



Standards & PACS Data Ownership

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Overview



- **Standard migration**
- **Standard annotations**
- **Standard storage of report, request**
- **Standard viewer interface (data,code)**
- **Standard performance (multi-frame)**
- **Standard change management**
- **Standard purging**
- **Standard identifiers**
- **Standard values**

Standard Migration



- **Migration of archive content**
 - PACS migration, VNA migration, ...
- **Migration of what?**
 - images – clean or “dirty” (RIS mismatched)
 - annotations
 - reports?
 - requests?
 - state (complete, clean, read, etc.)?
- **Are files in standard format? Anything?**

Standard Image Migration



- **DICOM PS 3.10 files**
 - *up to date* with respect to patient ID changes, study splits, merges, corrections, etc.
 - sufficient performance of access, migration?
 - *standard compression* not proprietary
 - with all modality *private data elements* intact
- **Interface**
 - network: DICOM, network file system API, XDS-I.b ...
 - physical: unplug and carry away? use or import?
- **Database ????**
 - no standard “schema” - reconstruct from headers?

Standard Image Migration



- **Is an IHE “image migration profile” realistic?**
- **Migration use-cases**
 - same site?
 - to another site? to or from central site?
 - stay live (& federate access), or big bang?
 - planned or surprise?
- **Related (or not) to:**
 - cleaning house (RIS-reconciled IDs, orders)
 - disaster-recovery & business continuity
 - system of record (medico-legal/statutory retention)

Standard Annotation



- **Does anyone make/need annotations?**
- **Standard DICOM**
 - Overlays (in images)
 - Presentation States (PS)
 - Structured Reports (SR)
 - RT Structure Sets
- **Proprietary**
 - database or private data elements
 - *convert to DICOM during migration* (or morphing?)
- **Don't forget support in destination viewer**

Standard Storage of Report



- **Too many standards**
 - plain text, PDF, HL7 CDA, DICOM SR (IHE SINR)
- **Reporting workflow “standards” not used** ☹️
- **Stored in which system (being migrated)?**
 - RIS? PACS? EMR?
- **When and where is report needed?**
 - requester, others, with priors for next time?
- **Which is the “system of record”?**
- **How to access (+/- view) it?**
 - XDS alone? XDS-I? Plain old HTTP (POH)? HL7 V2?

Turn away from CDA?



- **HL7 charging for use of CDA – not open std.**
 - change in their “interpretation” of IP policy (MU?)
- **Underlying data type changes**
 - V2 data types – future incompatibility
- **Too complicated?**
 - Consolidated (US Realm MU), “green”, etc.
- **V3 messaging is dead, model to follow?**
- **Any practical alternatives ?**
 - CE/ISO 13606 (OpenEHR extract)
 - DICOM SR (IHE SINR)

Standard Storage of Request



- **IHE Scheduled Workflow**
 - HL7 V2 and MWL messages (transient)
 - copy (some) fields into image header
- **No standard persistent form**
- **Store in which system? HIS? RIS?**
- **A “document” in enterprise repository?**
- **Why bother?**
- **In, with or same format as report?**

Standard Viewer Interface



- **What is the (standard) interface boundary?**
 - different vendors on either side of that boundary
 - different clients of server
 - different servers accessible by same client
 - e.g., specialty PACS, shared content, EMR links
- **Navigation versus images**
 - i.e., the “page” inside which the images live
 - image links standardized, page form & content is not
 - how is the viewing workflow managed? RIS-driven?
 - viewer code deployment
- **Distinct from transfer (import) use case**

Standard Viewer Interface



- **Data**

- DICOM (PS 3.8), WADO (PS 3.18), WS (XDS-I.b), JPIP, RESTful WS, proprietary HTTP, raw socket?
- whole object, header separate from pixels?

- **Code (image & navigation)**

- thick v. thin v. absolute zero (or more than zero: Flash, SilverLight, .NET, Java, plugins, one browser)?
- what can JavaScript + Canvas element do? mobile?
- generic remote/virtual desktop (image-optimized)?
- view “through” PACS (wrapped around VNA)?
- archive directly (VNA + “universal viewer” == PACS)?

