The DICOM Standard

Open Media Storage and Interchange
A powerful new dimension to DICOM

SPIE 95, San Diego

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GE Medical Systems

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The DICOM Standard
Digital Imaging and Communications in Medicine

DICOM networking (Parts 1-8) was approved in October 1993 (ACR & NEMA). In 1995, it will be a European Standard (MEDICOM) and a Japanese Standard (MIPS 94).

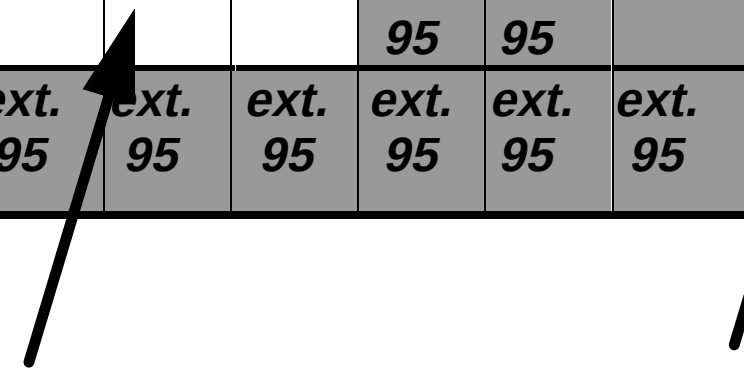
Major extensions are under final ballot:

- **X-Ray Angio/RF images**
- **Extensions for NM and US images (Final Ballot mid-95) and, ...**

DICOM now standardizes Media Storage for Media Interchange.
3 Supplements to DICOM have just been approved

The DICOM Standard
A rapidly broadening field of Application

DICOM Feature	CT	MR	CR	Sec. Capt.	Basic Film	US	NM	X-Ray RF	X-Ray Angio	Endo scopy	RT	Post-Script Film
Network	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes +ext. 95*	*Yes ext. 95*	*ext. 95*	*ext. 95*			
Media Storage	*ext. 95*	*ext. 95*	*ext. 95*	*ext. 95*	*ext. 95*	*ext. 95*	*ext. 95*	*ext. 95*	*ext. 95*			



DICOM 94 ===> DICOM 95 ==>

DICOM Media Storage and Interchange

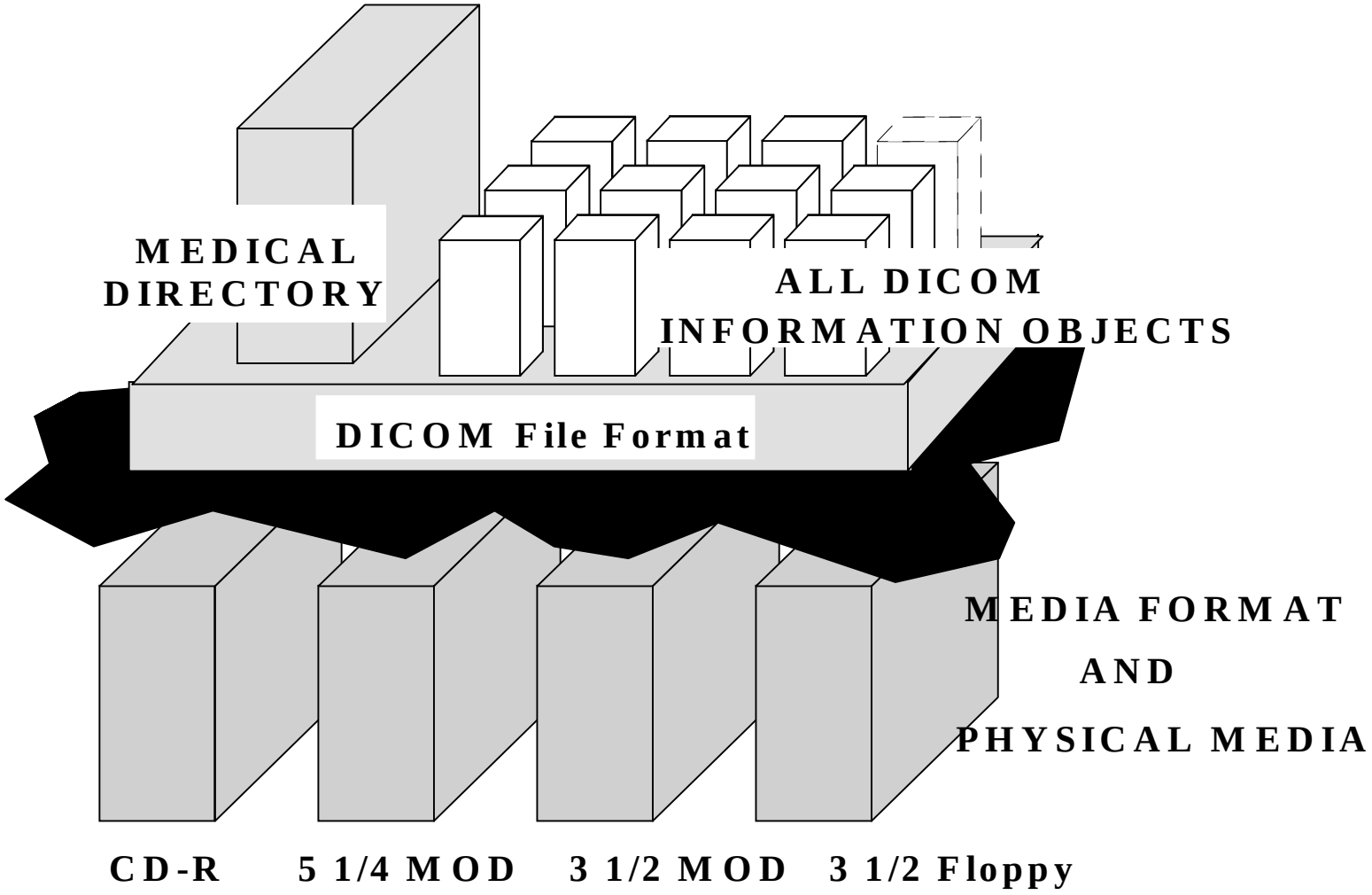
Builds upon sucessful DICOM Networking.

