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Redundant Mini-PACS as a Back up and Migration Tool

RIS / PACS Specifications

Since 1999, the University Clinic Essen has been using Medora from Innomed, Germany, as its Radiology Information System (RIS). In December 2001, the decision was made to introduce a Picture Archiving and Communication System (PACS) into the Radiology Department and the product chosen was Centricity from GE Medical Systems, USA. Subsequently, in March 2004,a collaboration between the Radiology Department of the University Clinic Essen and GE Healthcare was undertaken, resulting in the introduction of a second, smaller PACS system for backup and upgrade purposes into the original PACS environment.

This smaller PACS (called a mini-PACS) consists of a disk-based storage system on an EMC CX200 computer, equipped with9disks in a Redundant Array of Independent Disks (RAID) 5 configuration, plus one disk serving as hot spare - resulting in 1.2 terabytes (TB) of storage capacity using RAID technology. In this system, all images from the past 90 days are stored in their original DICOM format with a 2 to 1 compression rate (jpeg lossless). The computer controlling the storage system is a standard DELL 2650 system with two 36 gigabyte (GB) system disks configured in a RAID 1 configuration with 2 GB random access memory (RAM) storage. The EMC disk storage system is connected with two Emulex 982 Bus Host Adapter cards, running under Navisphere CLI and Powerpath (both from EMC). On the DELL computer, Centricity 2.0 Enterprise Archive runs on a standard Windows 2000 Server with Service Pack 4. All images from the previous 90 days are stored and access to the images is done via Centricity 2.0 Web Server.

Integration of the Mini-PACS into the Department Workflow

The system is completely integrated within the normal PACS work-flow. All exams with a verified status are immediately sent into the mini-PACS, and all modalities can store images via DICOM and also send them to the mini-PACS. In case of a PACS failure or a planned system update, all users inside the radiology department can use their normal PACS workstations with the web software (Centricity Web) to generate reports in the still-running RIS (in these systems RIS and PACS are, on the server side, two completely independent systems). Outside the Radiology Department, users only use Centricity Web to access images and, in the case of errors or updates, all requests are automatically re-routed to the mini PACS. One benefits of using a mini-PACS is that reports can be generated and a web-based distribution of all images and reports from the last 90 days is possible.

The Department of Radiology at the University Clinic Essen has already used this system for three migration steps to upgrade the normal PACS system. It was also used in two system failures with a downtime of three and one hours, respectively (both network failures - one because of error in a gigabit switch in the large hospital network, and the other because of an error in the network controller card installed on the PACS server). The biggest update in the system was the change of the uninterruptible power supply (UPS), which resulted in a complete shutdown of all computers in one of two server rooms. This was necessary because of weather conditions (snow blizzard) at end of November 2005, that created a high voltage burning down of the UPS in one server room. The mini-PACS running in the other server room proved to be fully functional under all of these conditions and allowed the Radiology Department to examine patients, generate reports and distribute the images and reports in the same way as with the normal PACS system. During one planned update, the workload in the department with the mini-PACS was measured and compared with the normal PACS and it was found that it was possible to archive 80% of the normal workload using the mini-PACS.

Advantages and Disadvantages of the Mini-PACS

Using the redundant mini-PACS in a large-scale environment proved to be feasible and immediately useful in the case of errors or upgrades within the normal PACS system. In our opinion, a film-less hospital like our large university clinic needs to maintain a backup and migration system. Under special circumstances, or updates, all requests are automatically re-routed to the mini-PACS. One benefit of using a mini-PACS is that reports can be gen-mini-PACS may also be a viable solution (for example, using a different PACS pool for industrial studies, etc.).

One of the two disadvantages of the system was the price. This was 150,000, in total, for our mini-PACS, but compared to the total costs of the RIS / PACS installation (3 Million) - this 5% add-on investment has been worth the cost. The other disadvantage is the lost direct integration between the mini-PACS and RIS, so inside the Radiology Department patients must be manually selected in the RIS and PACS software for generating reports and users have to be very careful not to write the reports under an incorrect patient name. That was also the reason for the reduced workload inside the department when using the mini-PACS, but efforts are still ongoing between GE and the University Clinic Essen to find a solution for this integration problem.

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