**Xt-EHR – EHDS Imaging Study Manifest – DICOM KOS Manifest Implementation Guide**

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# Introduction

This document provides a comprehensive implementation guide for the Xt-EHR EHDS Imaging Study Manifest defined as a DICOM Key Object Selection Document (KOS) object with a Manifest Title Code.

The content requirements for the Imaging Study Manifest are defined in [eHN Guidelines Medical Imaging Studies and Reports (MIS)](https://health.ec.europa.eu/publications/ehn-guidelines-medical-imaging-studies-and-reports_en). A fit/gap analysis between the eHN manifest requirements and the DICOM Key Object Selection Document (KOS) IOD is presented. The way in which the standard DICOM Key Object Selection Document (KOS) IOD is extended to fill the identified gaps is also shown, leading to the full manifest specification in terms of the mandatory modules and, in turn, the attributes required to meet the eHN guideline requirements.

# References

|  |  |  |
| --- | --- | --- |
| **Name** | **Reference** | **Version** |
| DICOM | [Digital Imaging and Communication in Medicine](https://www.dicomstandard.org/current) | Latest |
| eHN MIS | [eHN Guidelines on Medical Imaging Studies and Reports (MIS)](https://health.ec.europa.eu/publications/ehn-guidelines-medical-imaging-studies-and-reports_en) | Release 1.1 |
| IHE-RAD | [IHE Radiology Technical Framework](https://www.ihe.net/resources/technical_frameworks/#radiology) | Latest |
| MCWG | [IHE Multi-Country Working Group on Imaging Information Sharing](https://www.ihe-europe.net/multi-country-working-group-Imaging-Information-Sharing) | Latest |

## MCWG - Multi-Country Working Group

The MCWG has defined specific recommendations on the extension of the DICOM KOS Manifest for use in both cross-border and national document sharing infrastructures - [Extensions to Imaging Study Manifest](https://www.ihe-europe.net/sites/default/files/2024-05/3-MCWG-Recommendations-KOS%20Manifest-FinalPublished-V9.pdf). These align with the eHN Guideline gaps.

These extensions are referenced throughout this DICOM KOS manifest specification.

# Requirements

## EU - eHN Guidelines on Medical Imaging Studies and Reports

The content requirements for the Imaging Study Manifest are defined in [eHN Guidelines Medical Imaging Studies and Reports (MIS)](https://health.ec.europa.eu/publications/ehn-guidelines-medical-imaging-studies-and-reports_en) – Section 4.2. “Imaging study manifest data set” which states:

The data set defines the contents of the key information about the imaging study as conveyed by the imaging study manifest data set. The imaging study manifest contains key information about the imaging study that is referenced, including the “pointers” that allow access to the series of images.

It is important to note that the metadata used in expressing the filters associated with the querying for a list of imaging studies and/or imaging reports are defined in Section 2 Article 10: Selection List and filtering Parameters. These parameters are expressed as coded values from standardized value sets to ensure a robust search for a list of relevant imaging studies. Such metadata filtering parameters are associated with imaging studies, but may not be present in the content of the imaging study manifest.

### eHN Guideline – Imaging Study Manifest Data Set

A fit/gap analysis of the eHN content requirements and the DICOM KOS ([DICOM](https://www.dicomstandard.org/current) – DICOM Part 3: Information Object Definitions – A.35.4 Key Object Selection Document IOD) specification shows that some of the required eHN content is not supported by standard DICOM KOS IOD.

The Value Type specifying the DICOM KOS attribute optionality (presence) is defined in the relevant module in the Key Object Selection Document IOD Modules section below.

Table 1 eHN - 4.2. Imaging study manifest data set, shows the eHN content requirements with the **DICOM KOS Support** column identifying the specific DICOM attribute(s) used to meet the content requirement color coded as follows:

|  |
| --- |
| **DICOM Kos Support** |
| Direct support by standard DICOM KOS IOD |
| Extension to DICOM KOS IOD. These extensions are based on the MCWG [Extensions to Imaging Study Manifest](https://www.ihe-europe.net/sites/default/files/2024-05/3-MCWG-Recommendations-KOS%20Manifest-FinalPublished-V9.pdf) recommendations. |
| MCWG extension not defined as eHN content requirement. |
| No support in DICOM KOS Manifest for eHN content requirement. |

The Value Type specifying the DICOM KOS attribute optionality (presence) is defined in the relevant module in the Key Object Selection Document IOD Modules section below.