Standard Viewer Performance



- **Traditional highly optimized proprietary tight client-server coupling**
 - sets the benchmark for both anticipated & random access (+/- server-side “rendering”)
- **Can standard interfaces compete?**
 - potentially, if optimized too (even high BDPN)
- **Do they need to (IS versus user)?**
 - infrastructure > priority than responsiveness?
 - tiered, e.g., for occasional priors from archive

Standard Performance



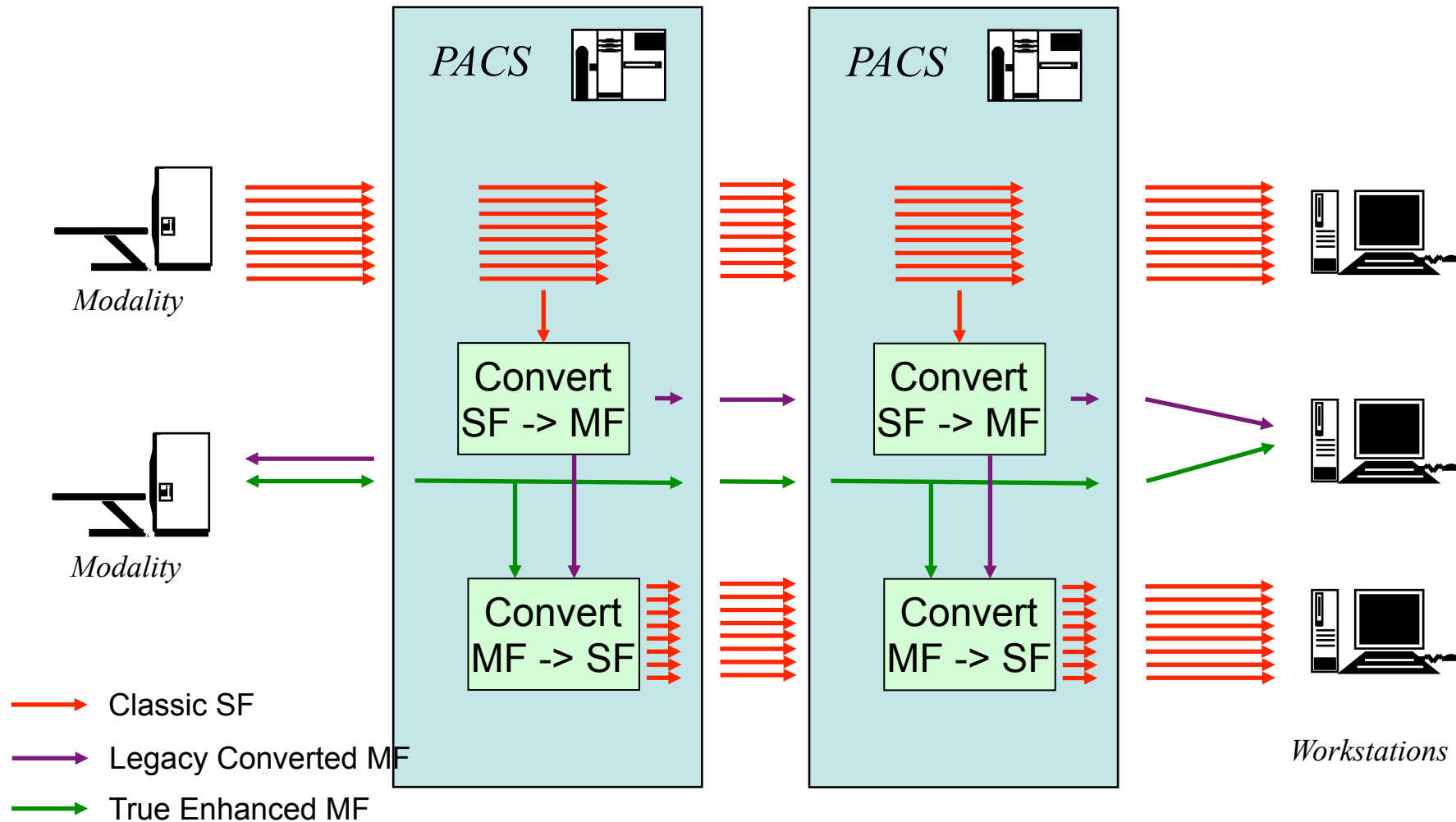
- **DICOM & IHE have shied away from specifying performance**
- **What benchmarks?**
 - time until series navigator ready
 - time until 1st slice/image (in how many windows?)
 - time until all slices scrollable interactively
 - time until 3D MPR navigable interactively
 - ...
 - under what simultaneous load? on what hardware?
- **IHE Basic Image Review (BIR) profile**
 - CD benchmarks only

Standard Multi-frame



- **Performance issue**
 - lots of thin CT slices encoded separately
 - a problem especially if naively implemented
 - strongly tied to underlying storage & database & transfer design
 - organization server-side optimized for streaming to recipient
- **So make multi-frame**
 - combine into one (or at least fewer) 3D, 4D instances
 - shared header, single stream of bulk data
- **Enhanced SOP Classes rarely implemented ☹️**
- **Sup 157 Multi-Frame Converted Legacy Images WIP**
 - intent is to use for DICOM and Web Services
 - convert during migration ??

Standard Multi-frame



Standard Change Mx.



- **Patient identity change**
 - IHE Patient Information Reconciliation (PIR)
 - intended for local ADT-driven fixes – not for VNA??
- **All manner of changes**
 - mistakes (wrong patient, wrong work list entry)
 - design: “fix” versus “deprecate & replace” ?
 - IHE Imaging Object Change Mx (IOCM)
 - KOS – deprecate (informative if no auto-hide)
 - images, etc. – send replacements (new UIDs)
- **NEVER RE-USE UIDs for replacement**
 - semantics undefined (illegal) & inconsistent

Standard Purging



- **Why bother?**
 - given accelerating volume annually?
- **If you really think you must ...**
 - nice to have standard rules ... national policy
 - standard mechanism – IOCM
 - use “Data Retention Period Expired” KOS
 - a “retention policy engine” with configurable rules?

Standard Identifiers



- **One person, one number ... yeah, right**
 - NHS number (old or new one ?)
 - National Insurance (NI) number
 - Identity Register number (or primary key)
 - local (hospital) medical record number (MRN)
 - each system record number (or internal primary key)
 - account number
 - aaargh !
- **IHE Multiple Image Manager Profile (MIMA)**
 - Multiple Identity Resolution option
 - leverages IHE PIX for cross-referencing

Standard Values



- **For codes and strings**
 - identifiers (patient, study)
 - procedure codes & series “descriptions”
 - more granular – anatomy, view, weighting, ...
- **Why?**
 - hanging (default display) protocols
 - merge fields in radiologist report templates
- **Who needs “tag morphing” anyway?**
 - symptom of poorly standardized data?
 - symptom of poorly implemented PACS?
 - symptom of excessive local customization?

Standard Values



- **Easy to say, difficult in practice**
- **Few (useful) standards**
 - DICOM PS 3.16, SNOMED, LOINC, ...
 - RadLex Playbook ... WIP, struggling
 - combinatorial expansion v. post-coordination
- **UK Interim Codes (NISDCIP)**
 - a step in the right direction
 - do you use them (for anything useful)?
 - are they accurate, interoperable, sufficient?

Standard Values



- **Enhanced DICOM image objects**
 - MR, CT, PET, XA, DBT, 3D US, etc.
 - way more standard attributes
 - way more standard codes
 - pretty much unimplemented ☹️
- **Standard hanging protocol rules**
 - standardized by DICOM
 - intended to share amongst PACS (migration?)
 - pretty much unimplemented ☹️

Conclusion



- **Standards for almost everything**
- **Some are unused – insufficient value over proprietary installed base**
- **Some provide you with greater control over your own (data's) destiny**
- **Some gaps are yet to be filled (or not fillable)**
- **Standards are not at the bleeding edge of innovation (nor should you be ?)**
- **Avoid bad standards, e.g., CDA is not open**
- **#1 priority is a fast, capable PACS**



**“Доверяйте Но Проверяйте”
 (“Trust, but verify”)**

***Russian Proverb
(Used by Vladimir Lenin, Ronald Reagan)***