Digital Imaging and Communication in Nondestructive Evaluation (DICONDE)

Overview

May 13, 2011

Inspection Data Retention

Critical infrastructure requires long-term retention of inspection data

- Aviation

- Transportation

- Energy

- Defense

Inspection Data Storage Challenges

- Changes in computer hardware

- Changes in computer software

- Changes in inspection vendors

- Maintaining inspection metadata

Digital Revolutions Enabled by Standardization

■ Information Technology

- Hypertext Markup Language (HTML)

- Compile once, run anywhere

■ Digital Music

- Motion Picture Experts Group Audio Layer 3 (MP3)

■ Digital Photography

- Joint Photographic Experts Group (JPEG)

ASTM E07.11 Subcommittee on Digital Imaging and Communication in NDE (DICONDE)
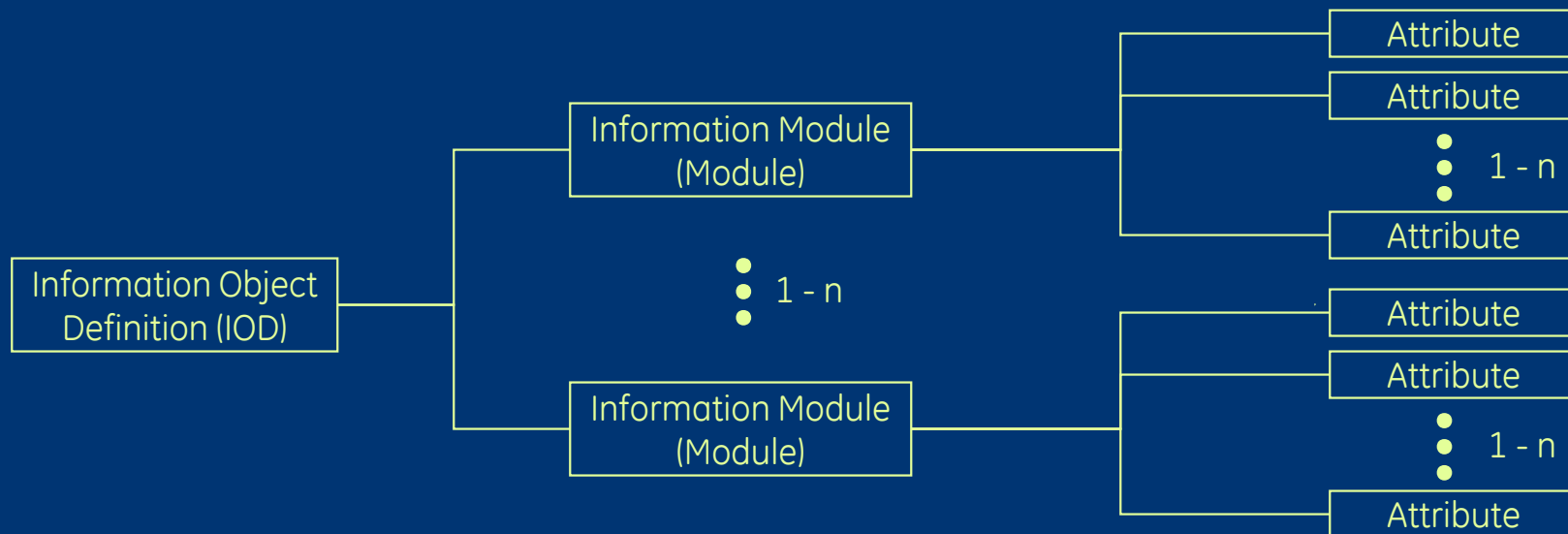
Scope: E07.11 on DICONDE is concerned with the formulation of standards for the communication and storage of image data generated by all nondestructive testing methodologies capable of displaying images/data in an electronic format. The communication and storage standard called DICONDE is based on the universally adopted medical standard DICOM.

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

DICOM Information Model

- Information modules may be used in more than one IOD

- Attributes may be used in more than one Module

- Example modules: Patient, General Equipment

- Example attributes: Patient Name, Transducer Frequency

Attribute Definition in DICOM

Tag	Value Representation (VR)	Value Multiplicity (VM)

- Tag – An ordered pair of 16-bit unsigned integers representing the Group Number followed by the element number.

