Memory Management

存储管理

Chapter 3

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1. Memory Management Requirements
2. Memory Management Techniques
3. Virtual Memory Management Techniques

Learning objectives (3.1-3.2)

By the end of this lecture you should be able to:

- **Understand *Memory Management Requirements***
  - **Explain what's Relocation（重定位）, Logical Organization *vs.* Physical Organization, Logical/Physical Address, Relative/Absolute Address, Overlay（覆盖）, Page/ Frame, Translation Lookaside Buffer（联想存储器，快表）**

Learning objectives (3.1-3.2) (continue)

By the end of this lecture you should be able to:

- **Understand *Memory Management Techniques***
  - **Fixed Partitioning, Dynamic Partitioning , Simple Paging, Simple Segmentation**
  - **Explain Internal/External Fragmentation （内 / 外零头） , Compaction （紧凑 ）**
  - **Understand *Dynamic Partitioning Placement Algorithm, Logical-to-Physical Address Translation***

第27讲 存储管理需求分析

§3.1 Overview

Memory Management

- Subdividing memory to accommodate multiple processes.
- Memory needs to be allocated efficiently to pack as many processes into memory as possible.

Memory Management Requirements

- Relocation (重定位)
- Memory Protection (存储保护)
- Memory Sharing (存储共享)
- Logical Organization (逻辑组织)
- Physical Organization (物理组织)

Relocation

- Programmer does not know where the program will be placed in memory when it is executed.
- While the program is executing, it may be swapped to disk and returned to main memory at a different location (relocated).
- Memory references(存储引用)must be translated in the code to actual physical memory address.

Relocation

- When program loaded into memory the actual (absolute) memory locations are determined.
- A process may occupy different partitions which means different absolute memory locations during execution (from swapping).
- Compaction will also cause a program to occupy a different partition which means different absolute memory locations.

Addresses

- **Logical**
  - reference to a memory location independent of the current assignment of data to memory.
  - translation must be made to the physical address.
- **Relative**
  - address expressed as a location relative to some known point.
- **Physical**
  - the absolute address or actual location in main memory.

Protection

- Processes should not be able to reference memory locations in another process without permission.
- Impossible to check absolute addresses in programs at compile time since the program could be relocated.
- Must be checked during execution by the processor(hardware) rather than OS(software)
- Operating system cannot anticipate all of the memory references that a program will make.

Sharing

- Allow several processes to access the same portion of memory.
- Better to allow each process (person) access to the same copy of the program rather than have their own separate copy.

Logical Organization

- Programs are written in modules.
- Modules can be written and compiled independently.
- Different degrees of protection given to modules (read-only, execute-only).
- Share modules.

Physical Organization

- Computer memory is organized into at least two levels, referred as main memory and secondary memory.
- Memory available for a program plus its data may be insufficient.
  - Overlaying allows various modules to be assigned the same region of memory.
- Programmer does not know how much space will be available.