



International Telecommunication Union

# MPEG-2 extends DICOM to new domains (Endoscopy, Microscopy, Surgery)

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ITU-T VICA Workshop  
22-23 July 2005, ITU Headquarter, Geneva



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***Mission Statement: Enable Multimedia Connectivity for Healthcare***

- **DICOM Solutions for Medical Imaging Networks**
  - **Member of the DICOM Standards committee**
    - (Emmanuel Cordonnier, *ETIAM* chairman)
  - **Sell DICOM toolkits, modules, applications, devices**
    - **Final users**
    - **OEM partners**
  - [www.etiam.com](http://www.etiam.com)
  - **Rennes, France**



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# DICOM Overview

- o **D**igital **I**maging and **C**ommunications in **M**edicine
  - Digital Image format
  - Communication protocol
- o **H**istory
  - [1983-1988] ACR/NEMA V1.0 and V2.0
    - American College of Radiology
    - National Electrical Manufacturers Association
  - [1993] DICOM 3.0
    - ACR/NEMA
    - JIRA, CEN TC251



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# DI COM Members

VENDORS	USERS
<ul style="list-style-type: none"><li>• <a href="#">AGFA U.S. Healthcare</a></li><li>• <a href="#">Boston Scientific</a></li><li>• <a href="#">Camtronics Medical Systems</a></li><li>• <a href="#">Carl Zeiss Meditec</a></li><li>• <a href="#">CPS Innovations</a></li><li>• <a href="#">CTI Mirada</a></li><li>• <a href="#">DeJarnette Research Systems</a></li><li>• <a href="#">Dynamic Imaging</a></li><li>• <a href="#">Eastman Kodak</a></li><li>• <a href="#">ETIAM</a></li><li>• <a href="#">FujiFilm Medical Systems U.S.A.</a></li><li>• <a href="#">GE Healthcare</a></li><li>• <a href="#">Heartlab</a></li><li>• <a href="#">Hologic</a></li><li>• <a href="#">IBM Life Sciences</a></li><li>• <a href="#">IDX Systems Corporation</a></li><li>• <a href="#">Konica Minolta Medical Corporation</a></li><li>• <a href="#">MatrixView</a></li><li>• <a href="#">McKesson Medical Imaging Company</a></li><li>• <a href="#">MEDIS</a></li><li>• <a href="#">Merge eFilm</a></li><li>• <a href="#">Philips Medical Systems</a></li><li>• <a href="#">RadPharm</a></li><li>• <a href="#">R2 Technology, Inc.</a></li><li>• <a href="#">Siemens Medical Solutions USA, Inc.</a></li><li>• <a href="#">Sony Europe</a></li><li>• <a href="#">Toshiba America Medical Systems</a></li></ul>	<ul style="list-style-type: none"><li>• <a href="#">American Academy of Ophthalmology</a></li><li>• <a href="#">American College of Cardiology</a></li><li>• <a href="#">American College of Radiology</a></li><li>• <a href="#">American Dental Association</a></li><li>• <a href="#">College of American Pathologists</a></li><li>• <a href="#">Deutsche Roentgensgesellschaft</a></li><li>• <a href="#">European Society of Cardiology</a></li><li>• <a href="#">Medical Image Standards Association of Taiwan</a></li><li>• <a href="#">Societa Italiana di Radiologia Medica</a></li><li>• <a href="#">Societe Francaise de Radiologie</a></li></ul>
	GENERAL INTEREST
	<ul style="list-style-type: none"><li>• <a href="#">Canadian Institute for Health Informatics</a></li><li>• <a href="#">Center for Devices &amp; Radiological Health</a></li><li>• <a href="#">Japan Industries Association of Radiological Systems (JIRA)</a></li><li>• <a href="#">Korean PACS Standard Committee</a></li><li>• <a href="#">National Cancer Institute</a></li><li>• <a href="#">National Electrical Manufacturers Association</a></li></ul>



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HIS

Referring physician orders the desired radiology procedure

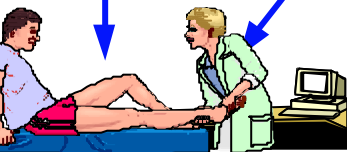
examination orders

# Hospital Workflow

Initial capture of patient demographic information



**Registration**



**Orders Placed**

**RIS**



**Orders Filled**

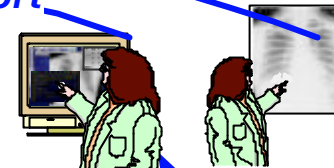
Break down the entered order into specific radiology procedure steps to be performed