Relies on a solid Media Storage architecture:

- **Is object oriented (uses common objects)**
- **Leverages standard off-the shelf technology**
- **Balances generality and ease of implementation**
- **Multi-media coexistence (TIFF, QuickTime, etc.)**

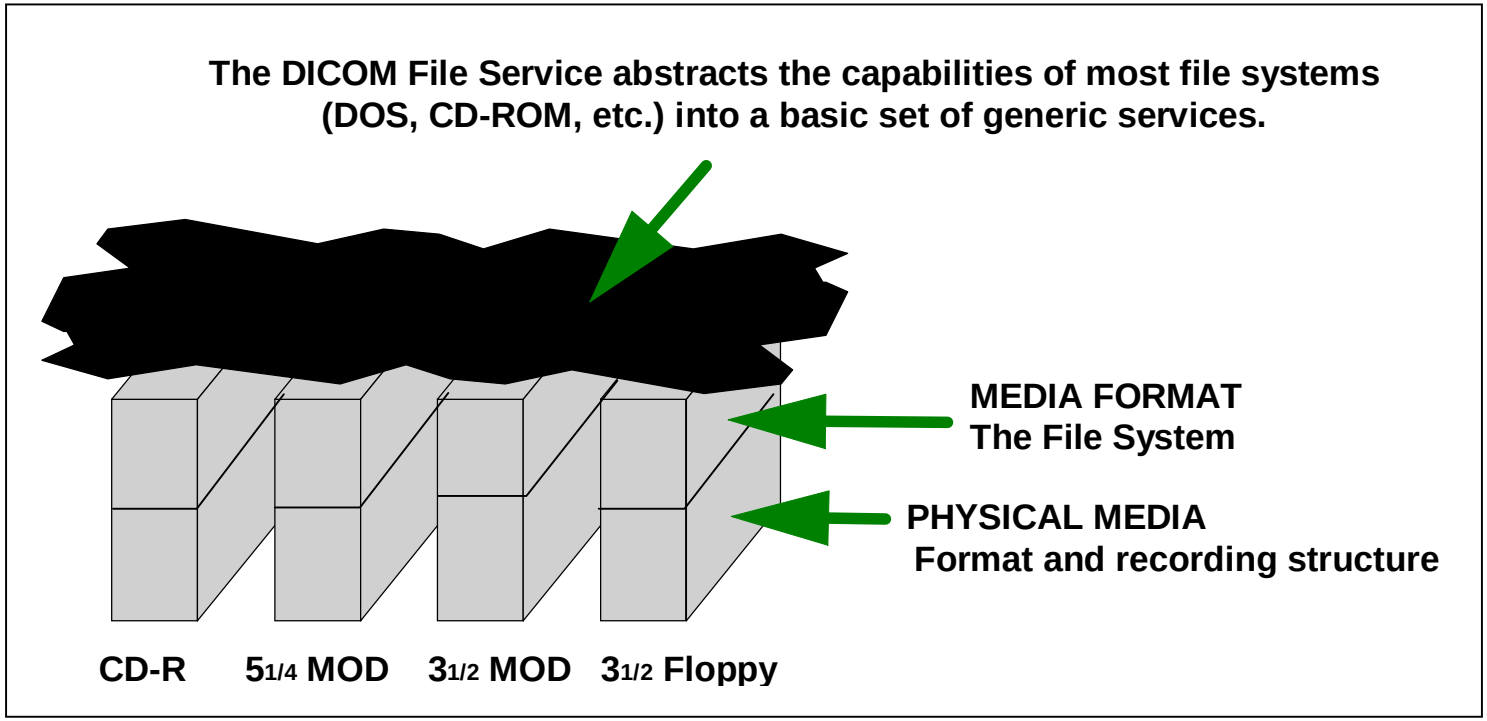
DICOM MEDIA INTERCHANGE

New DICOM Part 10 specifies overall architecture



DICOM MEDIA INTERCHANGE

New DICOM Part 12
defines a set of Physical Media and Media Formats

