Final Text - Supplement 2

Digital Imaging and Communications in Medicine (DICOM)

Part 11 : Media Storage Application Profiles

Addenda on Conformance

STATUS: Final Text - Feb 26, 1995

Table of Contents

Foreword

The ACR (the American College of Radiology) and NEMA (the National Electrical Manufacturers Association) formed a joint committee to develop a Standard for Digital Imaging and Communications in Medicine. This DICOM Standard was developed according to the NEMA Procedures. The ACC (American College of Cardiology) has decided to join this standardization effort with a particular interest in the definition of Digital Media Storage Standards.

This Standard was developed in liaison with other Standard Organizations including CEN TC251 in Europe and JIRA in Japan, with review also by other organizations including IEEE, HL7 and ANSI in the USA.

The DICOM Standard is structured as a multi-part document using the guidelines established in the following document:

- ISO/IEC Directives, 1989 Part 3 - Drafting and Presentation of International Standards.

The first nine Parts of DICOM were approved in October 1993:

PS 3.1: Introduction and Overview

PS 3.2: Conformance

PS 3.3: Information Object Definitions

PS 3.4: Service Class Specifications

PS 3.5: Data Structures and Encoding

PS 3.6: Data Dictionary

PS 3.7: Message Exchange

PS 3.8: Network Communication Support for Message Exchange

PS 3.9: Point-to-Point Communication Support for Message Exchange

These Parts are independent but related documents. They focus on the communication of digital image data across point-to-point and network interfaces. This Supplement to the DICOM Standard addresses the open interchange of medical images in files or on removable storage media. It takes into account past and current related efforts:

- The ACR-NEMA Standard for Magnetic Tape (PS1) has defined a generic means to store on a 9 track magnetic tape one or more Data Sets formatted per the ACR-NEMA V2.0 Standard;
- A Japanese effort called IS&C (Image Save and Carry) has also used an ACR-NEMA V2.0 based format to store images on an 130 millimeter or 5 1/4 Inch Magneto-Optical Disk with an IS&C specific media organization format;
- A European effort initiated by the University of Geneva in Switzerland has defined

PAPYRUS, an ACR-NEMA V2.0 based format to store one or more images grouped as folders in files irrespective of the physical media and its file organization format. The new PAPYRUS V3.0 is intended to be compatible with this Supplement to the DICOM Standard.

This DICOM Supplement includes a new Part, PS 3.11, that references two related new Parts:

- PS 3.10: Media Storage and File Format for Media Interchange;
- PS 3.12: Media Formats and Physical Media for Media Interchange.

Together, these Parts and a number of Addenda to existing Parts extend DICOM for the exchange of information on removable media by:

- Defining a File Format, a DICOM File Service, and a directory structure;
- Defining a Media Format and referencing standard physical media;
- Providing a set of Application Profiles that define needed sections of DICOM based on particular clinical applications;
- Establishing a mechanism for stating conformance to these Parts.

As both network communication and media interchange share a number of common characteristics, significant parts of the existing Parts of DICOM are leveraged:

- PS 3.3: Information Object Definitions;
- PS 3.4: Service Class Specifications;
- PS 3.5: Data Set Structures and Encoding;
- PS 3.6: Data Dictionary.

This Supplement also includes addenda to the existing PS 3.2:

- PS 3.2 Addenda - Conformance for Media Storage;

This Supplement contains one Application Profile. Other forthcoming Supplements will include other Application Profiles.

ACC-ACR-NEMA

Digital Imaging and Communications in Medicine (DICOM)

Part 11 : Media Storage Application Profiles

Foreword

The American College of Radiology (ACR) and the National Electrical Manufacturers Association (NEMA) formed a joint committee to develop a Standard for Digital Imaging and Communications in Medicine. The ACC (American College of Cardiology) joined this standardization effort with a particular interest in the definition of Digital Media Storage Standards. This DICOM Standard was developed according to NEMA Procedures.

This Standard is developed in liaison with other Standard Organizations including CEN TC251 in Europe and JIRA in Japan, with review also by other organizations including IEEE, HL7 and ANSI in the USA.

The DICOM Standard is structured as a multi-part document using the guidelines established in the following document:

- ISO/IEC Directives, 1989 Part 3 - Drafting and Presentation of International Standards.

This document is part of the DICOM Standard which consists of the following parts:

PS 3.1: Introduction and Overview

PS 3.2: Conformance

PS 3.3: Information Object Definitions

PS 3.4: Service Class Specifications

PS 3.5: Data Structures and Encoding

PS 3.6: Data Dictionary

PS 3.7: Message Exchange

PS 3.8: Network Communication Support for Message Exchange

PS 3.9: Point-to-Point Communication Support for Message Exchange

PS 3.10: Media Storage and File Formats for Media Interchange

PS 3.11: Media Storage Application Profiles

PS 3.12: Media Formats and Physical Media for Media Interchange

PS 3.13: Print Management Point-to-Point Communication Support

These Parts are independent but related documents. Their development level and approval status may differ.

PS 3.7, PS 3.8, and PS 3.9 focus on the communication of digital image data across point-to-point and network interfaces. PS 3.10, PS 3.11, and PS 3.12 address the open interchange of digital image data on removable storage media. Their development takes into account past and current related

efforts:

- The ACR-NEMA Standard for Magnetic Tape (PS1) has defined a generic means to store on a 9 track magnetic tape one or more Data Sets formatted per the ACR-NEMA V2.0 Standard;
- A Japanese effort called IS&C (Image Save and Carry) has also used an ACR-NEMA V2.0 based format to store images on a 130 millimeter (5 1/4 inch) Magneto-Optical Disk with an IS&C specific media organization format;
- A European effort initiated by the University of Geneva in Switzerland has defined PAPYRUS, an ACR-NEMA V2.0 based format to store one or more images grouped as folders in files irrespective of the physical media and its file organization format. The new PAPYRUS V3.0 is intended to be a specific Application Profile compatible with this Part.

As both network communication and media interchange share a number of common characteristics, the following parts of DICOM developed for network communication are leveraged for media interchange:

- PS 3.2: Conformance
- PS 3.3: Information Object Definitions
- PS 3.4: Service Class Specifications
- PS 3.5: Data Set Structures and Encoding
- PS 3.6: Data Dictionary

PS 3.10: Media Storage and File Formats for Media Interchange, lays a foundation for two other Parts of the DICOM Standard by specifying a general model for the storage of Medical Imaging information on removable media. PS 3.12: Media Formats and Physical Media defines a number of standard Physical Media and corresponding Media Formats suitable for medical image information exchange. This Part, PS 3.11: Media Storage Application Profiles, enables interoperability by specifying standard sets of elements from the various other parts of the DICOM Standard related to a specific clinical need. Conformance to DICOM in the area of Media interchange is defined by PS 3.2 and is based on the Application Profiles defined by this Part.

PS 3.11 and PS 3.12 will be expanded through the addition of Application Profile and media definition Annexes as clinical needs and physical media technologies evolve.

1 Scope and Field of Application

This Part of the DICOM Standard specifies application specific subsets of the DICOM Standard to which an implementation may claim conformance. Such a conformance statement applies to the interoperable interchange of medical images and related information on storage media for specific clinical uses. It follows the framework, defined in PS 3.10, for the interchange of various types of information on storage media.

This Part is related to other parts of the DICOM Standard in that:

- PS 3.2: Conformance, specifies the general rules for assuring interoperability, which are applied for media interchange through the Application Profiles of this Part;
- PS 3.3: Information Object Definitions, specifies a number of Information Object Definitions (e.g., various types of images) which may be used in conjunction with this Part. It also defines a medical Directory structure to facilitate access to the objects stored on media;
- PS 3.4: Service Class Specifications, specifies the Media Storage Service Class upon which Application Profiles are built;
- PS 3.5: Data Structure and Encoding, addresses the encoding rules necessary to construct a Data Set which is encapsulated in a file as specified in PS 3.10;
- PS 3.6: Data Dictionary, contains an index by Tag of all Data Elements related to the Attributes of Information Objects defined in PS3.3. This index includes the Value Representation and Value Multiplicity for each Data Element;
- PS 3.10: Media Storage and File Formats for Media Interchange standardizes the overall open Storage Media architecture used by this Part, including the definition of a generic File Format, a Basic File Service and a Directory concept;
- PS 3.12: Media Formats and Physical Media, defines a number of standard Physical Media and corresponding Media Formats. These Media Formats and Physical Media selections are referenced by one or more of the Application Profiles of this Part. PS 3.12 is intended to be extended as the technologies related to Physical Medium evolve.

2 References

2.1 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibilities of applying the most recent editions of the standards indicated below.

ISO/IEC Directives, 1989 Part 3 - Drafting and presentation of International Standards.

ISO 7498-1, Information Processing Systems - Open Systems Interconnection - Basic Reference Model.

ISO 8859, Information Processing - 8-bit single-byte coded graphic character sets - Part 1: Latin Alphabet No. 1.

3 Definitions

For the purposes of this Standard the following definitions apply.

3.1 Reference Model Definitions

This Part of the Standard is based on the concepts developed in ISO 7498-1 and makes use of the following terms defined in it:

a) Application Entity;

b) Service or Layer Service;

c) Transfer Syntax.

3.2 DICOM Introduction and Overview Definitions

This Part of the Standard makes use of the following terms defined in PS 3.1 of the DICOM Standard:

a) Attribute.

3.3 DICOM Conformance

This Part of the Standard makes use of the following terms defined in PS 3.2 of the DICOM Standard:

a) Conformance Statement;

b) Standard SOP Class;

c) Standard Extended SOP Class;

d) Specialized SOP Class;

e) Private SOP Class;

f) Standard Application Profile;

g) Augmented Application Profile;

h) Private Application Profile.

3.4 DICOM Information Object Definitions

This Part of the Standard makes use of the following terms defined in PS 3.3 of the DICOM Standard:

a) Information Object Definition;

b) Basic Directory IOD;

c) Basic Directory Information Model.

3.5 DICOM Data Structure and Encoding definitions

This Part of the Standard makes use of the following terms defined in PS 3.5 of the DICOM Standard:

a) Data Element;

b) Data Set.

3.6 DICOM Message Exchange definitions

This Part of the Standard makes use of the following terms defined in PS 3.7 of the DICOM Standard:

a) Service Object Pair (SOP) Class;

b) Service Object Pair (SOP) Instance;

c) Implementation Class UID.

3.7 DICOM Media Storage and File Format definitions

This Part of the Standard makes use of the following terms defined in PS 3.10 of the DICOM Standard:

a) Application Profile;

b) DICOM File Format;

c) DICOM File Service;

d) DICOM File;

e) DICOMDIR File;

f) File;

g) File ID;

h) File Meta Information;

i) File-set;

j) Media Storage Model.

3.8 Media Storage Application Profiles

This Part of the DICOM Standard uses the following definitions:

3.8.1 Application Profile Class:

A group of related Application Profiles defined in a single Annex to this Part.

4 Symbols and Abbreviations

The following symbols and abbreviations are used in this Part of the Standard.

ACC	American College of Cardiology
ACR	American College of Radiology
AP	Application Profile
ASCII	American Standard Code for Information Interchange
AE	Application Entity
ANSI	American National Standards Institute
CEN TC 251	Comite Europeen de Normalisation - Technical Committee 251 - Medical Informatics
DICOM	Digital Imaging and Communications in Medicine
FSC	File-set Creator
FSR	File-set Reader
FSU	File-set Updater
HL7	Health Level 7
IEEE	Institute of Electrical and Electronics Engineers
IS&C	Image Save and Carry
ISO	International Standards Organization
ID	Identifier
IOD	Information Object Definition
JIRA	Japanese Industry Association for Radiation Apparatus
NEMA	National Electrical Manufacturers Association
OSI	Open Systems Interconnection
SOP	Service-Object Pair

TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier
VR	Value Representation

5 Conventions

Words are capitalized in this document to help the reader understand that these words have been previously defined in Section 3 of this document and are to be interpreted with that meaning.

6 Purpose of an Application Profile

An Application Profile is a mechanism for selecting an appropriate set of choices from the Parts of DICOM for the support of a particular media interchange application. Application Profiles for commonly used interchange scenarios, such as inter-institutional exchange of x-ray cardiac angiographic examinations, or printing ultrasound studies from recordable media, are meant to use the flexibility offered by DICOM without resulting in so many media and format choices that interchange is compromised.

Media interchange applications claim conformance to one or more Media Storage Application Profiles. Two implementations that conform to identical Application Profiles and support complementary File-set roles (e.g. an FSC interchanging media with an FSR) are able to exchange SOP Instances (pieces of DICOM information) on recorded media within the context of those Application Profiles.

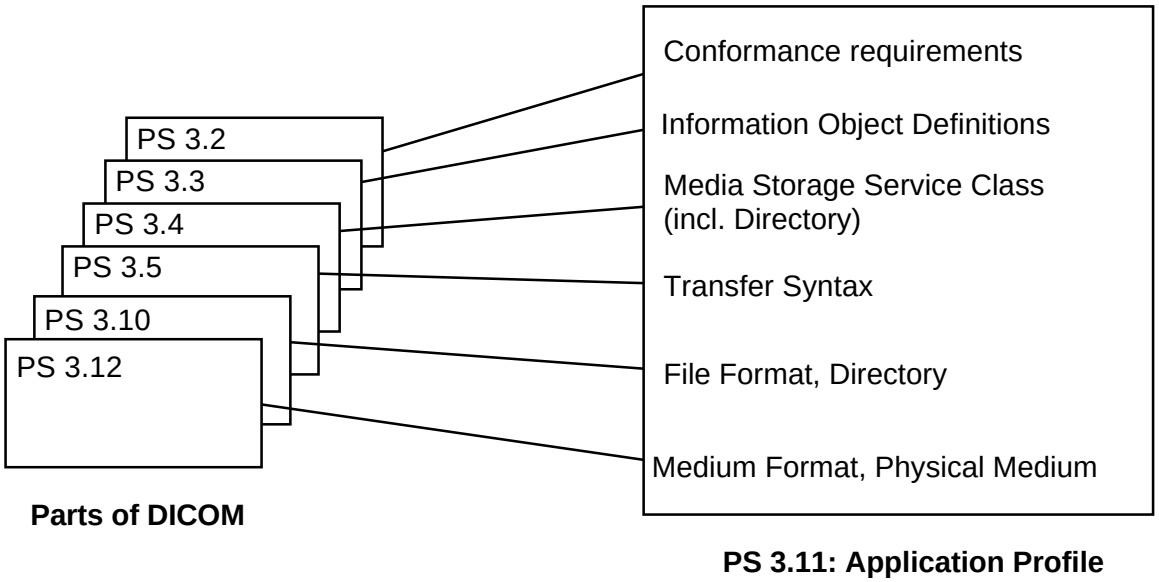
A DICOM Application Profile specifies:

- which SOP Classes and options must be supported, including any required extensions, specializations, or privatizations;
- for each SOP Class, which Transfer Syntaxes may be used;
- what information should be included in the Basic Directory IOD;
- which Media Storage Service Class options may be utilized;
- which roles an application may take: File-set Creator, File-set Reader, and/or File-set Updater;
- which physical media and corresponding media formats must be supported;

and any additional conformance requirements.

The result of making the necessary choices means that the Application Profile can be thought of as a vertical path through the various Parts of DICOM that begins with choices of information to be exchanged and ends at the physical medium. Figure 6-1 shows the relationship between the concepts used in an Application Profile and the Parts of DICOM.

Figure 6-1: Relationship Between an Application Profile and Parts of DICOM



An Application Profile is organized into the following major parts:

- The name of the Application Profile, or the list of Application Profiles grouped in a related class;
- A description of the clinical context of the Application Profile;
- The definition of the Media Storage Service Class with the device Roles for the Application Profile and associated options;
- An informative section describing the operational requirements of the Application Profile;
- Specification of the SOP Classes and associated IODs supported and the Transfer Syntaxes to be used;
- The selection of Media Format and Physical Media to be used;
- If the Directory Information Module is used, the description of the minimum subset of the Information Model required;

- Other parameters which need to be specified to ensure interoperable media interchange.

The structure of DICOM and the design of the Application Profile mechanism is such that extension to additional SOP Classes and new exchange media is straightforward.

7 Conformance Requirements

Implementations may claim conformance to one or more PS 3.11 Application Profiles in a Conformance Statement as outlined in PS 3.2.

NOTE: Additional specific conformance requirements for an Application Profile may be listed in the Application Profile definition.

8 Structure of Application Profile

Application Profiles specific to various clinical areas are defined in the Annexes to this Part. Each Annex defines an Application Profile Class related to a single area of medical practice, e.g., cardiology, or to a single functional context, e.g., image transfer to a printer system. Several specific Application Profiles may be defined in each Application Profile class, and an identification scheme is established to label each specific Application Profile.

An example of an Application Profile structure is provided in below. The section identifier "X" should be replaced by the identifier of the Annex.

Class and Profile Identification - Section X.1

Section X.1 of the Application Profile defines the class and specific Application Profiles in that class.

This section assigns an identifier to each Application Profile of the form ttt-x...x-y...y, where “ttt” indicates the type of Application Profile, "x...x" is an abbreviation of a significant term for the clinical context and "y...y" is a significant term for a distinguishing feature of the specific Application Profile. The “ttt” type term shall be one of STD, AUG, or PRI, indicating whether the Application Profile is a Standard, Augmented, or Private Application Profile respectively (see PS 3.2). Neither "x...x" nor "y...y" is restricted in length or content.

Clinical Context - Section X.2

Section X.2 of the Application Profile shall describe the clinical need for the interchange of medical images and related information on storage media, and its context of application. This section shall not require any specific functionality of the Application Entities exchanging information using media interchange beyond their capabilities in the roles of File-set Creator, File-set Reader, and File-set Updater.

Note: This Section does not, for example, place any graphical presentation or performance requirements on workstations which read DICOM interchange media. Such requirements are beyond the scope of a DICOM Media Storage Application Profile. The requirements which fall within the scope of an Application Profile are the specific functional storage media interchange capabilities associated with the defined roles.

