# Perennity DICOM edition

# DICOM Conformance Statement

Version: 4.50

# 1. Table of contents


1. Table of contents 2
2. Preface 3
3. Introduction 4
4. Data workflow 5
5. Perennity DICOM server (AE) specifications 6
5.1. Transfer syntax 6
5.1.1. Native 6
5.1.2. Compression 6
5.1.3. SR 6
5.2. Supported SOP Classes 7
5.3. Implementation Class and Version 11
6. Verification 12
7. C-STORE 13
8. C-FIND 14
9. C-MOVE 18
10. C-ECHO 18


**Revision history**

| | | | |
|---|---|---|---|
| Original document | Oct 2006 | Laurent Janssens | |
| Revision 1 | Oct 2009 | Laurent Janssens | |
| Revision 2 | May 2011 | Laurent Janssens | |
| Rev.3 v4.10 | May 2012 | Laurent Janssens | |
| Rev. 4 v4.20 | March 2013 | Laurent Janssens | |
| Rev. 5 v4.21 | Sep 2014 | Laurent Janssens | |
| Rev. 5 v4.50 | Aug 2015 | Laurent Janssens | Review - Unchanged |

## 2. Preface

Perennity DICOM edition offers a turnkey solution for the medical industry to output DICOM images from any modality or PACS system to CD, DVD and BluRay. While dramatically reducing production costs compared to traditional film, CD, DVD & BluRay can as well be used for archiving purposes as for the exchange of DICOM data (images, video, reports, ...) between hospitals, doctors and patients.

Perennity uses CD/DVD/BD autoloaders (robots) to fully automate the CD/DVD/BD recording and printing. Its operation can be 'attended', where a human action will trigger the writing processes, or 'unattended', in which case Perennity automatically generates the discs grouped by series, study or patient. IQ-Lite, Osirix, eFilm and Keosys DICOM viewers are available as an option and can be added to every CD, offering convenient browsing and image manipulation functionality (changing colors, windowing, measurements...). Those DICOM viewers, which autoruns when a CD is inserted, do not require any local installation on the PC and it can easily be translated in any language. Please note that Perennity also supports any other DICOM compatible viewers.

Perennity DICOM edition uses a central database (MySQL or MS SQL Server) to log all operations and keep track of which media contain which data. For archiving purposes you may optionally decide to keep available on the Perennity server all processed data - with the possibility to resubmit it to CD/DVD/BD later on.

Perennity DICOM is composed of two essential components; one being a DICOM Server module, the second one being the DICOM Burner module. Both are running as Windows services.

# 3. Introduction

This is a conformance statement for the "Perennity DICOM Server" and "Perennity DICOM Burner", which both support DICOM.

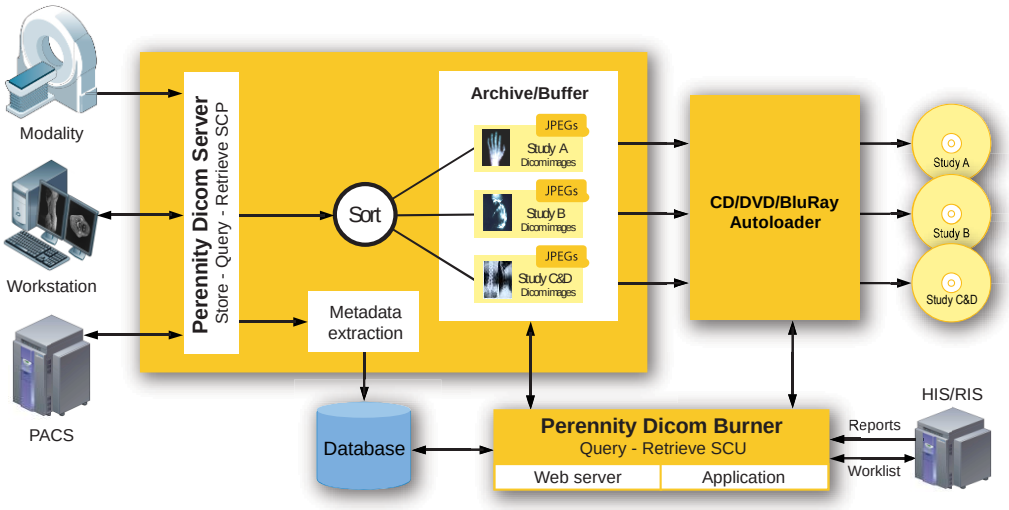
"Perennity DICOM Server" is a component of the Perennity DICOM edition solution. Its goal is to receive images sent by modalities or PACS system, and store them as file. It also extracts DICOM metadata in the Perennity database (MySQL or Microsoft SQL Server).

