微算機系統實習
MICROPROCESSOR SYSTEMS LAB.
SPRING, 2021

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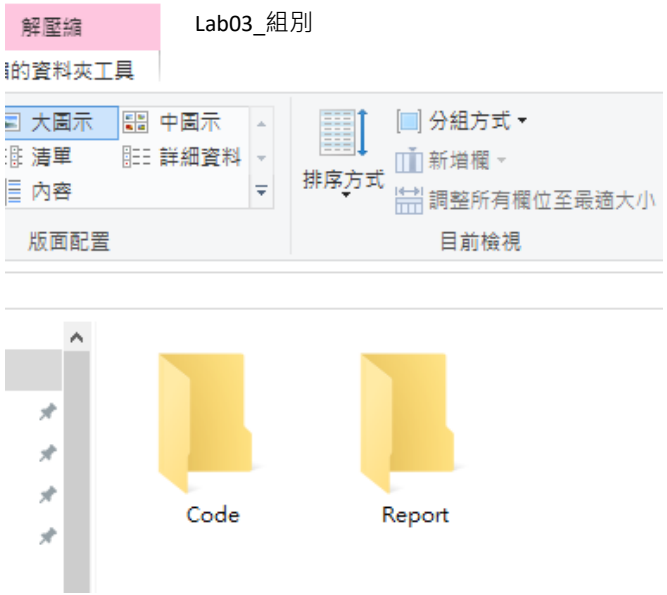
實驗三

3/26 遠距教學

作業繳交格式

- 檔名: Lab03_組別.zip
- 其zip裡要包含如下資料夾
    1. -Code //存放專案程式碼
    2. -Report //存放報告



實驗三 項目要求

- 項目一： 安裝虛擬機及使用Vim更改鏡像檔
  - 截圖：自行安裝虛擬機的過程或結果(10%)
  - 截圖：使用Vim更改鏡像檔的過程(10%)
- 項目二：熟悉Linux指令
  - 截圖：將本次實驗中介紹的Linux指令，挑選10個指令操作過程(20%)
- 項目三：使用Qt Creator寫一個GUI程式控制4個LED
  - 1. 程式碼+截圖：控制LED開關事件(15%)
  - 2. 程式碼+截圖：依據指定閃爍次數控制LED開關(15%)

作業繳交

- 以小組為單位繳交報告：
- 3/29 (一) 23:59 前繳交至i學園+

-實作項目： 以書面繳交(70%)

-報告： (30%)

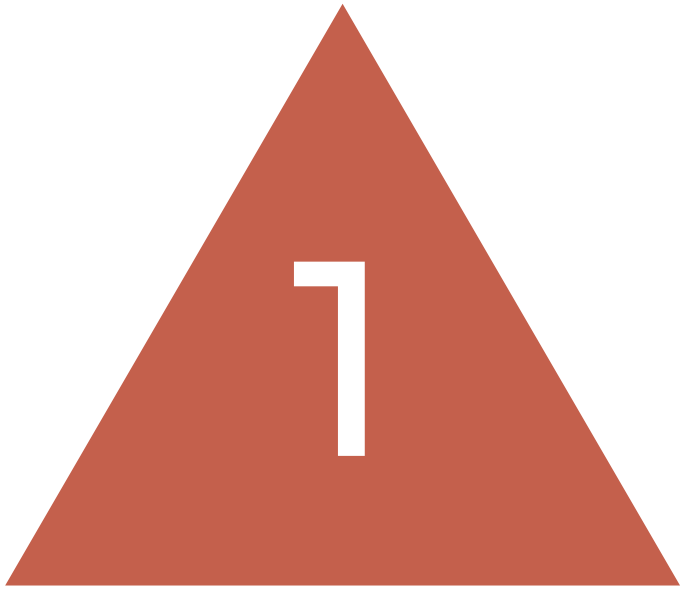
* 若有因為特殊原因繳交時間有變動助教會另外公布
超過時間遲交每隔一週（含一週內）分數打8折，採累計連乘方式，實驗與報告打折是分開算的

- 舉例：
遲交三天 - 以遲交一週計算 <遲交的項目單獨分數>*0.8 = 該項目得到的分數
遲交九天 - 以遲交兩週計算 <遲交的項目單獨分數>*0.8*0.8 = 該項目得到的分數

- 以上配分與注意事項有問題請聯絡助教

本次實驗目標

- 學習安裝UBUNTU虛擬機並更改鏡像來源
- 熟悉Linux常見指令
- 了解使用Vim編輯器
- 學習如何使用Qt開發嵌入式系統GUI操作界面
- 學習如何使用Qt控制LED燈



