

***DICOM[®] Unified Worklist
module v1.0***

DICOM Conformance Statement

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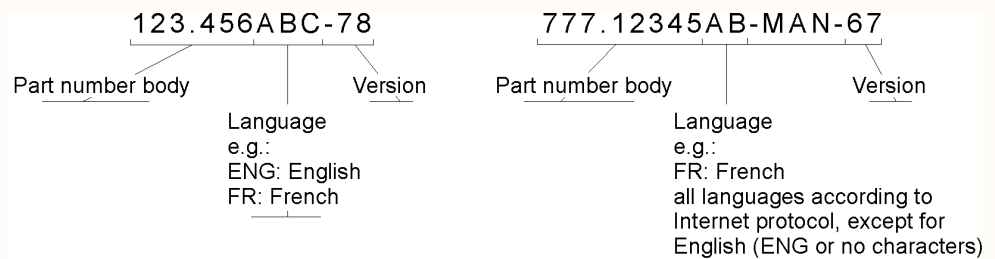
Preface

Identification

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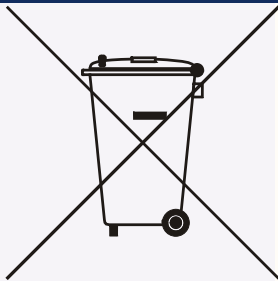

Example 1:

Example 2



The part number is printed at the bottom of the title page. Numbers printed on other pages are for internal revision control and may differ.

Symbols

Symbol	Meaning	Remarks
 <p>Location: Near or on the type identification plate.</p>	Symbol for separated collection of electrical and electronic equipment per Directive 2002/96 of the European Parliament and the Council of the European Union (Directive on Waste of Electrical and Electronic Equipment - WEEE). If applicable to the type of device, it indicates legally imposed obligations within EU member states, Iceland, Norway and Switzerland when the equipment is disposed of, at the end of its life-time.	Owners of marked equipment should contact the organization that imported the equipment into their country, when they want to dispose of the equipment, at the end of its lifetime. The Directive prioritizes re-use of equipment over re-use of components over re-use of materials over disposal as waste. Article 5 part 2d allows producers to decline the return of any used equipment that is or may be biologically or radiologically contaminated.
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Conventions

Throughout this manual certain conventions are used. These are Warnings, Cautions and Notes. They provide a means of prioritizing information to be brought to the attention of the user. They are given as follows:

Warning: Designates a possibly dangerous situation. Non-observance may lead to death or the most severe injuries

Caution: Designates a possibly harmful situation. Non-observance may lead to minor injuries or damage to the product.

Note: Designates a possibly harmful situation. Non-observance may lead to damage to the product or the environment.

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This manual was originally drafted in the English language.



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1. Introduction

1.1 Purpose

This conformance statement specifies how the DICOM Unified Worklist application conforms to the DICOM standard and the IHE-RO Treatment Delivery Workflow Profile.

1.2 Scope

DICOM Unified Worklist module is a link between Nucletron's treatment delivery systems and treatment managements systems supporting the DICOM Unified Worklist and Procedure Step (UPS).

DICOM UPS is at the time of writing still not in a final state. As a result, most vendors only support a subset of the expected functionality. DICOM Unified Worklist module in particular does not support input objects such as plans or images. Furthermore, it is not integrated into any of the delivery systems. Hence, in the first version it constitutes a completely manual link to worklist providers with the only purpose of being able to operate from and give rudimentary feedback to the management system.

1.3 Intended Audience

This document is intended for company personnel, hospital personnel or third party personnel who need to know the conformance details or compare them to those of another system. It is assumed that the reader is familiar with the DICOM standard.

1.4 Related Documents

Publications related to this manual are listed in the following table:

Reference	Revision	Description
555.00180 CIB	*	DICOM® Unified Worklist module 1.0 for ARIA 8.6 Release Notes
777.00176 CD	*	DICOM® Unified Worklist module Documentation CD
777.00189 MAN	*	DICOM® Unified Worklist module User Manual
777.00190 MAN	*	DICOM® Unified Worklist module Installation and Configuration Manual
777.00192 MAN		DICOM® Unified Worklist module Online Help (integrated with software)

* Latest version (available via the Nucletron Extranet).