Roles and Service Class Options - Section X.2.1

Section X.2.1 describes the Service Class Options used and the contextual application of the roles of File-set Creator, File-set Reader, and File-set Updater.

General Class Profile - Section X.3

Section X.3 defines characteristics of the Application Profile Class that are constant across all specific Application Profiles in the class.

SOP Classes and Transfer Syntaxes - Section X.3.1

Section X.3.1 lists the SOP Classes and Transfer Syntaxes common to all specific Application Profiles in the class, if any. This section specifies which SOP Classes are mandatory and optional for the roles of FSC, FSR, and FSU, including any required groupings or SOP options.

Physical Media And Media Formats - Section X.3.2

Section X.3.2 defines the physical media and corresponding media formats common to all specific Application Profiles in the class, if any.

This section also specifies any file service functionality beyond the DICOM File Service required by the clinical application to be supplied by the Media Format Layer.

Directory Information in DICOMDIR - Section X.3.3

Section X.3.3 specifies the type of Directory Records that shall be supported and any additional associated keys. It also defines any extensions to or specializations of the Basic Directory Information Object Definition, if any.

Other Parameters - Section X.3.4

Section X.3.4 is optional; if present, it should define any other parameters common to all specific Application Profiles in the class which may need to be specified in order to ensure interoperable media interchange.

Specific Application Profiles - Section X.4 and following

Sections X.4.and following, each define the unique characteristics of a specific Application Profile. If there are any Application Profile specific changes to IODs, Transfer Syntax, DICOMDIR, or other general class requirements, they should be described for each Application Profile that specifies such changes.

Annex A (Normative) - Basic Cardiac X-ray Angiographic Application Profile

A.1 Class and Profile Identification

This Annex defines an Application Profile Class for Basic Cardiac X-ray Angiographic clinical applications.
The identifier for this class shall be STD-XABC. This Annex is concerned only with cardiac angiography.

The specific Application Profile in this class is shown in the Table A.1.

Note: This table contains only a single Application Profile. It is expected that additional Application Profiles may be added to PS3.11.

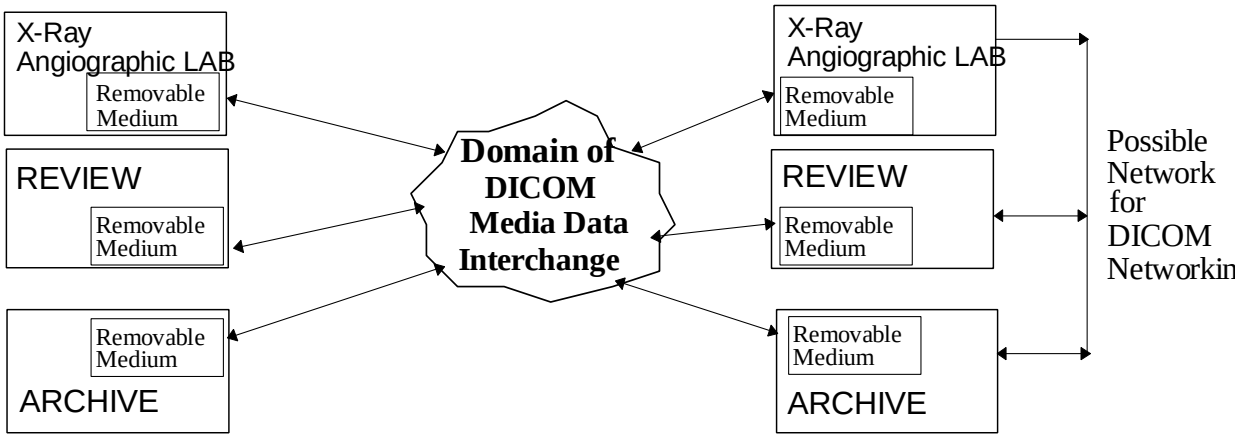
Table A.1 - Basic Cardiac XA Profile

Application Profile	Identifier	Description
Basic Cardiac X-Ray Angiographic Studies on CD-R Media	STD-XABC-CD	It handles single frame or multi-frame digital images up to 512x512x8 bits; biplane acquisitions are encoded as two single plane information objects.

A.2 Clinical Context

This Application Profile Class facilitates the interchange of primary digital X-ray cine runs, typically acquired as part of cardiac catheterization procedures. Typical media interchanges would be from in-lab acquisition equipment to either a display workstation or to a data archive system, or between a display workstation and a data archive system (in both directions). This context is shown in the figure below.

Figure 1 Clinical Context Diagram



The operational use of media interchange is potentially both intra-institutional and inter-institutional.

A.2.1 Roles and Service Class Options

This Application Profile Class uses the Media Storage Service Class defined in PS3.4 with the Interchange Option.

The Application Entity shall support one or more of the roles of File-set Creator, File-set Reader, and File-set Updater, defined in PS3.10.

A.2.1.1 File Set Creator

The Application entity acting as a File-Set Creator generates a File Set under the STD-XABC Application Profile Class. Typical entities using this role would include X-ray angiographic lab equipment, and archive systems which generate a patient record for transfer to another institution. File Set Creators shall be able to generate the Basic Directory SOP Class in the DICOMDIR File with all types of Directory Records related to the SOP Classes stored in the File-set.

FSC shall offer the ability to either finalize the disc at the completion of the most recent write session (no additional information can be subsequently added to the disc) or to allow multi-session (additional information may be subsequently added to the disk).

NOTE: A multiple volume (a logical volume that can cross multiple physical media) is not supported by this Application Profile Class. If a set of Files, e.g., a Study, cannot be written entirely on one CD-R, the FSC will create multiple independent DICOM File-sets such that each File-set can reside on a single CD-R media

controlled by its individual DICOMDIR file. The user of the FSC can opt to use written labels on the discs to indicate that there is more than one disc for this set of files (e.g., a study).

A.2.1.2 File Set Reader

The role of File Set Reader is used by Application Entities which receive a transferred File Set. Typical entities using this role would include display workstations, and archive systems which receive a patient record transferred from another institution. File Set Readers shall be able to read all the SOP Classes defined for the specific Application Profile for which a Conformance Statement is made, using all the defined Transfer Syntaxes.

A.2.1.3 File Set Updater

The role of File Set Updater is used by Application Entities which receive a transferred File Set and update it by the addition of information. Typical entities using this role would include analytic workstations, which, for instance, may add to the File-set an information object containing a processed (e.g., edge-enhanced) image. Stations which update patient information objects would also use this role. File-set Updaters do not have to read the images. File-set Updaters shall be able to generate one or more of the SOP Instances defined for the specific Application Profile for which a conformance statement is made, and to read and update the DICOMDIR file.

FSU shall offer the ability to either finalize the disc at the completion of the most recent write session (no additional information can be subsequently added to the disc) or to allow multi-session (additional information may be subsequently added to the disk).

NOTE: If the disc has not been closed out, the File-set Updater shall be able to update information assuming there is enough space on the disc to write a new DICOMDIR file, the information, and the fundamental CD-R control structures. CD-R control structures are the structures that are inherent to the CD-R standards, see PS3.12.

A.3 STD-XABC-CD Basic Cardiac Profile

A.3.1 SOP Classes and Transfer Syntaxes

This Application Profile is based on the Media Storage Service Class with the Interchange Option (see PS3.4).

SOP Classes and corresponding Transfer Syntaxes supported by this Application Profile are specified in the Table A.3.1-1.

Table A.3.1-1. STD-XABC-CD SOP Classes and Transfer Syntaxes

Information Object Definition	Service Object Pair Class UID	Transfer Syntax and UID	FSC Requirement	FSR Requirement	FSU Requirement
Basic Directory	1.2.840.10008.1.3.10	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	Mandatory	Mandatory	Mandatory
X-Ray Angiographic Image	1.2.840.10008.5.1.4.1.1.12.1	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	Mandatory	Mandatory	Optional
Detached Patient Management	1.2.840.10008.3.1.2.1.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	Optional	Optional	Optional

NOTES: 1.This application profile does not allow the use of the X-Ray Angiographic BiPlane Image Object. Biplane acquisitions must therefore be transferred as two single plane SOP instances. A future Application Profile that permits X-Ray Angiographic BiPlane Image Object transfer is under development.
2.This Applicaton Profile includes only the XA Image and Detached Patient Management SOP Instances. It does not include Standalone Curve, Modality LUT, VOI LUT, or Overlay SOP Instances.

A.3.2 Physical Media And Media Formats

Basic Cardiac Application Profiles in the STD-XABC class require the 120 mm CD-R physical media with the ISO/IEC 9660 Media Format, as defined in PS3.12.

A.3.3 Directory Information in DICOMDIR

Conformant Application Entities shall include in the DICOMDIR File a Basic Directory IOD containing Directory Records at the Patient and subsidiary levels appropriate to the SOP Classes in the File-set.

NOTE: DICOMDIRs with no directory information are not allowed by this Application Profile.

A.3.3.1 Additional Keys

Table A.3.3.1-1 specifies the type of Directory Records that shall be supported and the additional associated keys. Refer to the Basic Directory IOD in PS 3.3.

