static/dynamic lib

test env:

- Centos 7: kernel 4.17.2-1. x86_64 GNU/Linux
- gcc 4.85

static lib

- build lib

```
gcc -ansi -I../include -Wall -DLINUX -D_GNU_SOURCE  -c err.c
ar rcs ../libapue/libapue.a err.o
```

- List symbols in [file(s)] (a.out by default).

```
nm -s libapue.a
Archive index:
err_ret in err.o
err_sys in err.o
```

- link with static lib
  -L specify the search path,
  -lapue mean linking libapue.a
  e.g.

```
gcc -ansi -I../include -Wall -DLINUX -D_GNU_SOURCE  ls1.c -o ls1  -L../libapue -lapue
```

dynamuic lib , wo version

- build

```
gcc -shared -fPIC -o libapue.so err.c
```

- link:

```
gcc -I../include -o ls1 -L../libapue ls1.c -lapue
```

- run

```
./ls1 .
error while loading shared libraries: libapue.so: cannot open shared object file: No such file or directory
set the right env to fix path issue
export LD_LIBRARY_PATH="$HOME/base/clang/apue/libapue"
```

- checking the exe's dependency

```
ldd ls1
```

dynamic lib, with version

some terms

- filename: file generated, e.g. gcc -O
- soname: （Short for shared object name）， with major version,
  specified in gcc cmd's option: -Wl,-soname
- link filename: used in gcc -l
- build lib with soname and filename

```
gcc -shared -fPIC -Wl,-soname=libapue.so.0 -o libapue.so.0.1 err.o
```

- check via soname

```
readelf -d libapue.so.0

Dynamic section at offset 0x1df8 contains 25 entries:
  Tag        Type                         Name/Value
 0x0000000000000001 (NEEDED)             Shared library: [libc.so.6]
 0x000000000000000e (SONAME)             Library soname: [libapue.so.0]
```

- create link to soname

```
ldconfig -n .
ln -sf libapue.so.0 libapue.so
ls -l
lrwxrwxrwx. 1 alex alex    12 8月   1 14:14 libapue.so -> libapue.so.0
lrwxrwxrwx. 1 alex alex    14 8月   1 14:15 libapue.so.0 -> libapue.so.0.1
-rwxrwxr-x. 1 alex alex 12928 8月   1 14:10 libapue.so.0.1
```

- linking with link's name

```
gcc -Wall -I../include -L../libapue  ls1.c -lapue -o ls1
```

load lib by program itself

dlclose, dlopen, dlmopen - open and close a shared object