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Correction Number CP-2282
Log Summary: Add Note on handling C-CANCEL-FIND request in Query/Retrieve Service Class
Name of Standard PS3.4 2023d
Rationale for Correction: Currently, the standard text is a bit inconsistent regarding the handling of the C-CANCEL-FIND request that is used for various Service Classes. For Basic Worklist Management, Relevant Patient Information Query and Substance Administration Query there is a Note in the respective Service Definition that "The SCU needs to be prepared to receive C-FIND responses sent by the SCP until the SCP finally processed the C-CANCEL-FIND request." This Note is missing for the Query/Retrieve Service Class and other sections. Since this is only an explanatory note that does not change existing behavior, and this note might be helpful for some readers, it is proposed to add the same note as for the other Service Classes also for Query/Retrieve. Editor shall change all instances in PS3.4 of C-FIND/GET/MOVE-CANCEL to C-CANCEL-FIND/GET/MOVE to match PS3.7.
Correction Wording:

Change PS3.4 Section C.1.4

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 PS3.7.

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 that 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 Composite 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 PS3.7.

- 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.

  Note

  The SCU needs to be prepared to receive C-FIND responses sent by the SCP until the SCP finally processed the C-CANCEL-FIND request.

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 role of the Query/Retrieve SOP Class and the SCU role of the Storage SOP Class may be performed by different applications that may or may not reside on the same system. Initiation mechanism of C-STORE sub-operations is outside of the scope of DICOM Standard.

  Note

  This does not imply that they use the same AE Title. See Section C.6.1.2.2.2 and Section C.6.2.2.2.2 for the requirements to the C-MOVE SCP conformance.

- 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.

Amend PS3.4 Section C.4.1.2 and C.1.4.3

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 that 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 that 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.

  Note

  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**-FIND** 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**-FIND** was successful.

  Note

  The SCU needs to be prepared to receive C-FIND responses sent by the SCP until the SCP finally processed the C-CANCEL-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 that 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 that contains a status of Success. A status of Success shall indicate that a response has been sent for each match known to the SCP.

  Note

  When there are no matches, then no responses with a status of Pending are sent, only a single response with a status of Success.

- 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-**FIND** indication before it has completed the processing of the matches it shall interrupt the matching process and return a status of Canceled.

- If the SCP manages images in multiple alternate encodings (see Section C.6.1.1.5.1), only one of the alternate encodings of an image shall be included in the set of matches for a C-FIND request at the Instance level.

  Note

  For query of images with alternate encodings, the SCP may select the appropriately encoded Instance for the request response based on identity of the SCU or other factors.

For reference see Sections from PS3.4 Chapter K

K Basic Worklist Management Service (Normative)

[...]

K.1.4 Service Definition

Two peer DICOM AEs implement a SOP Class of the Basic Worklist Service Class with one serving in the SCU role and one serving in the SCP role. SOP Classes of the Basic Worklist Service Class are implemented using the DIMSE-C C-FIND service as defined in PS3.7.

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

The following description of the DIMSE-C C-FIND service provides a brief overview of the SCU/SCP semantics.

A C-FIND service conveys the following semantics:

- The SCU requests that the SCP perform a match for the Matching Keys and return values for the Return Keys that have been specified in the Identifier of the request, against the information that the SCP possesses, to the objects specified in the SOP Class.

  Note

  In this Annex, the term "Identifier" refers to the Identifier service parameter of the C-FIND service as defined in PS3.7.

- The SCP generates a C-FIND response for each match with an Identifier containing the values of all Matching Key Attributes and all known Return Key Attributes requested. Each response contains one worklist item. 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-CANCEL-FIND request at any time during the processing of the C-FIND service. The SCP will interrupt all matching and return a status of Canceled.

  Note

  The SCU needs to be prepared to receive C-FIND responses sent by the SCP until the SCP finally processed the C-CANCEL-FIND request.

[...]

K.4.1.2 C-FIND SCU Behavior

All C-FIND SCUs shall be capable of generating query requests that meet the requirements of the "Worklist" Search Method (see Section K.4.1.3.1).

Required Keys, and Optional Keys associated with the Worklist may be contained in the Identifier.

An SCU conveys the following semantics using the C-FIND requests and responses:

- The SCU requests that the SCP perform a match of all keys specified in the Identifier of the request against the information it possesses of the Worklist specified in the request.
- The SCU shall interpret Pending responses to convey the Attributes of a match of an Entity.
- The SCU shall interpret a response with a status equal to Success, Failed, Refused or Cancel 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**-FIND** request at any time during the processing of the C-FIND. The SCU shall recognize a status of Cancel to indicate that the C-~~**FIND-**~~CANCEL**-FIND** was successful.

