PACS - Next Generation

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Are you worried about PACS?

- 52% of PACS in US hospitals are more than 5 years old
  - Hospitals will soon be faced with expensive decisions on investing in new, but traditional PACS solutions, or whether they should invest in newer, and cheaper but equivalent technologies

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  - Hospitals will soon be faced with expensive decisions on investing in new, but traditional PACS solutions, or whether they should invest in newer, and cheaper but equivalent technologies

- Incorrect decisions could result in isolating the hospitals from network-based communications and inter-operability with other institutions around the globe

Traditional PACS

- Image Management and Display

- Communications

- Administration

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  - Functionality whereby systems can query and retrieve medical images from PACS
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  - Organization of medical images for a patient, including historical images
  - File system storage for the images
  - Secure access to the workstation

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Image Display Issues

- Images have to be downloaded completely before being viewed - latency can be an annoyance
- Application vendors have often built modality-specific workstations - leading to high capital expenditure and on-going maintenance costs.

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Inter-Operability Issues

- PACS typically operate on LANs - hard to reach from outside
    - Difficult to obtain second opinions from other physicians - inability of outsiders to gain access in a secure manner to the relevant image

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- Inconsistent implements of the DICOM Message Service Element (DIMSE) across vendors
- DICOM protocols specialized
  - Any development, modifications or enhancements will always take longer and cost more than comparable efforts using mainstream technologies

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  - Being hardware, institutions have to ensure that they are well maintained. This adds to human monitoring costs

Bottom Line

PACS are an expensive proposition

Their high costs are prohibitive, especially for institutions in developing countries.

Web-Based PACS

Technologies are mature

Web technologies have recently matured to a stage where a web-based PACS is a reality.
The Future is HERE.

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What the Web Brings

- Easy access from anywhere, any device and at any time
- Securing access of medical images to authorized personnel
- Use of a relational database to manage the organization of medical images
- Displaying DICOMs on a standard web browser "natively"
- Streaming Technology
- Enhanced Security

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- Ajax (Asynchronous JavaScript And XML) - create asynchronous applications

AJAX

- Enables slices to be downloaded asynchronously without causing browser to refresh
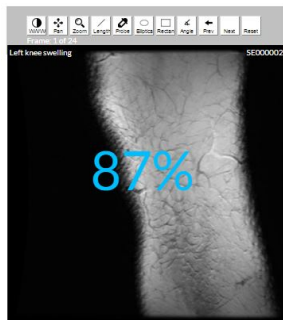
AJAX

- Enables slices to be downloaded asynchronously without causing browser to refresh
- With HTML5, DICOM image intensity bytes could be downloaded to browser natively without conversion to *jpg*
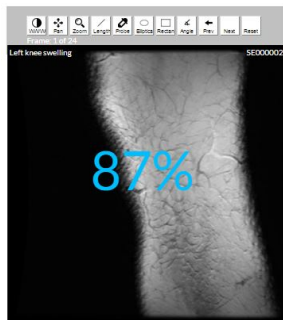
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- Enables slices to be downloaded asynchronously without causing browser to refresh
- With HTML5, DICOM image intensity bytes could be downloaded to browser natively without conversion to *jpg*
- For larger images, browser can send initial request to download every *n*th byte - faster downloads
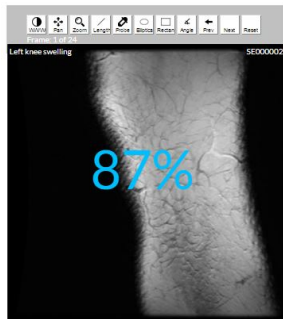
User Interaction
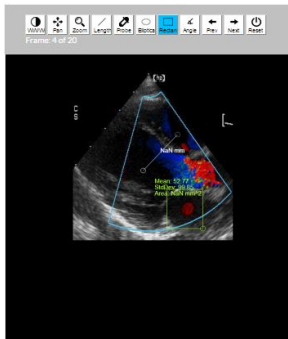
- HTML5 <canvas> allows user gestures to directly manipulate DICOM image pixels
- Offers PACS tools such as:
  - *Window Leveling*
  - *Contrast Adjustment*
  - *Rulers and Protractors*
 - *Voice Dictation*

Communications

- To replace traditional PACS, web-based system must support ability to query storage for specific DICOM
  - DIMSE calls replaced with REST APIs
    - REST APIs, in turn, make SQL Queries against relational database
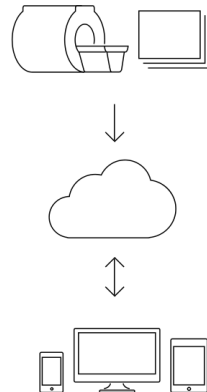   - Complex SQL Queries can be easily constructed

Cloud Based Systems

- Cloud-based systems offer "pay-as-you-go-model." Only pay for:
 - Actual storage
  - Bandwidth used
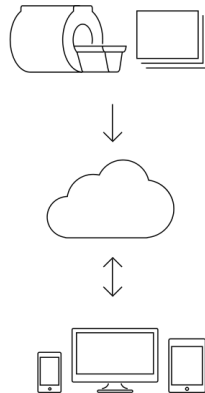
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  - Actual storage
  - Bandwidth used
- Operating costs dramatically reduced:
  - IT
  - Maintenance and upgrades
  - VPN

Other Features

- Strict web-based encryption technologies (TLS) can be applied
- System can be easily replicated across different geographies for quicker access
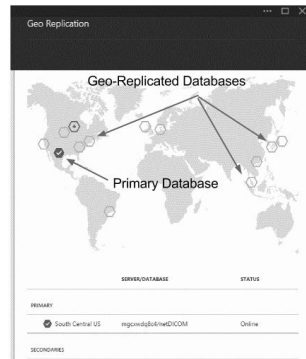
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- Easy sharing for second opinions
    - Using *oAuth*, "second opinion" users can login using their existing email addresses
        - New user accounts do not have be created and then deleted/inactivated when done
   - Simplifies user management

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    - New user accounts do not have be created and then deleted/inactivated when done
    - Simplifies user management
- Links to DICOMs and images can be inserted by external sites
 - Users will need to authenticate before logging in

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Powerful Processing Available

- Web infrastructure offers scalability
- Can be leverage to perform intensive computations
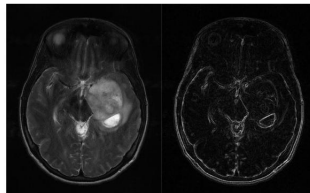
Powerful Processing Available

- Web infrastructure offers scalability
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  - Image processing algorithms can automatically scan DICOMs as they land on system
    - Potential concerns detected by system can automatically notify physicians via email/SMS
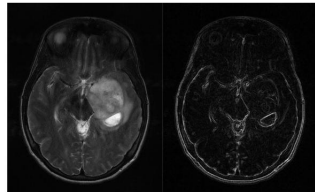
Conclusion

Future of Web-Based PACS is HERE

Today's web-based technologies makes the transition from traditional PACS to the internet a fast-approaching reality at a fraction of the cost

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Thank You