Table 1 eHN - 4.2. Imaging study manifest data set

|  |
| --- |
| Excerpt from **eHN – 4.2. Imaging study manifest data set** |
| **Field** | **Field Description** | **DICOM KOS Support** |
| B.1 Imaging study Manifest Dataset |
| B.1.1 | Study instance UID | Globally unique identifier of the study. If one or more series elements are present in the Imaging Study, then they should, share the same DICOM Study UID identifier. This element is relevant for the interactive retrieve of all images of an available studies. | Study Instance UID | (0020,000D) |
| B.1.2 | Description | The Imaging Manager description of the study. Institution-generated description of the Study performed. This element is relevant for the interactive selection of the available studies, preferably in English. | Study Description | (0008,1030)  |
| B.1.3 | Study custodian | Organization name, address, and contact information. | Institution NameMCWG extension contains both the **Institution (Organization) name and its unique national identifier**. Such an identifier is a reliable and a stable way to identify the source institution. | (0008,0080) |
| **Organization address** and **contact information** is not supported. Rationale: Current contact information is unlikely to be up to date if defined at the time of the publication of an imaging study manifest. |  |
| B.1.4 List of Referenced Series |
| B.1.4.1 | Series Description | For each imaging Study Series includes descriptive information about the series (e.g. phase). This element is relevant for the interactive selection of series within an available studies. | Series DescriptionMCWG extension. | (0008,103E)   |
| B.1.4.2 | Series Unique Identifier | A globally Unique ID for the series. All images belonging to such a series will bear this element. This element is relevant for the interactive selection of a specific series within an available study. | Series Instance UID​ | (0020,000E)  |
| B.1.4.3 | Modality | The acquisition modality (acquire on a patient) or technical modality (computer generated instance such as a presentation state) associated with the images of the series. | ModalityMCWG extension. | (0008,0060)  |
| B.1.4.4 | Radiation dose information | Kerma area product (KAP), Total KAP, Kerma at the end of tube (dental X-ray), Thickness of breast for the calculation of Average absorbed breast dose. Further work is needed to refine this definition of dose data in the imaging study manifest. The presence of the dose management reports within the imaging study as standardized by DICOM may be an alternative to consider in later revision of this guideline. | Not supported.Rationale: As suggested in the eHN Guideline, further work has demonstrated that this information **should not be included in the Manifest.**The use of a dose management report within the imaging study, as standardized by DICOM, is a better approach and is already widely deployed. |  |
| B.1.4.5 | Other series information | Imaging Series information such as: |  |  |
| Series number | Series Number​ | (0020,0011)​  |
|  | Series DateMCWG extension. | (0008,0021)  |
|  | Series TimeMCWG extension. | (0008,0031)  |
| B.1.4.6 | Series endpoint | An endpoint describes the technical details of a location that can be connected to for the delivery/retrieval of imaging information. Sufficient information is required to ensure that a connection can be made securely, and appropriate data transmitted as defined by the endpoint owner. These may be locally hosted services, regional services, or national services. | Retrieve Location UID | (0040,E011)​  |
| Retrieve URL​ | (0008,1190)​  |
| B.1.4.7 List of Referenced Instances in the referenced series |
| B.1.4.7.1 | Instance Globally Unique Identifier | Unique Identifier for the image instance | Referenced SOP Instance UID | ​(0008,1155)​  |
| B.1.4.7.2 | Instance Class Globally Unique Identifier | Unique identifier for the class of image instance | Referenced SOP Class UID | ​(0008,1150)​  |
| B.1.4.7.3 | Instance Number | Integer assigned to an image by the acquisition modality. | Instance NumberMCWG extension. | (0020,0013)  |
|  |  |  | Number Of FramesMCWG extension. | (0028,0008) |

# Imaging Study Manifest – DICOM KOS Manifest Specification

The following section defines the specification of the imaging study manifest in terms of a DICOM Key Object Selection Document (KOS) IOD with a Manifest Title Code.

## Key Object Selection Document IOD Modules

The following table specifies the mandatory modules of the KOS IOD.

Table 2 DICOM PS3.3 Table A.35.4-1 Key Object Selection Document IOD Modules

|  |
| --- |
| Excerpt from **DICOM PS3.3 Table A.35.4-1 Key Object Selection Document IOD Modules** © NEMA |
| **IE** | **Module** | **Reference PS3.3** | **Usage** |
| Patient | Patient Module | [C.7.1.1](http://dicom.nema.org/medical/dicom/current/output/chtml/part03/sect_C.7.html#sect_C.7.1.1) | M |
| Study | General Study Module | [C.7.2.1](http://dicom.nema.org/medical/dicom/current/output/chtml/part03/sect_C.7.2.html#sect_C.7.2.1) | M |
| Series | Key Object Document Series Module | [C.17.6.1](http://dicom.nema.org/medical/dicom/current/output/chtml/part03/sect_C.17.6.html#sect_C.17.6.1) | M |
| Equipment | General Equipment Module | [C.7.5.1](http://dicom.nema.org/medical/dicom/current/output/chtml/part03/sect_C.7.5.html#sect_C.7.5.1) | M |
| SR Document | Key Object Document Module | [C.17.6.2](http://dicom.nema.org/medical/dicom/current/output/chtml/part03/sect_C.17.6.2.html) | M |
| SR Document Content Module | [C.17.3](http://dicom.nema.org/medical/dicom/current/output/chtml/part03/sect_C.17.3.html) | M |
| SOP Common Module | [C.12.1](http://dicom.nema.org/medical/dicom/current/output/chtml/part03/sect_C.12.html#sect_C.12.1) | M |

The following sections specify each of the KOS IOD modules in detail. The Attributes belonging to each module are defined by Name, Tag, Value Type and Attribute Description.

