Managing Non-DICOM Images within an Enterprise Imaging Solution
Agenda

• Enterprise Imaging / Non-DICOM Market Trends

• Managing Non-DICOM Images in the Enterprise

• Merge’s Non-DICOM Solution Options

• Questions?
Enterprise Imaging / Non-DICOM Trends
Interoperability Market Drivers

M&A / Consolidation
Clinical and Financial Economies of Scale

Connecting Providers
Patient Centric Care Across Sites

Enterprise Image Management
Comprehensive Image Record

EHR Optimization
Unified Patient Image Record
### Providers Generate a Flood of Data

Providers generate a flood of data that are stored in a VNA. The iConnect™ solution provides a single database, single storage pool, single server, single admin tool, and single viewer from a single vendor.

#### Digital Clinical Objects

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<tr>
<th>Specialty</th>
<th>DICOM</th>
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#### Most Common Devices

<table>
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<tr>
<th>Specialty</th>
<th>Devices and Reports</th>
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<tbody>
<tr>
<td>Anesthesia</td>
<td>C-Arm, X-ray, Anesthetic, Record Keeping Reports</td>
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<tr>
<td>Cardiology</td>
<td>Cardiac CT, Cath, CVUS,CVECG / Holter / Stress / Pace</td>
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<tr>
<td>Dermatology</td>
<td>Physician Notes, Reports</td>
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<td>Emergency Medicine</td>
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<td>SPECT / CT, PET / CT, Nuclear Cardiology Reports, Voice Dictation Files</td>
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<tr>
<td>Family Medicine</td>
<td>Physician Notes, Reports</td>
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<tr>
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<td>Barium X-ray, CT, NM, Endoscopy, Nuclear Cardiology Reports, Voice Dictation Files</td>
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<td>US and MRI Angiography, Angioscopy (Nuc Med) Reports, Voice</td>
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<tr>
<td>ICU Medicine</td>
<td>In Dept C-Arm, X-ray, Patient CIS Flow Chart Reports</td>
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<tr>
<td>Nephrology</td>
<td>US and MRI Angiography, Angioscopy (Nuc Med) Reports, Voice</td>
</tr>
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<td>Neurology</td>
<td>Renal Scans, SPECT/CT, PET/CT, Physician Reports, Renal Grams, Voice</td>
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<td>Nuclear Medicine</td>
<td>US, Physician Reports, Nuclear Cardiology Reports, Voice</td>
</tr>
<tr>
<td>Obstetrics</td>
<td>X-ray, CT, Nuclear Cardiology Reports, Reports</td>
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<tr>
<td>Oncology</td>
<td>FDG-PET, PET/CT, Nuclear Cardiology Reports</td>
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<td>Pediatrics</td>
<td>Nuclear VNA Voice Dictation Files</td>
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<td>Brain Lab, Nuclear Cardiology Reports, Voice Dictation Files</td>
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<td>Rheumatology</td>
<td>US, MRI, Nuclear Cardiology Reports, Voice Dictation Files</td>
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<tr>
<td>Surgery</td>
<td>In Department Nuclear Cardiology Reports, Voice Dictation Files</td>
</tr>
<tr>
<td>Urology</td>
<td>MR, XR, Digital Fluoroscopy Reports, Voice Dictation Files</td>
</tr>
</tbody>
</table>
DICOM + non-DICOM / Dark Data

2017 Forecast
- 1.4B Objects / Year
- 51% VNA 5 Yr CAGR
- ~75% are Non-DICOM

Key Drivers
- Increased PACS to VNA Attach Rate
- Growth in Non-DICOM
Managing Non-DICOM Images in the Enterprise
Developing a Non-DICOM Solution

- Managing Clinical Image Content is about workflow

- Non-DICOM Clinical Content is often Dark Data
  - Gartner defines dark data as “the information assets organizations collect, process and store during regular business activities, but generally fail to use for other purposes”

- Goal: Ingest → Store → View a patient’s complete image record (DICOM and non-DICOM) within the context of the patients medical record
Key Workflow Questions

For each service line:
• Orders or Encounters Based?
• DICOM vs. XDS vs. XDS-I

<table>
<thead>
<tr>
<th></th>
<th>XDS Object</th>
<th>XDS-I Object</th>
<th>DICOM Object</th>
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<tbody>
<tr>
<td>Encounter</td>
<td>Surgical Services</td>
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<td>Dermatology</td>
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<tr>
<td>Order</td>
<td>ENT</td>
<td></td>
<td>Radiology / Cardiology</td>
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</tbody>
</table>

**XDS vs. XDS-I:** XDS-I typically involves DICOM exams stored in a DICOM Archive (e.g. PACS or VNA) and registered with an XDS Registry. This provides the benefits of DICOM and XDS.
Developing a Service Line Workflow

- The Bookends define the Use Case from a clinical perspective
- Create the Content
  - Who
  - Device
  - Format
  - Demographics / Metadata
- Consume the Content
  - Who
  - Workflow System (EMR, HIE, etc.)
  - Viewer (PACS, Enterprise, Specialist)
- This information will inform the decision about DICOM vs. XDS and Merge vs. 3(rd) party Solutions

