Chapter III
High Availability Technologies for PACS

INTRODUCTION

PACS disasters can, and do, appear in a variety of forms including storage hard disk failure, file corruption, network breakdown, and server malfunction. The PACS disasters are commonly classified into hardware, environmental and physical, network, database system, and server failures. A single point of hardware failure in PACS is at the PACS controller, or the main archive server. When it occurs, it renders the entire PACS inoperable and crippled, until the problem is diagnosed and resolved. Recently, various techniques were developed for the prevention of PACS disasters caused by the actual loss and inaccessibility of data. All those techniques are commonly called “High Availability (HA) Technologies” (Marcus, Stern, 2003). The objective of this chapter is to discuss various HA technologies for the prevention of PACS disasters.
HIGH AVAILABLE TECHNOLOGIES

Network

Nevertheless, all of the PACS devices still need to be connected to the network (Marcus, Stern, 2003). In order to maximize system reliability, a PACS network should be built with redundancy. To build a redundant network, two parallel gigabit optical fibres are connected between the PACS and the hospital networks forming two network segments using four Ethernet switches. The Ethernet switches are configured in such a way that one of the network segments is in active mode while the other is in standby mode. If the active network segment fails, the standby network segment will become active within less than 300 ms to allow the system to keep running continuously.

Server Clustering

The advantage of clustering computers (Marcus, Stern, 2003) (Huang, 2004) for high availability is seen if one of the computers fails; another computer in the cluster can then assume the workload of the failed computer (Thomas, 2007) at a pre-specified time interval. Users of the system see no interruption of access. The advantages of clustering DICOM Web servers for scalability include increased application performance and the support of a greater number of users for image distribution.

Clustering (Nesbitt, Schultz, and Dasilva, 2005) can be implemented at different levels of the system, including hardware, operating systems, middleware, systems management and applications. The more layers that incorporate clustering technology, the more complex the whole system is to manage. To implement a successful clustering solution, specialists in all the technologies (i.e. hardware, networking, and software) are required. For clustering the Web servers, we can connect all Web servers using a load balancing switch. This method has the advantages of low server overhead and requiring no computer processor power.

Database Cluster

Since the hearts of many medical information systems (Lou, 1997) such as PACS, HIS, and RIS (Smith, 2005) (Huang, 2004) are their databases, protection of the databases is an essential task during the design of a filmless hospital project. Database clustering is one of the most efficient for protection and load balancing of database service. It is a technique to connect several computer servers to provide a high available database service. The advantages of database cluster include: