

# New Information Object Definitions for DICONDE

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**Abstract.** In 2004, ASTM published the DICONDE (Digital Imaging and Communication in NDE) standard practice for the storage and communication of digital nondestructive evaluation (NDE) results. The current DICONDE practice (ASTM E2339-08) addresses only issues that apply to all NDE modalities. We will discuss our methodology for developing new Information Object Definitions for those NDT imaging modalities that have needs that are not currently addressed by the ASTM 2339-08 standard. We describe our definitions for ultrasound, digital radiography and computed tomography based on metadata in the ACR-NEMA DICOM standard with adaptations for industrial applications. After giving a brief overview of DICOM, we address several information entities required by ASTM industrial ultrasonic and radiography standards that have no comparable attributes in medical imaging. Several examples of attributes that present difficulties in using basic DICOM data structures will be identified (e.g., the spatial positioning of an object in the field of view or the number of rads generated by a linear accelerator source). Solutions to these problems will be proposed. We will also discuss the advantages and disadvantages of creating a new storage class for nondestructive testing. Lastly, we will discuss the use of DICONDE conformance statements, which are based on the DICOM standard, in evaluating an imaging system's compliance to DICONDE and its interoperability with other systems that claim DICONDE compliance. This article was presented at the BINDT 2008.

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imagination at work

## Topics

- Introduction
- DICONDE and DICOM differences
- A methodology for expanding the DICONDE standard
- Adding a new information object
  - for ultrasonic inspections
  - for tomographic inspections
  - for radiographic inspections
- The use of conformance statements
- Conclusions



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2 /  
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## DICONDE – Customer Benefits

- Avoid legacy data conversion costs when upgrading inspection systems (or useless data!)
- Archive data from multiple inspection equipment vendors in one system
- Support for data format beyond a single equipment vendor – “best of breed”
- Allows customers to review past inspection data with future software tools



3 /  
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## Digital Imaging and Communication in Medicine (DICOM)

A standard that facilitates the interoperability of medical imaging equipment by network communication protocols and data storage formats for medical image data.

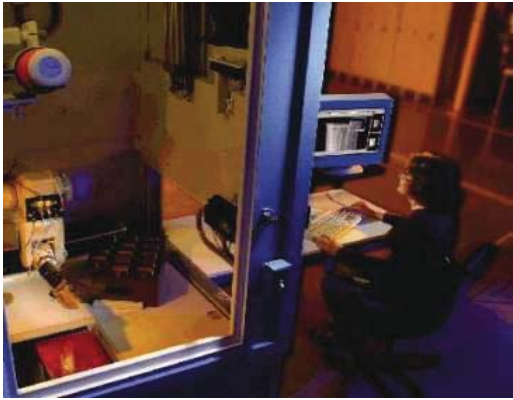
Not just an image



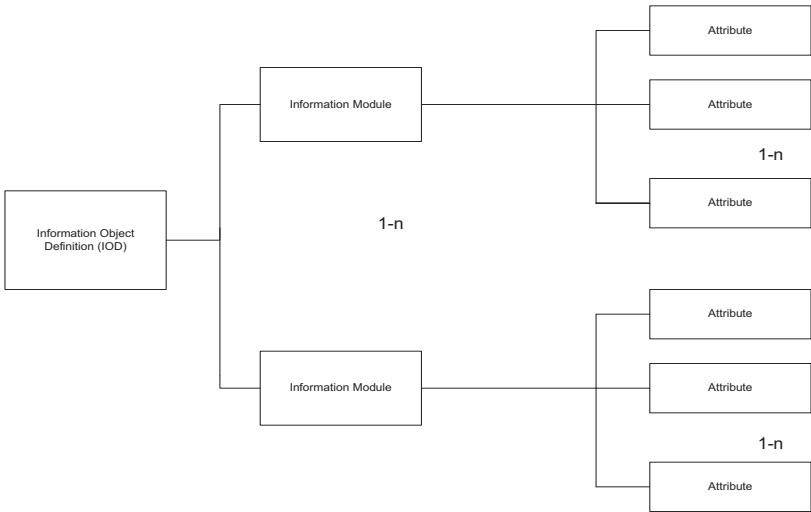
4 /  
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# Digital Imaging and Communication in NDE (DICONDE)

- DICONDE is an extension of the DICOM standard for the inspection industry.
- The first version of DICONDE standard released by ASTM in 2004.



