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DICOM℠
Digital Imaging and Communications in Medicine

Creating & Managing Data Sets for Adv. Visualization Testing

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DICOM WG6

SIEMENS

Creating & Managing Data Sets for Adv. Visual. Testing

- The goal: Do reading apps work well with top scanners?
- How to instruct field staff to collect the right studies?
- How do we anonymize studies to the right level?
- How to organize large amount of collected studies?
- How do we trigger apps with vendor specific studies?
- Key findings: MR4D, Adv. MR, Dynamic CT
- Conclusion

The goal: Do reading apps work well with top scanners?

DICOM
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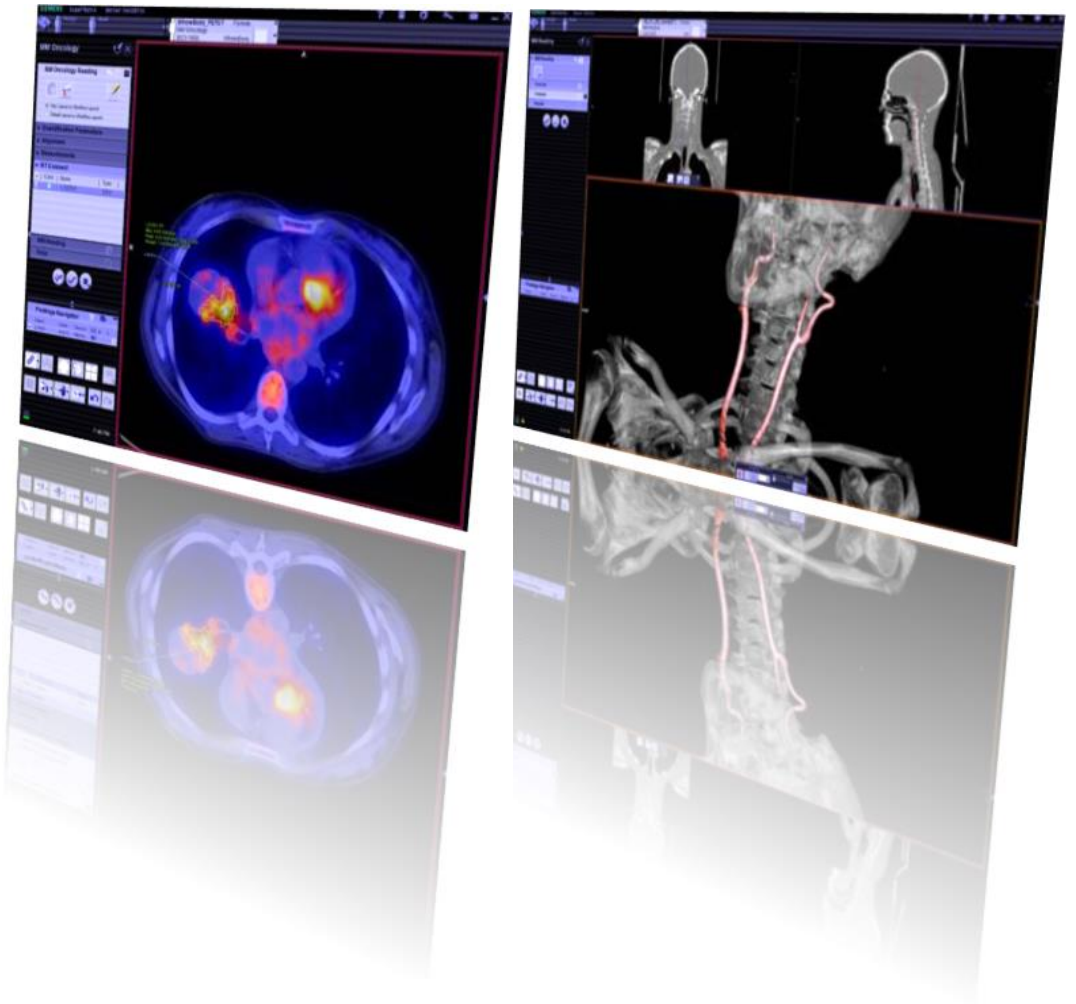
We want to ensure that radiologists can run as many workflows and apps as possible on any suitable studies – independent of vendor



How to instruct field staff to collect the right studies?