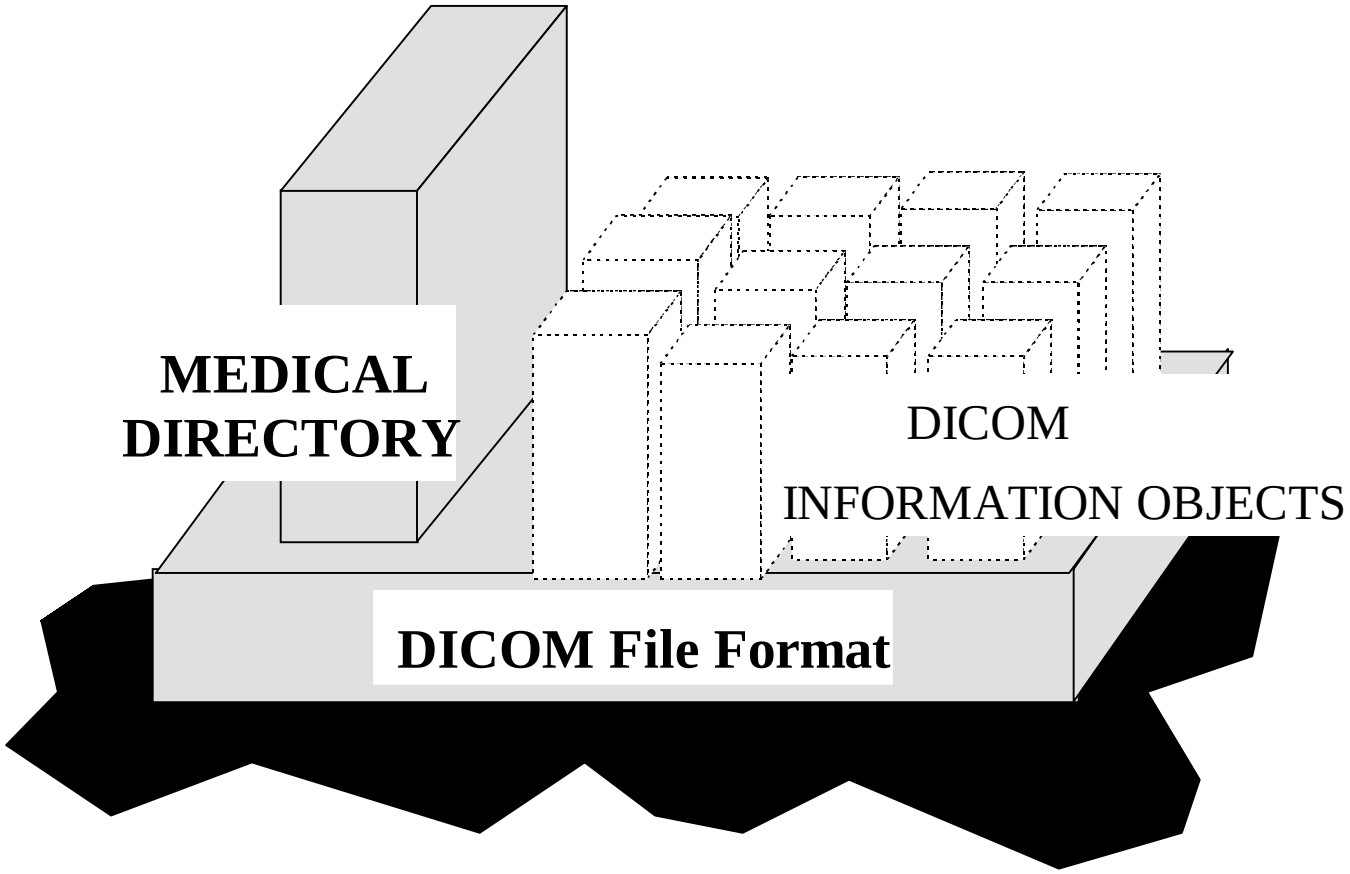


DICOM relies on broadly available Standard Media Storage Technology:

- **Standard Computer File Systems to facilitate Media copy**
- **Standard Physical Media and associated drives**

DICOM MEDIA INTERCHANGE

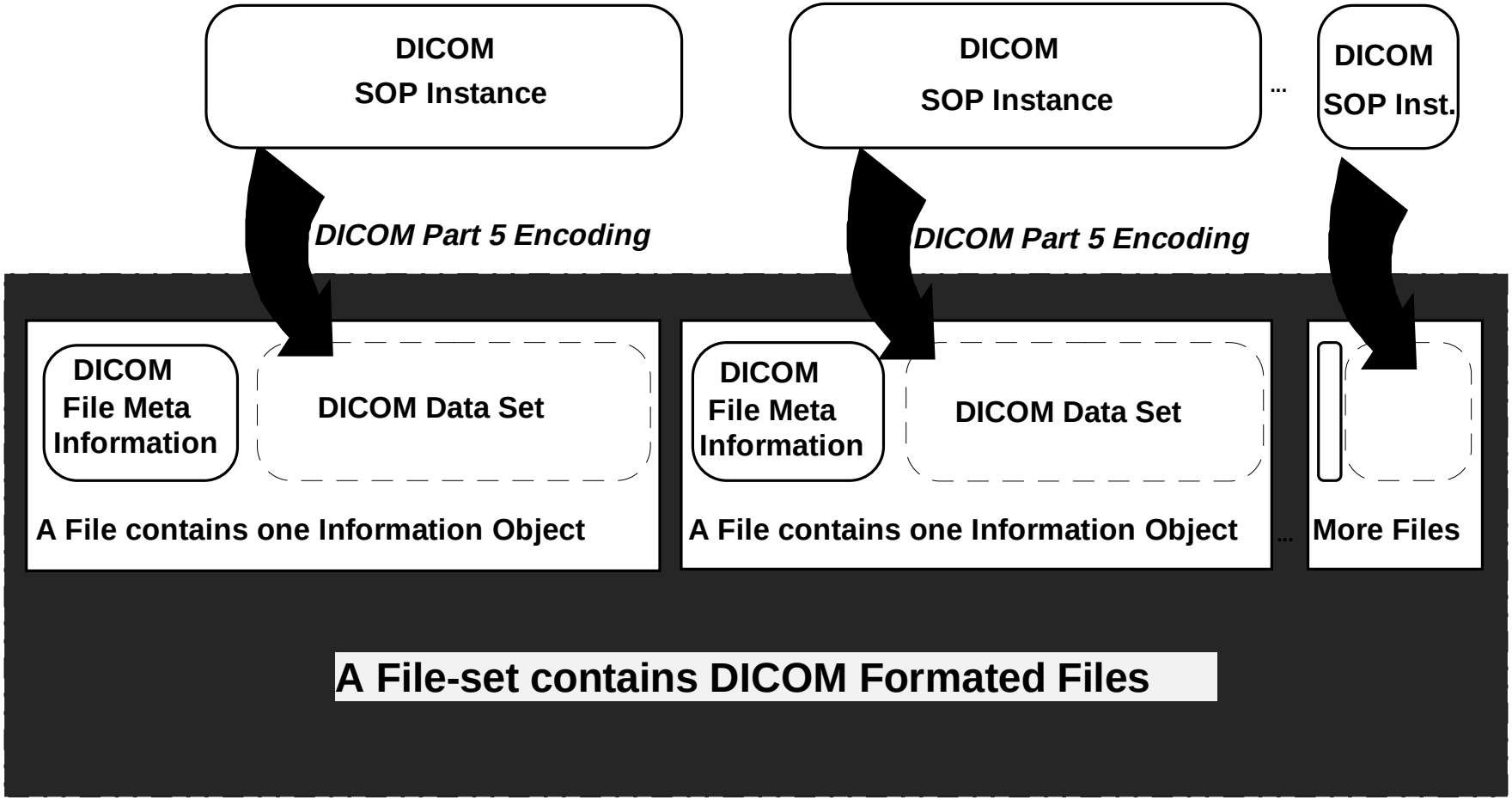
The Generic Elements, DICOM Part 1O



The DICOM File Format supports the encapsulation of any object including a directory. It allows easy access to any information object stored on the media.

