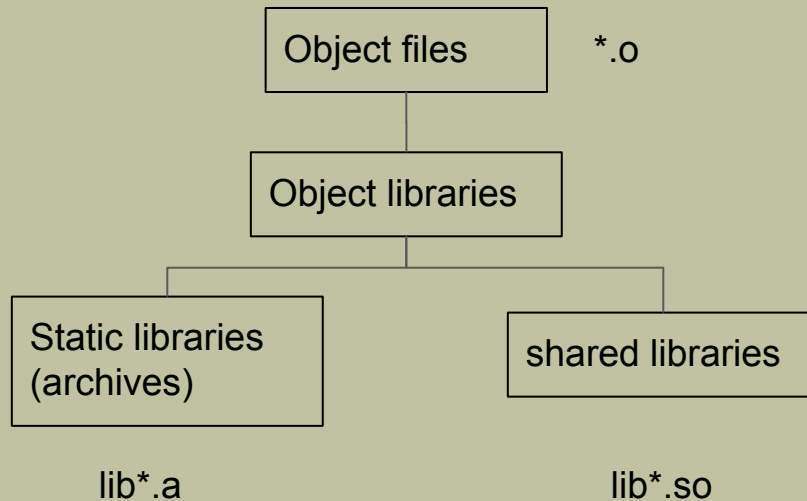


Лекция 5

- Библиотеки объектных модулей (архивы и разделяемые библиотеки).

Статические библиотеки - архивы, и библиотеки динамической компоновки.



```
~/Lab5> cat lab5-1.c
```

```
double fun1(double x, int n){  
    return n*x;  
}
```

```
int fun2(int n){  
    int m;  
    m=n*n;  
    return m;  
}
```

```
double y=12.4;
```

```
~/Lab5> cat lab5-2.c
```

```
double z=2.87;
```

```
double gun1(){  
    int a[3]={2,3,4};  
    return (double)(a[0]+a[1]+a[2])/3.0;  
}
```

~/Lab5> cat lab5.c

```
#include <stdio.h>
double fun1(double, int);
int fun2(int);
double gun1();
extern double y;
extern double z;
int main(){
    fprintf(stdout, "%g\t%d\t%g\t%g\t%g\n",
        fun1(0.1,123), fun2(8), y,gun1(),z);
return 0;
}
```

```
~/Lab5> vim lab5-1.c
~/Lab5> vim lab5-2.c
~/Lab5> gcc -c lab5-1.c lab5-2.c
~/Lab5> ar cr liblab5.a *.o
~/Lab5> vim lab5.c
~/Lab5> gcc -c lab5.c
~/Lab5> gcc lab5.o -L. -llab5 -o lab5
~/Lab5> ./lab5
```

12.3	64	12.4	3	2.87
------	----	------	---	------

```
~/Lab5> gcc -c -fPIC -Wall lab5-*.c
~/Lab5> gcc -shared lab5-*.o -o liblab5.so
~/Lab5> gcc -c lab5.c
~/Lab5> gcc lab5.o -L. -llab5 -o lab5s
~/Lab5> export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:.
~/Lab5> ./lab5s
12.3      64      12.4      3      2.87
```

```
~Lab5> cat lab5d.c
```

```
#include <stdio.h>
#include <stdlib.h>
#include <dlfcn.h>
typedef double (*fun) (double, int);
typedef double (*gun) ();
extern double y,z;

int main() {
    gun g;
```



```
void* h=dlopen("liblab5.so", RTLD_LAZY);  
    fprintf(stdout, "%g\t%g\n", y,z);  
    g=(gun)dlsym(h, "gun1");  
    fprintf(stdout, "%g\t%d\t%g\n",  
        ((fun)dlsym(h, "fun1"))(0.1,123),  
        ((int (*)(int))dlsym(h, "fun2"))(8),  
        g());  
  
    dlclose(h);  
    return 0;  
}
```

```
~Lab5> gcc lab5d.c -L. -llab5 -ldl -o lab5d
~/Lab5> export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:.
~/Lab5> ./lab5d
12.4      2.87
12.3      64      3
```

```
~/Lab5> ldd lab5s
        linux-vdso.so.1 (0x00007ffdb8de8000)
liblab5.so => not found
        libc.so.6 => /lib64/libc.so.6
(0x00007fc5dfc5f000)
        /lib64/ld-linux-x86-64.so.2
(0x00007fc5e001a000)
```

```
/Lab5> ldd lab5d
        linux-vdso.so.1 (0x00007fff037bc000)
        liblab5.so => not found
        libdl.so.2 => /lib64/libdl.so.2
(0x00007f1fb3b05000)
        libc.so.6 => /lib64/libc.so.6
(0x00007f1fb374a000)
        /lib64/ld-linux-x86-64.so.2
(0x00007f1fb3d09000)
```

/Lab5> readelf -s liblab5.so

Таблица символов «.dynsym» содержит 12 элементов:

Чис:	Знач	Разм	Тип	Связ	Vis	Индекс имени
0:	000000000000000000	0	NOTYPE	LOCAL	DEFAULT	UND
1:	000000000000000000	0	NOTYPE	WEAK	DEFAULT	UND _ITM_deregisterT[...]
2:	000000000000000000	0	NOTYPE	WEAK	DEFAULT	UND __gmon_start__
3:	000000000000000000	0	NOTYPE	WEAK	DEFAULT	UND _ITM_registerTMC[...]
4:	000000000000000000	0	FUNC	WEAK	DEFAULT	UND [...]@GLIBC_2.2.5 (2)
5:	0000000000000061a	24	FUNC	GLOBAL	DEFAULT	12 fun1
6:	00000000000000648	56	FUNC	GLOBAL	DEFAULT	12 gun1
7:	00000000000000632	22	FUNC	GLOBAL	DEFAULT	12 fun2
8:	0000000000201020	8	OBJECT	GLOBAL	DEFAULT	22 y
9:	00000000000000508	0	FUNC	GLOBAL	DEFAULT	9 _init
10:	0000000000201028	8	OBJECT	GLOBAL	DEFAULT	22 z
11:	00000000000000680	0	FUNC	GLOBAL	DEFAULT	13 _fini

```
/Lab5> objdump -T liblab5.so
```

```
liblab5.so:          формат файла elf64-x86-64
```

DYNAMIC SYMBOL TABLE:

0000000000000000	w	D	*UND*	0000000000000000		
_ITM_deregisterTMCloneTable						
0000000000000000	w	D	*UND*	0000000000000000		
__gmon_start__						
0000000000000000	w	D	*UND*	0000000000000000		
_ITM_registerTMCloneTable						
0000000000000000	w	DF	*UND*	0000000000000000	GLIBC_2.2.5	
__cxa_finalize						
000000000000061a	g	DF	.text	0000000000000018	Base	fun1
0000000000000648	g	DF	.text	0000000000000038	Base	gun1
0000000000000632	g	DF	.text	0000000000000016	Base	fun2
0000000000201020	g	DO	.data	0000000000000008	Base	y
0000000000000508	g	DF	.init	0000000000000000	Base	_init
0000000000201028	g	DO	.data	0000000000000008	Base	z
0000000000000680	g	DF	.fini	0000000000000000	Base	_fini

```
~/Lab6> gcc -shared -o liblab5.so *.o
```

```
/Lab6> readelf --syms liblab5.so
```

Таблица символов «.dynsym» содержит 12 элементов:

Чис:	Знач	Разм	Тип	Связ	Vis	Индекс	имени
0:	000000000000000000	0	NOTYPE	LOCAL	DEFAULT	UND	
.....							
5:	000000000000000061a	24	FUNC	GLOBAL	DEFAULT	12	fun1
6:	0000000000000000648	56	FUNC	GLOBAL	DEFAULT	12	gun1
7:	0000000000000000632	22	FUNC	GLOBAL	DEFAULT	12	fun2
8:	00000000000201020	8	OBJECT	GLOBAL	DEFAULT	22	y
9:	0000000000000000508	0	FUNC	GLOBAL	DEFAULT	9	_init
10:	00000000000201028	8	OBJECT	GLOBAL	DEFAULT	22	z
11:	0000000000000000680	0	FUNC	GLOBAL	DEFAULT	13	_fini

```
VERSION_1 {  
    global:  
        fun1;  
        fun2;  
    local:  
        *;  
};
```

```
/Lab6> gcc -shared -o liblab5.so *.o \  
-Wl,--version-script,lab5.map
```



```
~/Lab6> gcc -shared -o liblab5.so *.o \
-Wl,--version-script,lab5.map

/Lab6> readelf --syms liblab5.so
```

Таблица символов «.dynsym» содержит 8 элементов:

Чис:	Знач	Разм	Тип	Связ	Vis	Индекс имени
0:	000000000000000000	0	NOTYPE	LOCAL	DEFAULT	UND
1:	000000000000000000	0	NOTYPE	WEAK	DEFAULT	UND
_ITM_deregisterT[...]						
2:	000000000000000000	0	NOTYPE	WEAK	DEFAULT	UND __gmon_start__
3:	000000000000000000	0	NOTYPE	WEAK	DEFAULT	UND
_ITM_registerTMC[...]						
4:	000000000000000000	0	FUNC	WEAK	DEFAULT	UND [...]@GLIBC_2.2.5
(3)						
5:	0000000000000005ca	24	FUNC	GLOBAL	DEFAULT	13 fun1@@VERSION_1
6:	0000000000000005e2	22	FUNC	GLOBAL	DEFAULT	13 fun2@@VERSION_1
7:	000000000000000000	0	OBJECT	GLOBAL	DEFAULT	ABS VERSION_1