項目一：
安裝虛擬機
使用Vim更改鏡像檔

安裝虛擬機

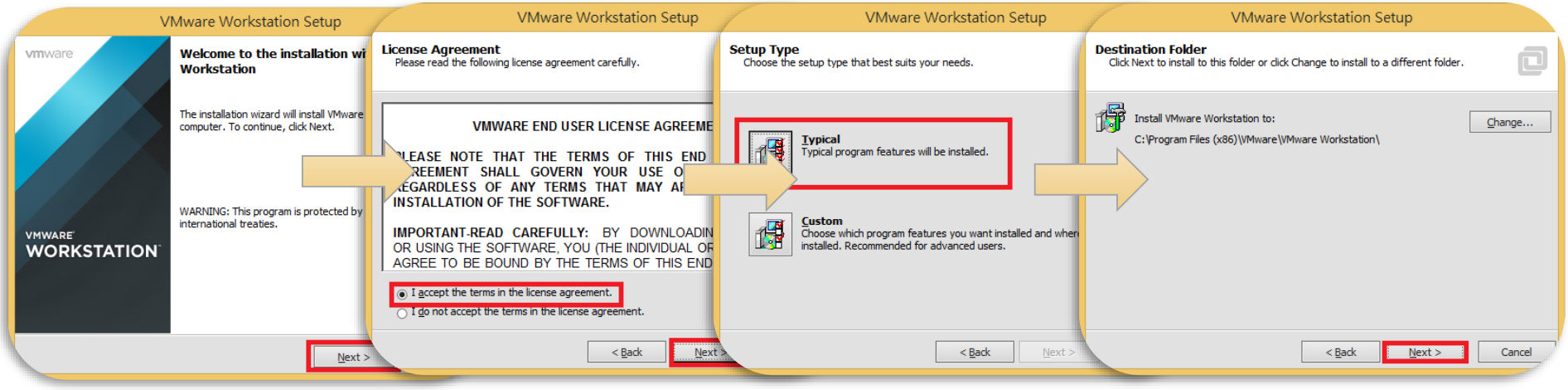
於VMWARE上安裝UBUNTU 18.04 LTS

- 為了能夠在Windows下同時使用Linux及Windows，故必須利用VMWare建立Virtual Machine，並在Virtual Machine上安裝Linux，以利往後建立嵌入式系統開發環境。

- 下載**VMWare Workstation**並安裝
  - 網址：https://my.vmware.com/en/web/vmware/downloads/info/slug/desktop_end_user_computing/vmware_workstation_player/16_0#product_downloads