DICOM MEDIA STORAGE

Generic Part 10 DICOM Object Encapsulation in a File

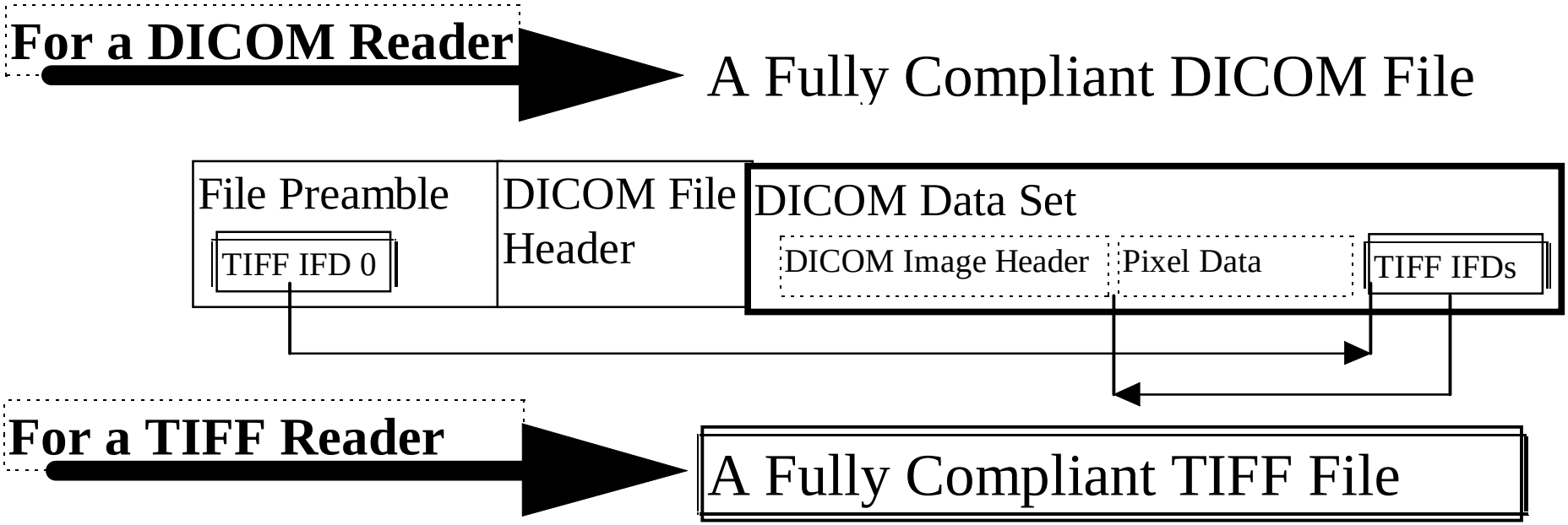


PART 10 FILE FORMAT
File Header: Meta Information Content

Attribute Name	Attribute Description
File Preamble	A fixed 128 byte field for implementation specified use
DICOM Prefix	Character string "DICM" to recognize that this File is a DICOM File.
Group Length	Number of bytes following this File Meta Element
File Meta Information Version	Two byte field where each bit identifies a version of this header
Media Storage SOP Class UID	**Uniquely identifies the SOP Class associated with the Data Set**
Media Storage SOP Instance UID	**Uniquely identifies the SOP Instance associated with the Data Set placed in the file following this File Meta Information.**
Transfer Syntax UID	**Uniquely identifies the Transfer Syntax used to encode the following Data Set**
Implementation Class UID	Identifies the type of implementation which wrote this file.
Implementation Version Name	Identifies a version for an Implementation Class UID
Source Application Entity Title	The DICOM Application Entity (AE) Title of the AE which wrote this file's content (or last updated it)
Private Information Creator UID	The UID of the creator of the Private Information.
Private Information	Contains Private Information placed in the File Meta Information.

