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Branch : Computer Batch: T4

Subject : System Programming and Operating Systems.

Topic: Assignment 3 (Theory)



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Questions:

1. Write advantages and disadvantages of all 6 types of loaders.
2. Differentiate between:
 - a. Linker and Loaders.
 - b. Static Linker and Dynamic Linker.

Answers:

1.
 - a. Compile and Go Loader:
 - The advantages are as follows:
 - This scheme is simple to implement. Because assembler is placed at one part of the memory and loader simply assembled machine instructions into the memory.
 - Disadvantages:
 - In this scheme, some portion of memory is occupied by assembler which is simply a waste of memory. As this scheme is combination of assembler and loader activities, this combination program occupies large block of memory.
 - There is no production of .obj file, the source code is directly converted to executable form. Hence, even though there is no modification in the source program it needs to be assembled and executed each time, which then becomes a time consuming activity.

b. General Loader Scheme:

- Advantages:

- The program need not be retranslated each time while running it. This is because initially when source program gets executed an object program gets generated.
- There is no wastage of memory, because assembler is not placed in the memory, instead of it, loader occupies some portion of the memory.

c. Absolute Loaders:

- Advantages:

- It is simple to implement.
- This scheme allows multiple programs as the source programs written in different languages then the respective language assembler will convert it to the target language assembler and a common object file can be prepared with all the address resolution.
- The task of loader becomes simpler as it simpler as it obeys the instructions regarding where to place the object code in the main memory.

- Disadvantages:

- In this scheme, it is the programmer's duty to adjust all the inter, segment addresses and manually do the linking activity.
- If at all any modification is done the same



segments, the starting addresses of immediate next segments may get changed, the programmer has to take care of this issue and he needs to update the corresponding starting addresses on any modification in the source.

d. Subroutine Linkage:

- Advantages:

- Subroutine Linkage allows the code to be divided in smaller, manageable modules or functions. Each module can be written and tested independently, making it easier to understand, maintain, and reuse.
- Subroutine linkage can help save memory by allowing multiple programs to share the same code. This is especially useful for libraries and commonly used functions.

- Disadvantages:

- Subroutine Linkage introduces some overhead. When calling a subroutine, the system needs to perform tasks like saving and restoring registers and program counters.
- Debugging code with complex subroutine linkage can be challenging.



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e. Relocating Loaders:

- Advantages:

- Using branch instructions to corresponding subroutine can be accessed. Thus the four functions of loader i.e. allocation, linking, relocation and loading are performed automatically by the loader.
- Using relocation bits it can be identified that which instruction needs to be relocated and which instruction needs to be directly placed.

- Disadvantages:

- The transfer vector-links are useful for transferring the control to external subroutines but this vector table is not well-suited for loading or storing external data.
- Due to transfer vectors, the size of object program in memory gets increased.

f. Direct link loader

- Advantages:

- The direct linking loader allows programmer multiple procedure segments and multiple data segment. Hence, external procedure and data references can be resolved by direct linking loader.

- Disadvantages:

- The loading process of direct linking loader is extremely time consuming because all the modifi



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needs to be allocated, linked and then get loaded.

2 a. Linker and Loader.

Linker	Loader
<ul style="list-style-type: none">- Linkers combine multiple object files into an executable file or library- Performed at compile time or before program execution.- Produces an executable file.- Symbol Resolution: Relocation	<ul style="list-style-type: none">- Loader loads and prepare the executable program for execution in memory.- Programmed at runtime, just before the program starts execution.- Doesn't produce an output file.- Memory allocation: Relocation of addresses

b. Static Link Libraries & Dynamic Link Libraries

Static Link Library	Dynamic Link Library.
<ul style="list-style-type: none">- For static library, actual code is extracted from library by linker and final executable code is	<ul style="list-style-type: none">- For dynamic link library, code need not be extracted and copied rather it is linked

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built at the compilation
time

- Compatibility issues do
not arise

- Size is larger

- Eg: All .lib files

with executable code
at run time.

- Compatibility issue
may arise

- Size is compact.

- Eg: all .dll files

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