1.5 Abbreviations

This section provides the definitions of terms, acronyms, and abbreviations, which are used throughout the document.

Abbreviations	Description
AE	Application Entity
DICOM	Digital Imaging and Communications in Medicine, a standard on image communications in medical applications
DIMSE	DICOM Message Service Element
IE	Information Entity
IOD	Information Object Definition. A complete description of attributes, modules and internal structure of an object class
NEMA	National Electrical Manufacturers Association
PDU	Protocol Data Unit
SCU	Service Class User
SCP	Service Class Provider
SOP	Service-Object-Pair, a definition of an information object (like an image) and of a service (like storage) that can be performed for the object
TCP/IP	Transmission Control Protocol / Internet Protocol, a widely used computer networking protocol
VR	Value Representation, a data encoding method in DICOM
UID	Unique Identifier used to identify an object by a worldwide unique Identifier.
C-MOVE	DIMSE for transfer of object instance(s) from a remote requestor AE, whose attributes match a specified set of attributes, to another remote AE, which could be the requestor AE.
C-FIND	DIMSE for matching of a set of attributes to the attributes of a set of DICOM object instances on a remote AE.
C-STORE	DIMSE for transfer of a DICOM object instance to a remote AE.
IHE-RO	Integrated Health Enterprise – Radiation Oncology. An initiative to improve interoperability of systems using established standards (e.g. DICOM) by defining very specific usage profiles.
UPS	Unified Procedure Step. Also sometimes, refer to the whole concept of Unified Worklist and Procedure Step – Unified Workflow.

1.6 References

This conformance statement relates to DICOM objects and services that are not yet part of the DICOM standard. It is based on information in supplements, released for test implementations. There are several versions of these documents and the following lists those versions to which this statement conforms:

Reference	Revision	Description
IHE-RO TDW	2010-05-06	IHE-RO Technical Framework Supplement Treatment Delivery Workflow
DICOM supplement 96	Letter Ballot, 2010-01-29	Unified Worklist and Procedure Step

1.7 DICOM Trademark

DICOM is the registered trademark of the National Electrical Manufacturers Association for its standards publications relating to digital communications of medical information.

2. Implementation Model

In its current version, DICOM Unified Worklist module is basically an implementation of:

- Query and Retrieve for Unified Worklist as an SCU.
- Update Unified Procedure Steps (N-Action and N-Set) as an SCU.

2.1 Application Data Flow Diagram

A diagram illustrating the application model is shown below:

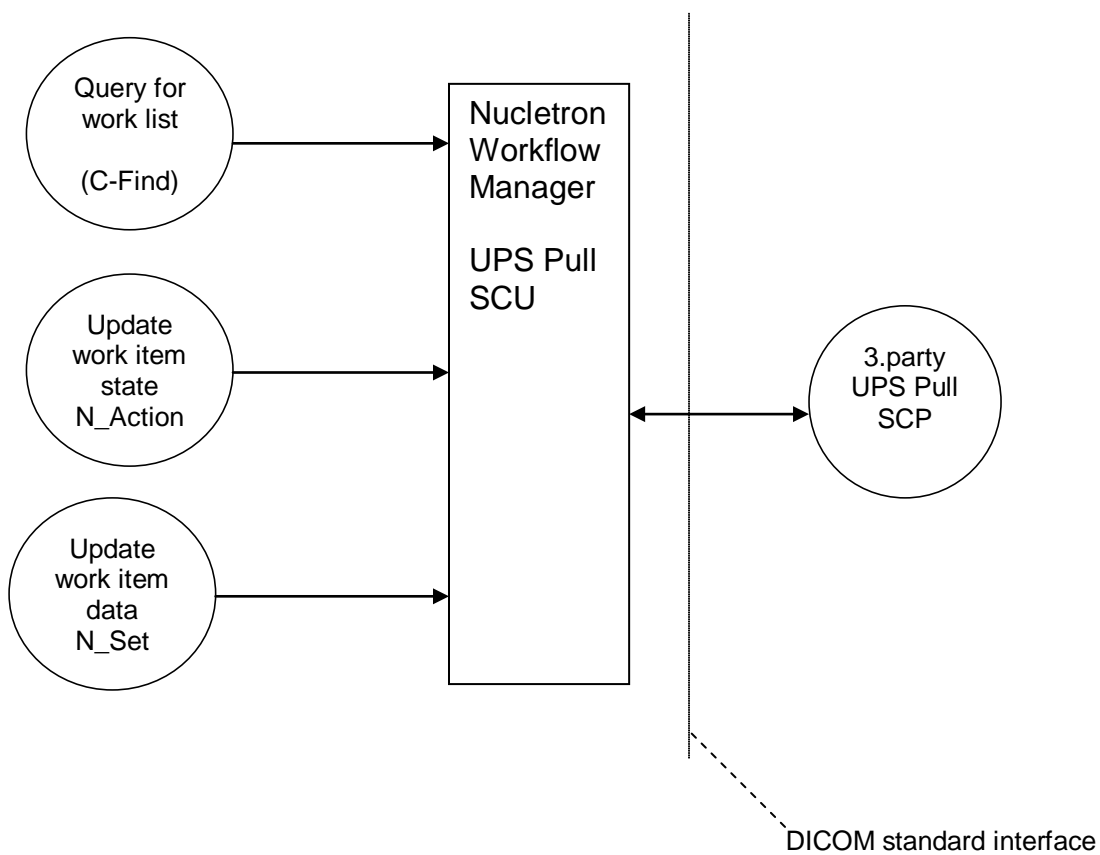


Figure 1: Data flow diagram

2.2 Functional Definitions of AE's

All communications and transfer with the remote application is accomplished with the DICOM protocol over a network using the TCP/IP protocol stack.

Nucletron workflow has commands to get work list, change state of work item and update work item. These are translated into C-Find, N-Action and N-Set requests as appropriate and processed over an association.

2.3 Sequencing of Real World Activities

Real world activities are sequenced as specified in the [IHE-RO TDW] Profile, with limitations as indicated below:

- TDW-RO-1: Worklist Query for Treatment Delivery
 - Supported.

- TDW-RO-2: Retrieve Static Treatment Delivery Input Instances from TMS
 - Not supported.

- TDW-RO-3: Treatment Delivery in Progress
 - Supported.

- TDW-RO-4: Retrieve Dynamic Treatment Delivery Input Instances from TMS
 - Not supported.

- TDW-RO-5: Treatment Delivery Progress Update
 - Supported.

- TDW-RO-6: Store Treatment Delivery Results to TMS
 - Not supported.

- TDW-RO-7: Treatment Delivery Final Update
 - Supported.

- TDW-RO-8: Treatment Delivery Completed/Canceled
 - Supported.

Further details and diagrams of these activities can be found the IHE-RO document.

3. AE Specifications

3.1 Unified Procedure Step Pull SCU – Specification

DICOM Unified Worklist module provides Standard Conformance to the following DICOM Service Object Pair (SOP) Class as a Unified Worklist and Procedure Step Service Class User (SCU).

SOP Class Name	SOP Class UID
UPS Pull SOP Class	1.2.840.10008.5.1.4.34.4.3

3.2 Association Establishment Policies

3.2.1 General

When DICOM Unified Worklist module needs to execute command(s) it creates an association and then closes the association immediately when the commands have been performed. Hence, all associations are short lived and in general there is no open association between the SCU and the SCP.

3.2.2 Number of Associations

DICOM Unified Worklist module will establish at most one association per client workstation.

3.2.3 Asynchronous Nature

DICOM Unified Worklist module does not support asynchronous communication (multiple outstanding transactions over a single association).