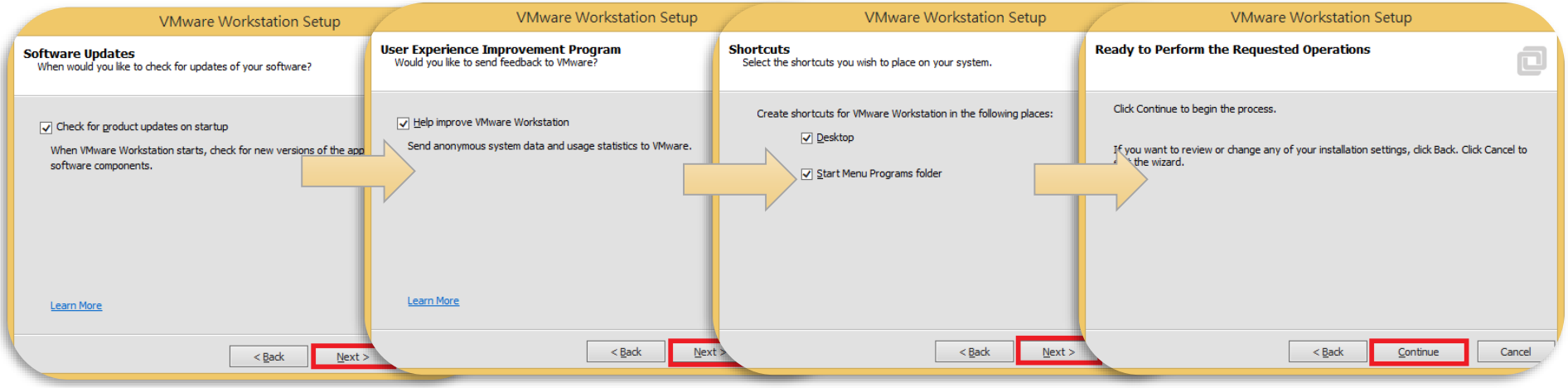
環境建立-安裝VMWARE

- 安裝 VMWare
  - 建議照預設值安裝



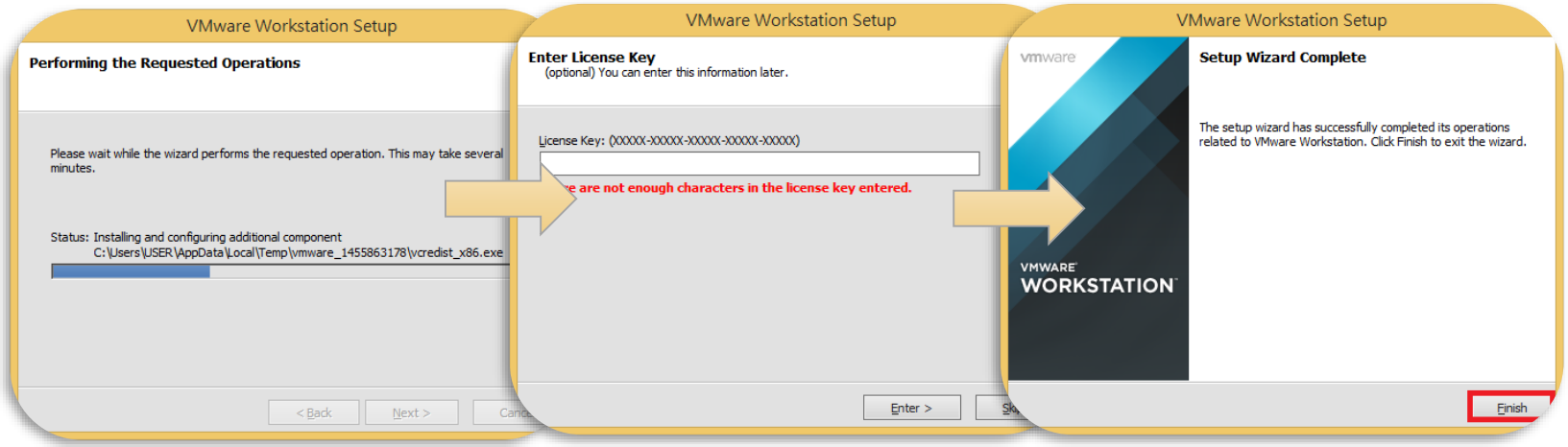
環境建立-安裝VMWARE

- 安裝 VMWare
  - 建議照預設值安裝



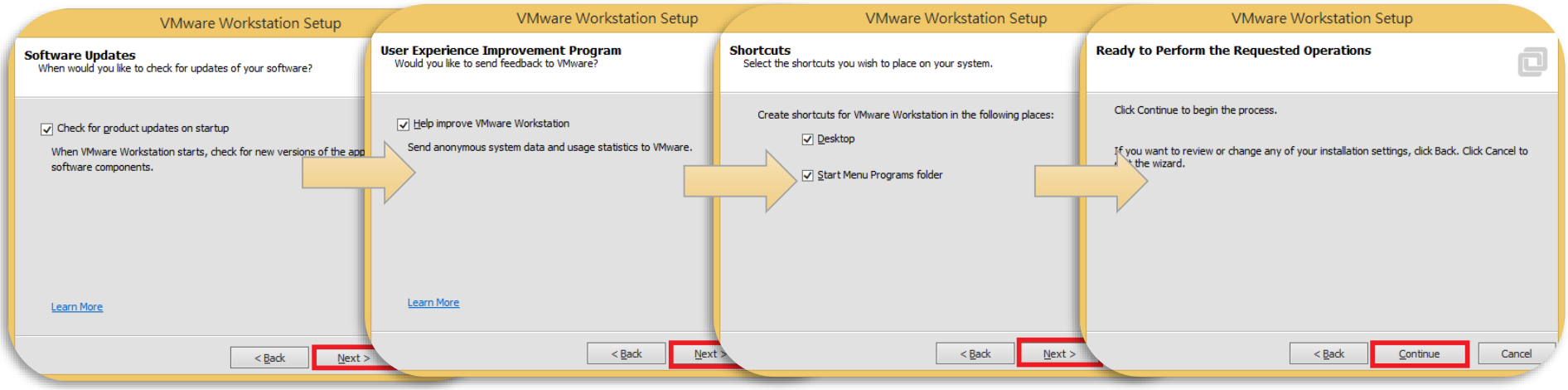
環境建立-安裝VMWARE

- 安裝 VMWare
  - 建議照預設值安裝



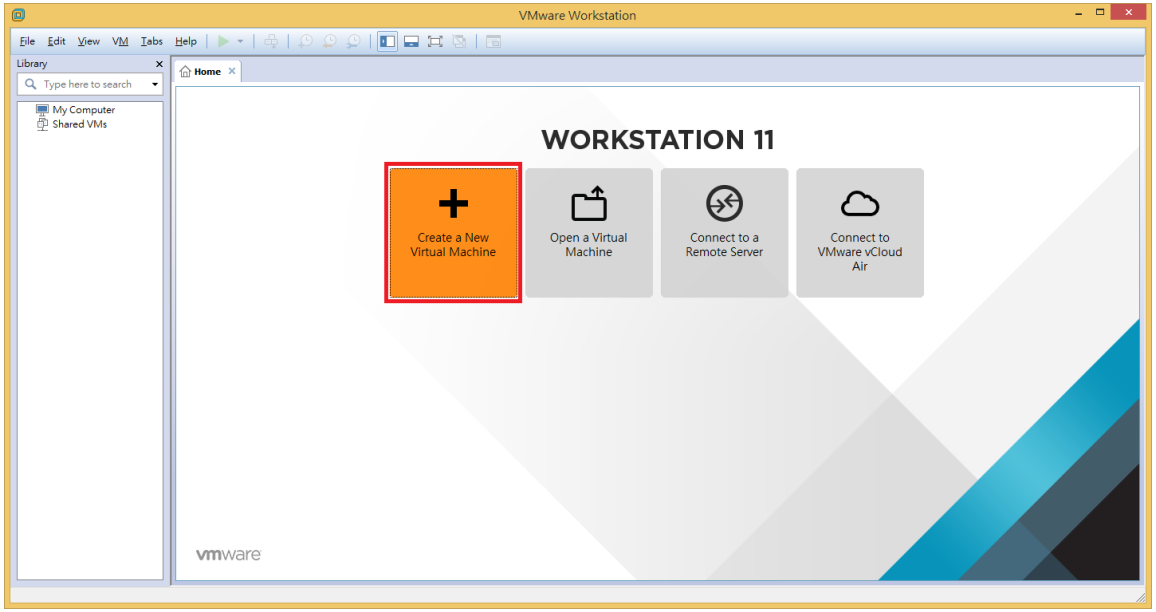
環境建立-安裝VMWARE

- 安裝 VMWare
  - 建議照預設值安裝



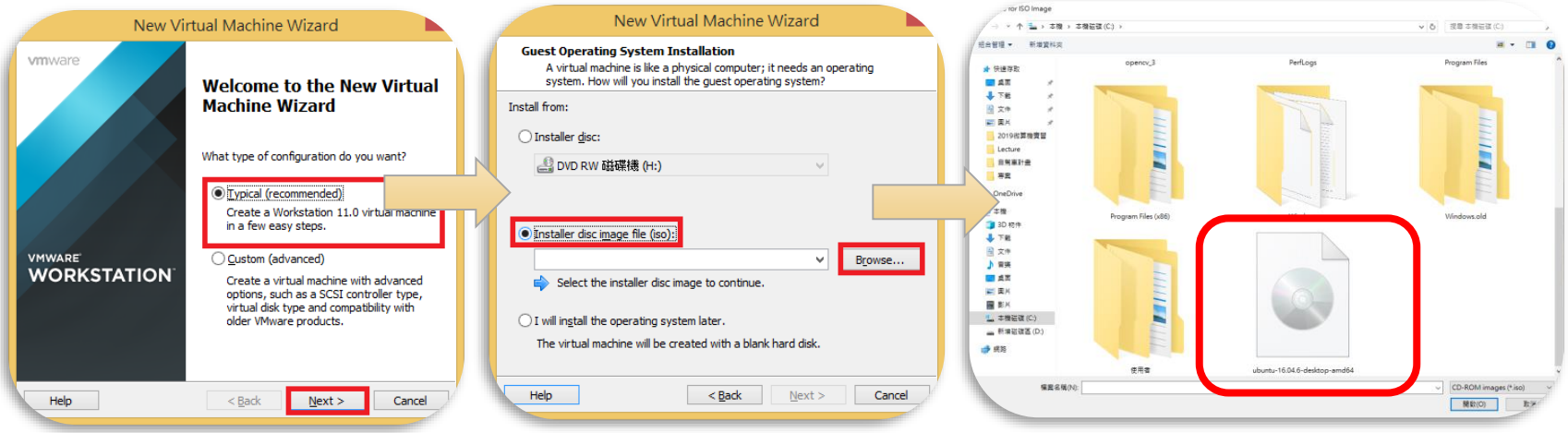