The DICOM Value Type (see DICOM PS 3.5 – section 7.4 Data Element Type) describes the standard attribute presence in the module and is copied from the Key Object Selection Document IOD specification (see DICOM PS 3.3 – section A.35.4 Key Object Selection Document IOD).

Some attributes have been added to the Standard KOS SOP Class defining a Standard Extended KOS SOP Class. These additional attributes are formally defined with a presence of Type 3 (optional), but in order to enhance manifest interoperability to meet the eHN Guideline requirements, an “EHDS” Value Type has been added to indicate the “required” presence. This approach is similar to the IHE-RAD R & R+ extensions for the IHE XDS-I.b profile requirements.

The following color coding is used in the module tables to highlight the attributes added to the standard KOS IOD.

|  |
| --- |
| **Value Types** |
| Standard DICOM KOS IOD attribute Value Type. |
| Extension to DICOM KOS IOD. These extensions are based on the MCWG [Extensions to Imaging Study Manifest](https://www.ihe-europe.net/sites/default/files/2024-05/3-MCWG-Recommendations-KOS%20Manifest-FinalPublished-V9.pdf) recommendations. |

## Patient Module

Table C.7-1 specifies the Attributes of the Patient Module, which identify and describe the Patient who is the subject of the Study.

Table 3 DICOM PS3.3 Table C.7-1 Patient Module

|  |
| --- |
| Excerpt from **DICOM PS3.3 Table C.7-1 Patient Module** © NEMA |
| **Attribute Name** | **Tag** | **Value Type** | **Attribute Description** |
| Patient's Name​ | (0010,0010)  | 2 | Patient's full name. |
| Patient ID​ | (0010,0020)​  | 21 (EHDS) | Primary identifier for the patient.Value: National Patient Id. |
| Issuer of Patient ID | (0010,0021)  | 3 | Identifier of the Assigning Authority (system, organization, agency,​ or department) that issued the Patient ID.If present should contain a label that corresponds to the authority identified by the Universal Entity ID (0010,0032) in the Issuer of Patient ID Qualifiers Sequence (0010,0024).  |
| Issuer of Patient ID Qualifiers Sequence | (0010,0024) | 31 (EHDS) | Attributes specifying or qualifying the identity of the Issuer of the​ Patient ID (0010,0021), or scoping the Patient ID (0010,0020).​ Only a single Item shall be included in this Sequence. |
| > Universal Entity ID | (0010,0032) | 31 (EHDS) | Globally unique identifier (OID) for the Patient ID Assigning Authority.​ The authority identified by this attribute shall be the same as that​ labelled by the Issuer of Patient ID (0010,0021). |
| > Universal Entity ID Type | (0010,0033) | 1C | Standard defining the format of the Universal Entity ID. Required if Universal​ Entity ID (0040,0032) is present.Fixed value: “ISO” |
| > Type of Patient ID | (0010,0022) | 3 | The type of identifier in the Patient ID (0010,0020).Fixed value (if present): “TEXT” |
| Patient's Birth Date​ | (0010,0030)​  | 2 | Birth date of the patient. |
| Patient's Sex​ | (0010,0040)​  | 2 | Sex of the named patient.Enumerated Values: * “M” - male
* “F” - female
* “O” - other
 |
| Patient Comments | (0010,4000) | 3 | Used for national extensions (e.g. birth place) associated to patient demographics information used to validate the consistency between the patient ID and its demographic traits beyond sex, birth date, and names. |
| Other Patient IDs Sequence | (0010,1002)  | 31 (EHDS) | A Sequence of identification numbers or codes used to identify the​ Patient, which may or may not be human readable, and may or may​ not have been obtained from an implanted or attached device such​ as an RFID or barcode.​ One or more Items shall be included in this Sequence.Values: National, Regional and Local Patient Ids.Note: This attribute should provide a list of the national, regional and local patient identifiers. The local patient identifiers are those known in the imaging source at the time of the manifest creation. |
| > Patient ID | (0010,0020) | 1 | An identifier for the Patient. |
| > Issuer of Patient ID  | (0010,0021) | 3 | Identifier of the Assigning Authority (system, organization, agency,​ or department) that issued the Patient ID (0010,0020).If present should contain a label that corresponds to the authority identified by the Universal Entity ID (0010,0032) in the Issuer of Patient ID Qualifiers Sequence (0010,0024). |
| > Issuer of Patient ID Qualifiers Sequence | (0010,0024) | 31 (EHDS) | Attributes specifying or qualifying the identity of the Issuer of the​ Patient ID (0010,0021), or scoping the Patient ID (0010,0020). Only a single Item shall be included in this Sequence. |
| >> Universal Entity ID | (0010,0032) | 31 (EHDS) | Globally unique identifier (OID) for the Patient ID Assigning Authority.​The authority identified by this attribute shall be the same as that​ labelled by the Issuer of Patient ID (0010,0021). |
| >> Universal Entity ID Type | (0010,0033) | 1C | Standard defining the format of the Universal Entity ID. Required if Universal​ Entity ID (0040,0032) is present.Fixed value: “ISO” |
| >> Type of Patient ID | (0010,0022) | 1 | The type of identifier in the Patient ID (0010,0020) in this Item.Fixed value: “TEXT”Note: This attribute is mandatory (type 1) in this item. |

## General Study Module

Table C.7-3 specifies the Attributes, which identify and describe the Study performed upon the Patient.

Table 4 DICOM PS3.3 Table C.7-3 General Study Module

|  |
| --- |
| Excerpt from **DICOM PS3.3 Table C.7-3 General Study Module** © NEMA |
| **Attribute Name** | **Tag** | **Value Type** | **Attribute Description** |
| Study Instance UID​ | (0020,000D)  | 1 | Unique identifier for the Study. Copy of the referenced study’s Study Instance UID (0020,000D).Note: There is a 1 to 1 relationship between this KOS manifest and the study that this KOS manifest references. |
| Study Date​ | (0008,0020)  | 21 (EHDS) | Date the Study started.Note: The study date needs to be defined and, although Type 2 in the referenced imaging study, is by experience always quasi-present. |
| Study Time​ | (0008,0030)​  | 2 | Time the Study started. |
| Referring Physician's Name​ | (0008,0090)​  | 2 | Name of the Patient's referring physician. |
| Study ID | (0020,0010) | 2 | User or equipment generated Study identifier. |
| Accession Number | (0008,0050)  | 2 | A departmental IS generated number that identifies the order for the Study.The Accession Number (0008,0050) is associated with a departmental IS (RIS) request. There is no departmental IS (RIS) request for a KOS manifest and so this attribute must be present with no value defined.Note: As there is a need to associate several RIS requests to a single study, the RIS request accession number(s) are placed in the Referenced Request Sequence (0040,A370). |
| Study Description | (0008,1030)  | 3 | Institution-generated description or classification of the​ Study performed. |

## Key Object Document Series Module

Table C.17.6-1 defines the Attributes of the Key Object Document Series.

Table 5 DICOM PS3.3 Table C.17.6-1 Key Object Document Series Module

|  |
| --- |
| Excerpt from **DICOM PS3.3 Table C.17.6-1 Key Object Document Series Module** © NEMA |
| **Attribute Name** | **Tag** | **Value Type** | **Attribute Description** |
| Modality | ​(0008,0060)  | 1 | Fixed value: “KO” |
| Series Instance UID​ | (0020,000E)  | 1 | Unique Identifier for the Series.DICOM Series Instance UID assigned by KOS Manifest creator for the series where the KOS Manifest is placed.  |
| Series Number​ | (0020,0011)​  | 1 | A number that is not already used by another series in the study that identifies the Series.Recommendation to assign a value of 59 if unused. |
| Series Date | (0008,0021) | 3 | Date the Series started. If the KOS Manifest is the first one assigned to a new series, the date value should be the same as the date of the KOS Manifest creation. |
| Series Time | (0008,0031) | 3 | Time the Series started. If the KOS Manifest is the first one assigned to a new series, the time value should be the same as the time of the KOS Manifest creation. |
| Referenced Performed Procedure Step Sequence | (0008, 1111) | 2 | Uniquely identifies the Performed Procedure Step SOP Instance for which the Series is created.No items shall be included in this Sequence. |

## General Equipment Module

Table C.7-8 specifies the Attributes of the General Equipment Module, which identify and describe the piece of equipment that produced​ Composite Instances.

Table 6 DICOM PS3.3 Table C.7-8 General Equipment Module

|  |
| --- |
| Excerpt from **DICOM PS3.3 Table C.7-8 General Equipment Module** © NEMA |
| **Attribute Name** | **Tag** | **Value Type** | **Attribute Description** |
| Manufacturer​ | (0008,0070)  | 21 (EHDS) | Manufacturer of the equipment that produced the KOS manifest. This attribute is required to facilitate the discovery of errors’ sources in the creation of KOS Manifests. |
| Institution Name | (0008,0080) | 31 (EHDS) | Defines the institution that created the KOS manifest. This information is important to trace back any content error in a KOS Manifest.Fixed value configured onsite at install time of the software that created the KOS Manifests.Note: It is recommended by IHE MCWG to format this attribute according to the HL7 V2.5 XON data type so that it contains, in addition to the institution name, its globally unique identifier. This format is identical to the format of the authorInstitution Attribute of the MHD, XDS and XCA metadata. |

## Key Object Document Module

Table C.17.6-2 specifies the Attributes of a Key Object Selection Document. These Attributes identify and provide context for the Key​ Object Selection Document.

Table 7 DICOM PS3.3 Table C.17.6-2 Key Object Document Module

|  |
| --- |
| Excerpt from **DICOM PS3.3 Table C.17.6-2 Key Object Document Module** © NEMA |
| **Attribute Name** | **Tag** | **Value Type** | **Attribute Description** |
| Instance Number​ | (0020,0013) | 1 | A number that identifies the Document. |
| Content Date​ | (0008,0023)​ | 1 | The date the document content creation started. |
| Content Time​ | (0008,0033)​ | 1 | The time the document content creation started. |
| Referenced Request​ Sequence | (0040,A370) | 1C | Identifies Requested Procedures that are being fulfilled (completely​ or partially). This sequence will contain the same number of items as the number of **unique combinations of accession numbers and order placer numbers associated with this Study**. Each element shall have an Accession Number and an Order Placer Number corresponding to and associated with this Study. |
| > Study Instance UID | (0020,000D) | 1 | Unique Identifier for the Study.Copy of the referenced study’s Study Instance UID (0020,000D).Note: There is a 1 to 1 relationship between this KOS manifest and the study that this KOS manifest references. |
| > Referenced Study Sequence | (0008,1110) | 2 | Uniquely identifies the Study SOP Instance.No items shall be included in this Sequence. |
| > Accession Number | (0008,0050) | 21 (EHDS) | A departmental IS generated number that identifies the imaging order for the Study. Shall contain a value associated with the Placer Order Number (0040,2016) in the sequence item. |
| > Issuer of Accession Number Sequence | (0008,0051) | 31 (EHDS) | Identifier of the Assigning Authority that issued the​ Accession Number (0008,0050).​ A value shall be present.Only a single Item shall be included in this Sequence. |
| >> Universal Entity ID | (0010,0032) | 1C1 (EHDS) | Globally unique identifier (OID) for the Accession Number (0008,0050) Assigning Authority. |
| >> Universal Entity ID Type | (0010,0033) | 1C | Standard defining the format of the Universal Entity ID. Required if Universal​ Entity ID (0040,0032) is present.Fixed value: “ISO” |
| > Filler Order Number / Imaging Service Request | (0040,2017) | 2 | The order number assigned to the Imaging Service Request by the party performing the order.This attribute may be empty. If a value is present it may be ignored. |
| Requested Procedure ID | (0040,1001) | 2 | This attribute may be empty. If a value is present it may be ignored. |
| Requested Procedure Description | (0032,1060) | 2 | This attribute may be empty. If a value is present it may be ignored. |
| Requested Procedure Code Sequence | (0032,1064) | 2 | A Sequence that conveys the requested procedure. Zero or more Items shall be included in this Sequence. |
| > Placer Order Number / Imaging Service Request | (0040,2016) | 2 | The order number assigned to the Imaging Service Request by the party placing the order.Shall contain a value associated with the Accession Number (0008,0050) in the sequence item. |
| > Order Placer Identifier Sequence | (0040,0026)  | 31C (EHDS) | Identifier of the Assigning Authority that issued the​ Placer Order Number​ (0040,2016).​ Shall be present if Placer Order Number / Imaging Service Request (0040,2016) is not empty.Only a single Item shall be included in this Sequence. |
| >> Universal Entity ID | (0010,0032) | 1C1 (EHDS) | Globally unique identifier (OID) for the Placer Order Number​ (0040,2016) Assigning Authority. |
| >> Universal Entity ID Type | (0010,0033) | 1C | Standard defining the format of the Universal Entity ID. Required if Universal​ Entity ID (0040,0032) is present.Fixed value: “ISO” |
| Current Requested Procedure​ Evidence Sequence | (0040,A375)  | 1 | List of all Composite SOP Instances references in Content Sequence (0040,A730), including all presentation states, real world value maps and other accompanying composite instances that are referenced from the content items. |
| > Study Instance UID​ | (0020,000D)  | 1IHE-RAD R | Unique identifier for the Study. Copy of the referenced study’s Study Instance UID (0020,000D).Note: There is a 1 to 1 relationship between this KOS manifest and the study that this KOS manifest references. |
| > Referenced Series Sequence​ | (0008,1115)​  | 1IHE-RAD R | Sequence of Items where each item includes the Attributes of a Series containing referenced Composite Object(s) |
| For each series in referenced PACS study { |
| >> Series Date | (0008,0021)  | 32 (EHDS) | Date the Series started.Fallback to fill this value from an instance date of the first referenced image in the corresponding series within the imaging study. |
| >> Series Time | (0008,0031)  | 32 (EHDS) | Time the Series started. |
| >> Modality | (0008,0060)  | 31 (EHDS) | Type of device, process or method that created the​ Instances in this Series. |
| >> Series Description | (0008,103E)   | 32 (EHDS) | Description of the Series. |
| >> Series Instance UID​ | (0020,000E)  | 1IHE-RAD R | Unique Identifier of a Series that is part of this Study and contains the referenced Composite Object(s) |
| >> Retrieve AE Title​ | (0008,0054)​  | 3IHE-RAD R+ | Title of the DICOM Application Entity where the Composite Object(s) may be retrieved on the network.This attribute may be present but shall be ignored. |