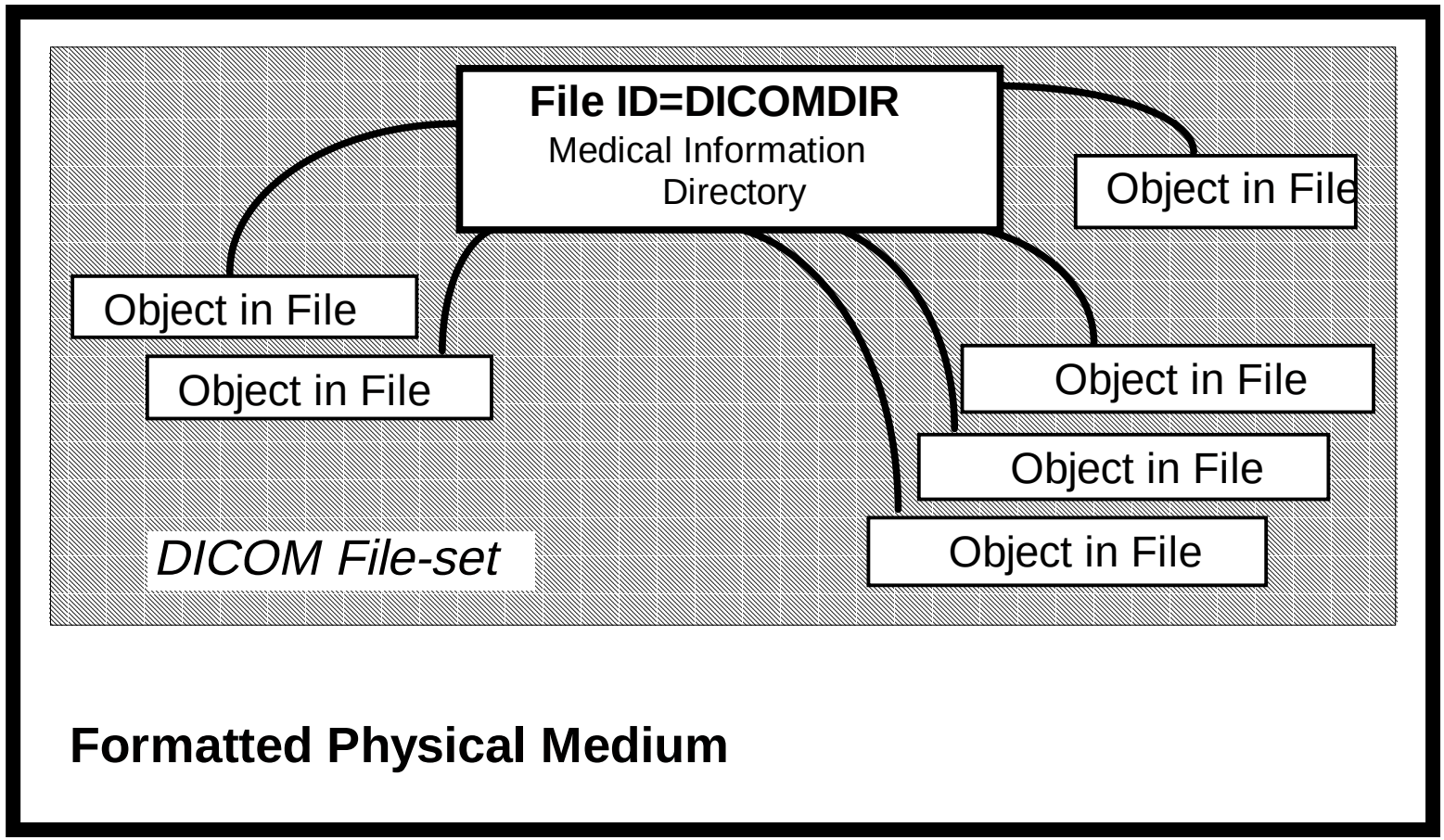
PART 10 File Format - The File Preamble

The Secret to TIFF and Multi-Media Compatibility



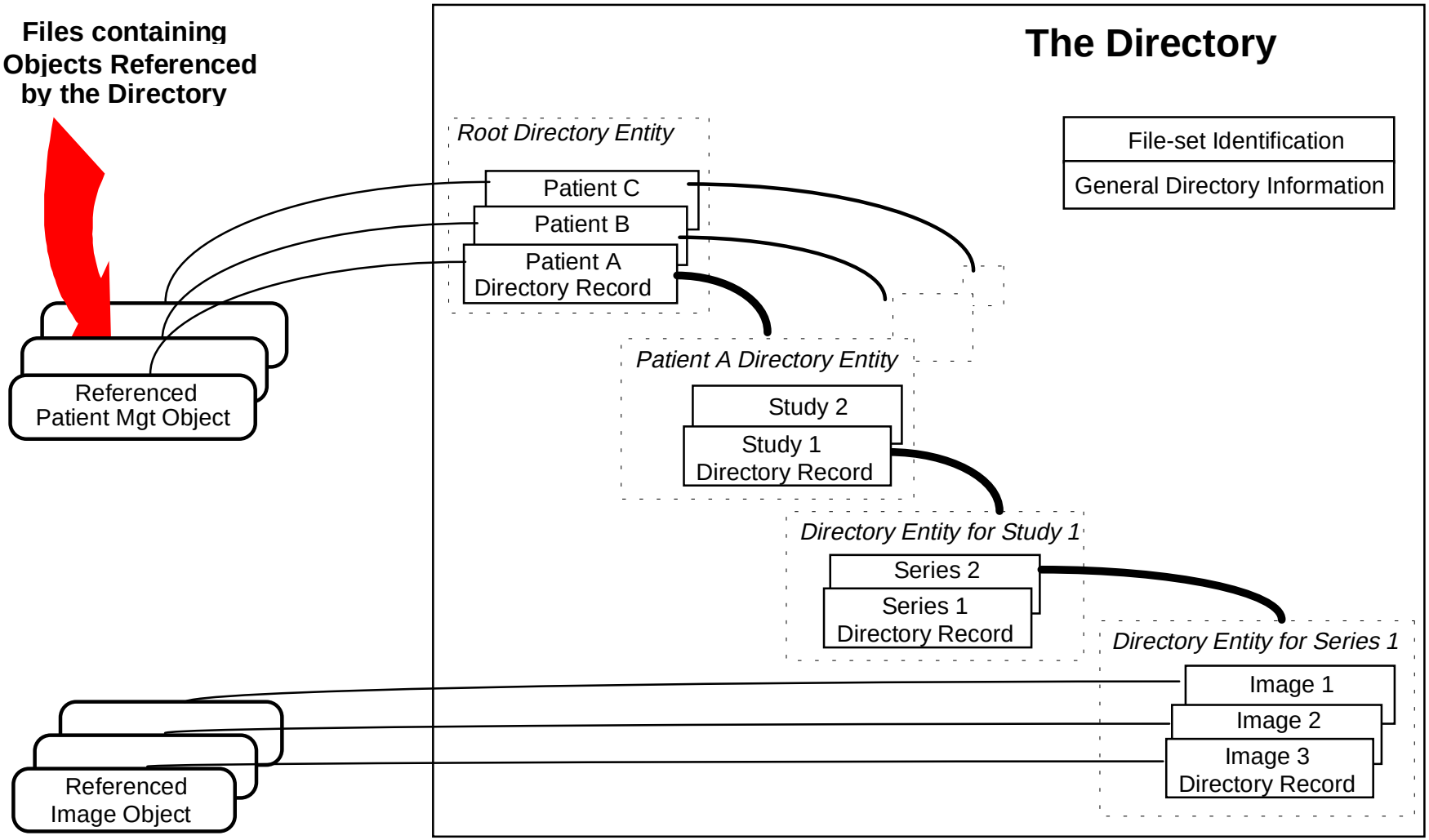
The Same DICOM File supports two Personalities:
DICOM+TIFF, DICOM+DEFF, DICOM+QuickTime, etc.
And this has been implemented, it works !

