Lab2: SCSI Command

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Goals

- To understand how to send SCSI command under WINDOWS environment
- Create a program to send read/write SCSI command to use the SSD

SCSI command

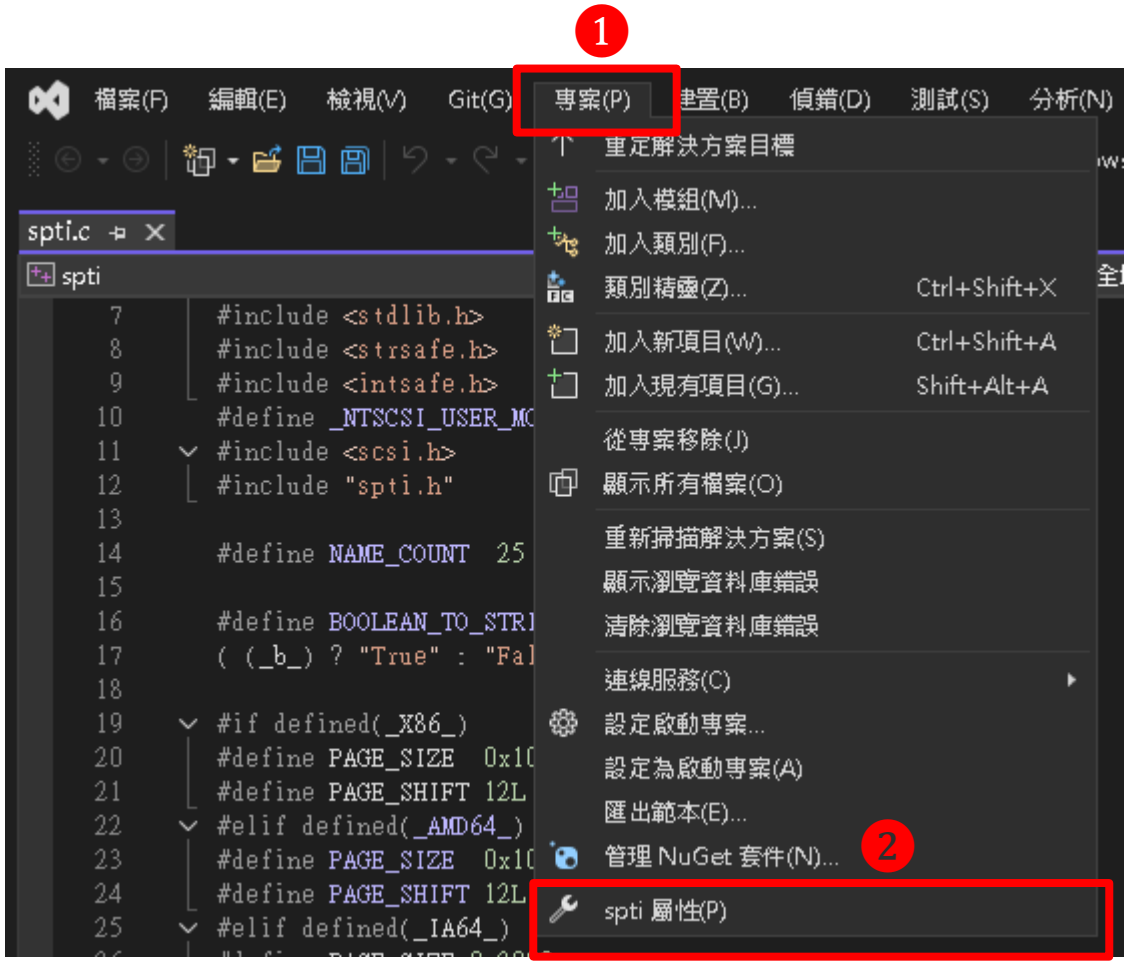
- A standard to transfer data between computer and device
- Devices communicate by sending CDB(command descriptor block)
- SSD controller receives the command and then works accordingly
- For more detail, please refer to Seagate SCSI command manual
  - Hint : 3.18 READ (16) command & 3.62 WRITE (16) command