- Example – (0010,0010)

- Often denoted (gggg, eeee)

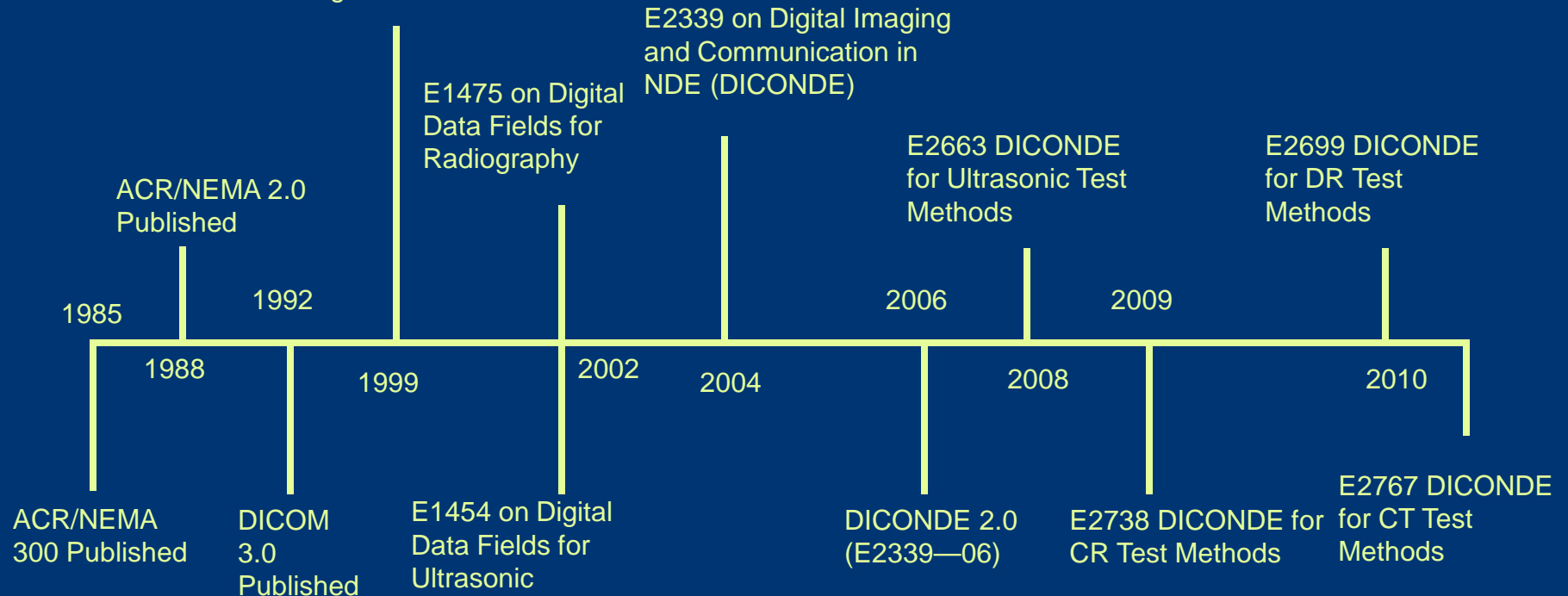- Odd Group Numbers denote private data elements

DICONDE Committee Philosophy

- Utilize DICOM as a 'parent' standard

- Reuse DICOM IOD's, Information Modules and Attributes where possible

- Use references to minimize repetition of DICOM standard information

- Create new IOD's, Information Modules and Attributes where no reasonable Medical equivalent exists

DICONDE Timeline

ASTM forms a committee (E07.11) on communication of NDE image data.

E2339 on Digital Imaging and Communication in NDE (DICONDE)

E1475 on Digital Data Fields for Radiography

E2663 DICONDE for Ultrasonic Test Methods

E2699 DICONDE for DR Test Methods

ACR/NEMA 2.0 Published

1985

1992

2006

2009

1988

1999

2002

2004

2008

2010

ACR/NEMA 300 Published

DICOM 3.0 Published

E1454 on Digital Data Fields for Ultrasonic

DICONDE 2.0 (E2339—06)

E2738 DICONDE for CR Test Methods

E2767 DICONDE for CT Test Methods

DICOM Is More Than A File Format

Features

- – Communication protocol
- – Workflow
- – Security
- – Display Consistency (GrayScale Softcopy Presentation State GSSPS)
- – Application Hosting (Standard Software Plugins)
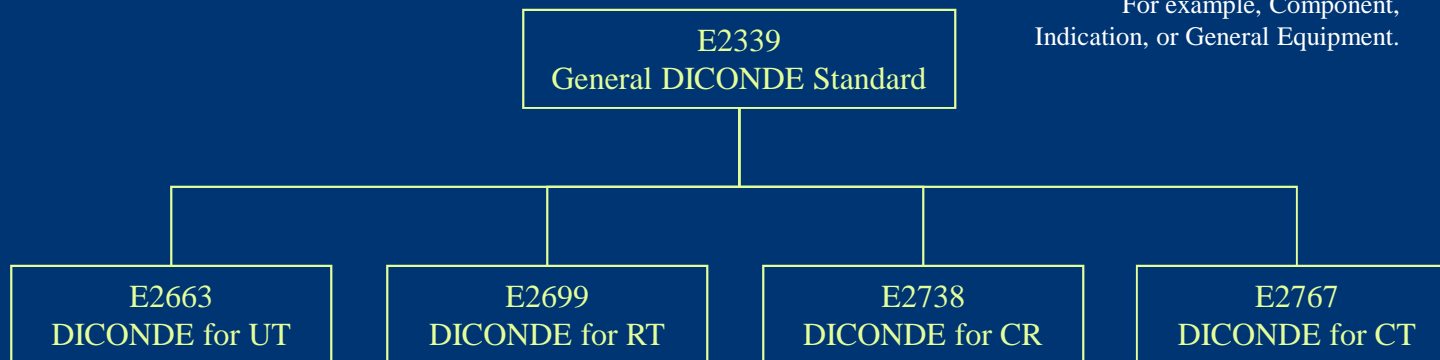
Benefits

