Solving Healthcare's BIG Data Problem...
Imaging and Cloud Infrastructure

Michael J. Gray
Gray Consulting
Objectives

- Background & Landscape
- Summary of Problems & Issues
- Role of Vendor Neutral Archive
- VNA Deployment Challenges
- Role of Cloud Infrastructure & SaaS
- Cloud Considerations
- Technology Considerations
- Conclusions
Background

- Most IT Organizations spend 75% of their Budget “keeping the lights on”, leaving no money to Innovate

- With shrinking budgets, the mandate is “do more with less”

- Biggest Consumer of Power is Storage, and the Biggest Consumer of Storage is Medical Image Data
Background

• Either continue to spend money on the conventional approach to managing image data, or consider doing something different.

• Federation to the Cloud is the new stated mission:
  – Reduce Server count thru Virtualization in the Cloud
  – Move a significant percentage of Storage off-premise into the Cloud
Landscape

• Most Healthcare Organizations are supporting a Heterogeneous PACS Environment
  – Dedicated Archive Infrastructures
  – Disparate Servers and Storage Solutions
  – Minimalistic Disaster Recovery
  – Non-existent Business Continuity
Many Organizations have deployed Electronic Medical Record Systems – *The Physician Portal*

- Image Data is accessed using External Viewers associated with External Repositories…PACS
- Each Individual PACS Viewer Requires its own interface to the EMR
- Typical thin client PACS Viewer applet operates on image data that has to be downloaded to a PC
- Users manipulate multiple, separate viewing sessions to view all the patient’s medical images
Summary of Problems & Issues

• Disparate server and storage solutions are expensive to deploy and manage

• PACS create Proprietary Data… header idiosyncrasies which prevent/complicate data exchange

• Reasonable Disaster Recovery solution requires second copy on reliable media in geographically separate location
Summary of Problems & Issues

• Lack of true Business Continuity (independent second instance of the PACS) jeopardizes patient care

• Portal strategy based on interfacing to multiple PACS/Viewers will be expensive, inefficient, and difficult to use

• Most PACS viewers are restricted to Wintel PC platforms and require high bandwidth to download full fidelity image data
Summary of Problems & Issues

• Growing volumes of image data, need for reliable and HIPAA compliant back-up, Disaster Recovery, and Business Continuity are rapidly going to exceed the capabilities of current PACS “Archive”

• Department-specific PACS Displays lack the features, speed, and convenience required to support Meaningful Use. Furthermore their older technology forces *proximity* of the data repository and the viewing platform, which restricts use to Local Area Networks
Summary of Problems & Issues

• Applying Cloud Infrastructure to a Heterogeneous PACS Environment produces minimal benefit
  – Many PACS do not lend themselves to the benefits of virtualization
  – Insufficient bandwidth between Cloud and its Display platforms means only back-up data could be moved to the Cloud
  – Image Data would remain proprietary to each PACS
Role of Vendor Neutral Archive

• Consolidate individual PACS archives into more advanced and more easily managed enterprise data management solution
• Ensure data exchange, inter-operability and elimination of future data migrations with Dynamic Tag Mapping
• Manage Data in more efficient and economical current generation Storage Solution
• Achieve sophisticated Information Lifecycle Management
Role of Vendor Neutral Archive

• Extend useful lifetime of a good PACS by reducing its role to the “front end” department-specific applications

• VNA is compatible with Cloud Infrastructure
  – Server and Storage Virtualization facilitates additional cost reductions
  – Significant percentage of data volume can be moved off-premise, because new generation UniViewers solve the Wide Area Network Bandwidth issues
Role of UniViewer

• Zero Client, Server-side Rendering UniViewer
  – Replaces disparate clinical PACS viewers with Single Session, basic multi-modality viewer
  – There is no local client...access to and control of the display application running on the rendering server is through a browser
  – Supports multiple platforms (PC, MAC, Tablets, Smart Phones) and multiple Browsers
Role of UniViewer

Continued…

– Rendering Server requires minimal bandwidth for download of the rendered (HTML) version of the image data to the Display platform

– Image on the Display platform is transient… it disappears when the browser is closed

– As long as Rendering Servers and Image Data Repository are co-located, users can access and display images from anywhere inside or outside of the enterprise with no performance compromise
VNA Deployment Challenges

• VNA demands
  – Mirrored subsystems…
    • Primary subsystem in main data center
    • Secondary subsystem in a remote data center
  – Advanced Management and Support Resources
    • Security (credentialing, log review, tracking down security breaches)
    • ILM/Purge (set-up and Monitoring)
  – Storage utilization monitoring and procurement scheduling
VNA Deployment Challenges

- Capitalized, Self-managed VNA
  - Probably doubles the amount of storage currently associated with a PACS that has poor DR solution
  - Probably requires building/contracting for a second data center
  - Difficult to purchase storage on an as-needed basis
  - Managing *twice* the system requires *twice* the staff
VNA Cost Justification

• Total Cost of Ownership for a VNA in a multi-PACS environment can be shown to be lower than the TCO for the multiple PACS...