Table A.3.3.1-1 APL-XA-BCCD Additional DICOMDIR Keys

Key Attribute	Tag	Directory Record Type	Type	Notes
Date of Birth	(0010,0030)	PATIENT	2	
Sex	(0010,0040)	PATIENT	2	
Institution Name	(0008,0080)	SERIES	2	
Institution Address	(0008,0081)	SERIES	2	
Performing Physician	(0008,1050)	SERIES	2	
Icon Image Sequence	(0088,0200)	IMAGE	1	
Image Type	(0008,0008)	IMAGE	1	
Calibration Image	(0050,0004)	IMAGE	2	
Referenced Image Sequence	(0008,1140)	IMAGE	1C	Required if the SOP Instance referenced by the Directory Record has an Image Type (0008,0008) of BIPLANE A or BIPLANE B.
>Referenced SOP Class UID	(0008,1150)	IMAGE	1C	Required if Referenced Image Sequence (0008,1140) is present
>Referenced SOP Instance UID	(0008,1155)	IMAGE	1C	Required if Referenced Image Sequence (0008,1140) is present

A.3.3.2 Icon Images

Directory Records of type IMAGE shall include Icon Images. The icon pixel data shall be supported with Bits Allocated (0028,0100) equal to 8 and Row (0028,0010) and Column (0028,0011) attribute values of 128.

NOTES: 1. This icon size is larger than that recommended in PS3.10 because the 64x64 icon would not be clinically useful for identifying and selecting x-ray angiographic images.

2. For multi-frame images, it is recommended that the icon image be derived from the frame identified in the Directory Frame Number attribute (0028,6010), if defined for the image SOP Instance. If the Directory Frame Number is not present, a frame approximately one-third of the way through the multi-frame image should be selected. The process to reduce a 512x512 image to a 128x128 image is beyond the scope of this standard.

A.3.4 Other Parameters

This section defines other parameters common to all specific Application Profiles in the STD-XABC class which need to be specified in order to ensure interoperable media interchange.

A.3.4.1 Image Attribute Values

The attributes listed in Table A.3.4.1-1 used within the X-Ray Angiographic Image files shall take the values specified.

Table A.3.4.1-1 STD-XABC-CD- Required Image Attribute Values

Attribute	Tag	Value
Modality	(0008,0060)	XA
Rows	(0028,0010)	512 (see below)
Columns	(0028,0011)	512 (see below)
Bits Allocated	(0028,0100)	8
Bits Stored	(0028,0101)	8

When creating or updating a File-set, Rows or Columns shall not exceed a value of 512.
When reading a File-set, an FSR or FSU shall accept a value of at least 512 for Rows or Columns.

Overlay data, if present, shall be encoded in Overlay Data (60XX,3000).

A.3.4.1.1 Attribute Value Precedence

The values of attributes contained in a Detached Patient Management SOP Instance referenced by a Directory Record of type PATIENT shall take precedence over the values of those attributes contained in a SOP Instance referenced by a subsidiary Directory Record. The DICOMDIR Directory Records of type PATIENT shall have key attribute values in accordance with this precedence.

NOTE: This allows patient identification and demographic information to be updated without changing the composite Image IOD files. The DICOMDIR file is critical in establishing the link between the updated information and the image. As an example, at the time an Image file was written, the patient's name was incorrect, or inconsistent with the Hospital Information System records. Subsequently, a Detached Patient Management file with the corrected name is added to the File-set. If the FSR supports the Detached Patient Management SOP Class, then the FSR should use the information from this SOP Class rather than the information in the Image file.

ACC-ACR-NEMA

Digital Imaging and Communications in Medicine(DICOM)

PART 2 Addenda: Media Storage Conformance

Items to be added or changed in PS 3.2: Conformance

Item #1
Add to the list of DICOM Parts in the Foreword:

PS 3.10: Media Storage and File Format for Media Interchange

PS 3.11: Media Storage Application Profiles

PS 3.12: Media Formats and Physical Media for Media Interchange

Item #2
Changes to Section 3 (Definitions)
Renumber section 3.10 DICOM Conformance to Section 3.11, replace the definition in 3.10.1 by the following definition, and add definitions 3.11.8 to 3.11.10 :

3.11.1 Conformance Statement: A formal statement associated with a specific implementation of the DICOM Standard. It specifies the Service Classes, Information Objects, Communications Protocols and Media Storage Application Profiles supported by the implementation.

3.11.8 Standard Application Profile: An Application Profile defined in the DICOM Standard that is used in an implementation with no modifications.

3.11.9 Augmented Application Profile: An Application Profile derived from a Standard Application Profile by incorporating support for additional Standard or Standard Extended SOP Classes.

3.11.10 Private Application Profile: An Application Profile that is not defined in the DICOM Standard, but is published in an implementation's Conformance Statement.

Item #3
Add Section 3.10

3.10 Media Storage and File Format for Media Interchange

This Part of the Standard makes use of the following terms defined in PS 3.10:

a) File-set
b) File-set Creator (FSC)
c) File-set Reader (FSR)
d) File-set Updater (FSU)
e) Application Profile

Item #4
Add the following to the list of Symbols and Abbreviations of section 4:

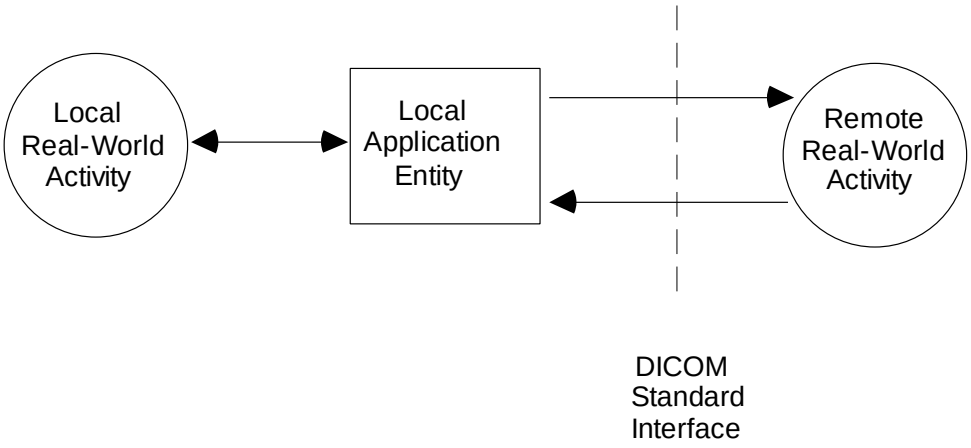
AP	Application Profile
FSC	File-set Creator
FSR	File-set Reader
FSU	File-set Updater
RWA	Real-World Activity

Item #5
Replace section 5.1.4 with the following:

5.1.4 Network_Associations

An association **over a network** between a local Application Entity and a remote Application Entity supporting a remote Real-World Activity is depicted within an Application Data Flow Diagram by placing the remote Real-World Activity to the right of the related local Application Entity with one or two arrows drawn between them as shown in Figure 5.1.4. The dashed line represents the DICOM Standard Interface between the local Application Entities, and whatever remote Application Entities that handle the remote Real-World Activities. An arrow from the local Application Entity to the remote Real-World Activity indicates that an occurrence of the local Real-World Activity will cause the local Application Entity to initiate an association for the purpose of causing the remote Real-World Activity to occur. An arrow from the remote Real-World Activity to the local Application Entity indicates that the local Application Entity expects to receive an association request when the remote Real-World Activity occurs, causing the local Application Entity to perform the local Real-World Activity.

Figure 5.1.4 - Associations Convention



Item #6
Add section 5.1.5

5.1.5 Media Storage File-set Access

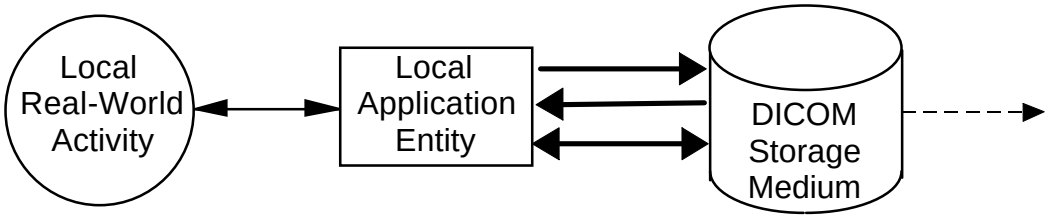
Application Entities exchanging information on media use the DICOM File Service as specified in PS 3.10 for access to, or creation of, File-sets. This File Service provides operations that support three basic roles, which are File-set Creator (FSC), File-set Reader (FSR), and File-set Updater (FSU).

These roles are depicted on an Application Data Flow diagram by directional arrows placed between the local Application Entities and the DICOM Storage Media on which the roles are applied.

- File-set Creator (FSC), denoted by ;
- File-set Reader (FSR), denoted by ;
- File-set Updater (FSU), denoted by .
- Physical movement of the medium, denoted by (with or without arrowhead)

Figure 5.1.5 illustrates the three basic roles.

Figure 5.1.5 - File-set Access



The local interactions shown on the left between a local Real-World activity and a local Application Entity are depicted by a bi-directional arrow. The arrows on the right represent access by the local Application Entity to a File-set on the DICOM Storage Medium. When an Application Entity supports several roles, this combination is depicted with multiple arrows corresponding to each of the roles. The dotted arrow symbolizes the removable nature of media for an interchange application.