環境建立-安裝UBUNTU 18.04 LTS

- 新增模擬機器
  - 作業系統：Linux
  - 版本： Ubuntu-64bit



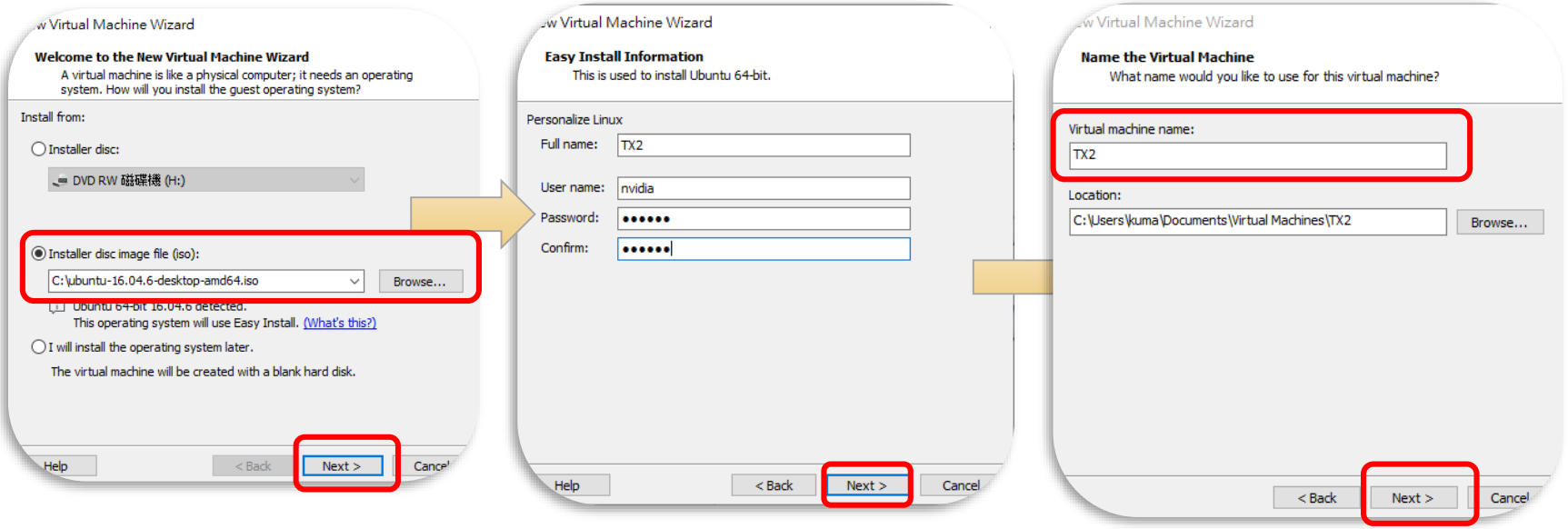
環境建立-安裝UBUNTU 18.04 LTS

- 載入**Ubuntu 18.04 iso檔**
- https://drive.google.com/file/d/1ipZM6xO72MXv9TBtqJmaqHMNUYEOSNtn/view?usp=sharing **(ios檔雲端連結，可自行到官方下載)**



環境建立-安裝UBUNTU 18.04 LTS

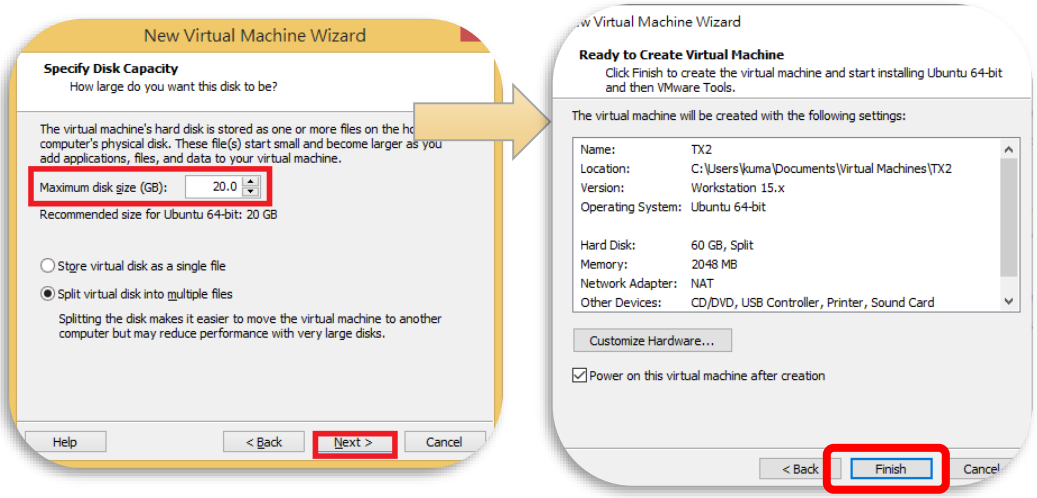
- 輸入資訊
  - User Name: nvidia
  - Password: nvidia