"Perennity DICOM Burner" is a second component of the Perennity DICOM solution. Its goal is to submit CD/DVD/BD Production jobs for images retrieved either from the local Perennity Archive or from remote PACS systems (via Query/Retrieve or Store from the PACS).

This document contains: SOP classes supported, "Perennity DICOM Server" roles and a view of interaction components in Perennity DICOM solution.

Supported roles: Storage SCP, Storage SCU, Query-Retrieve SCP

# 4. Data workflow




Different modalities and/or the PACS send images to the Perennity DICOM Server over the local area network using the DICOM Store protocol over TCP/IP, whereby the Perennity DICOM Server acts as a genuine DICOM server.

You may decide to keep all images in a high capacity storage (RAID, optical libraries, ...). If not, the images are temporarily stored in a buffer and will be deleted once processed. Images are automatically sorted by study and series. Perennity extracts their metadata (study ID, patient name or identifier, type of modality, etc.) and stores them in its database (MySQL or SQL Server).

Using the Perennity DICOM Burner application, the radiologist can query and select the series of images to be output to CD/DVD/BD. He can specify the number of copies and optionally add some comments to be printed on the disk and stored in the database.

The DICOM Burner can also be used to Query a third party PACS and Retrieve images from it.

Multiple studies belonging to different patients can also be combined on a single disk.

The CDs/DVDs/BDs are automatically recorded and printed using a CD/DVD/BD autoloader. This robot is hooked to a workstation or has a Windows based embedded PC. The robot is managed by the Perennity DICOM Burner.

The disc output process can also be fully automated, in which case every series will automatically be recorded to a CD/DVD/BD after a predefined latency time (e.g. when no images have been received during the last 5 minutes). A DICOM Worklist can also be used to select the studies/series to be recorded.

Series can be output to different discs or grouped by study or patient.

# 5. Perennity DICOM server (AE) specifications

## 5.1. Transfer syntax

### 5.1.1. Native

| Name | UID |
|---|---|
| Explicit VR Little Endian | 1.2.840.10008.1.2.1 |
| Explicit VR Big Endian | 1.2.840.10008.1.2.2 |
| Implicit VR Little Endian | 1.2.840.10008.1.2 |

### 5.1.2. Compression

| Name | UID |
|---|---|
| JPEGBaseline | 1.2.840.10008.1.2.4.50 |
| JPEGExtended | 1.2.840.10008.1.2.4.51 |
| JPEGLSLossyNearLossless | 1.2.840.10008.1.2.4.81 |
| JPEG2000Lossy | 1.2.840.10008.1.2.4.91 |
| JPEGLossless14 | 1.2.840.10008.1.2.4.57 |
| JPEGLossless | 1.2.840.10008.1.2.4.70 |
| JPEGLSLossless | 1.2.840.10008.1.2.4.80 |
| JPEG2000Lossless | 1.2.840.10008.1.2.4.90 |
| MPEG2 | 1.2.840.10008.1.2.4.100 |
| RLELossless | 1.2.840.10008.1.2.5 |

### 5.1.3. SR

| Name | UID |
|---|---|
| Deflated Explicit VR Little Endian | 1.2.840.10008.1.2.1.99 |