  Note

  The SCU needs to be prepared to receive C-FIND responses sent by the SCP until the SCP finally processed the C-CANCEL-FIND request.

K.4.1.3 C-FIND SCP Behavior

All C-FIND SCPs shall be capable of processing queries that meet the requirements of the "Worklist" Search (see Section K.4.1.3.1).

An SCP conveys the following semantics using the C-FIND requests and responses:

- The SCP is requested to perform a match of all the keys specified in the Identifier of the request, against the information it possesses. Attribute matching is performed using the key values specified in the Identifier of the C-FIND request as defined in Section K.2.
- The SCP generates a C-FIND response for each match using the "Worklist" 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 that contains a status of Success. A status of Success shall indicate that a response has been sent for each match known to the SCP.

  Note

  1. No ID is contained in a response with a status of Success. For a complete definition, see PS3.7.
  2. When there are no matches, then no responses with a status of Pending are sent, only a single response with a status of Success.

- 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**-FIND** indication before it has completed the processing of the matches it shall interrupt the matching process and return a status of Cancel.

Change PS3.4 Section Q.4.2 (fix typo)

Q Relevant Patient Information Query Service Class (Normative)

[...]

Q.4.2 Service Definition

Two peer DICOM AEs implement this Relevant Patient Information Query Service Class with one serving in the SCU role and one serving in the SCP role. The SOP Class is implemented using the DIMSE-C C-FIND service as defined in PS3.7.

Only a baseline behavior of the DIMSE-C C-FIND is used in this Service Class.

A C-FIND service conveys the following semantics:

- The SCU requests that the SCP perform a match for the Matching Keys and return values for the Return Keys that have been specified in the Identifier of the request, against the Relevant Patient Information that the SCP possesses.

  Note

  In this Annex, the term "Identifier" refers to the Identifier service parameter of the C-FIND service as defined in PS3.7.

- The SCP generates a C-FIND response for at most one match with an Identifier containing the values of all Matching Key Attributes and all known Return Key Attributes requested. The response contains one relevant patient information instance in the form that matches the Template that was requested. This response shall contain a status of Pending.

- When the process of matching is complete, with zero or one match, a C-FIND response is sent with a status of Success and no Identifier.

- A Failed response to a C-FIND request indicates that the SCP is unable to process the request. This shall be used to indicate that the requested template is not supported by the SCP, or that more than one match was found by the SCP.

- The SCU may cancel the C-FIND service by issuing a C-~~FIND-~~CANCEL**-FIND** request at any time during the processing of the C-FIND service. The SCP will interrupt all matching and return a status of Canceled.

  Note

  The SCU needs to be prepared to receive C-FIND responses sent by the SCP until the SCP finally processe~~d~~**s** the C-~~FIND-~~CANCEL**-FIND** request.

For reference see Sections from PS3.4 Chapter V

V Substance Administration Query Service Class (Normative)

[...]

V.1.4 Service Definition

Two peer DICOM AEs implement a SOP Class of the Substance Administration Query Service Class with one serving in the SCU role and one serving in the SCP role. SOP Classes of the Substance Administration Query Service Class are implemented using the DIMSE-C C-FIND service as defined in PS3.7.

Only a baseline behavior of the DIMSE-C C-FIND is used in the Service Class. Extended Negotiation is not used.

The following description of the DIMSE-C C-FIND service provides a brief overview of the SCU/SCP semantics.

A C-FIND service conveys the following semantics:

- The SCU requests that the SCP perform a match for the Matching Keys and return values for the Return Keys that have been specified in the Identifier of the request, against the information that the SCP possesses relating to the Information Model specified in the SOP Class.

  Note

  In this Annex, the term "Identifier" refers to the Identifier service parameter of the C-FIND service as defined in PS3.7.

- The SCP generates at most one C-FIND response for a match with an Identifier containing the values of all Matching Key Attributes and all known Return Key Attributes requested. This response shall contain a status of Pending.
- When the process of matching is complete, with zero or one match, a C-FIND response is sent with a status of Success and no Identifier.
- A Failure 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-CANCEL-FIND request at any time during the processing of the C-FIND service. The SCP will interrupt all matching and return a status of Canceled.

  Note

  The SCU needs to be prepared to receive C-FIND responses sent by the SCP until the SCP finally processed the C-CANCEL-FIND request.