| >> Retrieve Location UID​ | (0040,E011)​  | 31 (EHDS) | Unique identifier of the system where the Composite Object(s) may be retrieved on the network.MCWG: Unique identifier of the location where the instances are stored on the network. This is an OID that may be used as a reference to obtain the actual retrieval service end-point. The retrieval URL should then be composed by the consumer using the service end-point and study/series/instance UIDs from this manifest.Usage of this attribute in a cross-border (country A/B) context requires further study. |
| >> Retrieve URL​ | (0008,1190)​  | 3IHE-RAD R+1 (EHDS) | URL specifying the location of the referenced Instance(s).MCWG: The Retrieve URL is the Base URI + Study Instance UID​ (0020,000D) + Series Instance UID (0020,000E), so that, if left unchanged, can be used to retrieve the instances of the series where the Retrieve URL is placed in the tree of references. It could be changed to perform a retrieve at an instance or entire study level.The Base URI is the intra-border (country A) value for retrieval at a national/regional level. The way in which this Base URI is modified/prefixed for cross-border (country B) usage is for further study. |
| >> Referenced SOP Sequence​ | (0008,1199)​  | 1IHE-RAD R | References to Composite Object SOP Class/SOP Instance pairs that are part of the Study defined by Study Instance UID and the Series defined by Series Instance UID (0020,000E). One or more Items shall be included in this Sequence.  |
| For each instance in referenced PACS series { |
| >>> Referenced SOP Class UID | ​(0008,1150)​  | 1IHE-RAD R | Uniquely identifies the referenced SOP Class. |
| >>> Referenced SOP Instance UID​  | (0008,1155)  | 1IHE-RAD R | Uniquely identifies the referenced SOP Instance. |
| >>> Instance Number | (0020,0013)  | 32 (EHDS) | A number that identifies this SOP Instance. |
| >>> Number Of Frames | (0028,0008)  | 31C (EHDS) | Number of frames in a Multi-frame Image. Required if the instance contains multi-frame pixel data. |
| Significant Images – see “Sharing imaging studies with images marked as significant” (MCWG extension).Expresses the fact that the Reference SOP Instance is flagged by a KOS/KIN and links to the Referenced SOP Instance associated with the KOS/KIN instance that marks the SOP instance as being significant. |
| >>> Related Series Sequence | (0008,1250) | 31C (EHDS) | Sequence of Items identifying Series that contain a KOS/KIN marking the SOP Instance in this Item (of the enclosing Referenced SOP Sequence (0008,1199)) as being significant.Required if the SOP Instance in this Item (of the enclosing Referenced SOP Sequence (0008,1199) is marked as significant in a KOS/KIN.One or more Items shall be present in this Sequence.Note: If multiple KOS/KIN tag a specific SOP Instance in a given study, those KOS/KIN may be assigned to the same series or to different series. |
| >>>> Series Instance UID | (0020,000E) | 1 | Series Instance UID of the series to which a KOS/KIN instance belongs.This attribute facilitates traversing the KOS Manifest through the series in which is located a KOS/KIN in the corresponding Reference SOP Sequence (0008,1199).  This helps when accessing the content of the KOS/KIN comment, if any. |
| >>>> Referenced SOP Sequence | (0008,1199) | 1 | The set of KOS/KIN SOP Instances in this Item of Related Series Sequence (0008,1250).One or more Items shall be included in this Sequence.Note: If multiple KOS/KIN tag a specific SOP Instance in a given study, those KOS/KIN may be assigned to the same series or to different series. |
| >>>>> Referenced SOP Class UID | (0008,1150) | 1 | SOP Class UID of the referenced KOS/KIN instance.Fixed value: KOS SOP Class UID. |
| >>>>> Referenced SOP Instance UID | (0008,1155) | 1 | SOP Instance UID of the referenced KOS/KIN instance. |
| >>>>> Purpose of Reference Code Sequence | (0040,A170) | 31 (EHDS) |  |
| >>>>>> Code Value | (0008,0100) | 1 | Shall use the Code Value “113000” if this Item (of the enclosing Referenced SOP Sequence (0008,1199)) is flagged as a significant image.May use any other code value from BCID 7010. |
| >>>>>> Coding Scheme Designator | (0008,0102) | 1 | Identifier of the coding scheme in which the Code Value (0008,0100).DICOM coding scheme. Shall use a fixed value: Coding Scheme Designator “DCM”. |
| >>>>>> Code Meaning | (0008,0104) | 1 | Convey the code meaning as specified by BCID 7010.E.g., “Of  Interest” for the code value “113000”. |
| Significant Images – see “Sharing imaging studies with images marked as significant” (MCWG extension).Add a copy of the comment (“Key Object Description”) in every reference to a KOS/KIN SOP instance that is used to flag one or more SOP instances.  |
| >>> Content Sequence | (0040,A730) | 32C (EHDS) | Sequence of Text Values providing the Key Object Description of a KOS/KIN.Required if this Item (of the enclosing Referenced SOP Sequence (0008,1199)) references a KOS/KIN instance with a title code “Of Interest”.May be present if this Item (of the enclosing Referenced SOP Sequence (0008,1199)) references a KOS/KIN instance with a title code other than “Of Interest”.      Zero or one Item shall be included in this Sequence. |
| >>>> Text Value | (0040,A160) | 31 (EHDS) | Contains the Concept Name (113012, DCM, "Key Object Description") Text Value copied from the KOS/KIN instance referenced.Non-formatted textual data, allowing for implementation specific display. This value may contain spaces as well as CR LF separators for one or more lines. |
| } |
| } |