## 5.2. Supported SOP Classes

The Perennity DICOM server SCP entity provides standard conformance to the following SOP classes:

| SOP Class Name | SOP Class UID | Transfer Syntax | Role |
|---|---|---|---|
| Basic Study Content Notification SOP Class (Retired) | 1.2.840.10008.1.9 | All | SCP |
| Stored Print Storage SOP Class (Retired) | 1.2.840.10008.5.1.1.27 | All | SCP |
| Hardcopy Grayscale Image Storage SOP Class (Retired) | 1.2.840.10008.5.1.1.29 | All | SCP |
| Hardcopy Color Image Storage SOP Class (Retired) | 1.2.840.10008.5.1.1.30 | All | SCP |
| Computed Radiography Image Storage | 1.2.840.10008.5.1.4.1.1.1 | All | SCP |
| Digital X-Ray Image Storage - For Presentation | 1.2.840.10008.5.1.4.1.1.1.1 | All | SCP |
| Digital X-Ray Image Storage - For Processing | 1.2.840.10008.5.1.4.1.1.1.1.1 | All | SCP |
| Digital Mammography X-Ray Image Storage - For Presentation | 1.2.840.10008.5.1.4.1.1.1.2 | All | SCP |
| Digital Mammography X-Ray Image Storage - For Processing | 1.2.840.10008.5.1.4.1.1.1.2.1 | All | SCP |
| Digital Intra-oral X-Ray Image Storage - For Presentation | 1.2.840.10008.5.1.4.1.1.1.3 | All | SCP |
| Digital Intra-oral X-Ray Image Storage - For Processing | 1.2.840.10008.5.1.4.1.1.1.3.1 | All | SCP |
| Standalone Modality LUT Storage (Retired) | 1.2.840.10008.5.1.4.1.1.10 | All | SCP |
| Encapsulated PDF Storage | 1.2.840.10008.5.1.4.1.1.104.1 | All | SCP |
| Standalone VOI LUT Storage (Retired) | 1.2.840.10008.5.1.4.1.1.11 | All | SCP |
| Grayscale Softcopy Presentation State Storage SOP Class | 1.2.840.10008.5.1.4.1.1.11.1 | All | SCP |
| Color Softcopy Presentation State Storage SOP Class | 1.2.840.10008.5.1.4.1.1.11.2 | All | SCP |
| Pseudo-Color Softcopy Presentation State Storage SOP Class | 1.2.840.10008.5.1.4.1.1.11.3 | All | SCP |

| SOP Class Name | SOP Class UID | Transfer Syntax | Role |
|---|---|---|---|
| Blending Softcopy Presentation State Storage SOP Class | 1.2.840.10008.5.1.4.1.1.11.4 | All | SCP |
| X-Ray Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.12.1 | All | SCP |
| Enhanced XA Image Storage | 1.2.840.10008.5.1.4.1.1.12.1.1 | All | SCP |
| X-Ray Radiofluoroscopic Image Storage | 1.2.840.10008.5.1.4.1.1.12.2 | All | SCP |
| Enhanced XRF Image Storage | 1.2.840.10008.5.1.4.1.1.12.2.1 | All | SCP |
| X-Ray Angiographic Bi-Plane Image Storage (Retired) | 1.2.840.10008.5.1.4.1.1.12.3 | All | SCP |
| Positron Emission Tomography Image Storage | 1.2.840.10008.5.1.4.1.1.128 | All | SCP |
| Standalone PET Curve Storage (Retired) | 1.2.840.10008.5.1.4.1.1.129 | All | SCP |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | All | SCP |
| Enhanced CT Image Storage | 1.2.840.10008.5.1.4.1.1.2.1 | All | SCP |
| Nuclear Medicine Image Storage | 1.2.840.10008.5.1.4.1.1.20 | All | SCP |
| Ultrasound Multi-frame Image Storage (Retired) | 1.2.840.10008.5.1.4.1.1.3 | All | SCP |
| Ultrasound Multi-frame Image Storage | 1.2.840.10008.5.1.4.1.1.3.1 | All | SCP |
| MR Image Storage | 1.2.840.10008.5.1.4.1.1.4 | All | SCP |
| Enhanced MR Image Storage | 1.2.840.10008.5.1.4.1.1.4.1 | All | SCP |
| MR Spectroscopy Storage | 1.2.840.10008.5.1.4.1.1.4.2 | All | SCP |
| RT Image Storage | 1.2.840.10008.5.1.4.1.1.481.1 | All | SCP |
| RT Dose Storage | 1.2.840.10008.5.1.4.1.1.481.2 | All | SCP |
| RT Structure Set Storage | 1.2.840.10008.5.1.4.1.1.481.3 | All | SCP |
| RT Beams Treatment Record Storage | 1.2.840.10008.5.1.4.1.1.481.4 | All | SCP |
| RT Plan Storage | 1.2.840.10008.5.1.4.1.1.481.5 | All | SCP |
| RT Brachy Treatment Record Storage | 1.2.840.10008.5.1.4.1.1.481.6 | All | SCP |
| RT Treatment Summary Record Storage | 1.2.840.10008.5.1.4.1.1.481.7 | All | SCP |

| SOP Class Name | SOP Class UID | Transfer Syntax | Role |
|---|---|---|---|
| Nuclear Medicine Image Storage (Retired) | 1.2.840.10008.5.1.4.1.1.5 | All | SCP |
| Ultrasound Image Storage (Retired) | 1.2.840.10008.5.1.4.1.1.6 | All | SCP |
| Ultrasound Image Storage | 1.2.840.10008.5.1.4.1.1.6.1 | All | SCP |
| Raw Data Storage | 1.2.840.10008.5.1.4.1.1.66 | All | SCP |
| Spatial Registration Storage | 1.2.840.10008.5.1.4.1.1.66.1 | All | SCP |
| Spatial Fiducials Storage | 1.2.840.10008.5.1.4.1.1.66.2 | All | SCP |
| Real World Value Mapping Storage | 1.2.840.10008.5.1.4.1.1.67 | All | SCP |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7 | All | SCP |
| Multi-frame Single Bit Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.1 | All | SCP |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2 | All | SCP |
| Multi-frame Grayscale Word Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.3 | All | SCP |
| Multi-frame True Color Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.4 | All | SCP |
| VL Image Storage - Trial (Retired) | 1.2.840.10008.5.1.4.1.1.77.1 | All | SCP |
| VL Endoscopic Image Storage | 1.2.840.10008.5.1.4.1.1.77.1.1 | All | SCP |
| Video Endoscopic Image Storage | 1.2.840.10008.5.1.4.1.1.77.1.1.1 | All | SCP |
| VL Microscopic Image Storage | 1.2.840.10008.5.1.4.1.1.77.1.2 | All | SCP |
| Video Microscopic Image Storage | 1.2.840.10008.5.1.4.1.1.77.1.2.1 | All | SCP |
| VL Slide-Coordinates Microscopic Image Storage | 1.2.840.10008.5.1.4.1.1.77.1.3 | All | SCP |
| VL Photographic Image Storage | 1.2.840.10008.5.1.4.1.1.77.1.4 | All | SCP |
| Video Photographic Image Storage | 1.2.840.10008.5.1.4.1.1.77.1.4.1 | All | SCP |

| SOP Class Name | SOP Class UID | Transfer Syntax | Role |
|---|---|---|---|
| Ophthalmic Photography 8 Bit Image Storage | 1.2.840.10008.5.1.4.1.1.77.1.5.1 | All | SCP |
| Ophthalmic Photography 16 Bit Image Storage | 1.2.840.10008.5.1.4.1.1.77.1.5.2 | All | SCP |
| Stereometric Relationship Storage | 1.2.840.10008.5.1.4.1.1.77.1.5.3 | All | SCP |
| VL Multi-frame Image Storage - Trial (Retired) | 1.2.840.10008.5.1.4.1.1.77.2 | All | SCP |
| Standalone Overlay Storage (Retired) | 1.2.840.10008.5.1.4.1.1.8 | All | SCP |
| Basic Text SR Storage | 1.2.840.10008.5.1.4.1.1.88.11 | All | SCP |
| Enhanced SR Storage | 1.2.840.10008.5.1.4.1.1.88.22 | All | SCP |
| Comprehensive SR Storage | 1.2.840.10008.5.1.4.1.1.88.33 | All | SCP |
| Procedure Log Storage | 1.2.840.10008.5.1.4.1.1.88.40 | All | SCP |
| Mammography CAD SR Storage | 1.2.840.10008.5.1.4.1.1.88.50 | All | SCP |
| Key Object Selection Document Storage | 1.2.840.10008.5.1.4.1.1.88.59 | All | SCP |
| Chest CAD SR Storage | 1.2.840.10008.5.1.4.1.1.88.65 | All | SCP |
| Standalone Curve Storage (Retired) | 1.2.840.10008.5.1.4.1.1.9 | All | SCP |
| 12-lead ECG Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.1.1 | All | SCP |
| General ECG Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.1.2 | All | SCP |
| Ambulatory ECG Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.1.3 | All | SCP |
| Hemodynamic Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.2.1 | All | SCP |
| Cardiac Electrophysiology Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.3.1 | All | SCP |
| Basic Voice Audio Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.4.1 | All | SCP |
| Hanging Protocol Storage | 1.2.840.10008.5.1.4.38.1 | All | SCP |
| Siemens CSA Non-Image Storage | 1.3.12.2.1107.5.9.1 | All | SCP |

## 5.3. Implementation Class and Version

| | |
|---|---|
| Implementation Class UID | 1.2.40.0.13.1.1 |
| Implementation Version Name | Dcm4che-2.0 |

# 6. Verification

| SOP Class Name | SOP Class UID | Role |
|---|---|---|
| Verification | 1.2.840.10008.1.1 | SCP |

# 7. C-STORE

| SOP Class Name | SOP Class UID | Role |
|---|---|---|
| Storage | 1.2.840.10008.4.2 | SCP |

"Perennity DICOM Server" implements C-STORE service like defined in standard DICOM (ASSOCIATION-RQ, A-ASSOCIATE-AC, etc). The SOP Class, which can be accepted for the transfer, are included in the "Supported SOP classes" table of this document.

| Service status | Return code |
|---|---|
| Success | 0000 |
| Error | 0001 |

# 8. C-FIND

| SOP Class Name | SOP Class UID | Role |
|---|---|---|
| Patient Root Query/Retrieve information Model – FIND | 1.2.840.10008.5.1.4.1.2.1.1 | SCP |
| Study Root Query/Retrieve information Model – FIND | 1.2.840.10008.5.1.4.1.2.2.1 | SCP |
| Patient/Study Only Query/Retrieve information Model – FIND | 1.2.840.10008.5.1.4.1.2.3.1 | SCP |

Function C-FIND allows querying the "Perennity DICOM Server" to obtain information related to the images already stored. Four retrieve levels are available: PATIENT, STUDY, SERIES or IMAGES.

Information returned for each item:

**PATIENT**

| **Attribute Name** | **Tag** | **VR** | **Request** | **Return** |
|---|---|---|---|---|
| *SOP Common* | | | | |
| Specific Character Set | 0008,0005 | CS | x | x |
| *Patient Level* | | | | |
| Patient's Name | 0010,0010 | PN | x | x |
| Patient ID | 0010,0020 | LO | x | x |
| Patient's Birth Date | 0010,0030 | DA | x | x |
| Patient's Sex | 0010,0040 | CS | x | x |
| Number Of Patient Related Studies | 0020,1200 | IS | | x |
| Number Of Patient Related Series | 0020,1202 | IS | | x |
| Number Of Patient Related Instances | 0020,1204 | IS | | x |

**STUDY**

| Attribute Name | Tag | VR | Request | Return |
|---|---|---|---|---|
| *SOP Common* | | | | |
| Specific Character Set | 0008,0005 | CS | x | x |
| *Patient Level* | | | | |
| Patient's Name | 0010,0010 | PN | x | x |
| Patient ID | 0010,0020 | LO | x | x |
| Patient's Birth Date | 0010,0030 | DA | x | x |
| Patient's Sex | 0010,0040 | CS | x | x |
| *Study Level* | | | | |
| Study Instance UID | 0020,000D | UI | x | x |
| Study ID | 0020,0010 | SH | x | x |
| Study Date | 0008,0020 | DA | x | x |
| Study Description | 0008,1030 | LO | x | x |
| Accession Number | 0008,0050 | SH | x | x |
| Referring Physician's Name | 0008,0090 | PN | x | x |
| Modalities In Study | 0008,0061 | CS | x | x |
| Institution Name | 0008,0080 | LO | | x |
| Number Of Study Related Series | 0020,1206 | IS | | x |
| Number Of Study Related Instances | 0020,1208 | IS | | x |

**SERIES**

| Attribute Name | Tag | VR | Request | Return |
|---|---|---|---|---|
| *SOP Common* | | | | |
| Specific Character Set | 0008,0005 | CS | x | x |
| *Patient Level* | | | | |
| Patient's Name | 0010,0010 | PN | x | |
| Patient ID | 0010,0020 | LO | x | |
| Patient's Birth Date | 0010,0030 | DA | x | |
| Patient's Sex | 0010,0040 | CS | x | |
| *Study Level* | | | | |
| Study Instance UID | 0020,000D | UI | x | |
| Study ID | 0020,0010 | SH | x | |
| Study Date | 0008,0020 | DA | x | |
| Study Description | 0008,1030 | LO | x | |
| Accession Number | 0008,0050 | SH | x | |
| Referring Physician's Name | 0008,0090 | PN | x | |
| Modalities In Study | 0008,0061 | CS | x | |
| Modality | 0008,0060 | CS | x | x |
| Series Number | 0020,0011 | IS | x | x |
| Series Instance UID | 0020,000E | UI | x | x |
| Series Description | 0008,103E | LO | | x |
| Series Date | 0008,0021 | DA | | x |
| Number Of Series Related Instances | 0020,1209 | IS | | x |

**SERIES**

| Attribute Name | Tag | VR | Request | Return |
|---|---|---|---|---|
| *SOP Common* | | | | |
| Specific Character Set | 0008,0005 | CS | x | x |
| *Patient Level* | | | | |
| Patient's Name | 0010,0010 | PN | x | |
| Patient ID | 0010,0020 | LO | x | |
| Patient's Birth Date | 0010,0030 | DA | x | |
| Patient's Sex | 0010,0040 | CS | x | |
| *Study Level* | | | | |
| Study Instance UID | 0020,000D | UI | x | |
| Study ID | 0020,0010 | SH | x | |
| Study Date | 0008,0020 | DA | x | |
| Study Description | 0008,1030 | LO | x | |
| Accession Number | 0008,0050 | SH | x | |
| Referring Physician's Name | 0008,0090 | PN | x | |
| Modalities In Study | 0008,0061 | CS | x | |
| Modality | 0008,0060 | CS | x | |
| Series Number | 0020,0011 | IS | x | |
| Series Instance UID | 0020,000E | UI | x | |
| Instance Number | 0020,0013 | IS | x | x |
| SOP Class UID | 0008,0016 | UI | x | x |
| SOP Instance UID | 0008,0018 | UI | x | x |

The complete set of data is returned during the C-FIND query. If the SCU specifies a date (or a range of two dates – from … to …) in the "StudyDate" tag, the result set will be refined and returns only the data within this date range.

## 9. C-MOVE

| SOP Class Name | SOP Class UID | Role |
|---|---|---|
| Patient Root Query/Retrieve information Model – MOVE | 1.2.840.10008.5.1.4.1.2.1.2 | SCP |
| Study Root Query/Retrieve information Model – MOVE | 1.2.840.10008.5.1.4.1.2.2.2 | SCP |
| Patient/Study Only Query/Retrieve information Model – MOVE | 1.2.840.10008.5.1.4.1.2.3.2 | SCP |

## 10. C-ECHO

| Service Status | Return Code | Behavior |
|---|---|---|
| Success | 0000 | The C-ECHO request is accepted |