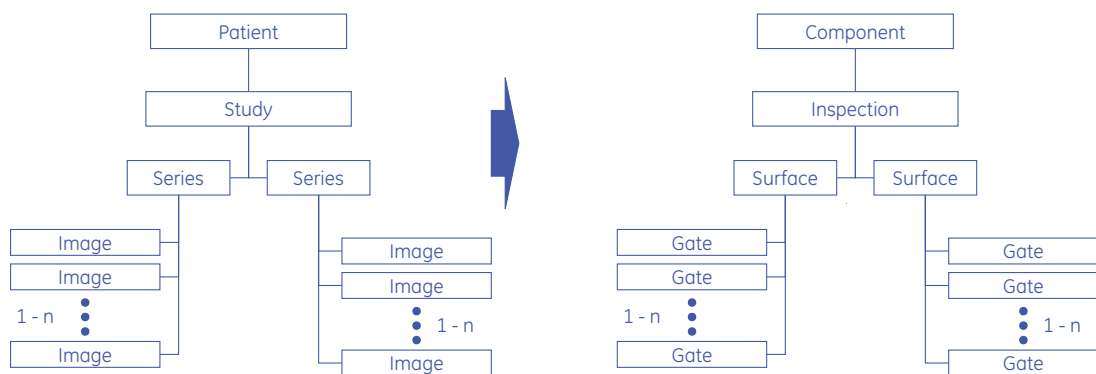
## DICOM/DICONDE IOD Hierarchy



# DICONDE and DICOM differences



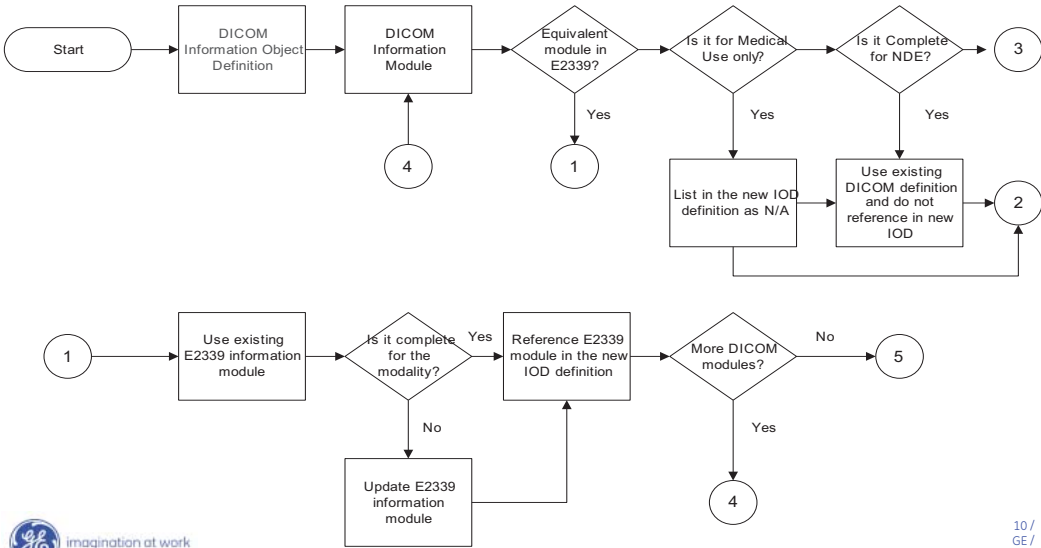
## Interpretation of Real World Model for NDE



