



ALX LESSON

0x09 C -Static libraries

C - Programming

TABLE OF CONTENTS

01

Overview
topics

02

Learning
Objectives

03

Quiz
questions

04

hands on lab
practice



01

OVERVIEW topics

Topics

C Programming

Topics

What is a static library

How dose static library work.

How to create static library,

How to use created static library

Basic usage or ar , ranlib, nm

Slides On Telegram

https://t.me/alx_2023

C
Programming
Topics





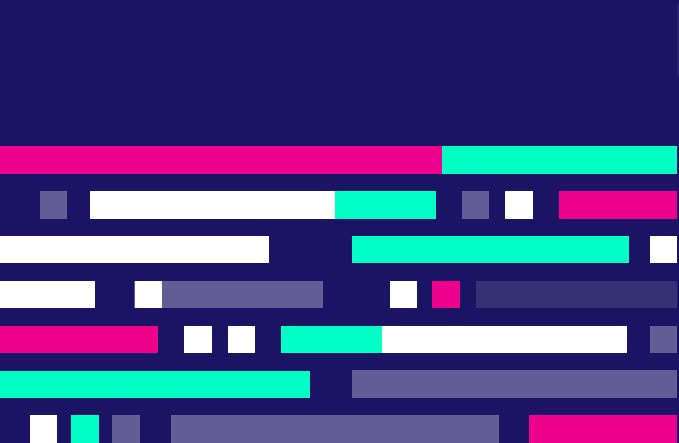
02

Learning Objectives

What is a static library

A static library is a file that contains **precompiled** object code that can be **linked** with other programs at compile time.

The library contains a collection of functions, variables, and other code that can be called by programs that link to it.



Linker: Static linking



What is a static library

Static libraries are typically created by archiving object files together into a single file with the `.a` extension.

This file can then be linked with a program by specifying its name on the linker command line.

When the program is compiled, the code from the library is included directly in the executable file, resulting in a single, self-contained executable.



How to create static library

Creating A Static "C" Library Using "ar" and "ranlib"

The basic tool used to create static libraries is a program called 'ar', for 'archiver'. This program can be used to create static libraries (which are actually archive files), modify object files in the static library, list the names of object files in the library, and so on. In order to create a static library, we can use a command like this:

```
ar rc libfoobar.a foo.o bar.o
```

This command creates a static library named 'libfoobar.a' and puts copies of the object files "foo.o", "bar.o" in it.

If the library file already exists, it has the object files added to it, or replaced, if they are newer than those inside the library.

The 'c' flag tells ar to create the library if it doesn't already exist.

The 'r' flag tells ar to replace older object files in the library, with the new object files.

How to create static library

After an archive is created, or modified, there is a need to index it.

This index is later used by the compiler to speed up symbol-lookup inside the library, and to make sure that the order of the symbols in the library won't matter during compilation

The command used to create or update the index is called 'ranlib', and is invoked as follows:

```
ranlib libfoobar.a
```

or we could use all at once

```
ar rcs libfoobar.a foo.o bar.o
```

How to create static library

Note: when an archive file's index generation date (stored inside the archive file) is older than the file's last modification date (stored in the file system), a compiler trying to use this library will complain its index is out of date, and abort. There are two ways to overcome the problem:

Use `'ranlib'` to re-generate the index.

When copying the archive file (`libfoobar.a for example`) to another location, use `'cp -p'`, instead of only `'cp'`.

The `'-p'` flag tells `'cp'` to keep all attributes of the file, including its access permissions, owner (if `"cp"` is invoked by a superuser) and its last modification date.

This will cause the compiler to think the index inside the file is still updated. This method is useful for makefiles that need to copy the library to another directory for some reason.

Using A "C" Library In A Program

After we created our archive, we want to use it in a program. This is done by adding the library's name to the list of object file names given to the linker, using a special flag, normally '-l'. Here is an example:

```
gcc main.c -L. -lfoobar -o prog
```

libfoobar.a < was the name of static library

This will create a program using file "main.c", and any symbols it requires from the "foobar" static library. Note that we omitted the "lib" prefix and the ".a" suffix when mentioning the library on the link command.

The linker attaches these parts back to the name of the library to create a name of a file to look for.

Note also the usage of the '-L' flag - this flag tells the linker that libraries might be found in the given directory ('.', referring to the current directory), in addition to the standard locations where the compiler looks for system libraries.

main.h

```
#ifndef MAIN_H
#define MAIN_H

#include <stdio.h>    // Include standard C
library headers

void foo();
void bar();

#endif
```

main.c

```
#include "main.h"

int main() {
    foo();
    bar();
    return 0;
}
```

Full Example

foo.c

```
#include "main.h"

void foo() {
    printf("This is me foo\n");
}
```

bar.c

```
#include "main.h"

void bar() {
    printf("This is me bar\n");
}
```

What is the ASCII character set

```
cook@pop-os:~$ ascii -d
```

0 NUL	16 DLE	32	48 0	64 @	80 P	96 `	112 p
1 SOH	17 DC1	33 !	49 1	65 A	81 Q	97 a	113 q
2 STX	18 DC2	34 "	50 2	66 B	82 R	98 b	114 r
3 ETX	19 DC3	35 #	51 3	67 C	83 S	99 c	115 s
4 EOT	20 DC4	36 \$	52 4	68 D	84 T	100 d	116 t
5 ENQ	21 NAK	37 %	53 5	69 E	85 U	101 e	117 u
6 ACK	22 SYN	38 &	54 6	70 F	86 V	102 f	118 v
7 BEL	23 ETB	39 '	55 7	71 G	87 W	103 g	119 w
8 BS	24 CAN	40 (56 8	72 H	88 X	104 h	120 x
9 HT	25 EM	41)	57 9	73 I	89 Y	105 i	121 y
10 LF	26 SUB	42 *	58 :	74 J	90 Z	106 j	122 z
11 VT	27 ESC	43 +	59 ;	75 K	91 [107 k	123 {
12 FF	28 FS	44 ,	60 <	76 L	92 \	108 l	124
13 CR	29 GS	45 -	61 =	77 M	93]	109 m	125 }
14 SO	30 RS	46 .	62 >	78 N	94 ^	110 n	126 ~
15 SI	31 US	47 /	63 ?	79 O	95 _	111 o	127 DEL

Hexadecimal Numbering System

Decimal	Binary	Hexadecimal
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F



04

Hands on lab Practice



```
...opt(comm, CURLOPT_URL, url);
...err, "Failed to set URL [%s]\n", errno);
...easy_setopt(comm, CURLOPT_FOLLOWLOCATION,
...err, "Failed to set redirect option [%s]\n",
...easy_setopt(comm, CURLOPT_WRITEFUNCTION,
...err, "Failed to set writer [%s]\n",
```

**Have a Question
Leave a Comment!**



Share

To let the others know more



Subscribe

To stay updated with latest
videos



Thanks