環境建立-安裝UBUNTU 18.04 LTS

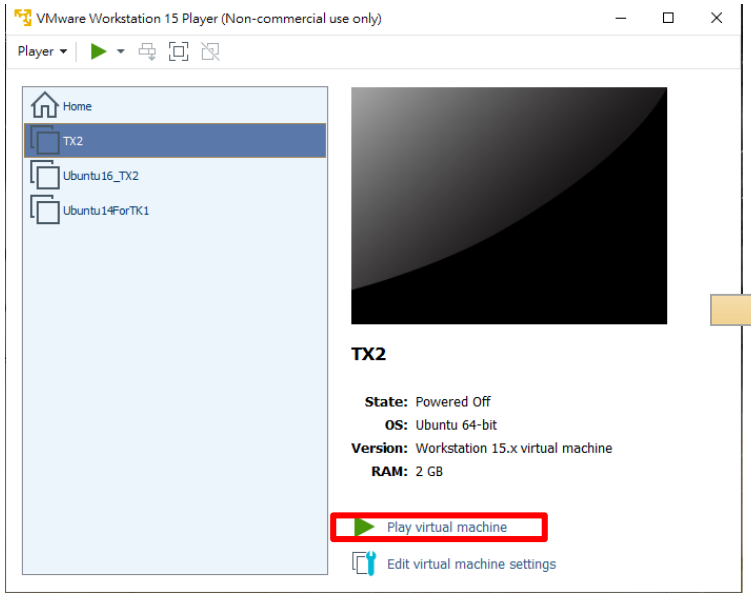
- 選擇disk size
  - 推薦100GB，如硬碟容量夠的話，可以自行增加

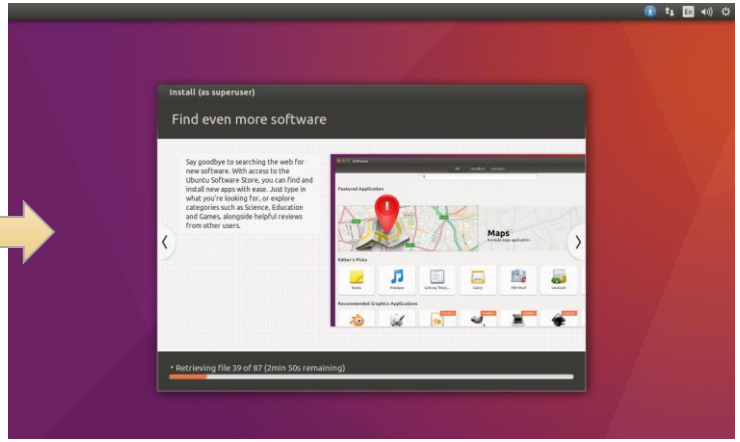
- 選擇RAM size
  - 推薦大於8GB



環境建立-安裝UBUNTU 18.04 LTS

- VMware設定
  - 直接啟動剛剛所建立好的虛擬機
  - 等待虛擬機的初始設定完成





Vim編輯器

Vim介紹及其指令

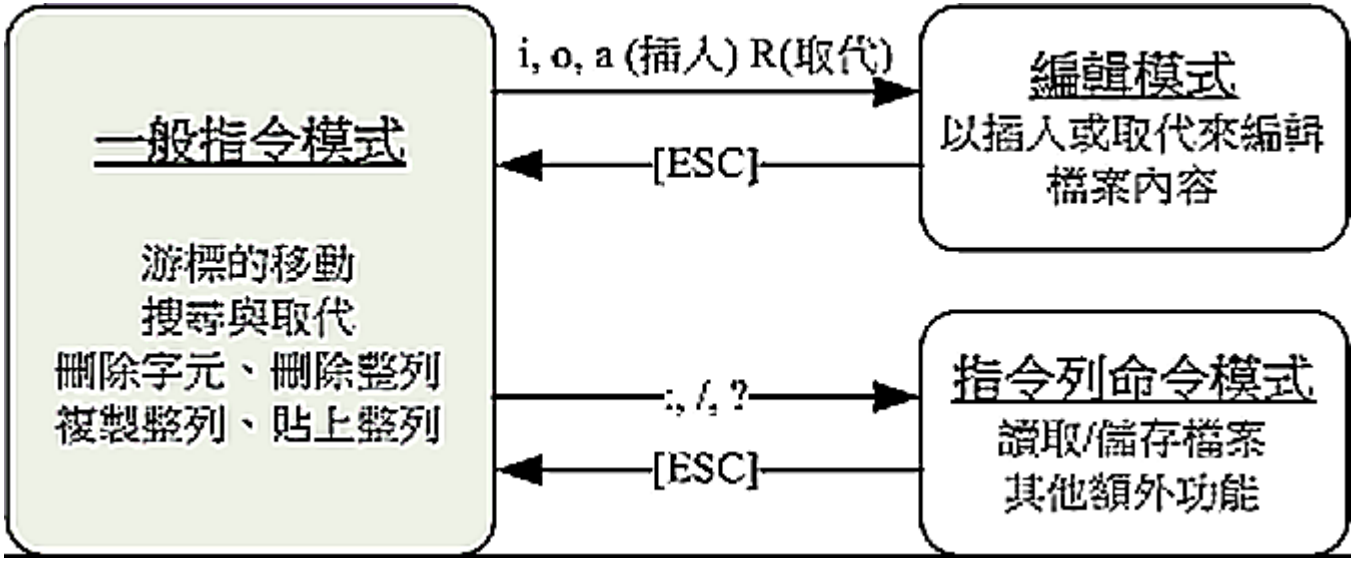
- vim 是 vi (舊式編輯器)的進階版本，vim 可以用顏色或底線等方式來顯示一些特殊的資訊，依據檔案的副檔名或者是檔案內的開頭資訊， 判斷該檔案的內容而自動的呼叫該程式的語法判斷式，再以顏色來顯示程式碼與一般資訊
- 具有程式編輯的能力，可以主動以字體顏色辨別語法的正確性
- 支援正規表示法的搜尋架構、多檔案編輯、區塊複製
- 熟悉基本的 vim 操作方式讓我們在終端機指令列操作時更加得心應手

