

MINUTES

MEETING NAME 09-WG33: WG-33 Data Archive and Management

MEETING PLACE/DIAL IN

DATE & TIME Wednesday, March 17, 2021 | 11:00 am – 12:30 pm US ET

PRESIDING OFFICERS Matthew Bishop, UnityPoint Health
 Keith Eklund, Healthcare Tech Solutions

<u>VOTING MEMBERS PRESENT</u>	AAPM	Bevins, Nicholas
	Argentix Informatix	Silver, Elliot
	DesAcc EMEA	King, Graham
	GE Healthcare	Nichols, Steven
	Grafimedia	Georgiadis, Pantelis
	Healthcare Tech Solutions	Eklund, Keith
	Laitek, Inc.	Brown, Barry
	Laitek, Inc.	Solomon, Harry
	Society for Imaging Informatics In Medicine	Bishop, Matthew
	Society for Imaging Informatics In Medicine	Carey, Cheryl

OTHERS Mega Informatica Ltd Fauquex, Jacques

<u>VOTING MEMBERS ABSENT</u>	ACR	Maldonado, Josh
	Ambra Health	Ostrow, Daniel
	Canon Medical Research USA	O'Donnell, Kevin
	Canon/Vital Images	Dawson, Tim
	Canon/Vital Images	Whitby, Jonathan
	Change Healthcare	Ho, Kinson

European Society of Radiology	Mildenberger, Peter
GE Healthcare	Numan, Jouke
Laitek, Inc.	Costea-Barluti, Razvan
Laitek, Inc.	Sluis, Douglas
Mach7 Technologies	Ulanov, Alexey
Mayo Clinic Rochester	Persons, Kenneth
PixelMed Publishing	Clunie, David
Society for Imaging Informatics In Medicine	Henson, Kyle
Varian Medical Systems, Inc.	Schwere, Thomas

DICOM Anna Zawacki, SIIM
SECRETARIAT

1 CALL TO ORDER AND REVIEW OF ANTI-TRUST RULES AND DICOM PATENT POLICY (Co-Chairs, Secretariat)

The meeting was called to order. Guidelines for Conducting NEMA Meetings was read and attendance was recorded.

2 REVIEW AND APPROVE AGENDA (Co-Chairs)

The agenda was reviewed.

3 REVIEW MINUTES (Co-Chairs)

The minutes of the previous meeting were reviewed.

4 TOPIC ITEMS TO BE DISCUSSED (All)

In the Sup223_21 draft, we reviewed the new or revised sections:

- C.YY.1.1.4 Included Inventory Instance Sequence (p.27)
- XXXX.2.2 Scope of Inventory (p.64) – last paragraph
- XXXX.2.3.3 Content Level (p.68)
- XXXX.2.6 Producer vs. Consumer Implementation (p.69)
- XXXX.6.1 Using Referenced Inventories (p.76)
- XXXX.6.5 Multiple Application Entity Titles (p.78)
- XXXX.6.8 Study Record Reconciliation (p.80)

ftp://d9-workgrps@medical.nema.org/MEDICAL/Private/Dicom/WORKGRPS/WG33/2021/2021-03-17/Sup223_21_InventoryIODandServices.docx

ftp://d9-workgrps@medical.nema.org/MEDICAL/Private/Dicom/WORKGRPS/WG33/2021/2021-03-17/SUP223_InventoryIODandServices-20210317.pptx

Reviewed C.YY.1.1.4 Included Inventory Instance Sequence and the attributes of that – C.YY.2.3. Inventory Link Macro.

Each referenced inventory has SOP Class and Instance UID.

Retrieve AETitle or URL that can get it with Dimse or Dicomweb.

Has a stored file access mechanism which is if available through a non-Dicom protocol.

Then recursively includes itself so that each inventory instance can link to other inventory instances.

C.YY.2.3 Inventory Link Macro

790 Table C.YY.2-3 specifies the attributes that describe a referenced Inventory SOP Instance, and its referenced Inventory SOP Instances.