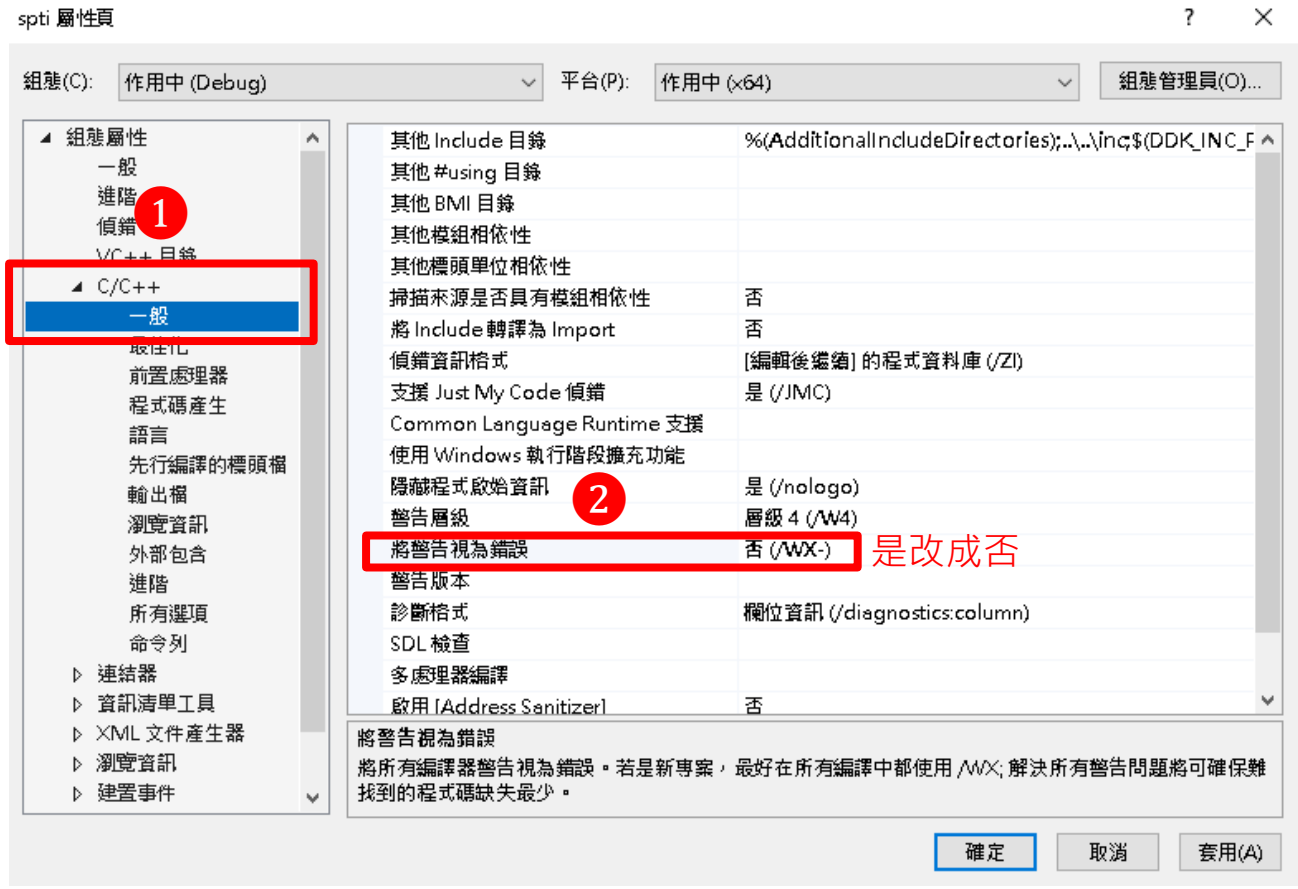
Setup

- Download WDK Windows Driver Kit
- Download the Windows-driver-samples to modify
  - storage/tools/spti/src/spti.c
- spti.sln
  - 修改完spti.c以後，找到storage/tools/spti/spti.sln並建置
  - 建置時可能會跳出 Error C2220/Warning C4324，若有跳出請見下頁
  - 會在storage\tools\spti\src\x64\Debug生成spti.exe
- spti.exe
  - 開啟終端機cd至.exe檔的位置輸入下面的指令要能跑出正確結果
  - .\spti.exe --disk 2 --read --lba 9 --sector_cnt 32
  - .\spti.exe --disk 2 --write --lba 10 --sector_cnt 32 --data aa

Error C2220/Warning C4324

- 專案 → spti屬性
- C/C++ → 一般 → 將警告視為錯誤 → 否





Requirements

- The homework should be a CLI application with following features
  - input argument parser
  - SCSI command READ16 and WRITE16 and print out the correct output
- You can program this under your own Windows or Linux environment
- The syntax used by Linux may differ, so you must check it yourself

Requirement 1

- Argument parser (40%):
  - `--disk` + %d: to select disk (You can get the info under Windows : 磁碟管理)
  - `--write` and `--read`: to select operation to perform
  - `--lba` + %d: to specify starting logical block address to perform operation on SSD
  - `--sector_cnt` + %d: the data length from starting logical block address to end
  - `--data` + %x: set the pattern to be write into SSD (e.g., --data FF will write `FF` into SSD from start to end for the length of sector_cnt)

- 注意 : **--disk** 在使用時請選擇實驗器材進行讀/寫操作，請勿對自己電腦的硬碟直接操作避免損壞
- 在終端機輸入 “**wmic diskdrive list brief**” 指令選擇正確的Device(實驗器材, Jmicron Generic SCSI Disk Device)

自己的硬碟 →
自己的硬碟 →
實驗器材 →

```
User@CSSLAB ~\Desktop wmic diskdrive list brief
Caption                        DeviceID            Model                          Partitions  Size
WDS500G3X0C-00SJG0             \\.\PHYSICALDRIVE1  WDS500G3X0C-00SJG0             4           500105249280
WDC WD40EZAZ-00SF3B0           \\.\PHYSICALDRIVE0  WDC WD40EZAZ-00SF3B0           1           4000784417280
JMicron Generic SCSI Disk Device \\.\PHYSICALDRIVE2  JMicron Generic SCSI Disk Device  0           90478080
```

Requirement 2

- Perform WRITE (30%): Hint : 3.62 WRITE (16) command
  - E.g., spti.exe --disk 2 --write --lba 10 --sector_cnt 32 --data aa

  Perform WRITE command on SSD (disk 2), it will:

  1. Set a 32 * 512 byte buffer with repeated pattern aa
  2. Set the struct IOCTL_SCSI_PASS_THROUGH_DIRECT accordingly
  3. Transfer the struct into SSD to perform by DeviceIoControl
  4. SSD will access the DataBuffer in the struct
  5. Write data full of aa from lba 10 to lba 41
  6. Print ”Done” info in terminal

Requirement 2 Cont.