Vim模式與指令

- 一般模式(Normal Mode)
  - 使用 vim 指令開啟檔案，一開始為「一般指令模式」，此模式可以使用以下操作：
  - 移動游標。
  - 刪除、複製、貼上。
  - 復原、重做。
  - 區塊範圍 (選取、複製、貼上)。
  - 多視窗功能。

Vim模式與指令

- 一般模式(Normal Mode)
- 在任何模式下，按下 Esc 會回到這個預設模式中。



Vim模式與指令

- 編輯模式(Insert Mode)
  - 在「一般指令模式」鍵盤按下 i、o、a、r 任一個符號可進入「編輯模式」(直到按下鍵盤 Esc 才會退出「編輯模式」)，此模式可以使用以下操作：
  - 插入功能：i、o、a。
  - 取代功能：r。

- 指令
  - Enter：換行
  - Back Space：刪除游標前一個字元
  - Del：刪除游標後一個字元
  - 方向鍵：在文檔中移動游標
  - Page Up/Page Down：上/下翻頁

Vim模式與指令

- 命令模式(Command Mode)
  - 在「一般指令模式」鍵盤輸入 /、:、? 任一個符號，游標就會移到最底下的「指令列命令模式」，此模式可以使用以下操作：
  - 搜尋、取代。
  - 儲存、離開、讀入檔案。
  - 顯示行號、執行 Shell 指令。
  - 多檔案編輯。
- 指令
  - :q：不儲存直接離開
  - :q!：不儲存，強制直接離開（當有修改不想儲存時）
  - :e!：放棄所有修改，從上次儲存文件紀錄開始編輯
  - :w：儲存文檔但不離開
  - :!w：強制儲存文檔但不離開
  - :w {name}：儲存文檔並命名為 name，但不離開
  - :wq：儲存並離開
  - :!wq：強制儲存並離開

Vim模式與指令

- 可視模式(Visual Mode)
  - 在「一般指令模式」鍵盤輸入v、V、Ctrl + v：
    - v：一個一個字符選取的可視模式
    - V：一行一行選取的可視模式
    - Ctrl + v：自由選取行列區塊的可視模式
  - 進入可視模式可使用滑鼠游標選擇文字，方便閱讀
- 指令
  - d： 刪除選取內容
    - 刪除後，按下 p 可以貼上刪除的內容
  - c： 欲變更的內容，按下後，變更選取內容並進入編輯模式
    - 變更後，按下 p 可以貼上變更前的內容

查看已安裝的套件

- 開啟terminal輸入sudo apt list --installed可以列出已安裝的package
- 使用grep篩選 sudo apt list --installed | grep <搜尋的文字>
  快速查看是否已安裝gedit, vim, nano等編輯器

```
nvidia@ubuntu:~$ sudo apt list --installed | grep vim

WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

vim/bionic-updates,bionic-security,now 2:8.0.1453-1ubuntu1.4 amd64 [installed]
vim-common/bionic-updates,bionic-updates,bionic-security,bionic-security,now 2:8.0.1453-1ubuntu1.4 all [installed,automatic]
vim-runtime/bionic-updates,bionic-updates,bionic-security,bionic-security,now 2:8.0.1453-1ubuntu1.4 all [installed,automatic]
vim-tiny/bionic-updates,bionic-security,now 2:8.0.1453-1ubuntu1.4 amd64 [installed,automatic]
nvidia@ubuntu:~$ sudo apt list --installed | grep gedit

WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

gedit/bionic-updates,now 3.28.1-1ubuntu1.2 amd64 [installed,automatic]
gedit-common/bionic-updates,bionic-updates,now 3.28.1-1ubuntu1.2 all [installed,automatic]
nvidia@ubuntu:~$ sudo apt list --installed | grep nano

WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

nano/bionic,now 2.9.3-2 amd64 [installed,automatic]
```

安裝缺少的編輯器

- 所有的 Unix-like 系統都會內建 vi 文書編輯器，其他的文書編輯器則不一定會存在
- 若沒有找到gedit, vim, nano等編輯器
- 則可以輸入sudo apt-get install <package>安裝

參考資訊

- https://vim.rtorr.com/lang/zh_tw (Vim Cheat)
- http://linux.vbird.org/linux_basic/0310vi.php
- https://blog.techbridge.cc/2020/04/06/how-to-use-vim-as-an-editor-tutorial/#:~:text=%E5%9C%A8%20vim%20%E4%B8%AD%E9%80%8F%E9%81%8E%E6%A8%A1%E5%BC%8F,%E6%9C%83%E7%94%A2%E7%94%9F%E4%B8%8D%E5%90%8C%E7%9A%84%E4%BD%9C%E7%94%A8%E3%80%82

Ubuntu Mirrors

Ubuntu 鏡像(mirror)來源

- 在安裝或更新套件時(Ex: sudo apt-get update)，鏡像檔來源預設為美國Ubuntu(http://us.archive.ubuntu.com/ubuntu/)，下載時間較久，改成台灣鏡像檔來源可加快下載速度。
- 下方網站提供Ubuntu Mirrors來源 https://launchpad.net/ubuntu/+archivemirrors