NOTE: The use of two arrows relative to an FSC and an FSR should be distinguished from the case where a double arrow relative to an FSU is used. For example, an FSU may update a File-set without creating a new File-set, whereas a combined FSC and FSR may be used to create and verify a File-set.

Item #7
Replace section 6 by:

6 Purpose of a Conformance Statement

An implementation need not employ all the optional components of the DICOM Standard. After meeting the minimum general requirements, a conformant DICOM implementation may utilize whatever SOP Classes, communications protocols, **Media Storage Application Profiles**, optional (Type 3) Attributes, etc., needed to accomplish its designed task.

NOTE: In fact, it is expected that an implementation might only support the SOP Classes related to its Real World Activities. For example, a simple film digitizer may not support the SOP Classes for other imaging modalities since such support may not be required. On the other hand, a complex storage server might be required to support SOP Classes from multiple modalities in order to adequately function as a storage server. The choice of which components of the DICOM Standard are utilized by an implementation depends heavily on the intended application and is beyond the scope of this Standard.

In addition, the DICOM Standard allows an implementation to extend or specialize the DICOM defined SOP Classes, as well as define Private SOP classes.

A Conformance Statement allows a user to determine which optional components of the DICOM Standard are supported by a particular implementation, and what additional extensions or specializations an implementation adds. By comparing the Conformance Statements from two different implementations, a knowledgeable user should be able to determine whether and to what extent communications might be supported between the two implementations.

Different structures are used for the content of Conformance Statements depending on whether the implementation supports a DICOM network interface, a DICOM Media Storage interface, or both. In the latter case, a single Conformance Statement shall be provided which consists of a section for networking and a section for media storage.

6.1 Overview of Networking Section for Conformance Statements

The networking section of a Conformance Statement consists of the following major parts:

- an Implementation Model which describes the Application Entities in the implementation with networking capability and how they relate to both local and remote Real-World Activities;
- a more detailed specification of each Application Entity, listing the SOP Classes supported and outlining the policies with which it initiates or accepts associations;
- for each Application Entity and Real-World Activity combination, a description of proposed (for Association Initiation) and acceptable (for Association Acceptance) Presentation Contexts;

  NOTE: A Presentation Context consists of an Abstract Syntax plus a list of acceptable Transfer Syntaxes. The Abstract Syntax identifies one SOP Class or Meta SOP Class (a collection of related SOP Classes identified by a single Abstract Syntax UID). By listing the Application Entities with their proposed and accepted Presentation Contexts, the Conformance Statement is identifying the set of Information Objects and Service Classes which are recognized by this implementation;

- for each SOP Class related to an Abstract Syntax, a list of any SOP options supported;
- a set of communications protocols which this implementation supports;
- a description of any extensions, specializations, and publicly disclosed privatizations in this implementation;
- a section describing DICOM related configuration details;
- a description of any implementation details which may be related to DICOM conformance or interoperability.

6.2 Overview of Media Storage Section for Conformance Statements

The media storage section of a Conformance Statement consists of the following major parts:

- an Implementation Model which describes the Application Entities in the implementation with media storage capability and how they relate to both local and remote Real-World Activities;

- a more detailed specification of each Application Entity listing the Media Storage Application Profiles supported (this defines SOP Classes supported and media selected) and outlining the policies with which it creates, reads, or updates File-sets on the media;
- a list of optional SOP Classes supported;
- for each Media Storage SOP Class related to a media storage Application Profile a list of any SOP options supported;
- for each Media Storage SOP Class related to a media storage Application Profile a list of optional Transfer Syntaxes supported;
- a description of any extensions, specializations, and publicly disclosed privatizations in this implementation such as Augmented or Private Application Profiles;
- a section describing DICOM related configuration details;
- a description of any implementation details which may be related to DICOM conformance or interoperability.

Item #8
Replace Section 7 with the following;

7 Conformance Requirements

An implementation claiming DICOM conformance may choose to support one of the following:

1) network conformance according to Section 7.1 (DICOM Network Conformance Requirements);
2) media storage conformance according to Section 7.2 (DICOM Media Storage Conformance Requirements);
3) both of the above.

7.1 DICOM Network Conformance Requirements

An implementation claiming DICOM network conformance shall:

- conform to the minimum conformance requirements defined in this section;
- provide with the implementation a Conformance Statement structured according to the rules and policies in this Part including Annex A;
- conform to at least one Standard or Standard Extended SOP class as defined in PS 3.4;

NOTE: Conformance to a Standard or Standard Extended SOP class implies conformance to the related IOD outlined in PS 3.3, the Data Elements defined in PS 3.6, and the operations and notifications defined in PS 3.7.

- comply with the rules governing SOP Class types outlined in Section 7.3;
- accept a Presentation Context for the Verification SOP Class as an SCP if the implementation accepts any DICOM association requests;
- produce and/or process Data Sets as defined in PS 3.5;

NOTE: Conformance to PS 3.5 also implies conformance to PS 3.6.

- obtain legitimate right to a registered <org id> for creating UIDs (see PS 3.5) if an implementation utilizes Privately Defined UIDs (i.e., UIDs not defined in the DICOM Standard);
- support one or more of the following communications modes:
  a) TCP/IP (See PS 3.8);
  b) OSI (See PS3.8);
  c) Point to Point (See PS 3.9).

7.2 DICOM Media Interchange Conformance Requirements

An implementation claiming DICOM Media Interchange conformance shall:

- conform to the minimum conformance requirements defined in this section;
- provide with the implementation a Conformance Statement structured according to the rules and policies in this Part including Annex C;
- conform to at least one Standard Application Profile as defined in PS 3.11;
- support one of the Physical Media and associated Media Format, as specified by PS 3.12;
- comply with the rules governing SOP Class types outlined in Section 7.3;
- comply with the specific rules governing media storage Application Profiles according to their types as specfified in Section 7.4. No other types of Application Profiles may be used;
- read as an FSR or FSU all SOP Classes defined as mandatory by each of the supported Application Profiles encoded in any of the mandatory Transfer Syntaxes;
- write as an FSC or FSU all SOP Classes defined as mandatory by each of the supported Application Profiles in one of the mandatory Transfer Syntaxes;
- be able to gracefully ignore any Standard, Standard Extended, Specialized or Private SOP Classes which may be present on the Storage Medium but are not defined in any of the

Application Profiles to which conformance is claimed;

NOTE: There may be more than one Application Profile used to create or read a File-set on a single physical medium (e.g., a medium may have a File-set created with Standard and Augmented Application Profiles).

- be able to gracefully ignore Directory Records in the DICOMDIR file which do not correspond to Directory Records defined in any of the Application Profiles to which conformance is claimed;
- access the File-set(s) on media using the standard roles defined in PS 3.10;
- produce and/or process Data Sets as defined in PS 3.5 encapsulated in DICOM Files;

NOTE: Conformance to PS 3.5 also implies conformance to PS 3.6.

- obtain legitimate right to a registered <org id> for creating UIDs (see PS 3.5) if an implementation utilizes Privately Defined UIDs (i.e., UIDs not defined in the DICOM Standard).

An implementation which does not meet all the above requirements shall not claim conformance to DICOM for Media Interchange.

7.3 Rules Governing Types of SOP Classes

Each SOP Class published in a Conformance Statement is one of four basic types. Each SOP Class in an implementation claiming conformance to the DICOM Standard shall be handled in accordance with the following rules, as dictated by the type of SOP Class.

Standard SOP Classes conform to all relevant Parts of the DICOM Standard with no additions or changes.

To claim conformance to a Standard SOP Class, an implementation shall make a declaration of this fact in its Conformance Statement, and identify its selected options, roles, and behavior.

Standard Extended SOP Classes shall:

a) be a proper super set of one Standard SOP Class;

b) not change the semantics of any Standard Attribute of that Standard SOP Class;

c) not contain any Private Type 1, 1C, 2, or 2C Attributes;

d) not change any Standard Type 3 Attributes to Type 1, 1C, 2, or 2C;

e) use the same UID as the Standard SOP Class on which it is based.

A Standard Extended SOP Class may include Standard and/or Private Type 3 Attributes beyond those defined in the IOD on which it is based as long as the Conformance Statement identifies the added Attributes and defines their relationship with the PS 3.3 information model.

An implementation claiming conformance with a Standard Extended SOP Class shall identify in its Conformance Statement the Standard SOP Class being extended, the options, roles, and behavior selected, and describe the Attributes being added with the Standard SOP Class's IOD Model and Modules.

Specialized SOP Classes shall:

a) be completely conformant to relevant Parts of the DICOM Standard;

b) be based on a Standard SOP Class, i.e.:

- contain all the Type 1, 1C, 2, and 2C Attributes of Standard SOP Class on which it is based;
- not change the semantics of any Standard Attribute;

c) use a Privately Defined UID for its SOP Class (i.e., shall not be identified with a DICOM Defined UID);

d) be based on the DICOM Information Model in PS 3.3 and PS 3.4.

Specialized SOP Classes may:

a) contain additional Standard and/or Private Type 1, 1C, 2, or 2C Attributes;

b) add Private and Standard Type 3 Attributes which may or may not be published in the Conformance Statement.

NOTE: The usage of any unpublished Attributes may be ignored by other users and providers of the Specialized SOP Class.

An implementation claiming conformance with a Specialized SOP Class shall include in its Conformance Statement the identity of the Standard SOP Class being specialized, a description of usage of all Standard and Private Type 1, 1C, 2, and 2C Attributes in the Specialized SOP Class, and the associated Privately Defined UIDs.

Private SOP Classes shall:

a) be completely conformant to relevant Parts of the DICOM Standard with the possible exception that support of the DICOM Default Transfer Syntax or a Transfer Syntax mandated by a media storage Application Profile is not required;

b) not change the PS 3.6 specification of any Standard Attributes;

c) use a Privately Defined UID for its SOP Class (i.e., shall not be identified with a DICOM Defined UID);

d) not change existing DIMSE Services or create new ones;

e) not change existing DICOM File Services defined in PS 3.10 or extend them in a manner which jeopardizes interoperability.

Private SOP Classes may:

a) use or apply DIMSE Services to privately defined or altered IODs (i.e., not necessarily be based on a Standard SOP Class);

b) use or apply Media Storage Operations to privately defined or altered IODs (i.e., not necessarily be based on a Standard SOP Class);

b) designate any Standard Attribute as Type 1, 1C, 2, or 2C regardless of the Type of the Attribute in other IODs;

c) define Private Attributes as Type 1, 1C, 2, or 2C;

d) include Private and Standard Type 3 Attributes which may or may not be published in the Conformance Statement.

An implementation claiming conformance with a Private SOP Class shall provide a PS 3.3, PS 3.4, and PS 3.6-like description of the Private SOP Class in the implementation's Conformance Statement, including descriptions of the usage of all Standard and Private Type 1, 1C, 2, or 2C Attributes in the SOP Class, the DICOM Information Model, and the Privately Defined UIDs.

NOTE: Unpublished SOP Classes (i.e., SOP Classes that are not defined in the DICOM Standard and are not defined in the Conformance Statement) are permitted in order to allow an implementation to support other abstract syntaxes within the DICOM Application Context. Such unpublished SOP Classes would utilize Privately Defined UIDs. The presence of an unpublished SOP Class does not prevent the implementation from being DICOM conformant but would have no meaning to other implementations and may be ignored.

7.4 Rules Governing Types of Application Profiles

An Application Profile used in a Conformance Statement for Media Storage shall be of one of three basic types. Each Application Profile in an implementation claiming conformance to the DICOM Standard shall be handled in accordance with the following rules, as dictated by the type of Application Profile.

7.4.1 Standard Application Profile

A Standard Application Profile shall:

a) conform to all relevant Parts of DICOM with no changes;

b) support only one of the Physical Media and associated Media Format, as specified by PS 3.12;

To claim conformance to a Standard Application Profile, an implementation shall make a declaration of this fact in its Conformance Statement, and identify its selected options, roles, and behavior.

An implementation of a Standard Application Profile may extend Standard SOP Classes of the Standard Application Profile. Such Standard Extended SOP Classes shall meet the requirements specified in Section 7.3.

7.4.2 Augmented Application Profile

An Augmented Application Profile shall:

a) be a proper super set of the Standard Application Profile. It adds the support of additional Standard or Standard Extended SOP Classes;

b) use the same Physical Media and its associated Media Format specified in the corresponding Standard Application Profile;

c) not include Specialized or Private SOP Classes.

An Augmented Application Profile may:

a) include one or more Standard or Standard Extended SOP Classes in addition to those of the corresponding Standard Application Profile. These additional SOP Classes may be mandatory or optional;

b) include the extensions (e.g. additional required keys, additional directory records) to the Basic Directory Information Object corresponding to the SOP Classes defined in a).

c) add one or more new roles (FSC, FSR, FSU)

To claim conformance to an Augmented Application Profile, an implementation shall make a declaration of this fact in its Conformance Statement, and shall identify the Standard Application Profile from which it is derived and specify the augmentations. The implementation shall also identify its selected options, roles, and behavior.

An implementation of an Augmented Application Profile may:

a) extend Standard SOP Classes of the corresponding Standard application profile. Such Standard Extended SOP Classes shall meet the requirements specified in Section 7.3;

b) also claim conformance to the Standard Application Profile on which this Augmented Profile is based. In this case, FSC and FSU implementations shall be able to restrict their behavior to the Standard Application Profile (i.e., provide a means to write only the Standard or Standard Extended SOP Classes defined in the corresponding Standard Application Profile).

7.4.3 Private Application Profile

A Private Application Profile:

- conforms to PS 3.10 and to the Media Storage Service Class specified in PS 3.4;
- supports only one of the Physical Media and associated Media Format, as specified by PS 3.12;

  NOTE: The intent of these two conditions is to ensure that at least the DICOMDIR is readable by implementations of other APs.

- complies with the rules governing SOP Classes in section 7.3.

To claim conformance to a Private Application Profile, an implementation shall make a declaration of this fact in its Conformance Statement, and shall provide a description of the Application Profile patterned after the descriptions in PS 3.11. The implementation shall also identify its selected options, roles, and behavior.

NOTE: An implementation that does not meet the provisions of Section 7, including the types of Application Profile is not conformant to DICOM and so is outside the scope of DICOM conformance. Such an implementation is not an Application Profile in DICOM terminology. For example, if an implementation chooses to write DICOM files onto media that is not in PS 3.12, or use a file system not defined for a specific media type in PS 3.12, then that implementation cannot claim that it conforms to the DICOM Standard using that media or file system.

7.5 Conformance of DICOM Media

DICOM does not define conformance of a piece of storage medium in a generic sense. DICOM conformance of a piece of medium can only be evaluated within the scope of one or more media storage Application Profiles which define specific contexts for interoperability.

NOTE: One may accept the statement “this is a DICOM CD-R” when pointing to a storage medium. However, one should not state “this CD-R is DICOM conformant”, but rather “this CD-R conforms to the Basic Cardiac X-ray Angiographic DICOM Application Profile”.

Annex C (Normative) DICOM Conformance Statement Template for Media Storage Application Profiles

C.0 Introduction

This Annex is a template which shall be used to generate a DICOM Conformance Statement. A DICOM Conformance Statement shall begin with an introduction which sets the framework. The introduction shall describe the implementation, and how, in general terms, it uses DICOM to achieve its purposes.

NOTE: The numbering scheme for numbering paragraphs in this document is to be used as a guideline in preparing the outline of the Conformance Statement. The Conformance Statement is not required to have exactly the same paragraph numbers. In fact, any particular Conformance Statement will have special considerations which will cause the outline to differ in certain details from the outline of this document.

C.1 Implementation Model

After the introduction, the first section of the Conformance Statement is a description of the Implementation Model. The Implementation Model shall identify the DICOM Application Entities in a specific implementation, and relate the Application Entities to Real-World Activities.

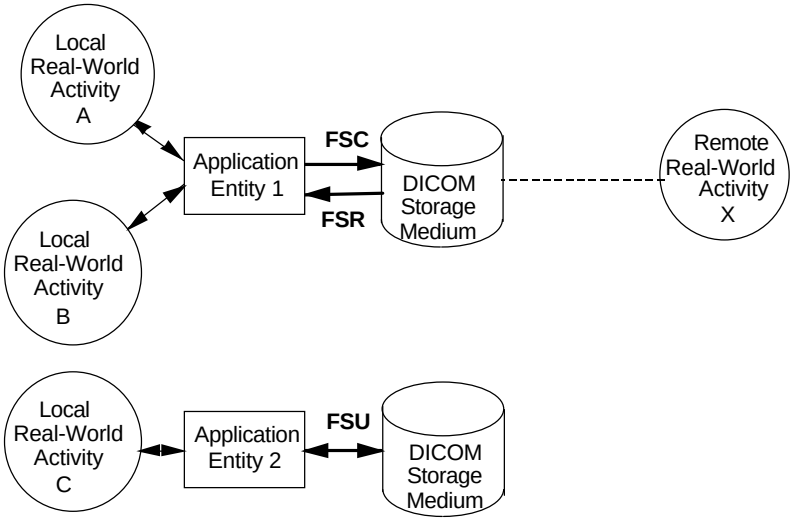
C.1.1 Application Data Flow Diagram

As part of the Implementation Model, an Application Data Flow Diagram shall be included. This diagram represents all of the Application Entities present in an implementation, and graphically depicts the relationship of the AE's use of DICOM to real world activities. Figure C.1.1-1 is a template for such a Data Flow Diagram. Accompanying the Application Data Flow Diagram shall be a discussion of the Application Data Flow represented.

In this illustration, according to figure C.1.1-1, an occurrence of local Real-World Activity A or B will cause the local Application Entity 1 to initiate either creation of a File-set on a medium (FSC) for the purpose of interchange with a remote Real-World Activity X or to access a File-set on a medium for reading (FSR). The remote Real-World Activity X accesses the medium physically transferred from the implementations supporting Real-World Activity A or B.

