Write a c/c++ program to implement copy one directory

Target

1. Write a c/c++ program
2. To implement copy one directory and it's subdiretories
3. GCC
4. IDE 集成开发环境
5. Test directory: (从www.kernel.org下载最新的linux内核linux-6.10.10.tar.xz)
    1. https://cdn.kernel.org/pub/linux/kernel/v6.x/linux-6.10.10.tar.xz
    2. extract linux-6.10.10.tar.xz to linux-6.10.10 directory
        1. tar -Jxvf linux-6.10.10.tar.xz
    3. and copy linux-6.10.10 directory to linux-6.10.10bak directory
        1. cp -r linux-6.10.10 linux-6.10.10bak
6. Verify that the directory copy is correct

Tools

Install GCC Software Collection

```
sudo apt-get install build-essential
```

How to use GCC

- gcc and make

Editor: vim

```
vim  mycopy.c
```

IDE

1. (推荐)Code::Blocks

```
sudo apt-get install codeblocks
```

2. (试用版或购买激活码)JetBrains CLion

```
sudo snap install clion --classic
```

md5

```
md5sum fileA fileB
```

get the total time of program execution

```
$ time pwd
/mnt/test2linux

real    0m0.000s
user    0m0.000s
sys 0m0.000s


$ time tar xvJf  linux-6.5.6.tar.xz

real    0m28.554s
user    0m7.738s
sys 0m3.554s
```

目录结构体：structure of directory

```
struct dirent
{
    ino_t d_ino; //d_ino 此目录进入点的inode
    ff_t d_off; //d_off 目录文件开头至此目录进入点的位移
    signed short int d_reclen; //d_reclen _name 的长度, 不包含NULL 字符
    unsigned char d_type; //d_type d_name 所指的文件类型 d_name 文件名
    har d_name[256];
};

the value returned in d_type:
              DT_BLK      This is a block device.
              DT_CHR      This is a character device.
              DT_DIR      This is a directory.
              DT_FIFO     This is a named pipe (FIFO).
              DT_LNK      This is a symbolic link.
              DT_REG      This is a regular file.
              DT_SOCK     This is a UNIX domain socket.
              DT_UNKNOWN  The file type could not be determined.

opendir()
readdir()
closedir()
```

创建符号链接文件：Create a symbol link file

```
#include <fcntl.h>           /* Definition of AT_* constants */
#include <unistd.h>
int link(const char *oldpath, const char *newpath);
```

How to do

- write a c program to implement copy one directory and it's subdirectories, and the program also verifies the result
    - 1. **拷贝一个指定目录及其子目录到另外一个目录中**
    - 2. 检验**源目录和目标目录的内容是否一致**
    - 3. **并采用Python或Java等语言编写拷贝目录的程序，与C语言拷贝目录程序进行性能对比**

1. Example of traverse one directory

```
#include <dirent.h>
#include <unistd.h>
#include <stdlib.h>

int main()
{
    DIR * dir;
    struct dirent * ptr;
    /*open dir*/
    dir = opendir("/home");
    /*read dir entry*/
    while((ptr = readdir(dir)) != NULL)
    {
        printf("d_name : %s", ptr->d_name);
        if (ptr->d_type==DT_DIR){
            printf("\tDir");
        }
            printf("\n");
    }
    /*close dir*/
    closedir(dir);
    exit(0);
}
```

Compiling:

```
gcc     listdir.c   -o listdir
```

Run application:

```
./listdir
```

End.