  – If all of the data center and IT support costs are accurately accounted for in the model
  – If the PACS are spinning at least copy 1 of their data, and copy 2 is in a near-line library
  – The TCO model is run for at least 7 years
  – Costs of future data migrations avoided are recognized
VNA Cost Justification

• On the other hand…

• If multiple PACS with weak DR solutions crammed into a single data center, are compared to a mirrored, dual-sited VNA, the TCO for the properly configured VNA is going to be higher than that of the multiple PACS.
Role of Cloud Infrastructure & Software as a Service

• Moving the VNA Secondary subsystem into the Cloud and conversion of it to a Software as a Service solution has numerous benefits

  – Capital Costs become Operational Expenses
  – System complexity is reduced, as is support staff
  – Storage is charged on an “as used” basis
  – Need for second data center are eliminated
  – Limited IT resources can be allocated to other strategic initiatives
Role of Cloud Infrastructure & Software as a Service

• Cloud and SaaS benefits…
  – Software and Hardware refreshes for the Secondary subsystem are spread over multiple users of the same multi-tenant infrastructure
  – Co-location of the UniViewer and Secondary Subsystem in the Cloud create true Business Continuity solution
  – TCO of this Hybrid VNA is typically 30% or more lower than that of the Capitalized, Self-managed VNA
Cloud Considerations

- Both the on-premise Primary and off-premise Secondary subsystems have to be based on the same VNA application
  - Data Migration charges would apply to copying data between dissimilar systems

- Chosen VNA has to support Virtualization

- Chosen Storage Solution has to support storage reclamation after data purging

- Cloud Infrastructure has to support enterprise-grade security and data protection technology
Cloud Considerations

• Cloud Vendor has to demonstrate solid reputation and experience in the medical image market

• UniViewer has to be Zero Client, Server-side Rendering application or bandwidth issues will preclude a Business Continuity solution
Technology Considerations: Web Services

- Adoption of Web Services (HTTP) Access Methodology by VNA, UniViewer and Storage Solution Vendors
  - Replace slower DICOM transfer protocol
  - Utilize rich metadata to more fully identify image data
  - Paired with 10 Gigabit WAN…eliminates bandwidth limitations, making it feasible to move large percentage of primary data to the Cloud
Technology Considerations: Intelligent Storage

• Use of Intelligent Storage solution in the Cloud
  – Server infrastructure sitting in front of commodity disk drives stores the rich metadata associated with the pixel data
  – Metadata can drive the information lifecycle management policies of the storage solution
  – Using Web Services, UniViewer can directly search and retrieve image data from Storage Solution, improving speed of image delivery, enabling movement of larger percentage of first copy of the image data to the Cloud
Conclusions

• Minimal benefit moving image data from a Heterogeneous PACS Environment to the Cloud
• Deploying a UniViewer and consolidating all of the Enterprise image data in a VNA…
  – Better long-term strategy for managing and distributing the enterprise image data
  – Best approach to image-enabling the EMR
Conclusions

• VNA can pose on premise challenges
  – Building and managing mirrored subsystems in two geographically separated data centers
  – Requires consideration of future migration costs in achieving ROI

• Hybrid VNA Cloud has 30% lower TCO than capitalized, self-managed VNA

• Hybrid VNA Cloud can show a lower TCO than the Heterogeneous PACS, without having to consider cost of future data migrations avoided
Conclusions

• Despite challenges, Technology Solutions make it feasible to not only move the VNA’s secondary subsystem into the Cloud, but to consider moving significant percentage of primary (copy 1) data into the Cloud:
  – Web Services
  – Intelligent Storage
  – 10 Gigabit WAN
EMC Cloud Infrastructure

• EMC Atmos
  – Policy
  – Performance
  – Price

• Features
  – Private Cloud
  – Public Cloud
  – Hybrid Cloud

• Centera Personality