The REQUEST: Please provide the following type of studies from all important MR, CT and PET scanners:

- ❑ **MR perfusion - passage of blood through the brain's vascular network**
- ❑ **CT studies containing 10 heart beats**
- ❑ **MR and PET studies suitable for registration**

The DELIVERY: We received unsorted studies from a specific day or days at the contributing clinic

How do we anonymize studies to the right level?

- **Anonymizing is described in DICOM PS3.15**
  ATTRIBUTE CONFIDENTIALITY PROFILE
- **Acquisition Time** (0008,0032)
  is important for dynamic studies, e.g. contrast agent
- **Missing Series Description** (0008,103E)

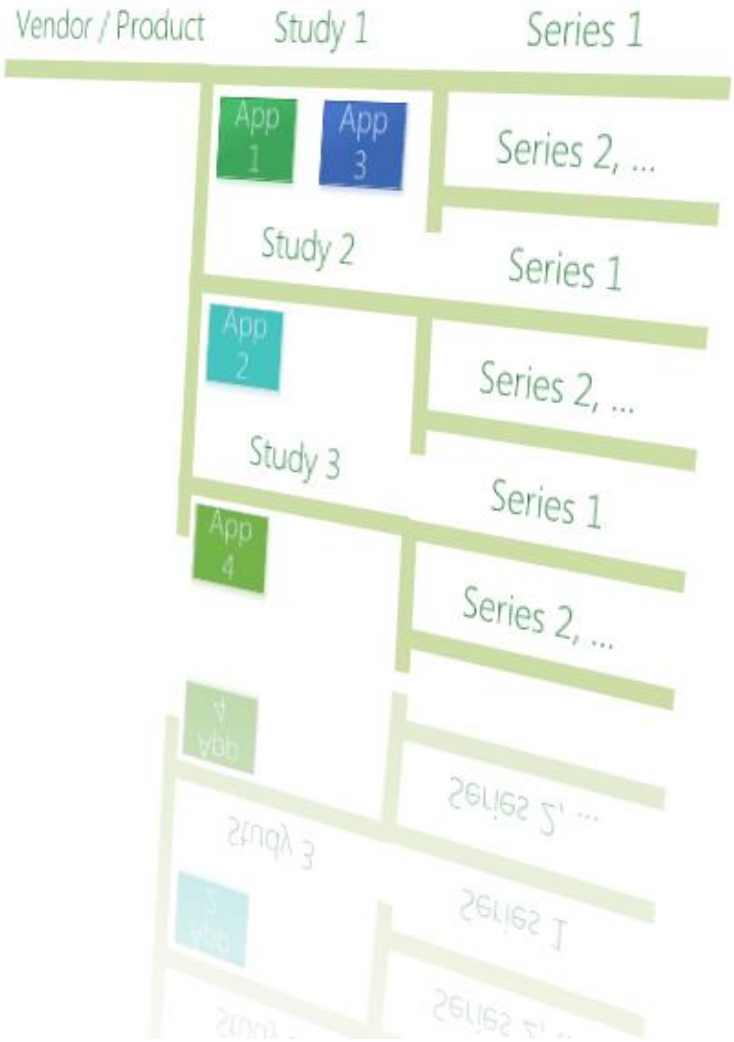
- **Private data contained full private address**
- **Private data necessary for specific workflow**

- **Series where not kept together within a study** TOOLING

How to organize large amount of collected studies?