DICOM MEDIA STORAGE
The DICOM Media Storage Directory



DICOM MEDIA STORAGE

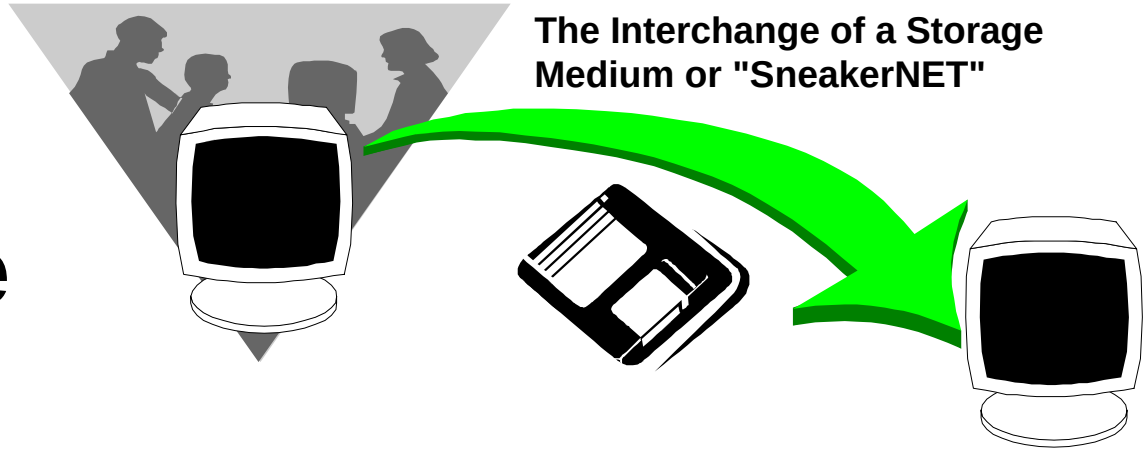
The DICOM Media Storage Directory - An Example