- – Remote data access and review
- – Automated escalation processes for non-standard inspection results
- – Confidence data has not been modified
- – Ability to know how the inspector viewed the image when making accept/reject decision
- – Develop custom data processing modules that will run on all DICONDE image review stations

DICONDE Standard Practices

ASTM No.	Title	Description	Status
E2339	Digital Imaging and Communication in Nondestructive Evaluation (DICONDE)	Data and metadata that applies to ALL NDE methods.	Issued 2004
E2663	Digital Imaging and Communication in Nondestructive Evaluation (DICONDE) for Ultrasonic Test Methods	Data and metadata that are relevent only to ultrasonic test methods	Issued 2008
E2767	Digital Imaging and Communication in Nondestructive Evaluation (DICONDE) for X-ray Computed Tomography (CT) Test Methods	Data and metadata that are relevent only to x-ray computed tomography test methods	Issued 2010
E2699	Digital Imaging and Communication in Nondestructive Evaluation (DICONDE) for Digital Radiographic (DR) Test Methods	Data and metadata that are relevent only to digital radiographic test methods	Issued 2010
WK20537	Digital Imaging and Communication in Nondestructive Evaluation (DICONDE) for Eddy Current Test Methods	Data and metadata that are relevent only to eddy current test methods	Waiting on Public Attributes
E2738	Digital Imaging and Communication Nondestructive Evaluation (DICONDE) for Computed Radiography (CR) Test Methods	Data and metadata that are relevent only to computed radiography test methods	Issued 2009

DICONDE Standard Practice Relationships

Information that applies to the communication and storage of digital data from all NDT methods. For example, Component, Indication, or General Equipment.

E2339
General DICONDE Standard

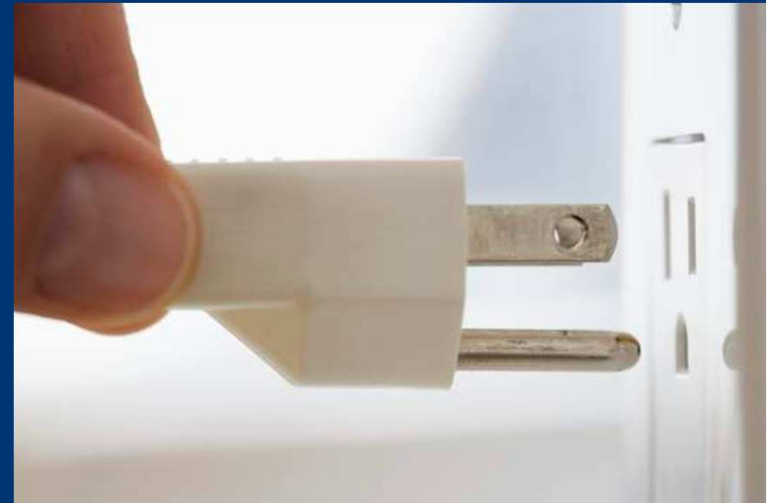| E2663 | E2699 | E2738 | E2767 |
| DICONDE for UT | DICONDE for RT | DICONDE for CR | DICONDE for CT |

Information that applies to the communication and storage of digital data from a specific NDT method. For example, E2663 for Ultrasonic Test Methods contains information on Transducers, Pulsers or Receivers.

Interoperability

def: The ability of a system or a product to work with other systems or products without special effort.

- Conformance Statements

- Validation Tools

- Industry Demonstrations

- Example DICONDE Compliant Files
  - CR, DX, CT, US and US-MF
  - Minimum required attributes
  - "Typical" attributes

- DVTK Validator .def files
  - CR, DX, CT and US

- Available on ASTM web site

- Join ASTM E07.11 and help develop standard practices

- Vendors – participate in the Interoperability Demonstration

- Users – Ask your vendors when they will be DICONDE compliant

Pat Howard

patrick.howard@ge.com

+1 513.552.4646

Lloyd Arrowood

arrowood@cs.utk.edu

+1 865.574.8700

Kate McClung

kmcclung@astm.org

+1 610.832.9717