Table C.YY.2-3 Inventory Link Macro Attributes

Name	Tag	Type	Description
Referenced SOP Class UID	(0008,1150)	1	SOP Class UID of the SOP Instance
Referenced SOP Instance UID	(0008,1155)	1	SOP Instance UID of the SOP Instance
Retrieve AE Title	(0008,0054)	1C	AE Title from which this Inventory SOP Instance may be retrieved. Required if Inventory SOP instance is available through Inventory MOVE or Inventory GET SOP Classes
Retrieve URL	(0008,1190)	1C	Base URI of the Origin Server to retrieve this Inventory SOP Instance. Required if Inventory SOP instance is available through the Non-Patient Instance Service (see Section 12 in PS3.18)
<i>Include Table C.YY.2-2 "Stored File Access Macro"</i>			
Included Inventory Instance Sequence	(0400,06x0)	1C	Inventory SOP Instances whose content matches the Scope of Inventory, and whose content is included by reference. See Section C.YY.1.1.4 for details. Required if referenced Inventory SOP Instance use includes Inventory SOP Instances by reference.
<i>>Include Table C.YY.2-3 "Inventory Link Macro"</i>			Recursive inclusion to describe a tree of referenced SOP Instances

Read through the text associated with C.YY.1.1.4

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C.YY.1.1.4 Included Inventory Instance Sequence

For implementation specific reasons, the content of an inventory may be divided into more than one Inventory SOP Instance. The Inventory SOP Instances shall be organized as a tree of linked SOP Instances, with one SOP Instance as the root. The Included Inventory Instance Sequence (0400,06x0) specifies the links from an
475 Inventory SOP Instance to its subsidiary Instances in the tree. The Included Inventory Instance Sequence recursively includes itself, thus allowing representation of the complete tree of referenced Inventory SOP Instances.

The inclusion of an Inventory SOP Instance reference in the Included Inventory Instance Sequence means that the Items of the Inventoried Studies Sequence (0400,06x1) in that referenced SOP Instance are logically
480 included in the current SOP Instance.

Any Referenced SOP Instance UID in the tree shall only appear once.

Notes

1. The implementation reasons for splitting an inventory might include as practical limits on the maximum size of an individual SOP Instance, parallel processing across multiple separate subsystems, or reuse of historical
485 inventories. See [Section XXXX.2.3 in PS3.17](#).
2. It is the responsibility of the creator of an Inventory SOP Instance to ensure that the inventoried Studies in the referenced SOP Instances match the Scope of Inventory of the current SOP Instance.
3. These requirements apply to every Inventory SOP Instance. Thus, each Inventory SOP Instance will include in its Included Inventory Instance Sequence the complete tree of links to the subtree of which it is the root.

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No requirement that each SOP instance referenced only once in the tree.

Let's construct a case where it might be.

Say you have an archive that has inventory from 2015, that might get referenced by an inventory for the years 2010-2015, might get ref by an inventory for the years 2015-2020, and both of those might then get referenced, but then you are counting the same set of studies multiple times. Is that an issue?

If you are doing a blind count – yes, but assume you go in and enumerate all of the reference instances and not include the same content more than once.

That could be handled by general reconciliation across multiple instances.

Based on inclusion of other inventories we need to deal with the fact it could happen.

Getting back to last call's question about cycles. Don't know that you can construct a cycle, unless if you are creating multiple instances concurrently. Not even there, you'd need to include the links to the subsidiary instances of each of those instances, it will come back to itself and you'll get an infinite tree. Not possible to get a cycle and still be conformant to the requirement here.

In references to the 3 notes – match the scope of the inventory of the current instance – if you are including the 2009 inventory in the 2001 through 2010 inventory, does the scope match or is it a subset? Inventoried studies in the referenced SOP instances are within the Scope of Inventory of the current SOP instance.

Getting back to the discussion of the scope of inventory XXXX 2.2

Shall not be extended in a standard extended SOP class.

C.YY.2.1.1 Scope of Inventory Macro Attributes

C.YY.2.1.1.1 Scope of Inventory Sequence

*10 The Scope of Inventory Sequence (00gg,0Fx0) specifies attributes parameterizing the selection of Studies to be included in an inventory. Since the Scope of Inventory Sequence defines the semantics of Study selection, the attributes of this sequence shall not be extended in a Standard Extended SOP Class (see [Section 3.11 "DICOM Conformance" in PS3.2](#)).