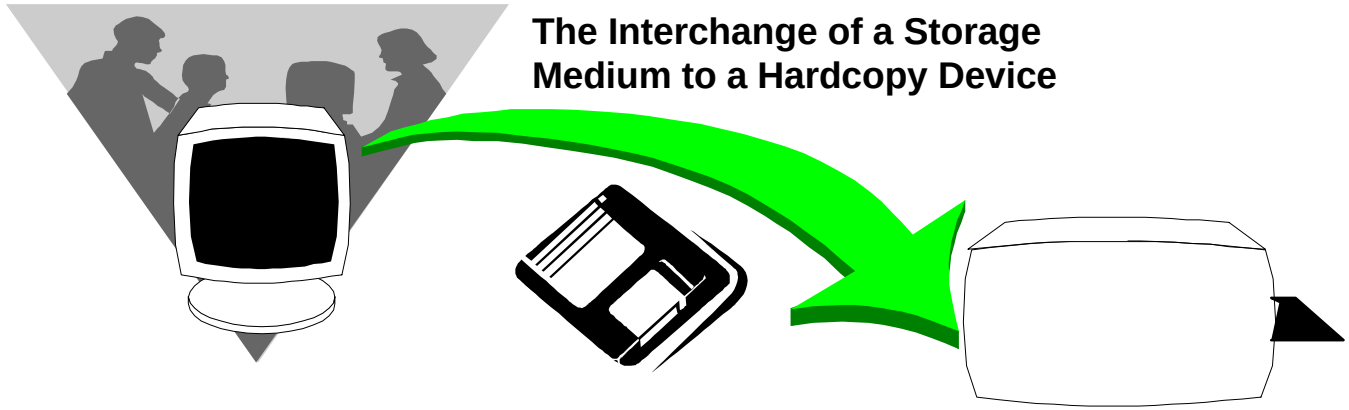
DICOM MEDIA STORAGE

Two Service Options are offered

Interchange

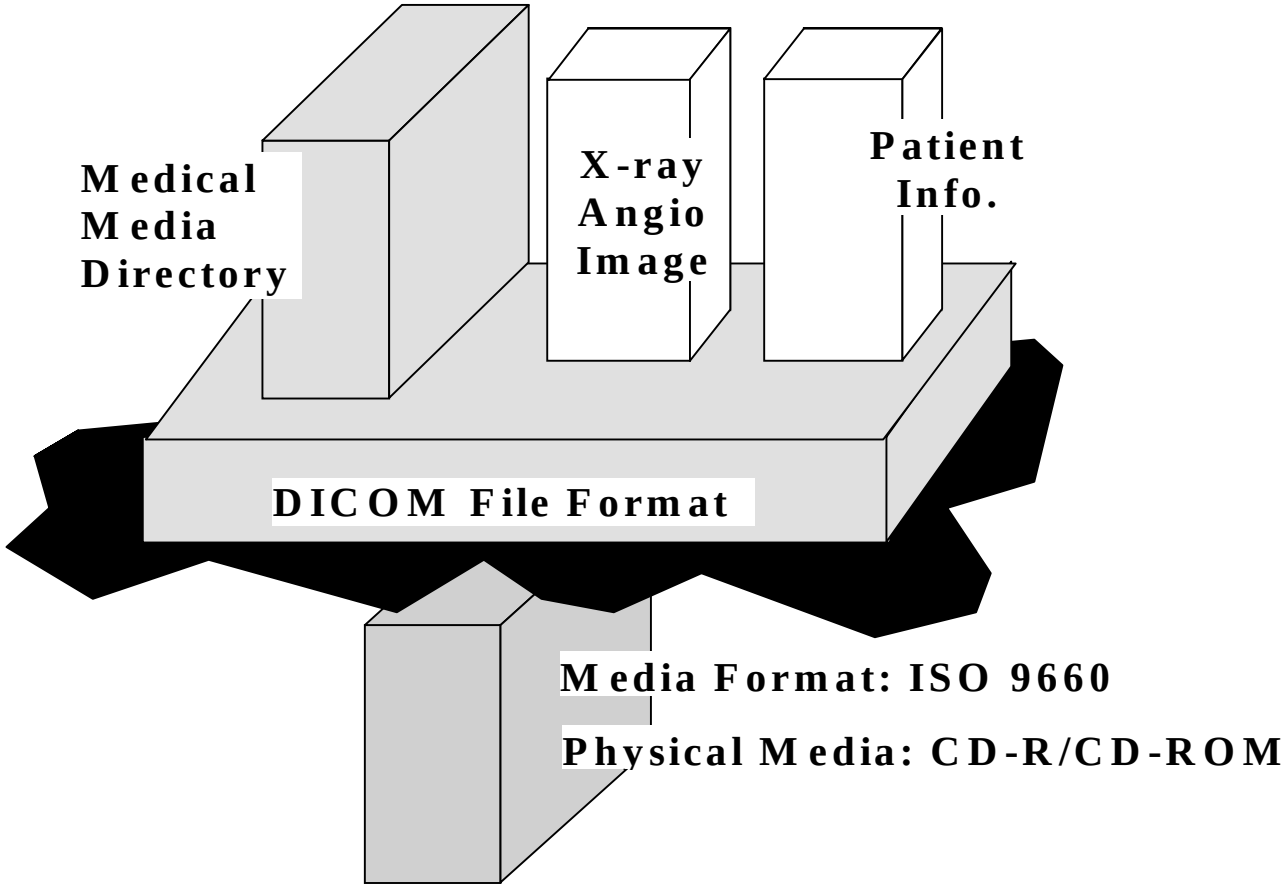


Print

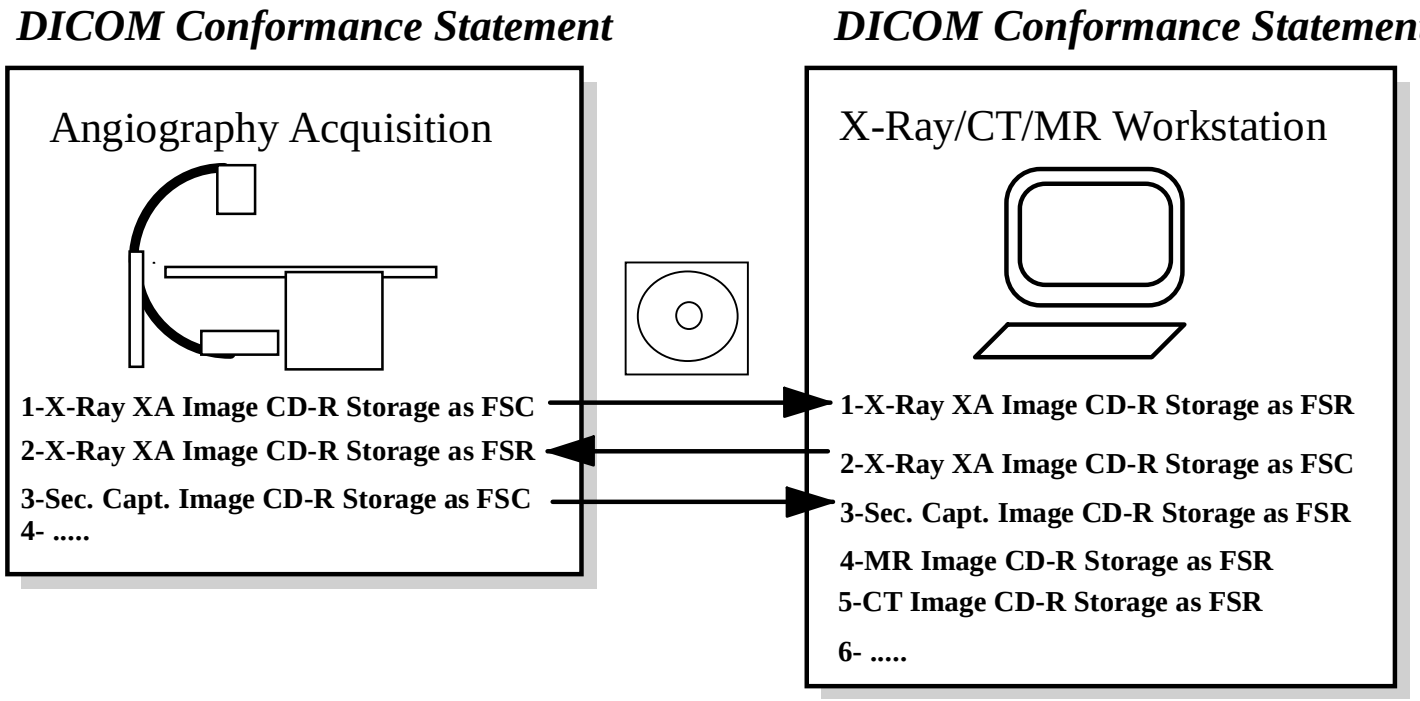


Application Profiles: Keys for Interoperability
A Predefined set of DICOM Building Blocks

Example: The Basic Cardiac CD-R Application Profile



Media Interchange between two Products
Simply Matching the Application Profiles from the DICOM Conformance Statements



FSC=File-Set Creator, FSR=File-Set Reader, FSU=File-Set Updater

Each Product claiming DICOM Conformance shall publish its Conformance Statement

DICOM Media Storage Works !

