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Chapter IX

# Video Database Techniques and Video-on-Demand

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*Generally, a large-scale video server is composed of numerous disk striping groups. The striping policies employed by each disk striping group largely determine the performance of a video server. For storage and transmission efficiency, video data are usually compressed using variable-bit-rate (VBR) encoding algorithms, such as JPEG and MPEG. The amount of data consumed by a VBR video stream varies with time. This property, when coupled with striping, unfortunately, results in load imbalance across disks, degrading the overall server performance significantly. This chapter focuses on VBR video striping. It presents two state-of-the-art VBR striping schemes proposed in the literature: one is designed for homogeneous disks and the other is designed for heterogeneous disks. To gain insights into VBR striping, this chapter also develops performance models for the two striping policies. With these performance models, system designers can predict the maximum service capacity of a server, perform online admission control for clients, and optimize the performance of a server, without performing exhaustive tests on a real-system.*

## INTRODUCTION

Over the past few years, Video-on-Demand (VOD) systems have been widely used in many applications, such as course-on-demand, movie-on-demand, and online news. In a VOD system, video data are stored on video servers and played out to user stations (via

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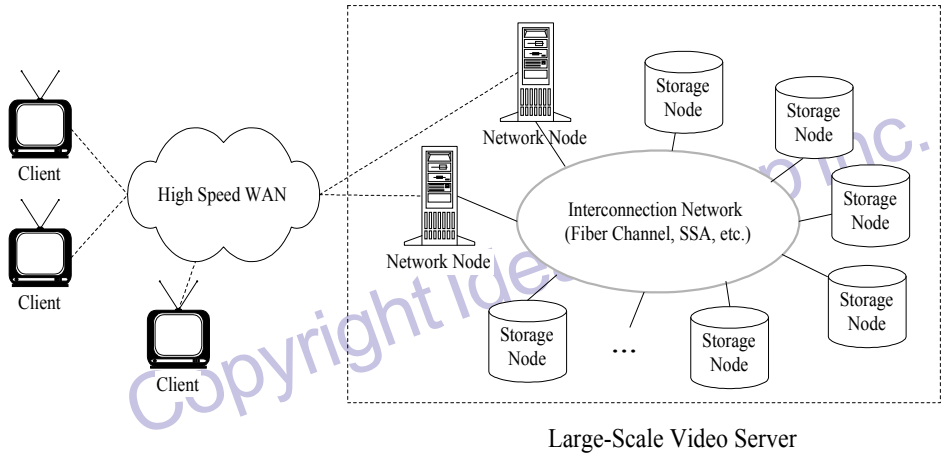
*Figure 1: General architecture of a large-scale video server*




networks) upon receiving their requests. However, designing a video server is more difficult than designing a conventional file server since video data is more voluminous than the conventional data (such as numeric data, text, and images) and requires real-time retrieval and delivery (Gemmell et al., 1995; Sitaram and Dan, 2000).

Figure 1 shows the general architecture of a large-scale video server. As shown in Figure 1, a video server consists of three key components: storage nodes, network nodes, and an interconnecting network (Reddy, 1995; Wu and Shu, 1996; Chen and Thapar, 1997; Lee, 1998). The storage nodes are responsible for storing video data either in disk, CD-ROM, DVD-ROM, tape or some other medium, and providing the required I/O bandwidth to this data. The network nodes are responsible for requesting data from various storage nodes and routing them to the clients. The interconnecting network, as its name implies, interconnects the storage and network nodes in the system. With this architecture, high scalability is provided since new resources can be easily added to the system. In addition, it is possible to balance the overall system load across all the components in the system by using well-designed algorithms. Because disks are by far the most popular secondary storage device, this chapter focuses on disks.

To provide high accessibility for videos, video files are generally striped across multiple disks, and these disks are referred to as a disk striping group (DSG). Figure 2

*Figure 2: An example of RRP striping strategy*