Note: DICOM offers a certain flexibility to assign KOS Objects (including KOS/KIN) to a specific series: all instances of a series shall be created on the same equipment.  So for example a PACS may create all KOS/KIN for a given study assigned to the same series or to different series.  Therefore, for the case where multiple KOS/KIN flag the same SOP Instance, the KOS/KIN may be assigned to different series or more than one KOS/KIN may be assigned to the same series.

## SR Document Content Module

Table C.17-4 specifies the Attributes contained in the SR Document Content Module. The Attributes in this Module convey the content​ of an SR Document.

Table 8 DICOM PS3.3 Table C.17-4 SR Document Content Module

|  |
| --- |
| Excerpt from **DICOM PS3.3 Table C.17-4 SR Document Content Module** © NEMA |
| **Attribute Name** | **Tag** | **Value Type** | **Attribute Description** |
| Value Type​ | (0040,A040)  | 1 | Fixed value: “CONTAINER”  |
| Concept Name Code​ Sequence | (0040,A043)​  | 1C1 (EHDS) | Code describing the concept represented by this Content Item. Also conveys the value of Document Title and section headings in documents.Required to indicate that this KOS instance is an imaging study manifest. Only a single Item shall be included in this Sequence.Use TID 2010 “Key Object Selection” to populate the remaining attribute values. Coded Document Title: (113030, DCM, Manifest) |
| > Code Value | (0008,0100) | 1 | Fixed value: “113030” |
| > Coding Scheme Designator  | (0008,0102) | 1 | Fixed value: “DCM” |
| > Code Meaning | (0008,0104) | 1 | Fixed value: “Manifest” |
| Continuity of Content | (0040,A050) | 1 | Fixed value: “SEPARATE” |
| Content Template Sequence | (0040,A504) | 1 | Template that describes the content of this Content Item and its subsidiary Content Items.Only a single Item shall be included in this Sequence. |
| > Mapping Resource | (0008,0105) | 1 | Fixed value: “DCMR" |
| > Template Identifier | (0040,DB00) | 1 | Fixed value: “2010” |
| Content Sequence | (0040,A730) | 1C1 (EHDS) | A potentially recursively nested Sequence of Items that conveys content​ that is the Target of Relationships with the enclosing Source Content Item.One or more Items shall be included in this Sequence – each item is a reference to one of the instances in referenced study. |
| For each series in referenced study { |
| For each instance in referenced series { |
| > Relationship Type  | (0040,A010) | 1 | Fixed value: “CONTAINS” |
| > Value Type | (0040,A040) | 1 | Fixed value (one of): “IMAGE”, “WAVEFORM” or “COMPOSITE”.Note: The Value Type depends on the SOP Class UID of the referenced object. |
| > Referenced SOP Sequence | (0008,1199) | 1C1 (EHDS) | References to Composite Object SOP Class Instance pairs.Only a single Item shall be included in this Sequence. |
| >> Referenced SOP Class UID | (0008,1150) | 1 | Uniquely identifies the referenced SOP Class. |
| >> Referenced SOP Instance UID | (0008,1155) | 1 | Uniquely identifies the referenced SOP Instance. |
| } |
| } |

## SOP Common Module

Table C.12-1 specifies the Attributes of the SOP Common Module, which are required for proper functioning and identification of the​ associated SOP Instances. They do not specify any semantics about the Real-World Object represented by the IOD.

Table 9 DICOM PS3.3 Table C.12-1 SOP Common Module

|  |
| --- |
| Excerpt from **DICOM PS3.3 Table C.12-1 SOP Common Module** © NEMA |
| **Attribute Name** | **Tag** | **Value Type** | **Attribute Description** |
| SOP Class UID​ | (0008,0016)​   | 1 | Uniquely identifies the SOP Class. |
| SOP Instance UID​ | (0008,0018)  | 1 | Uniquely identifies the SOP Instance. |
| Specific Character Set | (0008,0005) | 1C1 (EHDS) | Character Set that expands or replaces the Basic Graphic Set.Required if an expanded or replacement character set is used.Preferred repertoires for use in Western and Eastern Europe:* “ISO-IR 100” - Latin alphabet​ No. 1
* “ISO-IR 101” - Latin alphabet​ No. 2
* “ISO-IR 144” - Cyrillic
* “ISO-IR 126” – Greek
* “ISO\_IR 192” - Unicode in UTF-8
 |
| Instance Creation date | (0008,0012) | 3 | Same as Study Date (0008,0020) |
| Instance Creation Time | (0008,0013) | 3 | Same as Study Time (0008,0030) |
| Timezone Offset From UTC | (0008,0201)  | 31 (EHDS) | Contains the offset from UTC to the time zone for all DA and TM Attributes​ present in this SOP Instance, and for all DT Attributes present in this SOP​ Instance that do not contain an explicitly encoded time zone offset.​ |

# Sharing imaging studies with images marked as significant

The MCWG has produced some additional recommendations, extending the DICOM KOS Manifest, to address images marked as significant in a shared imaging study - see [MCWG Sharing Imaging Studies with Images Flagged as Significant](https://www.ihe-europe.net/sites/default/files/MCWG-Sharing-Imaging-Studies-with-Images-Flagged-as-Significant-V1.4.pdf)

The MCWG recommendations describe two additions to the manifest contents to support significant images as follows:

1. Expresses the fact that the Reference SOP Instance is flagged by a KOS/KIN and links to the Referenced SOP Instance associated with the KOS/KIN instance that marks the SOP instance as being significant.
2. Add a copy of the comment (“Key Object Description”) in every reference to a KOS/KIN SOP instance that is used to flag one or more SOP instances.