3.2.4 Implementation Identifying Information

The Implementation Identifying information is defined as followed:

- The implementation class UID is 2.16.840.1 (i.e. that of MergeCom-3).
- The implementation version name is “NucUWL10”.

3.2.5 Association Initiation policy

DICOM Unified Worklist module keeps no long living associations with the management system. Instead it creates short-lived associations each time it needs to perform some work and then closes it immediately. Depending on the nature of the work to be done, one or more commands can be sent while the association is open. The work to be done during an association is triggered by user actions, but associations are never kept open while waiting for user input.

3.2.6 Association Acceptance policy

Not applicable in this version.

3.2.7 Real-World Activity for operations in DICOM Unified Worklist module

3.2.7.1 Associated Real-World Activities

The following table is a map between the real world operations of DICOM Unified Worklist module and how they map to DICOM commands. Each real world operation maps to one association being established and closed.

Operation		DICOM commands	
Command	Description	Command	Description
Get Worklist	Get a list of work items for a given station and date	C-Find	Query for the list and process respond messages.
Start Work item	Indicates to the management system that this workstation intends to perform the work of this work item.	N-Action	Update the status from SCHEDULED to IN PROGRESS.
		N-Set	Set Procedure Step Progress to 0%.
Update Work item	Gives the management system an intermediate indication of the progress of the work item.	N-Set	Set Procedure Step Progress to any value (0 – 100%).
Complete Work item	Tells the management system that this work item has been completed.	N-Set	Set Procedure Step Progress to 100%. Set Station, Start Date, End Date, Comment and actual human performer.
		N-Action	Update the status from IN PROGRESS to COMPLETED.
Cancel Work item	Tells the management system that the work on this work item has been cancelled. The progress indicator and the comments give further information about the state of the work at cancellation.	N-Set	Set Procedure Step Progress to any value (0 – 100%).. Set Station, Start Date, End Date, Comment and actual human performer.
		N-Action	Update the status from IN PROGRESS to CANCELLED.

3.2.7.2 Accepted presentation Context for C-FIND and C-MOVE execution operations

The presentation contexts that are proposed by the Query Retrieve SCP AE for the Query Retrieve operations are specified in the following table:

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Unified Procedure Step Pull	1.2.840.10008.5.1.4.34.4.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.3 Specific Conformance for Unified Procedure Step Pull SOP class

3.3.1 C-FIND

The work list query uses the following keys and return values:

Level Name/Attribute Name	Tag	Key type	Comments
Study Instance UID	0020,000D	R	
PatientsName	0010,0010	R	
PatientID	0010,0020	R	
Scheduled Procedure Step Start Date And Time	0040,4005	M	A range corresponding to one day, user selected.
Scheduled Procedure Step Priority	0074,1200	R	
Procedure Step Label	0074,1204	R	
Work List Label	0074,1202	R	
Scheduled Station Name Code Sequence	0040,4025	M	
>CodeValue	0008,0100	M	User selected station.
Scheduled Workitem Code Sequence	0040,4018	M	
>Code Value	0008,0100	M	Always "121726".
>Coding Scheme Designator	0008,0102	M	Always "DCM".
>Code Meaning	0008,0104	R	
Input Information Sequence	0040,4021	R	
Referenced Request Sequence	0040,A370	R	
>Requested Procedure Description	0032,1060	R	
Scheduled Processing Parameter Sequence	0074,1210	R	Used to get delivery type (TREATMENT or CONTINUATION)
Unified Procedure Step State	0074,1000	M	Always "SCHEDULED".

Key Types of Matching:

- M : This key is used for matching.
- R : This key is requested for return without matching.

Response status return behavior

Service Status	Status Description	Status Code (0000,0900)
Success	All rows fetched, no error.	0000
Pending	One row fetched successfully, potentially more rows to fetch.	FF00
Pending – No optional keys		FF01
Any other response	Will be reported as an error.	

