

COMPARISON BETWEEN FIXED PARTITIONED MEMORY MANAGEMENT AND RELOCATABLE MEMORY MAMAGMEMET

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Abstract.

This paper describes some of the main concepts of Fixed Partitioned Memory Management (fixed, variable and multiple) by relocating and compacting the partitions and, at the end of the paper; we come out with a comparison between departments.

This way of management uses the idea of multiple programs "operations" by dividing the memory into partitions that differs in size in order to allow the possibility of loading programs with different sizes. Usually, the number of parts is fixed depending on the number of "operations" programs, as shown in the figure below:

Keywords. Fixed Partitioned Memory Management
(Fixed, Dynamic and Multiple) Relocatable memory management

1. Memory Management " RAM"

1- Fixed Partitioned Memory Management (Fixed, Dynamic and Multiple)

2- Relocatable memory management

1.1 Partitioned Memory Management

Partitioned Memory Management is divided into three sections:

- 1- Fixed,
- 2- Variable, and
- 3- Multiple

1.2 Fixed partitioned memory management

RAM		
Add	Job#	P#
360k	Free	P1
380k	Job 4	P2
415k	Free	P3
500k	Free	P4
590k	Free	P5
1024k		

Fixed partitioned memory

In this way of management, two registers are assigned to register the boundaries of each partition in order to avoid

overlapping of the jobs. The heading of the partition's beginning is stored in the first record while; the heading of the partition's end is stored in the second record. In order to implement the process of relocation "storage" in memory or to implement migration out from it, the "allocation table" which contains a set of entries shall be used, as shown in the table:

P. Number	size	location	status
1	20	360	Free
2	35	380	Job 4
3	85	415	Free
4	90	500	Free
5	434	590	Free

Example: Suppose the following tasks are required to be implemented in the previous memory ?

The first shall be made of size = 40kb

The second shall be made of size = 10kb

The third shall be made of size = 200kb

To load the first job, a free space in the size equivalent to kb40 or larger shall be looked for, and thus, the job shall be loaded and, it shall be existed in the third partition and its status shall become "busy" instead of "free". The second job of 10kb shall be loaded in first partition, as long as it's larger than the job size and, the third job of 200 kb shall be loaded in the fifth partition with the changing the partition status from "free" to "busy" i.e. "used" and, an internal space shall be resulted in those partitions due to the discrepancy between the job size and the partition size.

The mechanism for allocating sites is summarized as follows:

1. Requesting to settle "storage" the job of x bytes
2. Comparing between the size of job with the size of the free space

The mechanism of migrating sites is summarized as follows:

1. Determine the required partition number
2. Go to the number of the required partition in the settlement table and modify the status of the partition to "free"
3. IF the table ends while the required number is not met, it means there is an error in the partition number to be edited.

1.2.1 Advantages of Fixed partitioned memory Management

This way of management is characterized, somehow, by multiple programs "jobs" by allowing the load of more executable jobs and the lack of software, as well.

1.2.2 Disadvantages of Fixed partitioned memory Management

1. The existence of internal free spaces, which leads to the loss and waste of a large partition of memory
2. Wasting a lot of time in the processor unit in browsing sites, in full.
3. The process of relocation and migration requires time to review the relocation table and make adjustment that is appropriate to it
4. The implementation process requires comparisons of stored addresses
5. Job is restricted to the largest size available in the memory
6. The process of relocation "storage" depends on the principle of "first fit"

1.3 Dynamic partitioned memory management

This way of management differs from the Fixed Partitioned Memory Management in that; the memory is divided into different partitions during the implementation process and, here, it is divided depending on the size of the job required to be implemented and the internal spaces are eliminated and, it shall be made as a new external partition. In the Dynamic Partitioned Memory Management, bound registers

are also required where two registers are assigned for each partition as in the Fixed Partitioned Memory Management. However, the values of the bound registers may change due to the changing of site and size of the partition related to the job size, and two tables shall be required as well:

- 1- Allocated area table
- 2- Free area table

RAM		
Add	Job#	P#
32k	Job 1	P1
80k	Free	P2
110k	Job 2	P3
142k	Job 3	P4
270k	Free	P5
370k	Job 4	P6
420k	Free	P7
512k		

As shown in the partitioned memory, the busy space table and the free space table are as follows:

Table of busy and free spaces

Partition No	Size	Location	Status
1	48	32	U "used"
2	30	80	F
3	32	110	U
4	128	142	U
5	100	270	F
6	50	370	U

7	92	420	F
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Table of free spaces, only

Partition No	Size	Location	Status
1	30	80	F
2	100	270	F
3	92	420	F

Example:

IF a new job of 25K size is requested for relocation "storage", which change will result on the tables and how the mechanism will be made:

Solution:

1. Search the first table in the free spaces for part which size is larger than or equal to the size of the required job starting from the first part to the last one and, here we find that the second partition is the appropriate one for the process.
2. The job 25kb shall be loaded in the second partition starting from the site 80kb
3. Then, the table of spaces shall be modified and part 2 shall be (size = 25K) and (site = 80K)
4. Then, the table of free spaces shall be modified by adjusting the size and site .