The general model of DICOM is very useful for structuring large sets of studies

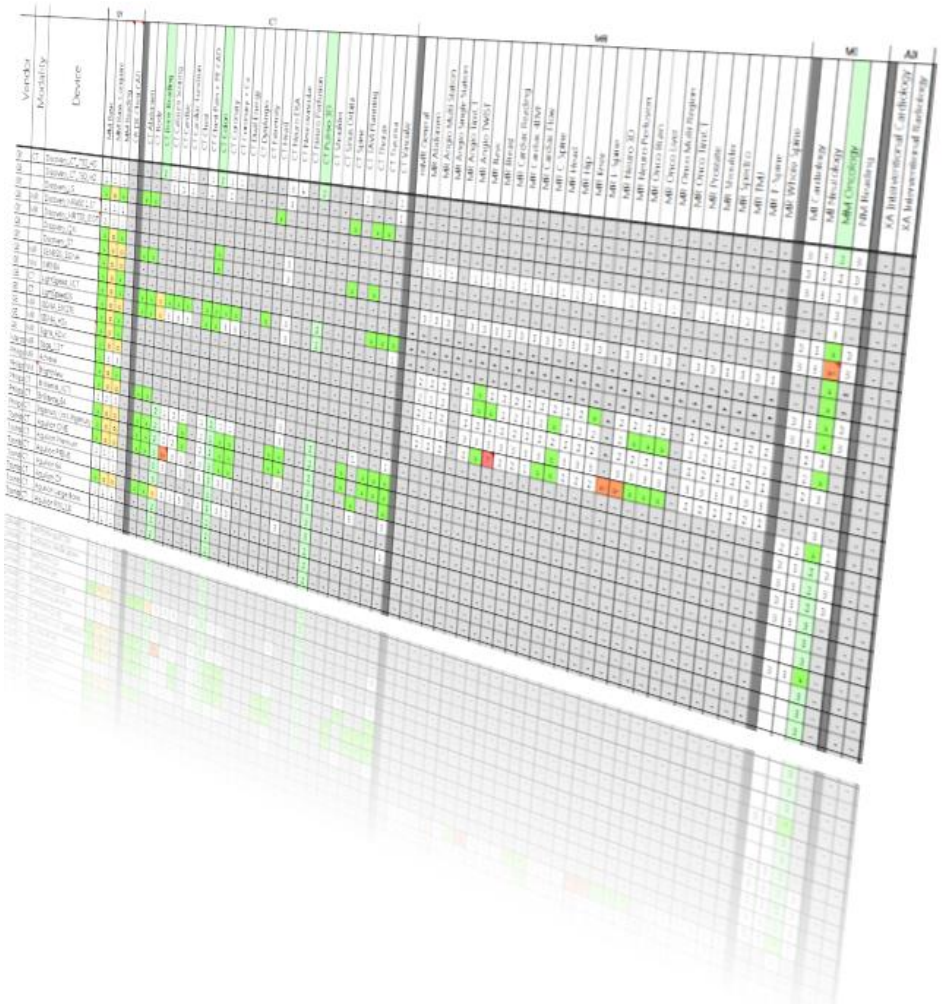
- **18 vendors**
- **200 scanner products**
- **1 Tbyte real world DICOM studies**
- **66 advanced applications**



How do we trigger apps with vendor specific studies?

We tracked and verified which workflows and apps worked with collected studies from appropriate scanners