An occurrence of Real-World Activity C will cause the local Application Entity 2 to update a File-set (FSU) on a mounted medium.

Figure C.1.1-1. Application Data Flow Diagram



NOTE: If the AE expects a remote Real-World Activity to access the medium for a specific purpose, this should be shown in the Application Data Flow Diagram as well as described in Section C.1.1.

C.1.2 Functional Definitions of AE's

The next part of the Conformance Statement shall contain a functional definition for each local Application Entity. This shall describe in general terms the functions to be performed by the AE, and the DICOM services used to accomplish these functions. In this sense, "DICOM services" refers not only to DICOM Service Classes, but also to lower level DICOM services, such as the Media File system and mapping to particular Media Formats.

C.1.3 Sequencing of Real World Activities

If applicable, this section shall contain a description of sequencing of Real World Activities which the AE's require.

NOTE: An example of a situation in which such a description is required is an AE which supports roles as a File-set Updater and File-set Reader. In some instances, the File-set will be updated then read (e.g., for verification), and in other instances, may be read first to determine if the File-set needs to be updated.

C.1.4 File Meta Information for Implementation Class and Version

This section shall be used to list the values assigned to the File Meta Information attributes (see PS 3.10) that pertain to the Implementation Class and Version. These are:

- File Meta Information Version;
- Implementation Class UID;

- Implementation Version Name.

C.2 AE Specifications

The next section in the DICOM Conformance Statement is a set of Application Entity Specifications. There shall be one such specification for each Application Entity type.

C.2.x AEx - Specification

Each individual AE Specification has a subsection, C.2.x. There are as many of these subsections as there are different AE's in the implementation. That is, if there are two distinct AE's, then there will be two subsections, C.2.1, and C.2.2.

The following table, Table C2.x-1, shows that for one or more APs in the first column, there are a number of Real-World Activities in the second column, the roles required for each of these Real-World Activities in the third column, and the Service Class Option (Interchange or Print) is listed in the fourth column.

Table C.2.x-1 AE Related Application Profiles, Real-World Activities, and Roles

Supported APs	Real-World Activity	Roles	SC Option
STD-AP1	RWA A	FSR	Interchange
	RWA B	FSR, FSC	Interchange
STD-AP1, AUG-AP2, etc.	RWA C	FSU	Print
	RWA D	FSC	Interchange

This section shall also contain any general policies that apply to all of the Real-World Activities described in subsequent sections.

C.2.x.1 File Meta Information for the Application Entity x

This section shall contain the values of the File Meta Information that pertain to the Application Entity (see PS 3.10). These are:

- Source Application Entity Title.

If Private Information is used in the Application Profile File Meta Information, the following two File Meta Information attributes may be documented:

- Private Information Creator UID;
- Private Information.

C.2.x.2 Real-World Activities

The first sentence in this section shall state the Roles and Media Storage Service Class Options supported by the AEx.

C.2.x.2.i Real-World Activity i

The AE Specification shall contain a description of the Real-World Activities which invoke the particular AE. There will be one section, C.2.x.2.i where i increments for each RWA, per Real-World Activity.

C.2.x.2.i.1 Media Storage Application Profile

The Application Profile that is used by the AE described in C.2.x is specified in this section

C.2.x.2.i.1.y Options

The options used in the Application Profile specified in C.2.x.1.i.1 shall be detailed in this section. There will be separate sections for each option specified for the AP. If there are no options used in the AP specified in C.2.x, this section may be omitted.

C.3 Augmented and Private Application Profiles

This Section shall be used for the description of Augmented and Private Application Profiles.

C.3.1 Augmented Application Profiles

Any Augmented Application Profiles used by an AE shall be described in these sections. The rules governing the structure of an Augmented AP are described in Section 7.4.2.

C.3.1.x Augmented Application Profile x

Each Augmented Application Profile shall have a section C3.1.x that describes the specific features of the Application Profile that make it Augmented. These shall be described in the three repeating sections that follow.

C.3.1.x.1 SOP Class Augmentations

The additional SOP Classes beyond those specified in the Standard AP on which this Augmented AP is based shall be detailed in this section.

C.3.1.x.2 Directory Augmentations

Any additions to the Directory IOD that augment this AP shall be described in this section.

C.3.1.x.3 Other Augmentations

Any additions to, or extensions of the Application Profile shall be described in this section. An example of such an other augmentation is addition of a role (FSR, FSC, FSU) to the Standard Application Profile set of defined roles.

C.3.2 Private Application Profiles

The rules that govern construction of a Private Application Profile are described in Section 7.4.3. This section shall be used to describe the details of the Private AP.

NOTES: 1. Refer to PS 3.11 for a description of constructing an Application Profile specification.
2. If the AP deviates from the rules governing a Private AP in Section 7.4.3 in any manner, it is non-conformant and is outside the scope of this Standard.

C.4 Extensions, Specializations, and Privatizations of SOP Classes and Transfer Syntaxes

This section shall be used to describe the Standard Extended, Specialized, or Privatized SOP Classes and any Private Transfer Syntaxes used by an Application Profile.

C.4.1 Extensions, Specializations, and Privatizations of SOP Classes

This Section shall be used for the description of any extensions, specializations, or privatizations of any of the SOP Classes used in an Application Profile.

C.4.1.x SOP Specific Conformance Statement for SOP Class x

For each SOP Class x specified by the Application Profile, this section shall be used to provide details of any extension, specialization, or privatization that changes the SOP Class from its Standard specification.

NOTE: This section has a parallel in the DICOM Network Conformance template

C.4.2 Private Transfer Syntax Specification

Any Private Transfer Syntaxes are described in this section.

NOTE: This section has a parallel in the DICOM Network Conformance Template

C.5 Configuration

Any implementation's DICOM conformance may be dependent upon configuration which takes place at the time of installation. Issues concerning configuration shall be addressed in this section (e.g. the configuration of the Source AE Title in File Meta Information).

C.6 Support of Extended Character Sets

Any support for Extended Character Sets shall be described here.

Annex D: (Informative) Example of a DICOM Conformance Statement for a DICOM Media Storage Implementation

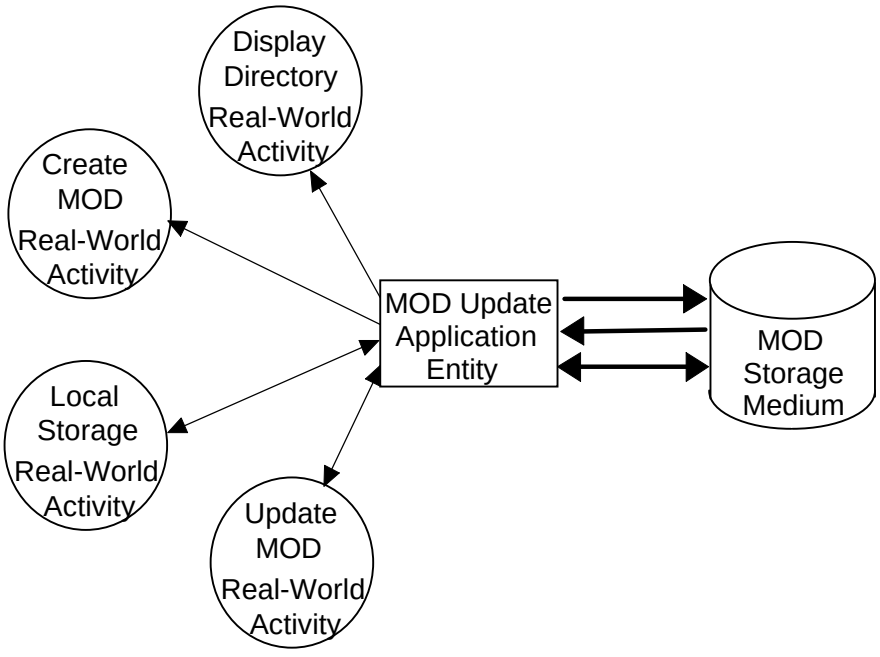
D.0 Introduction

This Annex is a sample DICOM Conformance Statement for a fictitious DICOM Media Storage Implementation. It is presented as an example only. The viability of such an implementation should not be assumed as the purpose of this Annex is only to guide the writer of DICOM Conformance Statements by providing a Conformance Statement example.

D.1 Implementation Model: MOD Update Device

The MOD Update Device creates and/or updates 5 1/4 inch MOD media with various DICOM SOP instances. It can process Ultrasound, CT, MR, and selected other IODs.

D.1.1 Application Data Flow Diagram: MOD Update Device Real-World relationship



The MOD Update Device has a local storage that may contain various SOP instances. These may have been obtained by network or from removable media using other application entities. These instances are external to this conformance claim and the origin of the SOP instances is outside the scope of this claim.

The MOD Update Application Entity can initialize Media by acting as an FSC to create a new DICOM File-set on either 630MB MOD or 1.2GB MOD media. It initializes the DICOM File-set and writes the specified SOP instances onto the MOD. The SOP instances written will be limited to instances that match the criteria of one of the Application Profiles that is supported. When updating media, a pre-existing File-set will be updated with the selected SOP instances that match one of the supported Application Profiles.

D.1.2 Functional Definition of Application Entities

This device has only one Application Entity: the MOD Update Application.