Motivation behind preventing extension. – receiver of the inventory doesn't know how to interpret those other attributes. So, they have a choice of either rejecting it or giving back a superset saying I ignored that. No, because if you have an additional attribute there, it will limit the # of studies in the inventory. If the receiver doesn't understand that further restriction, then it thinks it has the full set of studies according to the scope of inventory, but in fact it doesn't.

Next section to look at is XXXX.2.3.3 Content Level - In the discussion about creating trees of inventories.

XXXX.2.3.3 Content Level

1505 Inventory Content Level (00gg,0Fx3) specifies the types of records included in the Inventory SOP Instance. For simplicity of implementation, the IOD allows records below the specified level to be included. For example, an inventory being produced at the Study level may include by reference an existing SOP Instance with records at the Instance level. Of course, existing SOP Instances should not be included by reference if their Content Level is higher than the level specified in the root object.

1510 It is the responsibility of the creator of the root object for a tree to ensure that when the referenced objects are at a lower Content Level than the root that all records, including those at lower levels, accurately describe the repository data. For example, if Instance level records are included in a referenced inventory object for a Study level inventory, all of the SOP Instances of the Study must be referenced.

Line 1510-1513 – re-written to:

It is the responsibility of the creator of the root object for a tree to ensure that all records, including those at lower levels, accurately describe the repository data. For example, if Instance level records are included in an inventory specified at the Study level, all of the SOP Instances of the Study must be referenced. This requires care when the referenced inventory objects are at a lower Content Level than the root.

Read through section XXXX2.6 Producer vs Consumer Implementation – approved

XXXX.2.6 Producer vs. Consumer Implementation

1550 In all interoperability design, there is a tradeoff between ease of implementation for the producer of information versus the consumer of that information. By adding constraints on the message content to which the producer must adhere, the processing requirements for the receiver might be simplified. Fewer constraints on the producer means the consumer must account for more variability in the exchanged data.

1555 In the design of the Inventory IOD, a policy was chosen to simplify the production of the SOP Instances, even at the risk of complicating the implementation of the consumer. The goal is to allow the producer of the inventory to simply report what it has, without substantial additional processing. For example, in a repository that might distribute the SOP Instances of a study across multiple subsystems, each subsystem can report on the SOP Instances that it knows about, and there is no requirement for the producer of the combined inventory to consolidate or reconcile those different records. For the migration and consolidation use case (see [Section XXXX.4.1](#)), the consumer of the inventory will typically need to perform substantial reconciliation activities, which do not need to be replicated in the producer.

1565 This policy can also be seen in the approach to repository data that has been removed from operational use (deprecated, soft-deleted, or hidden). As there has been not an established DICOM standard approach to this type of data, storage system implementations take a variety of approaches. The Inventory IOD does not attempt to introduce a single way of managing such data. Rather, the system can simply report a removal status at the level(s) at which it manages that status, be it study, series, or instance, with an optional reason code if it has one. If the removal was due to a directive in a Key Object Selection SOP Instance, e.g., in accordance with the [IH-11720](#) file, the Inventory IOD also has a field to report on the presence of a Key Object in the repository. If the KOA object, the system simply reports whether it is stored in the repository.

-33 Bi-weekly calls 20210317-111720-Meeting Rec

Read through section XXXX.6.5 Multiple Application Entity Titles

XXXX.6.5 Multiple Application Entity Titles

A repository may have multiple Application Entities, with distinct DICOM protocol addresses (AE Titles). One common use is a PACS that has multiple separate archive subsystems, each of which supports DICOM protocol services (for example, as shown in Figure XXXX.2-4).

- 1935 Another use for multiple AE Titles may be to provide separate views of the repository, and hence separate inventory content, for restricted subsets of the stored data. For example, the repository may include data that has patient consent for research use and data without such consent. This distinction does not have an associated key attribute for the Scope of Inventory. The system may therefore present one AE Title for operations on the entire repository, and a different AE Title for operations only on the research qualified data.
- 1940 This approach could be used for any other subsets of the repository that the system manages, but for which there is no standard key attribute for the Scope of Inventory.

A similar use of multiple AE Titles may provide separate views of the repository to different sets of users. An example of this is described in the next section for views of the Patient ID.

What do we do in terms of security? Related to scope of inventory, i.e. I cannot tell you about this VIP patient. That would be a restriction that AE imposes. If you can't give me an inventory of those records, then those records don't exist through what's visible through that AE title, but it may be visible to somebody else through another mechanism. Should not be through the same AE Title. But if we are applying filtering based on user's identity, what gets shown may vary.

