Optional Keys which are supported.

An implementation which conforms to one of the SOP Classes of the Patient/Study Only SOP Class Group as an SCP shall state in its Conformance Statement whether it supports Relational Search. If it supports Relational Search, then it shall also support extended negotiation.

C.6.3.2.2.2 C-MOVE SCP Conformance

An implementation which conforms to one of the SOP Classes of the Patient/Study Only SOP Class Group as an SCP shall support transfers against the Query/Retrieve Information Model described in Section C.6.3.1 using the C-MOVE SCP Behavior described in Section C.4.2.3.

An implementation which conforms to one of the SOP Classes of the Patient/Study Only SOP Class Group as an SCP, which generates transfers using the C-MOVE operation shall state in its Conformance Statement the Storage Service Class SOP Classes under which it shall support the C-STORE sub-operations generated by the C-MOVE.

C.6.3.2.2.3 C-GET SCP Conformance

An implementation which conforms to one of the SOP Classes of the Patient/Study Only SOP Class Group as an SCP shall support retrievals against the Query/Retrieve Information Model described in Section C.6.3.1 using the C-GET SCP Behavior described in Section C.4.3.3.

An implementation which conforms to one of the SOP Classes of the Patient/Study Only SOP Class Group as an SCP, which generates retrievals using the C-GET operation shall state in its

Conformance Statement the Storage Service Class SOP Classes under which it shall support the C-STORE sub-operations generated by the C-GET.

C.6.3.3 SOP CLASSES

The SOP Classes in the Patient/Study Only SOP Class Group of the Query/Retrieve Service Class identify the Patient/Study Only Query/Retrieve Information Model and the DIMSE-C operations supported. The following Standard SOP Classes are identified:

SOP Class Name	SOP Class UID
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
Patient/Study Only Query/Retrieve Information Model - GET	1.2.840.10008.5.1.4.1.2.3. 3

Item: Amend PS 3.6 Section 6 Registry of DICOM data elements:

(0020,0013)	Instance Image Number	IS	1
(0020,1204)	Number of Patient Related Instances Images	IS	1
(0020,1208)	Number of Study Related Instances Images	IS	1
(0020,1209)	Number of Series Related Instances Images	IS	1