2.2.1. In this simple OS, we implement a design of multiple memory segments or memory areas in source code declaration. What is the advantage of the proposed design of multiple segments?

**Solution:**

* Advantages:
* By implementing multiple segments, the operating system can allocate different access privileges to distinct memory segments, resulting in enhanced memory protection. This feature prevents security vulnerabilities as it bars one process from interfering with the memory of another process.
* Enhanced memory utilization involves employing multiple segments of varying sizes. This technique can prevent memory fragmentation, a state where small, vacant memory blocks are spread over the address space. This condition may cause performance setbacks as the operating system has to allocate time in locating contiguous memory blocks for assigning to new processes.
* Enhancing the performance can be attained through the use of several sections that can be loaded into memory when needed, contributing to reducing the time it takes to begin a procedure. Also, keeping these sections cached in memory can help to improve the performance when accessing frequently utilized data.

2.2.2. What will happen if we divide the address to more than 2-levels in the paging memory management system?

**Solution:**

The memory management technique that divides the address to more than 2-levels in the paging memory management system is multilevel paging.

* Advantages:
* Multilevel paging is more efficient in terms of memory utilization and saves more memory space compared to single level paging. Unlike single level paging, multilevel paging allocates only the essential page tables, hence reducing the wastage of memory space on generating page tables for unused memory units.
* Due to the smaller quantity of entries per level, the process of searching up the page table can be more efficient with the implementation of multilevel paging.
* Multilevel paging provides more flexibility in memory management as it can accommodate different memory space needs by adjusting the sizes of different tables.
* Disadvantages:
* Multilevel paging is more difficult to design and implement, requiring usage of different data structures and algorithms.
* Because of the many levels of page tables, multilevel paging creates more overhead when looking up the page table.