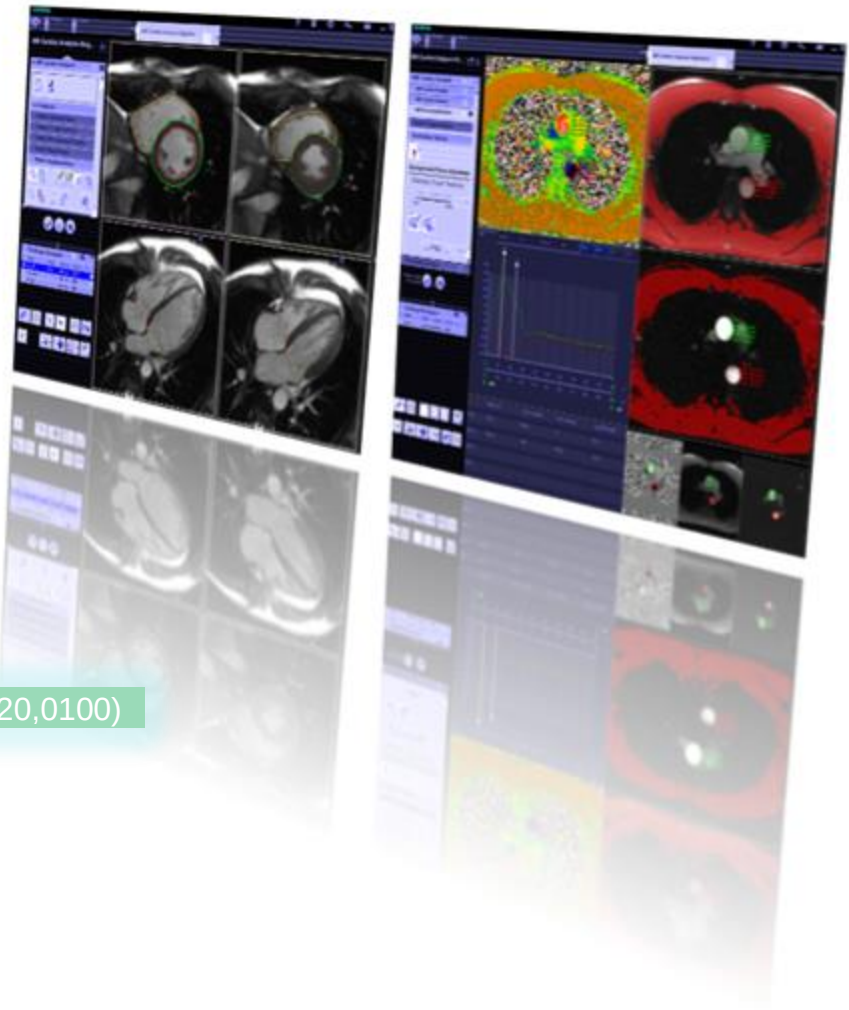
- ❑ **Successful test: scanner ←→ workflow**
- ❑ **Studies available, tests fail**
- ❑ **Tests ok or failing at clinical site**
- ❑ **Priority wish list for missing studies**



Key findings – MR 4D Study

Vendors use Acquisition Time
DICOM conform but totally different
(e.g. brain, liver, breast cancer)

- **Studies with several different phases, e.g. usage of contrast agents.**
- **Vendor 1: Acquisition Time is later for each new phase**
- **Vendor 2: Acquisition Time always contains the initial time point, but increments Temporal Position Identifier (0020,0100) for each phase**
- **Vendor 3: Acquisition Time always contains the initial time point**



Key findings – Dynamic CT

Vendors code Scan Options (0018,0022)
DICOM conform but totally different for dynamic studies with 3 or more phases. (E.g. Angio)

Vendor 1:

- XOP\A4DS\0001\CONT\A4TP000000MS00 → A4DS = Adaptive 4D spiral scan
- A4CS = Adaptive 4D cardiac shuttle mode = EGC triggered heart perfusion
- DSEQ = Dynamic sequence scan
- MULS = Dynamic multi scan

Vendor 2:

- CINE MODE

Vendor 3:

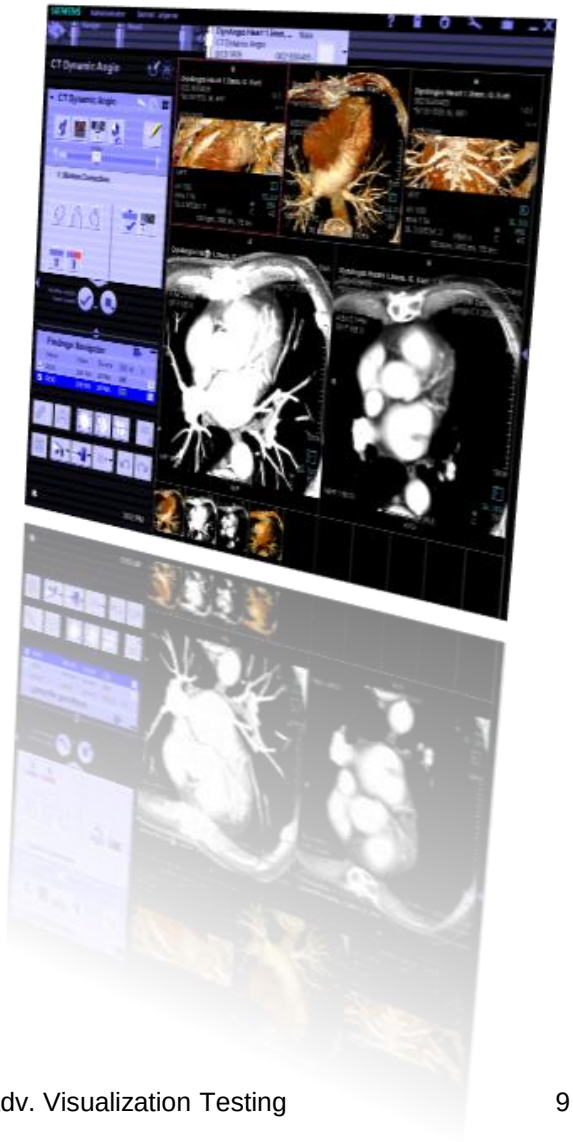
- DYNAMIC_CT

Vendor 4…n:

- No information (Most frequent case)

Work around:

Sorting and grouping of time points: DICOM Acquisition Datetime (0008,002A)
in combination with DICOM Image Position Patient (z-coordinate) (0020,0032)



Key findings – Adv. MR

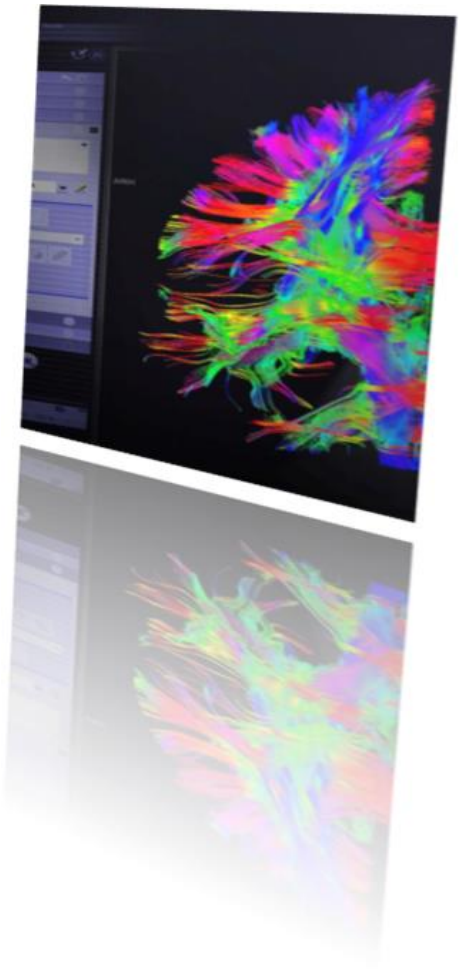
For advanced MR applications:

- **functional MR,**
- **MR Spectroscopy**
- **MR Cardiac**

There is no common interoperability.

The necessary application specific attributes are stored as private.

- **Many issues would be solved when vendors in general would adapt to Enhanced MR DICOM objects.**



Conclusion

The DICOM standard has served the interoperability goal very well over a very long time.

The DICOM standard is living and there is a need for further advances of the standard as new application and scanner scenarios get developed.

Author Contacts

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Thank you for your attention !