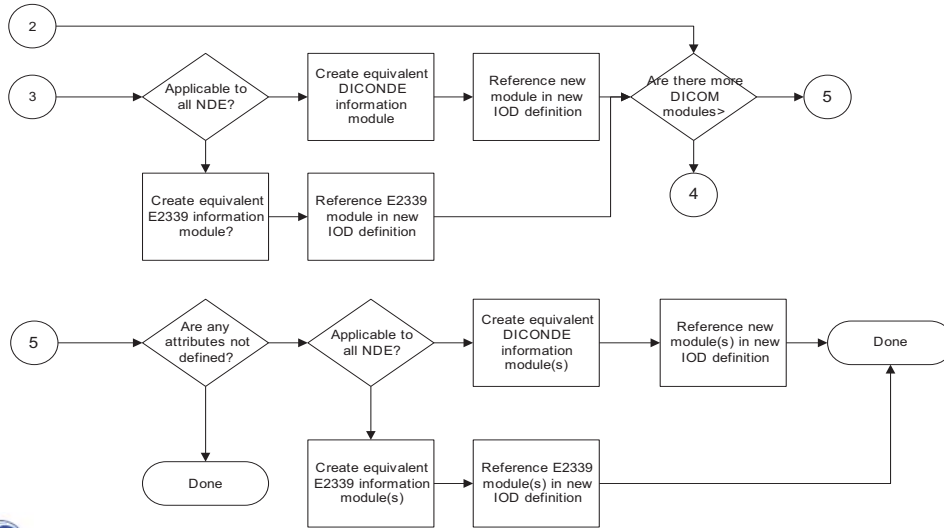
# A methodology for expanding the DICONDE standard



## Expanding DICONDE



# Creating new definitions



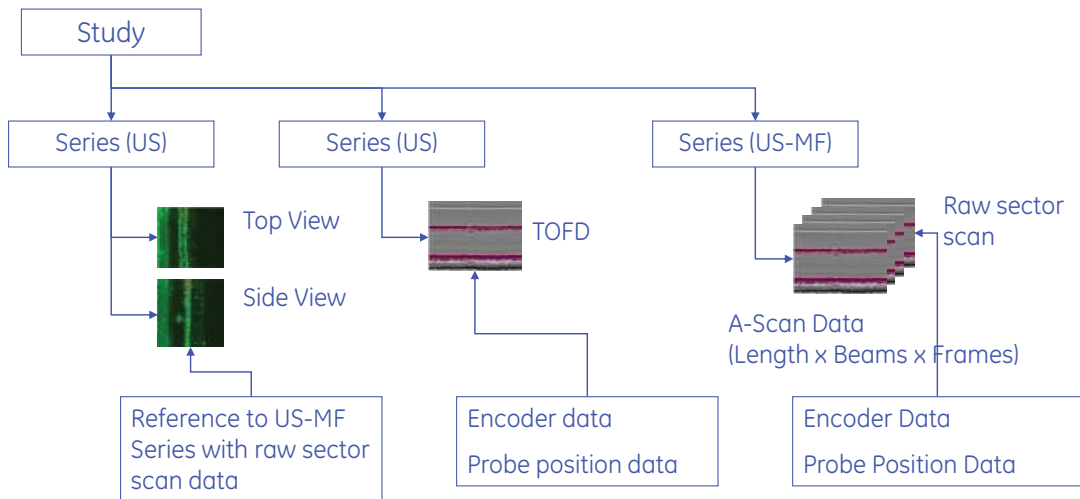
11 /  
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## Adding a new information object for...

### Ultrasonic inspections E2663-08



# Data organization



# DICONDE US IOD

DICOM Module	DICONDE Module	Reference	Usage
Patient	Component	E-2339, Section 7	M
Clinical Trial Subject	Not Applicable		
General Study	Component Study	E-2339, Section 7	M
Patient Study	Not Applicable		
Clinical Trial Study	Not Applicable		
General Series	Component Series	E-2339, Section 7	M
Clinical Trial Series	Not Applicable		
General Equipment	NDE Equipment	E-2339, Section 7	M
US Image	NDE US Image	E-2663 Section 7	M
US Region Calibration	Not Applicable		
	NDE US Equipment	E-2663 Section 7	U
	NDE US Equipment Settings	E-2663 Section 7	U
	NDE Indication	E-2339, Section 7	U
	NDE Geometry	E-2339, Section 7	U