(Size = free space size - process size)

Size = kb 30kb -25 Size = 5kb

(Site = the free site + the job size)

Site= kb 80kb + 25 Location = 105kb

The tables will be as follows:

Table of busy and free spaces

Partition No	Size	Location	Status
1	48	32	U مستخدم =
2	25	80	U
New partition	5	105	F
3	32	110	U
4	128	142	U
5	100	270	F
6	50	370	U
7	92	420	F

Table of free spaces, only

Partition No	Size	Location	Status
New partition	5	105	F
5	100	270	F
7	92	420	F

IF a job is migrated "removed" from the memory, you may encounter three possibilities:

- 1- The job intended to be migrated is located between two jobs as follows when the job is migrated, the size of the space is X and its location is L2

Add	Job#	P#
L1	Job 1	P0
L2	The Job to be	P1

	migrated) Job 2 (
L3	Job 3	P2

- 2- The job intended to be migrated is located over the highest free space as shown in the figure, After migration of job2, such will result in produces an area of x + z size and its location will be L1

Add	Job#	P#
L1	Free of X size	P1
L2	Job 2 "job to be migrated of Z size"	P2

- 3- The job intended to be migrated between two free spaces and results in free space and it is the total size of the three sites= X + Y + Z and its location will be L1 when migrated

Add	Job#	P#
L1	Free Of X size	P0
L2	A job Of Y size	P1
L3	Free Of Z size	P2

1.3.1 Advantages of the variable partitioned memory management

Of the advantages of this way of management is increasing the performance rate, increasing the power of the computer via multiplicity of programs and software, eliminating the problem of internal spaces and optimizing the use of memory "ram"

1.3.2 Disadvantages of the variable partitioned memory management

- 1- The size of the job is restricted to the size of the partition that is available for the job
- 2- Waste time to handle the tables' bounds
- 3- The problem of internal spaces is still present.

Example:

Let's say there are two free spaces, the first is 120kb and the second is 50kb and both are spaced out, and it's needed to perform a storage of job1 of 45K size ?

Add	Job#	P#
L1	Free 120kb size	P1
L2	A job Y size	P2
L3	Free 50kb size	P3

Solution: Job 1 will be stored in the first partition that is 120 kb in size, and in such case, it will result in a free space of 75kb

Add	Job#	P#
L1	job 45 kb size	P1
L2	Free 75kb size	P2 new
L3	Job2 of Y size	P3
L4	Free Of 50kb size	P4

For Example in the case of the request for the implementation of job3 which size is 80kb, in this case job cannot be performed "i.e. stored" for lack of suitable space, such case is called the

external space, taking into consideration that there is free dispersed space that will be 125 kb if collected in the second and fourth partitions.

1.3.3 Solving the problem of the external space:

In order to solve the problem of the external space, which is variable in size that is dispersed in the memory "RAM", the theory of "best fit" will be used. This theory is summarized by putting the free sites in an ascending order by according to the size. After applying the "best fit" theory, the memory will be as follows and, in such case, the previous job can be performed "Job 3 of 80kb size "

Add	Job#	P#
L1	Free 50 kb size	P1
L2	Job 2 Y size	P2
L3	Free 120 kb size	P3

The solution will be as follows:

Add	Job#	P#
L1	Job 245kb size	P1
L2	Job 2 Y size	P2
L3	Job 280 kb size	P3
L4	Free40 kb size	P4

1.4 Multiple Partitioned Memory Management

In the fixed and variable partitioned management, implementation of the job is required to be made in full coherent and in one partition while, in multiple memory, the requirement of cohesion is not necessary due to the possibility of dividing the job which is required to be implemented to partitions of varying size, provided that the size of the partition is to be of the multiples of the number "2" in order to facilitate the determination of different locations in memory as it is required in

this way of management to provide free spaces equal to the number of partitions of job. When the job is divided into partitions, it will result in difficulty in following it up, so, equipment will be needed to achieve storage and migration.

1.4.1 Equipment required in Multiple Partitioned Memory Management:

- 1- Register for labor protection and each job will have an number of recorders equal to number of partitions multiplied by 2
- 2- Register for each job (Job Table)
- 3- A job table where containing the partition number- the partition location- the job size
- 4- A free spaces table containing the partition size- the partition location- the partition number

1.4.2 Mechanism of storing the job in Multiple Memory Management

- 1- The job required to be migrated will be divided into partitions of multiples of the number 2
- 2- Make a special table containing the size, number and location of each partition
- 3- Calculates the number of partitions of the job and then reviews the table of free spaces where the number of free spaces must be greater than or equal to the number of partitions of the job in order to store the entire job.

