HealthManagement
Promoting Management and Leadership

Volume 3 / Issue 3 / 2008 - Features

PACS and IT

Does IT Really Decrease Costs of Healthcare IT?

Ing. E.Talini *andProf.* **D. Caramella** *are with the diadnostic and Interventional Radiology*

Department of the University

of Pisa, Italy.

During the last three years, the Radiology Department at the University Hospital in Pisa, Italy, has introduced PACS technology, implementing an open source PACS. The IT team working at the Division of Diagnostic and Interventional Radiology has been involved in many projects for the development of new IT solutions. Particular efforts have been devoted to the implementation of a prototype PACS system, based on an open source solution that also offers teleradiology and e-learning features.

In 2003, the hospital was provided with a commercial RIS (RA2000, Siemens, ASP model). At that time, there was no plan for introducing a PACS system, so the IT group moved toward possible low-cost integrated solutions. The O3-DPACS solution, provided through a research agreement with the University of Trieste, has enabled two radiology departments in Pisa to have a digital archive for radiological images that allows radiologists to report exams, checking images on diagnostic monitors.

The purpose of adopting an open source PACS has been to improve radiological workflow, and to evaluate the benefits and drawbacks of open source software, with in-house radiology information system management. We present the proposed model and report the results obtained during a real-world validation.

Currently, hospitals and institutions all over the world are upgrading their systems to reach a completely film- and paperless environment. Radiological modalities have been converted into digital imaging producers following DICOM standards, and PACS is becoming an essential requirement across the hospital environment. Since images are not printed any more, every physician in the hospital must be able to access the PACS database and visualise patients' studies on monitors.

The Hub of a Paperless Hospital

Due to its central role in a paperless environment, the PACS system is one of the most critical and cost-demanding information modules in any healthcare scenario. Therefore, providing a hospital with an IT infrastructure for medical images is a big issue: it needs time and resources, starting from the project design, to server and client installations, the introduction of the system into radiological workflow and the management of the running system. In our PACS adoption project, we started by analysing the radiological requirements to evolve toward a paperless environment and we evaluated different solutions available on the market.

We found the possibility to use open source software very interesting. According to a new report by the California Health- Care Foundation, open source software will decrease the cost of health IT and help physicians share information.

What are the Advantages of Open Source?

The term open source does not actually mean 'free', but pertains to the possibility of modifying the code and allows for personalisation and customisation by the hospital IT staff. Having access to the source code and to any change in it, grants an adopter greater control of the system and more possibilities to survive failures in this support.

Another advantage of open source software lies in the possibility of interfacing PACS with other systems, for instance RIS, EPR or HIS: licencing interface software often represents the biggest upfront costs for hospital IT departments implementing system modernisation or equipment upgrade projects.

Introducing O3-DPACS to Pisa

In 2005, Pisa University Hospital signed a research agreement with the Bioengineering and ICT group of the University of Trieste. They provided O3-DPACS open source software, as well as support to the in-hospital IT team for the implementation in the Pisa environment.

O3-DPACS was implemented to provide PACS functionalities to two radiology departments (S.Chiara and Cisanello) located in buildings about 4 kilometers from each other. Through this project, digital images and associated patient data can be transferred electronically between medical staff over a 100 Mb/s network, through a dedicated fibre-optic channel, and become available throughout the departments.

The IT group started in 2005 by testing the O3-DPACS software in a laboratory, connecting just one CT and one client workstation. In this way, with the remote support of the software developers, the IT group became familiar with the O3- DPACS configuration and features.

After some weeks of laboratory testing, the analysis of the departmental image productivities guided our choice of the best low-cost hardware.

Installing PACS in the Real Setting

The solution chosen was to realise the archive server with an ordinary PC, using an AMD Athlon XP 3000+, 2 GB RAM and a 2 TB NAS storage. The RAID hard disk configuration provided a security level against hardware failure. Security breaches are handled through encryption and firewalls.

The first production step involved the S.Chiara radiology department. All the DICOM modalities belonging to different vendors (CT, MR, CR and DX) were connected to the archive server and several clients (testing different DICOM software) were configured to query-retrieve images from the PACS server.

Some integration issues were resolved, occasionally with modality-provider support.

The second step involved the Cisanello Radiology department. To improve the DICOM server performances, another off-the-shelf PC was used to store images from Cisanello modalities. In this way the workload was divided between the two PC processors, but the clients of both departments were configured to access images on both archives.

All the modalities are now configured to automatically send results to the archive servers, so that they are immediately available for reporting. Radiologists from any client in both departments are able to access the images and share all relevant current and prior clinical information pertaining to any patients.

This PACS-guided workflow, characterised by rapid retrieval and presentation of a current study and comparison studies, resulted in a speeding up of the production of an imaging report from an image study and related tests.

Performance Metrics

From a user perspective, good performance for a PACS means that a query against current tests should last less

then five seconds, regardless of the acquisition date, and the time for retrieving results should remain in the order of the network transfer time. At Pisa, radiologists have to wait a very short time; for example, to retrieve a CT of more than 500 images, they need about 25 seconds. Obviously, such a performance time should remain stable in the long term and not degrade in a significant way.

The department's IT group developed sufficient competencies in hardware, systems and applications: all the available internal knowledge was used to plan and implement the system. Once the systemwas in production, fast failure response times could be controlled by the department's IT group itself. They were in a position to promptly react to malfunctions, solve more than 95% of the problems and provide the best information for the most effective intervention by the developer team.

The IT departmental group acts also as an interface to users, physicians and other personnel, teaching them how to use the system and helping in solving personal issues with it. High level support is the key to a good implementation of any technology in the real world scenario.

Within two years, both radiology departments collected 7 TB of images and O3-DPACS was appreciated for its stability, robustness, interoperability and reliability.

Scalability

During the course of the project, we also evaluated the scalability feature of the adopted PACS. A healthcare informative system should ideally be capable of implementing solutions in both low-load environments as well as at multiple centres, reaching up to regional environments.

This fosters vertical integration and a reduction in costs, due to a larger user base.

We also observed the economics of using an open source PACS: a healthcare informative system should not force unncessary high investments upfront and attempt to guarantee greater reliability at the lowest possible cost.

Defination:

Technically, open source offers access to software source code, with relaxed or non-existent copyright restrictions, no reference to trademarks and patents, or distribution, re-development and use.

To some, open source is just one of a range of possible design methodologies. To others, it is a strategic choice,

principally in terms of acquiring and retaining ownership of a software product.

The open source system allows concurrent inputs of a variety of approaches and, unlike proprietary products,

allows anyone to become part of the software development cycle.

Over the past two decades, open source has become a buzzword and acquired a cult following - especially after

the widespread dissemination of PCs Internet made it possible to quickly exchange and share information, and thereby build a learning community.

Open source is, however, different from free software or open content licenses, which have more formal rules to prevent deliberate misleading of end-users.

Examples of open source healthcare products include OpenEMR and openEHR (respectively, covering medical and health records), FreeMed and France's MedinTUX (for medical practice management), OpenClinica (for clinical trials) and Ipath (telemedicine). Given the costs associated with PACS, there also are a variety of open source products for imaging. Aside from O3-DPACS (used by the Pisa University Hospital), these include Opensource PACS, MedINRIA, Drishti, O3-RWS, CTSIM (for simulation) and OsiriX (which is targeted specifically at the Macintosh environment).

Published on : Mon, 3 Mar 2008