Design of the inverted page table

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Abstract

The operating system takes one of two variants when solving any memory management problem. The first variant is dividing things into variable-sized pieces and it is called segmentation. It has inherent difficulties, when dividing a space into different-size chunks. The second variant to divide space into fixed-sized pieces and it is called paging. It may be worth considering the second variant and system that uses this variant called paged systems. The choice of the data structure for paged systems significantly effects on the performance of paged systems. In this paper, as a data structure we take Inverted Page Table (IPT), which optimizes parameters as a size of memory occupied by the page table and the time to transformation virtual address into physical address.

Keywords: Inverted page table (IPT), virtual memory

1 Introduction

The virtual memory paging assumes that all memory of the computer as a physical as well as virtual divided into successive pages of the same size and when the programs run, then each element of the program receives a virtual address, and correspondence between the virtual and physical addresses is done automatically by the operating system.

The exchange between auxiliary and main memory is realized by whole pages, and during the exchange CPU switches to execution of commands of other programs. If during the execution of the program takes place a link to a page missing in the main memory, the page faults occur (failure).



FIGURE 1 The exchange between auxiliary and main memory

The program is interrupted, at least, for the time necessary to swap the page you want. In this case, one or some of the pages of the program is deleted from the main memory, that is, the memory occupied by them is considered to be free. If the content of the page to be deleted, distorted during her stay in the main memory, then the system provides an overwriting of modified pages in the Auxiliary memory while preserving the original content of the pages of the original. Otherwise, the need to rewrite the page at the Auxiliary memory is not necessary. Select a page (or group of pages) to be deleted from the main memory; the system is carried out in accordance with a particular algorithm called page replacement strategy.

2 Page Table

The Page Table is a data structure that is used to map virtual addresses to physical addresses. Each row of the page table usually consists 1-bit cell, for show the presence in the main memory, virtual page number, and physical frame number [3-7]. Below in figure 2 you can see an example of Page Table.



FIGURE 2 Page Table

Let's look in detail, in order to understand how it works. Firstly, operating system generates a virtual address, then we go to row that equal to the virtual page number, then if valid bit is 1, it means that it exist in main memory, after that