Download the DICOM Conformance Statement here.

Digital Imaging and Communications in Medicine (DICOM)
Digital Imaging and Communications in Medicine (DICOM) is a standard for handling, storing, printing, and transmitting information in medical imaging. It includes a file format definition and a network communications protocol. The communication protocol is an application protocol that uses TCP/IP to communicate between systems. DICOM files can be exchanged between two entities that are capable of receiving image and patient data in DICOM format. The National Electrical Manufacturers Association (NEMA) holds the copyright to this standard. It was developed by the DICOM Standards Committee, whose members are also partly members of NEMA. DICOM enables the integration of scanners, servers, workstations, printers, and network hardware from multiple manufacturers into a picture archiving and communication system (PACS). The different devices come with DICOM conformance statements which clearly state the DICOM classes they support. DICOM has been widely adopted by hospitals and is making inroads in smaller applications like dentists' and doctors' offices. DICOM is known as NEMA Standard PS3, and as ISO Standard 12052.

Parts of the DICOM Standard
The DICOM standard is divided into related but independent parts. Below you will find an overview of the 2008 version published in January 2008. Additions to the standard (Supplements and Change Proposals) since that publication are available through the DICOM website .

- 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 Structure and Encoding
- PS 3.6: Data Dictionary
- PS 3.7: Message Exchange
- PS 3.8: Network Communication Support for Message Exchange
- PS 3.9: Retired (formerly Point-to-Point Communication Support for Message Exchange)
- PS 3.10: Media Storage and File Format for Data Interchange
- PS 3.11: Media Storage Application Profiles
- PS 3.12: Storage Functions and Media Formats for Data Interchange
- PS 3.13: Retired (formerly Print Management Point-to-Point Communication Support)
- PS 3.14: Grayscale Standard Display Function
- PS 3.15: Security and System Management Profiles
- PS 3.16: Content Mapping Resource
- PS 3.17: Explanatory Information
- PS 3.18: Web Access to DICOM Persistent Objects (WADO)

History
DICOM is the third version of a standard developed by American College of Radiology (ACR) and National Electrical Manufacturers Association (NEMA).

In the beginning of the 1980s it was almost impossible for anyone other than manufacturers of computed tomography or magnetic resonance imaging devices to decode the images that the machines generated. Radiologists wanted to use the images for dose-planning for radiation therapy. ACR and NEMA joined forces and formed a standard committee in 1983. Their first standard, ACR/NEMA 300, was released in 1985. Very soon after its release, it became clear that improvements were needed. The text was vague and had internal contradictions.

In 1988 the second version was released. This version gained more acceptance among vendors. The image transmission was specified as over a dedicated 25 differential (EIA-485) pair cable. The first demonstration of ACR/NEMA V2.0 interconnectivity technology was held at Georgetown University, May 21-23, 1990. Six companies participated in this event, DeJarnette Research Systems, General Electric Medical Systems, Merge Technologies, Siemens Medical Systems, Vortech (acquired by Kodak that same year) and 3M. Commercial equipment supporting ACR/NEMA 2.0 was presented at the annual meeting of the Radiological Society of North America (RSNA) in 1990 by these same vendors. Many soon realized that the second version also needed improvement. Several extensions to ACR/NEMA 2.0 were created, like Papyrus (developed by the University Hospital of Geneva, Switzerland) and SPI, (Standard Product Interconnect, driven by Siemens Medical Systems and Philips Medical Systems).
The first large scale deployment of ACR/NEMA technology was made in 1992 by the US Army and Air Force as part of the MDIS (Medical Diagnostic Imaging Support) program run out of Ft. Detrick, Maryland. Loral Aerospace and Siemens Medical Systems led a consortium of companies in deploying the first US military PACS (Picture Archiving and Communications System) at all major Army and Air Force medical treatment facilities and teleradiology nodes at a large number of US military clinics. DeJarnette Research Systems and Merge Technologies provided the modality gateway interfaces from third party imaging modalities to the Siemens SPI network. The Veterans Administration and the Navy also purchased systems off this contract.

In 1993 the third version of the standard was released. Its name was then changed to DICOM so as to improve the possibility of international acceptance as a standard. New service classes were defined, network support added and the Conformance Statement was introduced. Officially, the latest version of the standard is still 3.0, however, it has been constantly updated and extended since 1993. Instead of using the version number the standard is often version-numbered using the release year, like "the 2007 version of DICOM".

While the DICOM standard has achieved a near universal level of acceptance amongst medical imaging equipment vendors and healthcare IT organizations, the standard has its limitations. DICOM is a standard directed at addressing technical interoperability issues in medical imaging. It is not a framework or architecture for achieving a useful clinical workflow. RSNA's Integrating the Healthcare Enterprise (IHE) initiative layered on top of DICOM (and HL-7) provides this final piece of the medical imaging interoperability puzzle.

DICOM Data Format

DICOM differs from other data formats in that it groups information into data sets. That means that a file of a chest X-Ray image, for example, actually contains the patient ID within the file, so that the image can never be separated from this information by mistake.

A DICOM data object consists of a number of attributes, including items such as name, ID, etc., and also one special attribute containing the image pixel data (i.e. logically, the main object has no "header" as such - merely a list of attributes, including the pixel data). A single DICOM object can only contain one attribute containing pixel data. For many modalities, this corresponds to a single image. But note that the attribute may contain multiple "frames", allowing storage of cine loops or other multi-frame data. Another example is NM data, where an NM image by definition is a multi-dimensional multi-frame image. In these cases three- or four-dimensional data can be encapsulated in a single DICOM object. Pixel data can be compressed using a variety of standards, including JPEG, JPEG Lossless, JPEG 2000, and Run-length encoding (RLE). LZW (zip) compression can be used for the whole data set (not just the pixel data) but this is rarely implemented.

DICOM uses three different Data Element encoding schemes. With Explicit Value Representation (VR) Data Elements, for VRs that are not OB, OW, OF, SQ, UT, or UN, the format for each Data Element is: GROUP (2 bytes) ELEMENT (2 bytes) VR (2 bytes) LengthInByte (2 bytes) Data (variable length). For the other Explicit Data Elements or Implicit Data Elements, see section 7.1 of Part 5 of the DICOM Standard.