## Tomographic inspection IOD

DICOM Module	DICONDE module	Reference	Usage
Patient	Component	E-2339, Section 7	M
Clinical Trial Subject	Not Applicable		
General Study	Component Study	E-2339, Section 7	M
Patient Study	Not Applicable		
Clinical Trial Study	Not Applicable		
General Series	Component Series	E-2339, Section 7	M
Clinical Trial Series	Not Applicable		
General Equipment	NDE Equipment	E-2339, Section 7	M
Enhanced Contrast/Bolus	Not Applicable		
Enhanced CT Image	NDE CT Image	WK17435, Section 7.1	M
X-Ray collimator		DICOM Part 3, Section C.8.19.6.12	U
X-Ray Filtration		DICOM Part 3, Section C.8.7.10	
X-Ray Grid		DICOM Part 3, Section C.8.7.11	
	NDE CT Detector	WK17435, Section 7.2	U
	NDE Indication	E-2339, Section /	U
	NDE Geometry	E-2339, Section 7	U
	NDE CT Calibration Data	WK17435, Section 7.3	U



15 /  
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## Radiographic inspection IOD

DICOM Module	DICONDE module	Reference	Usage
Patient	Component	E-2339, Section 7	M
Specimen Identification	Not Applicable		
Clinical Trial Subject	Not Applicable		
General Study	Component Study	E-2339, Section 7	M
Patient Study	Not Applicable		
Clinical Trial Study	Not Applicable		
General Series	Component Series	E-2339, Section 7	M
Clinical Trial Series	Not Applicable		
Synchronization	Not Applicable		
General Equipment	NDE Equipment		M
Enhanced Contrast/Bolus	Not Applicable		
DX Detector	NDE DX Detector	Wk17436, Section 7.1	M
	NDE Indication	E-2339, Section 7	U
	NDE Geometry	E-2339, Section 7	U
	NDE DX Calibration Data	WK17436, Section 7.2	U



16 /  
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## Eddy Current IOD

DICOM Module	DICONDE Module	Reference	Usage
Patient	Component	E-2339, Section 7	M
General Study	Component Study	E-2339, Section 7	M
General Series	Component Series	Section 7.1	M
Frame of Reference		DICOM Part 3 Section C.7.4.1	U
Synchronization		DICOM Part 3 Section C.7.4.2	U
	NDE Equipment	E-2339, Section 7	M
General Image		DICOM Part 3 Section C.7.6.1	M
Image Pixel		DICOM Part 3 Section C.7.6.3	M
Palette Color Lookup Table		DICOM Part 3 Section C.7.9	C
Device		DICOM Part 3 Section C.7.6.12	U
	NDE EC Image	Section 7.2	M
Overlay Plane		DICOM Part 3 Section C.7.9.2	U
VOI LUT		DICOM Part 3 Section C.7.11.2	U
SOP Common		DICOM Part 3 Section C.7.12.1	M
	NDE EC Equipment	Section 7.3	U
	NDE EC Equipment Settings	Section 7.4	U
	NDE Indication	E-2339, Section 7	U
	NDE Geometry	E-2339, Section 7	U

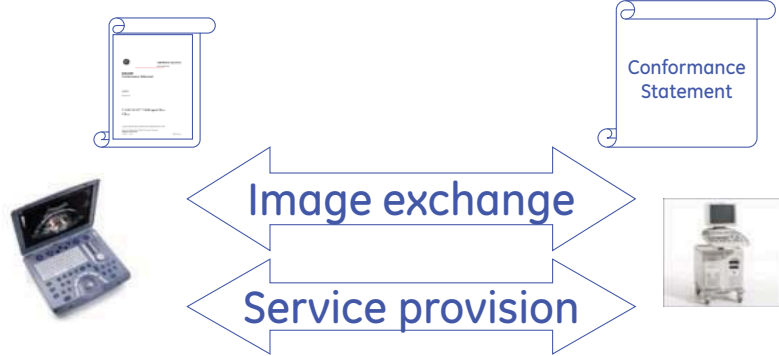


17 /  
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## The use of conformance statements



# Conformance



# Conclusion

# Viewing your DICONDE Data