Taiwan		30 Gbps	10 mirrors
NCHC, Taiwan 將鏡像更改為NCHC	http ftp	20 Gbps	Up to date
Ubuntu-TW	http ftp rsync	4 Gbps	Up to date
TKU-TamKangUniversity	http ftp	1 Gbps	Up to date
National Central University, Mobile Broadband Network Lab	http	1 Gbps	Up to date
Institute of Network Development, National Taiwan Ocean University	http ftp rsync	1 Gbps	Up to date
NCKU CCNS	https http	1 Gbps	Up to date
NCTUCSCC	http ftp rsync	1 Gbps	Up to date
Shu-Te University	http ftp	1 Gbps	Up to date
Taiwan Mirror	http ftp	100 Mbps	Up to date
Chunghwa Telecom	http	100 Mbps	Up to date

(台灣鏡像來源)

更改Ubuntu 鏡像(mirror)來源

- 建議使用NCHC, Taiwan(國家高速網路與計算中心)當作鏡像來源

查看Ubuntu 鏡像(mirror)來源

- 軟體套件來源列表的設定檔案路徑是「/etc/apt/sources.list」
- 使用sudo vim /etc/apt/sources.list 查看
- 同學可自行練習使用nano、gedit、vim等編輯器

```
#deb cdrom:[Ubuntu 18.04.5 LTS _Bionic Beaver_ - Release amd64 (20200806.1)]/ bionic main restricted

# See http://help.ubuntu.com/community/UpgradeNotes for how to upgrade to
# newer versions of the distribution.
deb http://us.archive.ubuntu.com/ubuntu/ bionic main restricted
# deb-src http://us.archive.ubuntu.com/ubuntu/ bionic main restricted

## Major bug fix updates produced after the final release of the
## distribution.
deb http://us.archive.ubuntu.com/ubuntu/ bionic-updates main restricted
# deb-src http://us.archive.ubuntu.com/ubuntu/ bionic-updates main restricted

## N.B. software from this repository is ENTIRELY UNSUPPORTED by the Ubuntu
## team. Also, please note that software in universe WILL NOT receive any
## review or updates from the Ubuntu security team.
deb http://us.archive.ubuntu.com/ubuntu/ bionic universe
# deb-src http://us.archive.ubuntu.com/ubuntu/ bionic universe
deb http://us.archive.ubuntu.com/ubuntu/ bionic-updates universe
# deb-src http://us.archive.ubuntu.com/ubuntu/ bionic-updates universe

## N.B. software from this repository is ENTIRELY UNSUPPORTED by the Ubuntu
## team, and may not be under a free licence. Please satisfy yourself as to
## your rights to use the software. Also, please note that software in
## multiverse WILL NOT receive any review or updates from the Ubuntu
## security team.
deb http://us.archive.ubuntu.com/ubuntu/ bionic multiverse
# deb-src http://us.archive.ubuntu.com/ubuntu/ bionic multiverse
deb http://us.archive.ubuntu.com/ubuntu/ bionic-updates multiverse
# deb-src http://us.archive.ubuntu.com/ubuntu/ bionic-updates multiverse

## N.B. software from this repository may not have been tested as
## extensively as that contained in the main release, although it includes
## newer versions of some applications which may provide useful features.
## Also, please note that software in backports WILL NOT receive any review
## or updates from the Ubuntu security team.
deb http://us.archive.ubuntu.com/ubuntu/ bionic-backports main restricted universe multiverse
# deb-src http://us.archive.ubuntu.com/ubuntu/ bionic-backports main restricted universe multiverse

## Uncomment the following two lines to add software from Canonical's
## 'partner' repository.
## This software is not part of Ubuntu, but is offered by Canonical and the
```

更改Ubuntu 鏡像(mirror)來源

- 此部分示範使用Vim 編輯 /etc/apt/sources.list
- 進入命令模式後，輸入指令

  :%s/http:\/\/us.archive.ubuntu.com\/ubuntu/http:\/\/free.nchc.org.tw\/ubuntu/g
- 該指令可將全文(%)全部(g)取代(s)功能。

  上例把「us.archive.ubuntu.com」取代成「free.nchc.org.tw」

更改Ubuntu 鏡像(mirror)來源

```
#deb cdrom:[Ubuntu 18.04.5 LTS _Bionic Beaver_ - Release amd64 (20200806.1)]/ bionic main restricted

# See http://help.ubuntu.com/community/UpgradeNotes for how to upgrade to
# newer versions of the distribution.
deb http://free.nchc.org.tw/ubuntu/ bionic main restricted
# deb-src http://free.nchc.org.tw/ubuntu/ bionic main restricted

## Major bug fix updates produced after the final release of the
## distribution.
deb http://free.nchc.org.tw/ubuntu/ bionic-updates main restricted
# deb-src http://free.nchc.org.tw/ubuntu/ bionic-updates main restricted

## N.B. software from this repository is ENTIRELY UNSUPPORTED by the Ubuntu
## team. Also, please note that software in universe WILL NOT receive any
## review or updates from the Ubuntu security team.
deb http://free.nchc.org.tw/ubuntu/ bionic universe
# deb-src http://free.nchc.org.tw/ubuntu/ bionic universe
deb http://free.nchc.org.tw/ubuntu/ bionic-updates universe
# deb-src http://free.nchc.org.tw/ubuntu/ bionic-updates universe

## N.B. software from this repository is ENTIRELY UNSUPPORTED by the Ubuntu
## team, and may not be under a free licence. Please satisfy yourself as to
## your rights to use the software. Also, please note that software in
## multiverse WILL NOT receive any review or updates from the Ubuntu
## security team.
deb http://free.nchc.org.tw/ubuntu/ bionic multiverse
# deb-src http://free.nchc.org.tw/ubuntu/ bionic multiverse
deb http://free.nchc.org.tw/ubuntu/ bionic-updates multiverse
# deb-src http://free.nchc.org.tw/ubuntu/ bionic-updates multiverse

## N.B. software from this repository may not have been tested as
## extensively as that contained in the main release, although it includes
## newer versions of some applications which may provide useful features.
## Also, please note that software in backports WILL NOT receive any review
## or updates from the Ubuntu security team.
deb http://free.nchc.org.tw/ubuntu/ bionic-backports main restricted universe multiverse
# deb-src http://free.nchc.org.tw/ubuntu/ bionic-backports main restricted universe multiverse

## Uncomment the following two lines to add software from Canonical's
## 'partner' repository.
## This software is not part of Ubuntu, but is offered by Canonical and the
## respective vendors as a service to Ubuntu users.
# deb http://archive.canonical.com/ubuntu bionic partner
# deb-src http://archive.canonical.com/ubuntu bionic partner
14 substitutions on 14 lines                                                35,1          Top
```