See DICOM CD-R Media Interchange at ACC'95

At ACC in March 1995, 25 vendors are participating in the Disc 95 Demonstration sponsored by the American College of Cardiology and the European Society of Cardiology.

X-Ray Angiographic (XA) and EchoCardiography (US) Cine Runs have been recorded on 8000 CDs. Users will be able to assess interoperability themselves.

The American Society of Echocardiography (ASE) is planning for June 1995 an MOD based demonstration of the DICOM Ultrasound Application Profiles (close to be issued for final Ballot).

A DICOM X-Ray Cardiac and Echocardiography Demonstration is planned in Amsterdam (ESC) Summer 1995.

Additional Demonstrations may be expected late 1995 (RSNA) and early 1996 (ACC).

Implementing DICOM Media Interchange

DICOM publicly available software to be released after ACC 95 and ASE 95. Two sets of software and documentation from:

- **Brown University-Institute for Medical computing (Dr. John Elion)**
- **MIT, Boston and Imperial College, London**

Like the DICOM network implementations, these will play an important role:

- **used as a quality test for completing the DICOM Standard**
- **used as Test Nodes at ACC DICOM CD-R and ASE Demonstrations**
- **available for vendors to test their implementations**
- **available for users to use on their existing development environments.**

DICOM Media International Acceptance

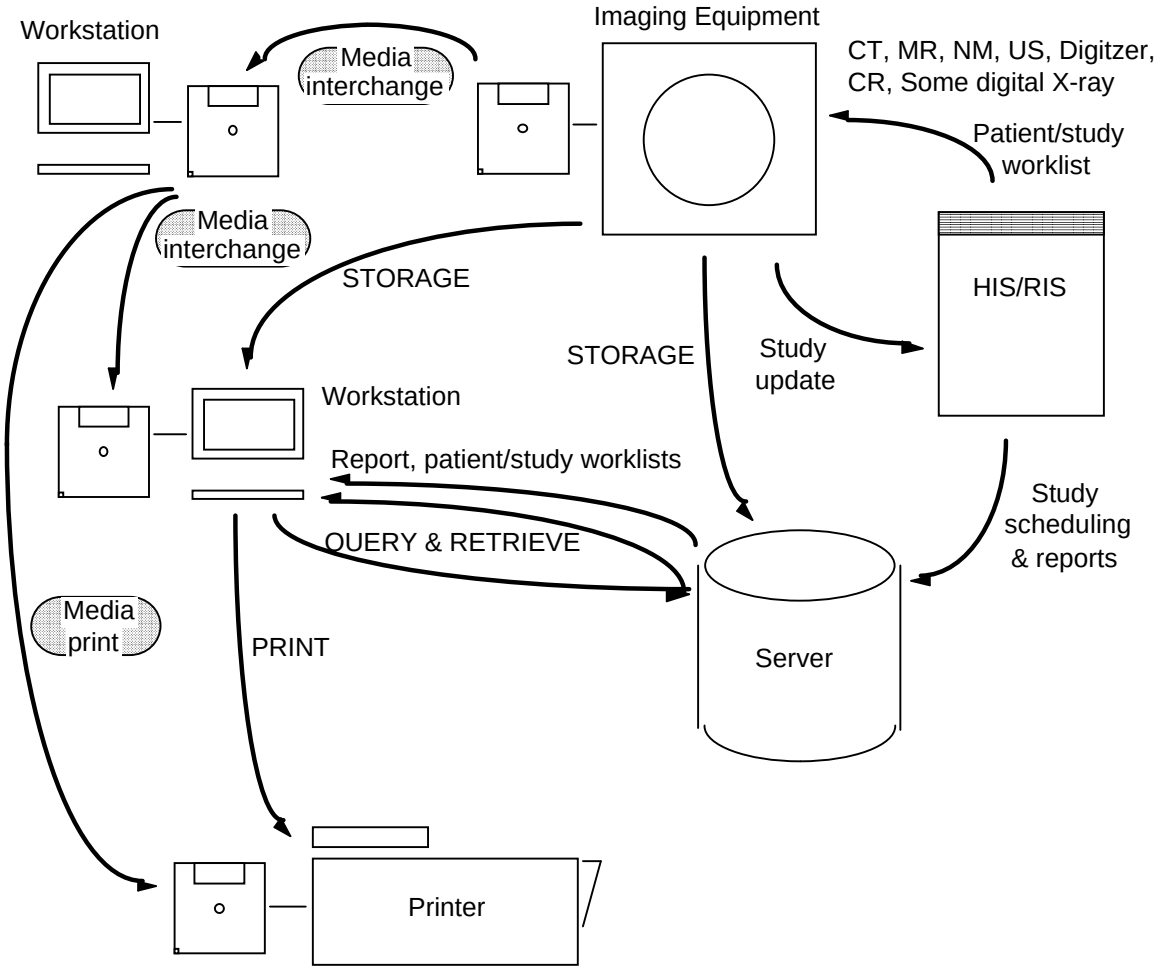
- **DICOM supplements (Parts 10, 11 and 12) have been approved by NEMA, ACC and ACR in February 1995 with the support of more than 15 manufacturers, including GE, Kodak, Polaroid, Picker, Siemens, Philips, ATL, Acuson, etc.**

- **In Europe, CEN TC 251 WG IV strategy to extend its reference to DICOM in the CEN MEDICOM Standard (new Work Item approved).**

- **The cooperation between CEN TC 251 WG IV and ACR-NEMA has entered a very active phase in 1995 (several joint meetings and activities).**

- **A joint effort has been started with JIRA (Japanese manufacturer Association) and Image Save and Carry (IS&C) to harmonize their standardization efforts in 1995.**

DICOM A SOLID FOUNDATION FOR AN OPEN IMAGE MANAGEMENT SYSTEM



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