1.4.3 Advantages and disadvantages of Multiple Partitioned Memory Management

The advantage of this administration is that it increases the multiplicity of programs, i.e. the ability of memory to absorb more than one job at the same time and reduce the external and internal space, and

1.4.4The disadvantages of Multiple Partitioned Memory Management

- 1- The job size is still restricted by the size of the free available partitions
- 2- Abundance of physical equipment (tables and registers)
- 3- The job is not migrated but after the implementation of all partitions, which leads to the presence of implemented partitions in the memory
- 4- The possibility of existence of an internal space being the size of the partition of multiples of the number "2": (2, 4, 6, 8)

1.5 Relocatable Memory Management

Memory management by relocating and compressing the partitions: (Relocatable Memory Management) Let's say that we have the following "RAM" memory:

RAM		
Add	Job#	P#
512k	Job 1	P1
520k	Free= 32kb	P2
552k	Job 2	P3
568k	Free=8kb	P4
576k	Job3	P5
584k	Free= 16kb	P6

Note that the memory contains three free partitions: 8kb, 16kb, 32kb, which means that the total space is 56kb

Example :

IF a job of 40KB is required to be implemented using Variable Partitioned Memory Management?

No doubt that the implementation process will be rejected because there is no space for the job 4, so, memory management by relocating and compressing the partitions

(Relocatable Memory Management) that specializes in the arrangement of free spaces or partitions will be used in order to be exploited to implement the jobs through "Compaction". The mechanism of such way of management summarized in loading the job in the memory there is a space that can absorb and grasp that job, but, if a suitable partition is not available, the sum of the free spaces is calculated and, if their size is greater than or equal to the job size, the spaces will be assembled by compacting the memory to produce a single free space that can absorb and grasp the job required to be done. Supposing the aforementioned case is existed and that the process of compacting is made on the free spaces, the memory will become as shown:

RAM		
Add	Job#	P#
512k	Job 1	P1
520k	Job 2	P2
536k	Job 3	P3
544k	Free=56kb	P4

Memory after compaction

Note that the job 2 has been displaced by the amount of size of the free space existing above it which is 32kb and, the job 3 has been displaced by the amount of size of 40kb which is the amount of free space existing above it that is "32kb + 8kb = 40kb". When the memory is displaced in the memory, the program contents remain constant without change, i.e. the program's instructions do not change so that the addresses that the instructions deal with will remain as they were prior to the compacting process. These addresses are called "logical or virtual addresses" while, "Physical addresses" job has changed because of changes occurred in the sites after the compacting process so, it is necessary to assign a special register for each job called "relocation register" in which the job's amount of displacement is stored and, the amount of displacement is usually negative or zero.

1.5.1 Calculating The Physical Address Of The Job Execution:

Physical address = (Logical location of the job) - (value of the relocation registers of sites)

Example : If we take job 2, the value that must be in the relocation register of site which is 32kb is the size of space existing over it, and The physical address will be as follows:

The Solution: Logical Site for the Job 2 - Value of relocation register of sites 552kb - 32kb = 520kb

1.5.2 Advantages Relocatable Memory

Management :

What distinguishes this management from the previous ways of management is the possibility of implementing the compacting process for the free partitions, which implementation leads to increasing the degree of multiplicity of programs by reducing the spaces as much as possible and trying to assemble them for loading another job

1.5.3 Disadvantages of Relocatable Memory

Management :

- 1- The need to provide special registers and thus exploit locations in the memory to save the values of displacement
- 2- Waste the time of CPU unit in:
 - Performing the compacting process
 - Calculating the values of displacement each job
 - Calculating the physical address when implementing each single instruction of the job instructions.

1.6 Summary :

Feature	Relocatable	Multiple	Dynamic	Fixed

<p>Disadvantages</p>	<ul style="list-style-type: none"> - The abundance of registers - Waste of processor time -Calculating the physical address -Performing the compacting process -Calculating the of displacement values of jobs 	<ul style="list-style-type: none"> - The abundance of physical equipment - Job is not migrated until after the implementati on of all partitions 	<ul style="list-style-type: none"> - Internal space - Job coherence 	<ul style="list-style-type: none"> - The existence of internal space - Waste of time - Job coherence
<p>Advantages</p>	<ul style="list-style-type: none"> - Lack of external space - Increasing the multiplicity of software - Increase the ability of the computer - Full exploit of the memory-ram - There is a lack , somehow of internal and external space 	<ul style="list-style-type: none"> - Job can be divided by parts of the multiples of the number "2" - Increasing the multiplicity of software - Memory utilization-ram - Lack of external space 	<ul style="list-style-type: none"> - Increase the computer ability by increasing the number of programs - Reduce internal space - Well exploitation of the memory 	<p>Multiplicity of software is limited</p> <ul style="list-style-type: none"> - Lack of software equipment

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