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Assignment B1

Title : Dynamic Link Library

Pro Date of Completion:

Problem Statement :

Write a program to create ① Dynamic Link Library for any mathematical operation & write an application program to test it.
(Java Native Interface / Use VB or VC++)

Objectives :

To understand Dynamic Link Library Concepts

To implement Dynamic Link Library Concepts

To study about Visual Basic

Outcomes : I will be able to understand & implement DLI by writing

in Visual Basic DLL library concept

Software & Hardware Requirements :

Working PC

64 bit Federal OS

Eclipse IDE & Java

i5 processor

Tracing:

Linking:
Any module program written in any language
has to use functions & subroutines.
These functions are either user-defined or
library functions.

The linking process makes address of modules
known to each other so that transfer of control
takes place during execution.

Passing of Parameters, Returing a value from
a function & Reusing of addresses of symbol
references are handled by the linker.

Values of public variables & external variable
should be same in every module.

Relocation:

Relocation is the process of modifying the
address used in address sensitive instruction
of a program such that the program can
execute correctly from any designated area
of memory. Consider function F1 which calls F.
Scenarios where relocation is required:

- (i) Space between the direct address translation
of F1 & F2 is getting wasted
- (ii) F1 & F2 are translated with identical address
then we have 2 types of relocation
- (iii) Dynamic

Program Relocatability :

Program Relocatability is the ability to load & execute a given program into an arbitrary place in memory as opposed to a fixed set of locations specified at program translation time.

Self Relocating Program :

It is a program which can perform the relocation itself. It contains:

- i. Table of info about address sensitive instructions
- ii. Relocating logic that performs relocation of above symbols.

Static Linking :

A static linker takes object files produced by compiler including library functions & produces an executable file.
Executable file contains a copy of every subroutine.

Disadvantages of Static Linking

- i. Each executable file has its own copy of library subroutine, this leads to wastage of memory.
- ii. Newer versions of library routines must be relinked into the executable.

Dynamic Linking:

It defers much of the linking process until the program starts running. This involves the following steps:

1. A reference to an external module during run time causes loader to find the target module & load it.
2. Persons relocation during runtime.

Advantages of Dynamic Linking

- i. Dynamically linked shared files are easier to create & update.
- ii. Dynamic linking provides automatic sharing of code.
- iii. New functionality to existing library can be easily added.
- iv. Dynamic Linking permits a program to load & unload routines at runtime.

Dynamic Link Library (DLL)

DLL is Microsoft Implementation of a Shared library in Windows.

File format of DLL & EXE are similar. A DLL can contain code, data and resources. Shared code is placed in a single separated file. Programs that call it are linked to it at runtime. Operating system performs the link linking. Each process has its own copy of DLL. Sharing of DLL's data allows interprocess communication through the shared memory.

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Callback Function:
A callback function is a function which we write, but it is called by some other program or module, like Windows or DLL. DLL can call these functions in an application, provided it has a pointer to the same.



Steps to implement Callback function:

1. Define Callback function
2. Declare type for callback function
3. Write code that uses callback
4. Implement function in the client
5. Call to DLL

Callback functions can be used to provide event handling for new scenarios. It can be used for a periodic task as well, like timely reports & progress bar.

DLL can be created in 2 ways

1. With import library linking
2. Without import library linking.

After compiling the code, it produces

- A dll
- An import library (.lib)
- An export library (.exp).

- To use DLL with import library
1. Include header file `test.h`
 2. Include import library when you are linking object files.

Difference between EXE & DLL file

A DLL file is a collection of functions which is called by the executable program (EXE) that is running.

DLL can only run when it is inside other executable file, which EXE can be standalone file.

Static Binding vs Dynamic Binding

Static Binding is created before execution of the program. It is carried out by linkage editor which produces an executable file. Thus no linking is required before calling a function during runtime. Thus Static Binding are more efficient in terms of time complexity. However it requires more memory than dynamic binding, since linked routines are a part of the executable program.

Loading Phases in Java

1. Loading
2. Linking -
 - i. Bytecode Verification
 - ii. Class Preparation
 - iii. Resolving
3. Initializing

Test Cases

Input	Expected Output	Actual Output	Result
1. Add 5 3	8	8	Success
2. Sub 5 3	2	2	Success
3. Mul 5 3	15	15	Success
4. Div 15 5	3	3	Success

Conclusion

Thus we have successfully implemented Dynamic Link Library.