Chapter XI

Statistical Placement on Hierarchical Storage Systems

Introduction

We have described the contiguous placement in the previous chapter and the statistical strategy to place objects on disks in Chapter IV. In this chapter, we describe the statistical strategy to place them on hierarchical storage systems. The objective of the data placement methods is to minimize the time to access object from the hierarchical storage system. The statistical strategy changes the statistical time to access objects so that the mean access time is optimal.

The objective of the frequency based placement method is to differentiate objects according to their access frequencies. The objects that are more frequently accessed are placed in the more convenient locations. The objects that are less frequently accessed are placed in the less convenient locations.
We will describe the frequency based placement method in the next section. Afterwards, we will analyze its performance. Last, we summarize this chapter.

**Frequency Based Placement**

Inside the tertiary storage library, the media units are physically placed in the cells. Some of these cells are near the drive while other cells are far from the drive. When objects are being accessed, the media unit that contains the object is exchanged to the drive. The time to exchange the media unit depends on the distance of the media unit from the drive. If the media unit is far from the drive, the exchange time would be long. If the cell containing the media unit is close to the drive, the exchange time is short.

The exchange time is a significant overhead in accessing an object. If the object is large, the transfer time is long and the exchange time is relatively a small fraction of the object access time. If the object is small, the transfer time is short and the exchange time becomes a significant percentage of the object access time. The frequency based placement method has been applied to reduce the average exchange time in accessing objects from hierarchical storage systems.

The frequency based placement has been applied to place objects across media units on the tertiary storage library. To reduce the average exchange time, the hot objects should be placed on the media units in the cells that are near the drive. For convenience, we would say in below paragraphs that the distance of a media unit from the drive is the distance of the cell that contains the media unit from the drive. The nearest media unit actually means the media unit in the cell that is the nearest to the drive. The farthest media unit actually means the media unit in the cell that is the farthest away from the drive.

The frequency based placement method places the objects according to their access frequencies or popularity and fills the media units according to their distance from the drive (Tse & Leung, 2000). First, the objects are sorted in the decreasing order of their access frequencies or popularities. The objects are placed in the order from the hottest object to the coldest object. Second, the media units are sorted in the increasing order of their distances from the drive. The media units are filled in the order from the nearest media unit to the farthest media unit.
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