Radiology report stored for network access



**Report Repository**

Diagnostic image and demographic info presented to radiologist



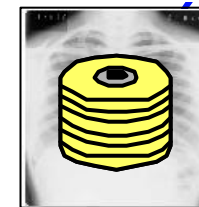
**Diagnostic Workstation**



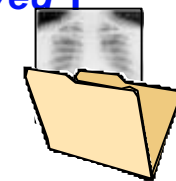
**Film Lightbox**

**PACS**

Diagnostic image and demographic info stored for network access



**Image Manager and Archive**



**Film Folder**

**Modality**



Position patient and acquire image

acquisition completed  
images printed



**Film**



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# DICOM Services

1. DICOM Worklist
  - HIS/RIS inquiry to get patient information and examination planning
2. DICOM IOD
  - Data set = {patient information, images}
3. DICOM Store
  - Transfer of the acquired data to a PACS
4. DICOM Query & Retrieve
  - Enterprise wide access



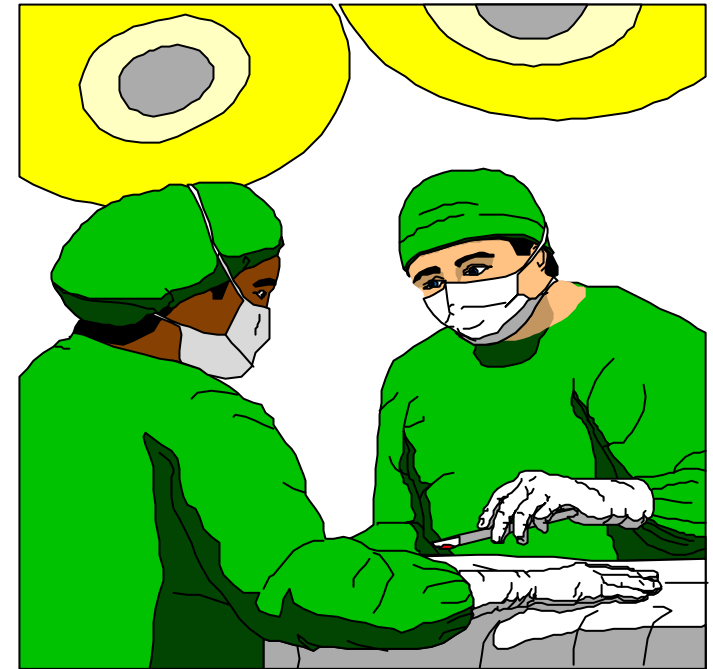
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# DICOM from X-Ray to VL: From Still Images To Video

Radiology



Visible Light



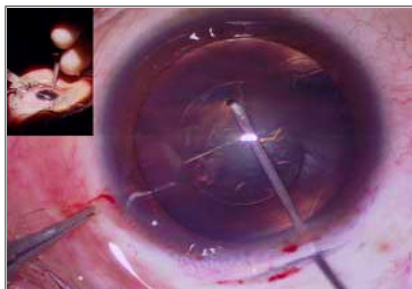




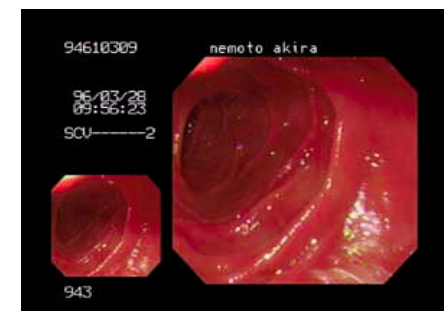
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# Visible Light Applications

Rigid Endoscopy



Microsurgery



Flexible Endoscopy





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# DI COM Visible Light Video (1)

- New Information Object Entities (IODs)
  - Endoscopy, Microscopy, Photography
  - Exemple: Endoscopy IOD

Table A.32.5-1  
VIDEO ENDOSCOPIC IMAGE IOD MODULES

IE	Module	Reference	Usage
Patient	Patient	C.7.1.1	M
	Clinical Trial Subject	C.7.1.3	U
Study	General Study	C.7.2.1	M
	Patient Study	C.7.2.2	U
	Clinical Trial Study	C.7.2.3	U
Series	General Series	C.7.3.1	M
	Clinical Trial Series	C.7.3.2	U
Equipment	General Equipment	C.7.5.1	M
Image	General Image	C.7.6.1	M
	Cine	C.7.6.5	M
	Multi-frame	C.7.6.6	M
	Image Pixel	C.7.6.3	M
	Acquisition Context	C.7.6.14	M
	VL Image	C.8.12.1	M

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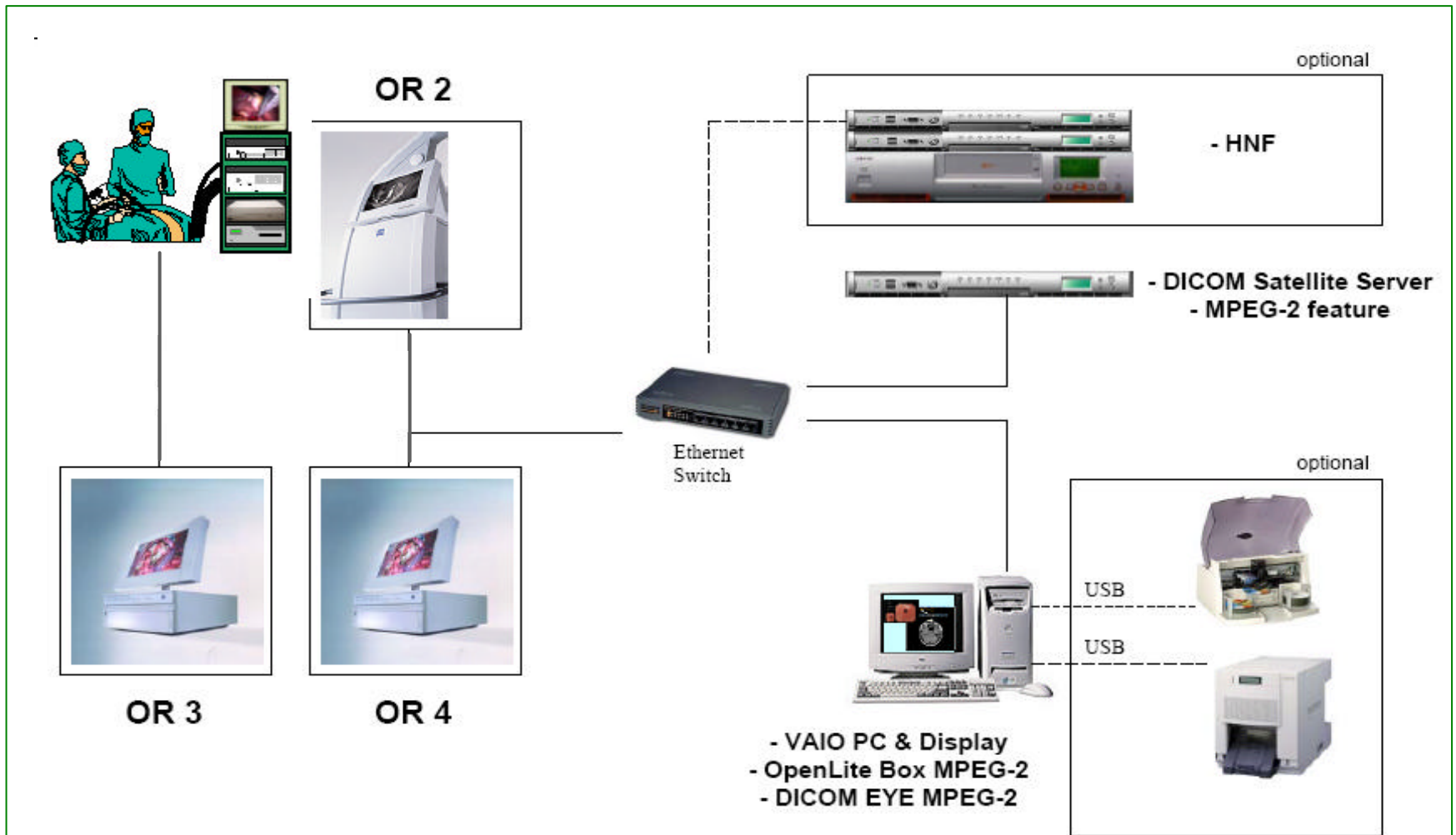
## DI COM Visible Light Video (2)

- o Video data encoded in MPEG-2. Why MPEG-2?
  - Open, mass market established standard
  - Compatibility to DVD and Networks
  - Low cost technology base (chips...)
  - Inter-operability & flexibility
  - Scalable bit rates
  - Industry Support...
  - and STABLE



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# Implementation (EAES 05)





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# DICOM Visible Light Videos: Challenges

- o DICOM general issues:
  - Encourage the use of DICOM workflow in non DICOM familiar environment
  - Coordination between vendors
    - Installation of DICOM Visible Light compatible modalities
    - Connection with compatible PACS



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# DI COM Visible Light Video: Challenges

- o Video specific issues
  - Video quality
    - Main Profile Main Level (MP@ML), 8 Mbps, variable bit rate (DVD quality)
  - Video consultation
    - Bandwidth & space issues
    - Streaming
  - Video workflow
    - Selection of sequence / sub-sequences / still images
    - Time to copy on media / servers



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# Conclusion

- o MPEG-2 extends DICOM to new domains
  - extend PACS to all digital images & videos produced by the hospital
- o Advantages
  - quicker access to relevant images, resulting in improved patient care
- o Perspectives
  - increase the usage of DICOM in the context of Visible Light
  - video quality management (MPEG4?)