Will list scope of inventory "no VIP records," or "not visibly by Dr.x" as an open issue - potential challenges if we do inventories for research vs for migration.

next section read through – XXXX.6.8 Study Record Reconciliation – made minor edits

2005 **XXXX.6.8 Study Record Reconciliation**

Within the tree of linked Inventory SOP Instances, a given Study may be referenced multiple times among the Inventoried Studies Sequence Items. The Items may have different content, but each Item is a complete record of the contents of the Study as known by the creator of that Item.

- 2010 Differences in content may occur due to changes to the metadata or content (SOP Instances) of the Study during the production of the inventory, or due to different Series of a Study being stored on different media or storage subsystems, or for other reasons. The application using an Inventory may need to reconcile such multiple occurrences.

- 2015 DICOM is not prescriptive regarding methods of reconciliation, but the Inventory IOD does provide attributes that can assist in the process, in particular the various timestamps associated with the study content and the process of inventory creation, as shown in Table XXXX.6-2. These timestamp attributes might be used to establish a timeline of changes to study content and metadata, and of record extraction for inclusion in the inventory. For

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- 2020 example, a study record may differ from a record with an earlier Item Inventory DateTime only with the presence of an additional Series whose Series Date is after the prior Item Inventory DateTime. The later record might reasonably be considered to be a more current replacement. However, two Study records might have entirely different sets of Series, and in that case simply choosing one record based on timestamp is probably not correct; the Study records would have to be further evaluated for the underlying reason for the difference, and the records merged in some way.

2025 In general, a major factor in reconciling diverse records is a full understanding of how the storage system manages the repository, and which timestamps and change auditing data it actually records. The reconciliation process will typically need to account for such system design features, which are not conveyed in Inventory SOP Instance attributes or in DICOM Conformance Statements.

Note that a task for study record merge is reconciliation of access paths to stored SOP Instances of the study.
2030 This may present challenges if the study records link to different access methods, target folders, or container files. In the case of conflicting information, it may be necessary to disregard Study or Series level access specifications, and use only the access links to each SOP Instance of the study as recorded in the Instance level record.

Read through XXXX.6.8.1 Example – Deleted Study – make a few minor wording changes

XXXX.6.8.1 Example – Deleted Study

2035 An example will show the dependency on system design for study record reconciliation. Consider two inventories, a baseline made at time A and an increment made at time B, and during the intervening time a study is deleted (perhaps because it was assigned to the wrong patient). The migration source storage system might have taken one of several approaches, with the associated result in the time B inventory (this is not an exhaustive list):

- 2040 1) It marks the study as deprecated, but otherwise retains the data – the time B incremental inventory includes the entire study record with the Removed from Operational Use attribute value Y.
- 2) It deletes the references to the Series and SOP Instances of the study in the database, retains the study level database record, but does not support a deprecation flag – the time B incremental inventory includes a study item, but no series items.
- 2045 3) It deletes all study information – the time B incremental inventory simply does not record the study.

In case 1), the client application knows exactly what has happened, and can make a determination whether to move the deprecated study data to the migration target repository. That determination would be based, among other factors, on the data retention policies of the organization, and on the technical approach the target system takes to identifying and managing deleted studies.

Looked through Open Issues; added two new items:

The Scope of Inventory is currently limited to only the specified key (scoping) attributes; additional attributes are not permitted (e.g., in a Standard Extended conformance). This is unlike C-FIND, which has a general mechanism for search keys. Is a general key attribute matching capability needed?

+ Security Permissions Restriction on Content of Inventory

Reviewed all slides that will be presented to WG-06.
Slight change in the picture of Inventory IOD structure

5 OLD BUSINESS

6 NEW BUSINESS

7 DATE AND TIME OF NEXT MEETINGS (Secretariat)

- Continue T-con meetings bi-weekly
- Next call is March 31, 2021 between 11:00 am and 12:30 pm ET

<u>NEMALINK CODE</u>	09-WG33
<u>SUBMITTED BY</u>	Hull, Carolyn
<u>SUBMITTED ON</u>	3/31/21
<u>LEGAL APPROVAL</u>	4/7/21
<u>UPLOAD LOCATION</u>	Enter upload location.