Start with the Bookends

- Acquire the Content
- Normalize the Content
- Store the Content
- View the Content
Merge’s XDS Capabilities

**Patient Identity Source (EMR, EMPI or PIX/PDQ Manager)**

**Patient ID Feed**

**XDS Document Registry**

**iCEA v11.3**

**XDS Document Repository**

**MDM**

**Enterprise Archive v11.1**

**Image Source**

**Data Source**

**Conversion to XDS Tools**

**Provide and Register XDS Source**

**Retrieve Images**

**Retrieve Evidence Documents**

**WADO Retrieve**

**PIX/PDQ**

**iConnect Access**

**XDS Document Consumer**

**Register Document Set**

**Query for Documents**

** Retrieve Documents**

- Retrieve Images
- Retrieve Evidence Documents
- WADO Retrieve

**EA can be a PIX /PDQ mrg. when in MPI mode**
IHE Connectathon 2015: 32 Unique Vendors

iConnect Enterprise Archive
24 Vendors

iConnect Access
19 Vendors

- CDC
- BHS
- Agfa
- Dell
- INFINITI
- ITH icoserve
- KAROS
- NEXTGATE
- OPTUM
- Perceptive / Acuo
- Oracle
- TeraMedica
- Tiani-Cisco
- Siemens
- Athena
- CAREEV
- OpenHIE
- QUADRAMET
- SAMSUNG
- Sandlot
- Summit
- VSB
- CERTIFY
- Caretech
- ezCaretech
- Healthland
- IntelHealth
- INTERSYS
- QVERA
- Smarter Care
- Siemens
- iCEA
Merge’s Non-DICOM Solution Options

Non-DICOM → DICOM
Non-DICOM → XDS
Non-DICOM → XDS-I
Non-DICOM to DICOM

1. Patient Registers
2. HL7 ORM or ADT to MWL
3. Capture photo
4. MWL Query
5. Store DICOM
6. Availability Notification to EMR
7. Searches a patient's record for images
8. Launches Access via Secure URL
9. Retrieves exam from VNA
Non-DICOM to XDS: User Initiated Workflow

1. Patient Registers
2. HL7 ORM (Order) or HL7 ADT (Encounter) to MWL
3. Capture photo
4. Launch MDM with Metadata
5. Upload File(s)
6. MWL Query
7. Store XDS Object in XDS Repository
8. Register Document with XDS Registry
9. Notify EMR
10. Searches a patient's record for images
11. Launches Access via Secure URL
12. Retrieves exam from XDS Repository

*HL7 ORM (Order) or HL7 ADT (Encounter) to MWL*
Non-DICOM to XDS: Polling Workflow

1. Patient Registers
2. HL7 ORM (Order) or HL7 ADT (Encounter) to MWL
3. Capture photo
4. Store File
5. Exceptions Worklist
6. MWL Query
7. Store XDS Object in XDS Repository
8. Register Document with XDS Registry
9. Notify EMR
10. Launches Access via Secure URL
11. Searches a patient’s record for images
12. Retrieves exam from XDS Repository

(with Partial Metadata)
Non-DICOM to XDS-I

1. Patient Registers
2. HL7 ORM or ADT to MWL
3. Capture photo
4. MWL Query
5. Store DICOM to Image Source
6. Store KOS in XDS Repository
7. Register Document with XDS Registry
8. Notify EMR
9. Searches a patient's record for images
10. Launches Access via Secure URL
11. Retrieves exam from XDS Image Source

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Dermatology Workflow

- Encounter Based Workflow
  - No Order or Accession # from EMR
  - iConnect Enterprise Archive Creates Accession Number

- Infrastructure
  - 3rd Party Dermatology Camera App
  - iConnect Enterprise Archive
  - iConnect Access
  - Epic EMR

- **Goal:** Develop a non-DICOM workflow that could be generalized to many service lines and facilities
Patient visits Derm Clinic

Patient “Checked In’ for Visit

Provider Examines Patient

Provider decides to acquire images

Provider selects Patient from Cameras Worklist

Provider Selects Body Part / Location, and Disorder in Camera

Provider acquires image for each body part/disorder

ADT creates Encounter Based Order on EA MWL

MWL Query

Provider sends unsolicited HL7 ORU Message to EMR with CSN

Unsolicited Proc. Record(s) created against CSN / Encounter

Procedure Code applied based on mapping to Study Description

MWL-R

Match

Accession Number Created

Images transferred via Wi-Fi to iCEA

Provider acquires image for each body part/disorder

Provider clicks Send

Exception Workflow

Hyperlink created in EMR with Proc. Description

End

End
Survey

Who has had PACS at their institution for more than 7 years?

Who has migrated their data from one system to another?

When you bought PACS, were you aware that your vendor stored the data in a proprietary “flavor” of DICOM?

Implications of storing your non-DICOM data in a proprietary format:
1. Can only view the data using that vendor’s viewer
2. Expensive proprietary migration in the future
3. Can you give that proprietary data to a patient if they ask for it?
4. Vendor Lock-In
Summary

Integrated Solution with a Single Database

Unified Infrastructure – Storage + Servers

Single Admin Tool for DICOM and XDS

Robust and Proven Business Continuity and Disaster Recovery Solution

Enterprise Viewer showing all clinical images
Questions?