Figure 1 KOS Manifest including extensions to reference KOS/KIN instances

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Figure 1 KOS Manifest including extensions to reference KOS/KIN instances” depicts these additions as the yellow stars for (1) and the yellow box for (2).

In terms of the DICOM Key Object Selection Document (KOS) IOD, these additions are made to the Key Object Document Module as a set of attributes using the color coding shown below.

|  |
| --- |
| **Key Object Document Module – Significant Images extension** |
| Expresses the fact that the Reference SOP Instance is flagged by a KOS/KIN and links to the Referenced SOP Instance associated with the KOS/KIN instance that marks the SOP instance as being significant. |
| Add a copy of the comment (“Key Object Description”) in every reference to a KOS/KIN SOP instance that is used to flag one or more SOP instances. |

# Alignment with Document Sharing Metadata

Further work to be done here.

A separate document will provide the imaging study and report document sharing metadata specifications.

Sources of content for the document sharing metadata and the DICOM KOS Manifest attribute values are:

* radiology order
* imaging service request
* imaging report
* imaging study

Some of the metadata values align with the DICOM KOS Manifest attribute values as shown in the table below:

Table 10 Document Sharing Metadata and DICOM KOS Manifest attribute alignment

|  |
| --- |
| **Document Sharing Metadata and DICOM KOS Manifest attribute alignment** |
| **Metadata Element**  | **DICOM Attribute** | **Metadata Format****(FHIR)** | **Value / Comment** |
| **patientId** | Patient ID​ (0010,0020)​ | Identifier | identifier.system = Issuer of Patient ID Qualifiers Sequence. Universal Entity ID (0010,0024). (0010,0032)identifier.value = Patient ID (0010,0020)identifier.assigner = “ISO” |
| Issuer of Patient ID Qualifiers Sequence. Universal Entity ID (0010,0024). (0010,0032)  |
| **eventCodeList** | Modality (0008,0060)   | CodeableConcept | Code & DisplayName values taken from:DICOM Modality (1.2.840.10008.6.1.19): Context Group CID 29 CodingScheme: “DCM” (CodingSchemeDesignator) |
| Anatomic Region/Body Part | CodeableConcept | Code & DisplayName values taken from:DICOM Anatomic Region/Body Part (4 1.2.840.10008.6.1.2)​ - Context Group CID 4 CodingScheme: “SCT” (CodingSchemeDesignator)Note: See [MCWG Recommendations Imaging Sharing Metadata Linkages](https://www.ihe-europe.net/sites/default/files/2024-05/2-MCWG-Recommendations-Imaging%20Sharing%20Metadata-Linkages-FinalPublished-V7.pdf) – course grained Anatomical Region. |
| Imaging Procedure Code – DisplayName(from the Procedure Code Sequence (0008,1032)) | CodeableConcept | Code & DisplayName values taken from:DICOM Imaging Procedure Code - DisplayName (from the Procedure Code Sequence (0008,1032)) |
| **referenceIdList** | Accession Number (0008,0050)  | Identifier | identifier.system = Issuer of Accession Number Sequence.Universal Entity ID (0008,0051).(0040,0032)identifier.value = Accession Number (0008,0050)identifier.assigner = “urn:ihe:iti:xds:2013:accession” |
| Issuer of Accession Number Sequence. Universal Entity ID (0008,0051).(0040,0032) |
| Placer Order Number / Imaging Service Request (0040,2016)  | Identifier | identifier.system = Order Placer Identifier Sequence.Universal Entity ID(0040,0026).(0040,0032)identifier.value = Placer Order Number / Imaging Service Request (0040,2016)identifier.assigner = “urn:ihe:iti:xds:2013:order” |
| Order Placer Identifier Sequence. Universal Entity ID (0040,0026).(0040,0032) |
| Study Instance UID​ (0020,000D)  | Identifier | identifier.system = “DCM”identifier.value = Study Instance UID​ (0020,000D)identifier.assigner = “urn:ihe:iti:xds:2016:studyInstanceUID” |
| **authorInstitution** | Institution Name (0008,0080) | Reference | Practitioner or Organization FHIR Resource |

# KOS Manifest Lifecycle Management

Further work to be done here.

Section on the manifest lifecycle management:

* creation by “Manifest Creator” actor - when creating a DICOM KOS object for a study, it's crucial to ensure it pertains solely to that study, maintaining a one-to-one relationship. Therefore, the KOS must form its own series and can never be part of an image data series.
* updates/deletion (reference to IHE IOCM?)
* consumption – as:
	+ DICOM part-10 format
	+ application/dicom+xml
	+ application/dicom+fhir – might give some roadmap to future use in FHIR based world?