3.3.2 N-SET

Updating a work item uses the following attributes:

Level Name/Attribute Name	Tag	Update type	Comments
UPS Progress Information Sequence	(0074,1002)	Any	
>Unified Procedure Step Progress	(0074,1004)	Any	
UPS Performed Procedure Sequence	(0074,1216)	Any	
>Performed Processing Parameter Sequence	(0074,1212)	Any	
>>Value Type	(0040,A040)	Any	"TEXT"
>>Text Value	(0040,A160)	Any	"-1"
>>Concept Name Code Sequence	(0040,A168)	Any	
>>>Code Value	(0008,0100)	Any	"121700"
>>>Coding Scheme Designator	(0008,0102)	Any	"DCM"
>>>Code Meaning	(0008,0104)	Any	"Referenced Beam Number in Progress"
>Actual Human Performers Sequence	(0040,4035)	Final	
>>Human Performer Code Sequence	(0040,4009)	Final	
>>>Code Value	(0008,0100)	Final	Performers id
>>>Coding Scheme Designator	(0008,0102)	Final	Performers designator
>>>Coding Scheme Version	(0008,0103)	Final	Performers Version
>>>Code Meaning	(0008,0104)	Final	Performers name
>>Human Performers Organization	(0040,4036)	Final	Empty
>>Human Performers Name	(0040,4037)	Final	
>Performed Station Name Code Sequence	(0040,4028)	Final	
>>Code Value	(0008,0100)	Final	Station id
>>Coding Scheme Designator	(0008,0102)	Final	Station designator
>>Coding Scheme Version	(0008,0103)	Final	Station version
>>Code Meaning	(0008,0104)	Final	Station name
>Performed Procedure Step Start Date	(0040,0244)	Final	
>Performed Procedure Step Start Time	(0040,0245)	Final	
>Performed Procedure Step End Date	(0040,0250)	Final	
>Performed Procedure Step End Time	(0040,0251)	Final	
>Performed Workitem Code Sequence	(0040,4019)	Final	As received from SCP
>>Code Value	(0008,0100)	Final	
>>Coding Scheme Designator	(0008,0102)	Final	
>>Coding Scheme Version	(0008,0103)	Final	
>>Code Meaning	(0008,0104)	Final	
>Performed Procedure Step Description	(0040,0254)	Final	
>Comments On The Performed Procedure Step	(0040,0280)	Final	
>Output Information Sequence	(0040,4033)	Any	Empty sequence
>Non DICOM Output Code Sequence	(0040,4032)	Any	Empty sequence

Update types:

- Any: Included in all updates.
- Final: Included in final update only, i.e. just before Complete/Cancel.

Response status return behavior

Service Status	Status Description	Status Code (0000,0900)
Success	All rows fetched, no error.	0000
Any other response	Will be reported as an error.	

3.3.3 N-ACTION

Changing the state of a work item uses the following attributes:

Attribute name	Tag	Comments
Transaction UID	(0008,1195)	Used and included according to DICOM supplement 96.
Unified Procedure Step State	(0074,1000)	

Response status return behavior

Service Status	Status Description	Status Code (0000,0900)
Success	All rows fetched, no error.	0000
Transaction UID not provided	The work item is already owned by another workstation.	C301
Any other response	Will be reported as an error.	

4. Communication Profiles

4.1 Supported Communication Stacks

DICOM Unified Worklist module uses DICOM TCP/IP Network Communication Support as defined in PS 3.8.

4.2 TCP/IP Stack

DICOM Unified Worklist module uses the MergeCOM-3 DICOM Tool Kit for .Net to communicate over the TCP/IP protocol stack.

4.2.1 Physical Media Support

DICOM Unified Worklist module is indifferent to the physical medium over which TCP/IP executes; it inherits this from the Microsoft Windows operating system upon which it executes.

5. Extensions/Specializations/Privatizations

5.1 Standard Extended/Specialized/Private SOPs

- None supported.

5.2 Private Transfer Syntaxes

- None supported.

6. Support of Extended Character Sets

- Not supported.

7. Codes and Controlled Terminology

- Not supported.

8. Security Profiles

- Not supported.