The MOD Update Application can perform these functions:

- It can initialize a piece of medium, writing a new DICOM File-set onto the medium;
- It can update a piece of medium by adding new SOP instances to an already existing DICOM File-set;
- It can display a directory listing of the File-set on a piece of medium;
- It can copy SOP instances from the MOD onto local storage.

D.1.3 Sequencing Requirements

The updating function can only be performed on a piece of medium that has already had a DICOM File-set created. There are no other sequencing requirements.

D.1.4 File Meta Information Options (see PS 3.10)

Implementation Class UID = "a.bbb.cccccc.ddd.eee.fff.ggg"
Implementation Version Name = "DICOM_Media_UPDT"

NOTE: The Implementation Class UID is part of the File Meta Information written into every file and therefore necessary for any device that acts as an FSC or FSU. One could in theory have a device that is purely an FSR without setting an Implementation Class UID.

D.2 AE Specifications

D.2.1 MOD Update Specification

The MOD Update provides standard conformance to DICOM Interchange Option of the Media Storage Service Class. The Application Profiles and roles are listed in Table D.2.1-1

Table D.2.1-1 Application Profiles, Activities, and Roles for MOD Update

Application Profiles Supported	Real World Activity	Role	SC Option
STD-US-ID-SF-MOD650, STD-US-ID-SF-MOD12, STD-US-ID-MF-MOD650, STD-US-ID-MF-MOD12, AUG-MODUP-MOD650, AUG-MODUP-MOD12	Create MOD	FSC	Interch.
	Update MOD	FSU	Interch.
	Display Directory	FSR	Interch.
	Copy to Local Storage	FSR	Interch.

NOTE: For MOD Update, the Service Class Option (SC Option) in Table 2.1-1 is Interchange. Had the Print option been supported for any of the Application Profiles, this would have been shown in the SC Option column.

The MOD Update Application will query the user before initializing media when a File-set is found on media and an initialize operation has been requested.

D.2.1.1 File Meta Information for the Application Entity

The Source Application Entity Title is set by the user in the configuration file.

D.2.1.2 Real-World Activities for this Application Entity

D.2.1.2.1 Real-World Activity: Create MOD Request

The MOD Update Application acts as an FSC using the Interchange option when requested to initialize media.

The MOD Update Application will take the user provided list of SOP instances (which may be empty), and eliminate any SOP Instance on that list that does not correspond to one of the Application Profiles in Table 2.1-1. These SOP Instances are written to the medium and a corresponding DICOMDIR is

created. The determination of the potentially applicable Application Profile is dependent on the type of media. This is determined by the drive and associated software on which the AE has been invoked.

If the selection list is empty, the FSC action results in the creation of an empty File-set.

NOTE: The empty File-set is compatible with any Standard Application Profile and does not require a special profile definition.

D.2.1.2.1.1 Application Profiles for the RWA: Create MOD

For the list of Application Profiles that invoke this AE for the Create MOD RWA, see Table D.2.1-1. There are no extensions or specializations.

D.2.1.2.2 Real-World Activity: Display Directory

The MOD Update Application acts as an FSR using the Interchange option when requested to provide a directory listing.

When the MOD Update Application is requested to provide a directory listing it will read the File-set and display the DICOMDIR directory entries for those SOP Instances in the File-set that correspond to the user selected Application Profile. If no profile has been selected, the application will display Directory Records corresponding to either the AUG-MODUP-MOD650 or the AUG-MODUP-MOD12 AP, depending upon the type of media that has been inserted.

D.2.1.2.2.1 Application Profiles for the RWA: MOD Directory Listing

For the list of Application Profiles that invoke this AE for the Create MOD RWA, see Table D.2.1-1. There are no extensions or specializations.

D.2.1.2.3 Real-World Activity: Copy to Local Storage

The MOD Update Application acts as an FSR when copying from the MOD to local storage.

The MOD Update Application will copy any SOP Instance selected from an MOD Directory list from the MOD to the local storage upon command. The MOD Directory listing Real-World Application will filter out the SOP Instances that do not match the Application Profile.

D.2.1.2.3.1 Application Profiles for the RWA: Copy to Local Storage

For the list of Application Profiles that invoke this AE for the Create MOD RWA, see Table D.2.1-1. There are no extensions or specializations.

D.2.1.2.4 Real-World Activity: Update MOD

The MOD Update Application acts as an FSU using the Interchange option when requested to update an MOD.

The MOD Update Application will take the selected list of SOP instances (which may be empty), and eliminate any SOP instance that does not correspond to a permissible SOP instance listed in one of the Applications Profiles in Table 2.1-1. The remaining SOP Instances are then written to the media that is found in the MOD Update Application disk drive. The determination of the potentially applicable Application Profile is dependent on the type of media. This is determined by the drive and associated software on which the AE has been invoked.

The MOD must have a pre-existing File-set present or an error will be reported.

NOTE: The MOD Update Device cannot place constraints on the contents of the pre-existing File-set. It need not correspond to any known Application Profile. This is a result of the rules defining Standard, Augmented, and Private Application Profiles. An FSU must be able to update any proper DICOM File-set.

D.2.1.2.4.1 Application Profiles for the RWA: Update Media Request

For the list of Application Profiles that invoke this AE for the Create MOD RWA, see Table D.2.1-1. There are no extensions or specializations.

D.3 Augmented and Private Profiles

D.3.1 Augmented Profiles

The MOD Update Device supports two augmented Application Profiles: AUG-MODUP-MOD650 and AUG-MODUP-MOD12.

NOTE: The only difference between these two profiles is the choice of type of media. This nonetheless requires the definition of two augmented profiles. Notice also that the augmentation does not specify media or media format. The PS 3.11 Annex that describes the Standard Application Profile specifies the selection of a single PS 3.12 Annex for media and media format. An augmentation is not allowed to change this.

D.3.1.1 AUG-MODUP-MOD650

This Application Profile is an augmentation of the STD-US-ID-MF-MOD650 Standard Application profile defined in PS 3.11. The augmentations add support for CR, CT, MR, and SC SOP Classes.

D.3.1.1.1 SOP Class Augmentations

The following IODs are part of the AUG-MODUP-MOD650. There are no requirements or restrictions on SOP options for these IODs beyond those in their standard definitions.

Table D.3.1.1.1 - IODs and Transfer Syntaxes for AUG-MODUP-MOD650

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1

This Application Profile does not place any further restrictions on options or extensions for any of these SOP classes. Any otherwise permissible SOP instance is acceptable for the AUG-MODUP-MOD650 profile.

NOTE: There are no columns or sections of constraints or removal of features because an augmentation must accept anything acceptable as part of the underlying Standard Application Profile. Only additions are allowed.

D.3.1.1.2 Directory Augmentations

There are no additional directory keys, records, or options as part of this profile. None are required to be written using either FSU or FSC.

D.3.1.1.3 Other Augmentations

None

D.3.1.2 AUG-MODUP-MOD12 Application Profile

This application profile is an augmentation of the STD-US-ID-MF-MOD12 Standard Application profile defined in PS 3.11. The augmentations add support for CT, MR, and other objects.

D.3.1.2.1 SOP Class Augmentations

The following IODs are part of the AUG-MODUP-MOD12. There are no requirements or restrictions on SOP options for these IODs beyond those in their standard definitions.

Table D.3.1.2.1 - IODs and Transfer Syntaxes for AUG-MODUP-MOD12

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1

This Application Profile does not place any further restrictions on options or extensions for any of these SOP classes. Any otherwise permissible SOP instance is acceptable for the AUG-MODUP-MOD12 profile.

D.3.1.2.2 Directory Augmentations

There are no additional directory keys, records, or options as part of this profile. None will be written as either FSU or FSC.

D.3.1.2.3 Other Augmentations

None

D.3.2 Private Profiles

None

NOTE: If the supported profile cannot be described as a Standard or Augmented Application Profile, then a Private Profile would be defined here. All of the information contained in a PS 3.11 Annex would be included here. See PS 3.11 for more details and examples of profile definitions.

D.4 Extensions, Specializations, Privatizations of SOP Classes and Transfer Syntaxes

None

D.5 Configuration

The MOD Update Device has three possible MOD drive configurations. If the 630MB-only drive is installed, the support for 1.2GB Profiles is eliminated. If the 1.2GB only drive is installed, the support for 630MB profiles is eliminated. If the dual mode drive is installed, all profiles are supported.

Table D.5-1 Supported Profiles for various Drive Configurations

Disk Drive Installed	Profiles Supported
Dual-mode Drive	STD-US-ID-SF-MOD650, STD-US-ID-SF-MOD12, STD-US-ID-MF-MOD650, STD-US-ID-MF-MOD12, AUG-MODUP-MOD650, AUG-MODUP-MOD12
630MB-only Drive	STD-US-ID-SF-MOD650, STD-US-ID-MF-MOD650, AUG-MODUP-MOD650
1.2GB-only Drive	STD-US-ID-SF-MOD12, STD-US-ID-MF-MOD12, AUG-MODUP-MOD12

D.6 Character Sets

The MOD Update Device will only support copy of SOP Instances containing the DICOM default character set as defined in PS 3.5.