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Health informatics — Digital imaging and communication in medicine (DICOM) including workflow and data management

Informatique de santé — Imagerie numérique et communication dans la médecine (DICOM) incluant le déroulement des opérations et la gestion des données

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 12052 was prepared by Technical Committee ISO/TC 215, *Health informatics*.

Introduction

ACR (the American College of Radiology) and NEMA (the National Electrical Manufacturers Association) formed a joint committee in 1983 to develop a Standard for Digital Imaging and Communications in Medicine. The third release of this work received the name DICOM, for Digital Imaging and Communications in Medicine. This DICOM Standard was developed according to the NEMA Procedures in liaison with other Standardization Organizations including ISO/TC/215, CEN TC251 in Europe and JIRA in Japan, with review also by other organizations including IEEE, HL7 and ANSI in the USA. Several countries have been actively involved in the development of the DICOM Standard — in particular Canada, Germany, France, Italy, Japan, Korea, Taiwan and the United States of America. Contributions were received from more than 20 other countries. DICOM is used in most healthcare institutions worldwide where patient imaging is performed. Most imaging devices and imaging related information systems products support it.

Within health informatics, this International Standard addresses the exchange of digital images and related information between both medical imaging equipment and systems concerned with the management of that information.

This International Standard facilitates interoperability of systems claiming conformance. In particular, it:

— addresses the semantics of commands and associated data; for devices and systems to interact, there must be standards on how they are expected to behave in response to commands and associated data, not just the information which is to be moved between devices and systems;

— is explicit in defining the conformance requirements of implementations of this International Standard; in particular, a conformance statement has to specify enough information to determine the functions for which interoperability can be expected with another system claiming conformance;

— facilitates operation in a networked environment and in the area of media interchange;

— is structured to accommodate the introduction of new services, thus facilitating support for future medical imaging applications.

Even though this International Standard has largely facilitated the implementations of Picture Archiving and Communication Systems (PACS) solutions and integrated digital imaging departments, use of this International Standard alone does not guarantee that all the goals of such solutions will be met. This International Standard facilitates interoperability of systems claiming conformance in a multi-vendor environment, but does not, by itself, guarantee interoperability.

This International Standard has been developed with an emphasis on diagnostic medical imaging as practiced in radiology, cardiology and other imaging disciplines.

Health informatics — Digital imaging and communication in medicine (DICOM) including workflow and data management

1 Scope

Within the field of health informatics this International Standard addresses the exchange of digital images, and information related to the production and management of those images, between both medical imaging equipment and systems concerned with the management and communication of that information.

This International Standard is intended to facilitate interoperability of medical imaging equipment and information systems by specifying:

— a set of protocols to be followed by systems claiming conformance to this International Standard.

— the syntax and semantics of commands and associated information data models that ensure effective communication between implementations of this International Standard;

— information that shall be supplied with an implementation for which conformance to this International Standard is claimed.

This International Standard does not specify:

— the implementation details of any features of this International Standard on a device or systems for which conformance is claimed;

— the overall set of features and functions to be expected from a larger system implemented by integrating a group of devices and systems each claiming conformance to this International Standard;

— a testing/validation procedure to assess an implementation's conformance to this International Standard.

Within health informatics, both medical imaging systems and equipment concerned with the management and communication of medical image data may also be required to interoperate with systems in other areas of health informatics. The communication of these data with these other areas may be in the scope of other standards.

2 Terms and definitions

For the purposes of this document, the terms and definitions in DICOM Standard, PS 3 apply.

3 Symbols and abbreviations

For the purposes of this document, the following abbreviations apply.

— **ACSE** Association Control Service Element

— **DICOM** Digital Imaging and Communications in Medicine

— **OSI** Open Systems Interconnection

— **PACS** Picture Archiving and Communication Systems

— **TCP/IP** Transmission Control Protocol/Internet Protocol

4 Requirements

4.1 Provisions

This International Standard references, normatively and in its entirety, the publicly available specification known as the "Digital Imaging and Communications in Medicine (DICOM) Standard, PS 3".

4.2 Conformance

A claim of conformance to this International Standard, with regard to a given product shall only be valid when supported by a DICOM Conformance Statement written in accordance with the provisions of the DICOM Standard, PS 3.2 (Part 2) which includes, but is not limited to, a list of all data IOD items communicated by the product and confirmation that their content conforms to the specifications of DICOM PS 3.

5 Overview of the content of the DICOM standard

5.1 Document structure

DICOM consists of the following parts:

PS 3.1: Part 1: Introduction and Overview

PS 3.2: Part 2: Conformance

PS 3.3: Part 3: Information Object Definitions

PS 3.4: Part 4: Service Class Specifications

PS 3.5: Part 5: Data Structure and Semantics

PS 3.6: Part 6: Data Dictionary

PS 3.7: Part 7: Message Exchange

PS 3.8: Part 8: Network Communication Support for Message Exchange

PS 3.9: Retired

PS 3.10: Part 10: Media Storage and File Format for Data Interchange

PS 3.11: Part 11: Media Storage Application Profiles

PS 3.12: Part 12: Media Formats and Physical Media for Data Interchange

PS 3.13: Retired

PS 3.14 Part 14: Grayscale Standard Display Function

PS 3.15: Part 15: Security and Systems Management Profiles

PS 3.16: Part 16: Content Mapping Resource

PS 3.17: Part 17: Explanatory Material

PS 3.18: Part 18: Web Access to persistent DICOM Objects

These parts of the DICOM Standard are related but independent documents. A brief description of each part is provided in 5.2 to 5.18.

DICOM Standard, PS 3 is available in print or in electronic form from the DICOM web site at: http://dicom.nema.org/.

5.2 PS 3.2: Conformance

PS 3.2 of the DICOM Standard defines principles that implementations claiming conformance to that Standard shall follow.

— Conformance requirements: PS 3.2 specifies the general requirements which shall be met by any implementation claiming conformance. It references the conformance sections of other parts of the Standard.

— Conformance statement: PS 3.2 defines the structure of a conformance statement. It specifies the information which shall be present in a conformance statement. It references the conformance statement sections of other parts of the Standard.

PS 3.2 does not specify a testing/validation procedure to assess an implementation's conformance to the Standard.

Figures 1 and 2 depict the construction process for a conformance statement for both network communication and media exchange. A conformance statement consists of the following parts:

— set of information objects, which is recognized by this implementation;

— set of service classes, which this implementation supports;

— set of communications protocols or physical media, which this implementation supports;

— set of security measures, which this implementation supports.