- Perform READ (30%): Hint : 3.18 READ (16) command
  - E.g., spti.exe --disk 2 --read --lba 9 --sector_cnt 32

    Perform READ command on SSD (disk 2), it will:

    1. Set a 32 * 512 byte buffer
    2. Set the struct IOCTL_SCSI_PASS_THROUGH_DIRECT accordingly
    3. Transfer the struct into SSD to perform by DeviceIoControl
    4. SSD will access the DataBuffer in the struct
    5. read data in SSD from lba 9 to lba 40
    6. Print data in terminal

Output

WRITE

```
LBA:10, SECTOR_CNT:32, DATA:aa, Path: \\.\PHYSICALDRIVE2 DONE
```

READ

First LBA (9)

```
42 d3 8d 40 cb d0 3e 98 27 18 fd 1d a4 ce 03 ce 6d 48 46 50 83 f2 44 f4 16 ec a8 ef db 16 7e 69
a3 2f 11 e8 12 b3 86 ba 39 b2 eb b9 96 56 39 5d a6 c1 ab 63 4b de 5b e0 28 9f 5f d0 18 91 40 7b
ad 38 15 d9 b0 fa e0 ba 44 47 68 76 82 8f c5 f8 59 b2 bd 0a a9 f6 03 17 72 60 bb 95 b7 d8 24 e2
0a 66 a4 03 6d ae 75 8b fd 2f a2 21 35 e0 ee 4c f7 5c 46 6c 50 7d d0 23 5f 3d 2f 32 05 0c af c4
30 9d d3 61 bd 43 13 dd ef dc 36 dc b3 0c a9 b5 a1 f4 99 3a 12 79 98 bf ca 41 57 35 d5 b6 29 6f
8b b1 c2 ef 12 42 28 eb c4 8e c9 bd 99 8b 28 bd 20 ba 73 95 f5 85 1a c4 02 12 1b 84 65 bb aa f1
6f 21 d5 86 c1 77 83 6c 59 7a d4 ac e9 33 94 01 6e 50 37 a2 f8 74 4c da 98 94 7e 9f 09 a2 dd a7
31 5d 44 e4 60 fd 7d 5f 3d 08 52 d1 39 74 19 f5 2c 8a 2d ba 9e ab 16 84 03 d1 20 28 01 32 00 cb
55 a1 22 7f 6a 07 c9 64 bc eb 8a f1 7c 20 b9 45 ad 37 de 1d 4d 1b 40 d1 84 68 63 5e 9a 67 7a 8c
0f 9c 9d 70 03 a7 4c 3f d1 01 03 07 61 b4 9c b3 9e c9 93 dd 7a ae 6f c8 c1 ec ad c3 71 61 d6 a6
c4 b4 ef f1 a5 22 26 0f 7d 5e 06 c2 fc fb df b2 d8 66 bc 9c b6 bb 33 b3 c6 34 30 a6 8d b5 3f 90
31 2a 8b 24 20 c4 15 29 5d f1 ae 87 f5 88 a0 cf c9 88 4d 5b db 70 75 de f7 33 92 36 ee 48 94 11
48 fc ed a2 08 cb d3 7b 42 dd d5 04 40 be 4b 6e 8a 97 76 18 c0 9d b6 5a e4 16 bd d3 f0 eb ad 06
ca d2 ca 78 cb 14 85 44 86 3f c8 1a 2e 3a c8 8f a1 e3 0d b2 10 38 05 f9 92 92 90 75 5f 06 e9 a4
ea cb 5b 95 ce 3d 86 06 2d 82 df 19 d7 18 a4 d6 63 07 27 fd eb 4c d9 8c e9 38 5d b5 29 be 70 0c
03 c9 29 8d 4c 16 6c e4 4f 50 2a 84 5d f5 a7 f7 fd 7f 75 6f 45 55 55 50 38 94 b6 51 f4 51 c3 ea
```

Second LBA (10)

...

```
aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa
aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa
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```

Grading

- Please come to CSSLAB(CSIE 65603) for the offline demo:
  - Argument parser _____ 40%
  - WRITE _____ 30%
  - READ _____ 30%
- Please mail me days before the appointment
  - I'll mail you back for the exact time
  - Available time : Friday 16:00 ~ 18:00
  - due time : 11/15(五)
  - You can join the discord group for discussion: https://discord.gg/GxNUyzxkZr
- Remember to submit *.c code in a .zip file to moodle