[…]

V.4.1.2 C-FIND SCU Behavior

All C-FIND SCUs shall be capable of generating query requests that meet the requirements of the Query Search Method (see Section V.4.1.3.1).

Required Keys and Optional Keys associated with the Query may be contained in the Identifier.

An SCU conveys the following semantics using the C-FIND requests and responses:

- The SCU requests that the SCP perform a match of all keys specified in the Identifier of the request against the information it possesses of the Query specified in the request.
- The SCU shall interpret Pending responses to convey the Attributes of a match of an item.
- The SCU shall interpret a response with a status equal to Success, Failure, or Cancel to convey the end of Pending responses.
- The SCU shall interpret a Failure 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**-FIND** request at any time during the processing of the C-FIND. The SCU shall recognize a status of Cancel to indicate that the C-~~FIND-~~CANCEL**-FIND** was successful.

  Note

  The SCU needs to be prepared to receive C-FIND responses sent by the SCP until the SCP finally processed the C-CANCEL-FIND request.

V.4.1.3 C-FIND SCP Behavior

All C-FIND SCPs shall be capable of processing queries that meet the requirements of the Query Search (see Section V.4.1.3.1).

An SCP conveys the following semantics using the C-FIND requests and responses:

- The SCP is requested to perform a match of all the keys specified in the Identifier of the request, against the information it possesses. Attribute matching is performed using the key values specified in the Identifier of the C-FIND request as defined in Section V.2.
- The SCP generates at most one C-FIND response for a match using the "Query" Search method. Such a response shall contain an Identifier whose Attributes contain values from the match. The response shall contain a status of Pending.
- When matching is complete and any match has been sent, the SCP generates a C-FIND response that contains a status of Success. A status of Success shall indicate that a response has been sent for any match known to the SCP.

  Note

  1. No Identifier is contained in a response with a status of Success. For a complete definition, see PS3.7.
  2. When there are no matches, then no responses with a status of Pending are sent, only a single response with a status of Success.
- The SCP shall generate a response with a status of Failure if it is unable to process the request. A Failure response shall contain no Identifier.
- If the SCP receives a C-~~FIND-~~CANCEL**-FIND** indication before it has completed the processing of the matches it shall interrupt the matching process and return a status of Cancel.

Change PS3.4 Section CC.2.8:

CC.2.8.2 Service Class User Behavior

All C-FIND SCUs shall be capable of generating query requests that meet the requirements of the "Worklist" Search Method (see Section CC.2.8.3.1).

Required Keys and Optional Keys, identified in Table CC.2.5-3, associated with the Query may be contained in the Identifier.

An SCU conveys the following semantics using the C-FIND requests and responses:

- The SCU requests that the SCP perform a match of all keys specified in the Identifier of the request against the information it possesses of the Query specified in the request.
- The SCU shall interpret Pending responses to convey the Attributes of a match of an item.
- The SCU shall interpret a response with a status equal to Success, Failure, or Cancel to convey the end of Pending responses.
- The SCU shall interpret a Failure 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 Cancel to indicate that the C-FIND-CANCEL was successful.

Note

The SCU needs to be prepared to receive C-FIND responses sent by the SCP until the SCP finally processed the C-CANCEL-FIND request.

CC.2.8.3 Service Class Provider Behavior

All C-FIND SCPs shall be capable of processing queries that meet the requirements of the "Worklist" Search (see Section CC.2.8.3.1). This does not imply that an SCP that supports the UPS Watch SOP Class or the UPS Query SOP Class must also be an SCP of the UPS Pull SOP Class.

The SCP shall support Attribute matching as described in Section C.2.2.2.

An SCP conveys the following semantics using the C-FIND requests and responses:

- The SCP is requested to perform a match of all the keys specified in the Identifier of the request, against the information it possesses. Attribute matching is performed using the key values specified in the Identifier of the C-FIND request as defined in Table CC.2.5-3.
- The SCP generates a C-FIND response for each match using the "Worklist" 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 that contains a status of Success. A status of Success shall indicate that a response has been sent for each match known to the SCP.

  Note

  1. No Identifier is contained in a response with a status of Success. For a complete definition, see PS3.7.
  2. When there are no matches, then no responses with a status of Pending are sent, only a single response with a status of Success.

- The SCP shall generate a response with a status of Failure if it is unable to process the request. A Failure 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 Cancel.

Bi-directional Authentication of machines/users/applications is possible at association time (see PS3.7 and PS3.15). PS3.7 provides a "Refused: Refused: Not authorized" error code. Further requiring or documenting authentication and/or authorization features from the SCU or SCP is beyond the scope of this SOP Class.