更改成功

測試Ubuntu 鏡像(mirror)來源

- 更改成台灣鏡像來源後，下載速度快上許多
- 測試輸入sudo apt-get update能發現下載來源變成NCHC

```
nvidia@ubuntu:~$ sudo apt-get update
[sudo] password for nvidia:
Get:1 file:/var/cuda-repo-10-2-local-10.2.89-440.40  InRelease
Ign:1 file:/var/cuda-repo-10-2-local-10.2.89-440.40  InRelease
Get:2 file:/var/cuda-repo-10-2-local-10.2.89-cross-aarch64  InRelease
Ign:2 file:/var/cuda-repo-10-2-local-10.2.89-cross-aarch64  InRelease
Get:3 file:/var/visionworks-repo  InRelease
Ign:3 file:/var/visionworks-repo  InRelease
Get:4 file:/var/visionworks-sfm-repo  InRelease
Ign:4 file:/var/visionworks-sfm-repo  InRelease
Get:5 file:/var/visionworks-tracking-repo  InRelease
Ign:5 file:/var/visionworks-tracking-repo  InRelease
Get:6 file:/var/cuda-repo-10-2-local-10.2.89-440.40  Release [574 B]
Get:7 file:/var/cuda-repo-10-2-local-10.2.89-cross-aarch64  Release [574 B]
Get:8 file:/var/visionworks-repo  Release [1,999 B]
Get:9 file:/var/visionworks-sfm-repo  Release [2,003 B]
Get:10 file:/var/visionworks-tracking-repo  Release [2,008 B]
Get:6 file:/var/cuda-repo-10-2-local-10.2.89-440.40  Release [574 B]
Get:7 file:/var/cuda-repo-10-2-local-10.2.89-cross-aarch64  Release [574 B]
Get:8 file:/var/visionworks-repo  Release [1,999 B]
Get:9 file:/var/visionworks-sfm-repo  Release [2,003 B]
Get:10 file:/var/visionworks-tracking-repo  Release [2,008 B]
Hit:11 http://free.nchc.org.tw/ubuntu bionic InRelease
Hit:12 http://free.nchc.org.tw/ubuntu bionic-updates InRelease
Hit:13 http://free.nchc.org.tw/ubuntu bionic-backports InRelease
Get:19 http://security.ubuntu.com/ubuntu bionic-security InRelease [88.7 kB]
Fetched 88.7 kB in 2s (51.4 kB/s)
Reading package lists... Done
```

項目二：
熟悉Linux指令

Linux常用指令

Linux常用指令

- 在許多嵌入式平台會使用到(Unix-like)系統，能藉由指令操作檔案管理、系統管理、程式碼編譯等事項，因此熟悉指令能加快處理速度
- 在課堂上已經介紹基本的Linux指令，請同學操作虛擬機熟悉指令，將以下介紹的指令，自行挑選10個指令操作過程放置於報告上

Linux常用指令

- **echo**
  - print text or show content
- **man**
  - show command user manual
  - ex: man echo
  - ex: man cat
- **whoami**
  - show user name
- **passwd**
  - change password

Linux常用指令

- **clear**
  - clear terminal output
- **shutdown**
  - shutdown computer
- **reboot**
  - restart computer
- **pwd**
  - print the current working directory
- **ls**
  - list file/directory
  - options:
    - -l: show each file in detail
    - -a: show each file including file/directory that start with “,”
    - -i: print index of inode
    - -R: recursively show directory

Linux常用指令

- **chmod**
  - change file mode
- **chown**
  - change owner and group
- **cat**
  - print file content
- **touch**
  - create file
- **mkdir**
  - make directory
- **rm**
  - remove file/directory
  - options:
    - -f: force
    - -i: interactive
    - -r: recursive

Linux常用指令

- **mv**
  - change file/directory name
  - move file/directory
- **cp**
  - copy file/directory
- **find**
  - search for specific pattern in life
  - options:
    - -name: filename
    - -type: file type
    - -user: file user name
- **grep**
  - grep keyword
- **history**
  - find history command

Linux常用指令

- **ps**
  - show computer process
  - options:
    - -a: all process
    - -u: user oriented report
    - -x: even process not executed from terminals
    - -l: long format
- **kill**
  - kill process
  - options:
    - -l: list signal name
- **top**
  - monitor system resource

項目三：
QT GUI介面設計

QT GUI設計

- 使用Qt Creator寫一個GUI程式控制4顆LED燈

  (因應3/26遠距教學，在家操作以圖片代替LED，4/9課程實驗須實際控制LED，報告只需交出以圖片代替LED的程式碼)
- 程式說明
  - 可以參考上課講義的範例code，控制實際LED的程式碼可參考Lab2

控制LED開關事件

QT GUI設計

1. 控制LED開關事件

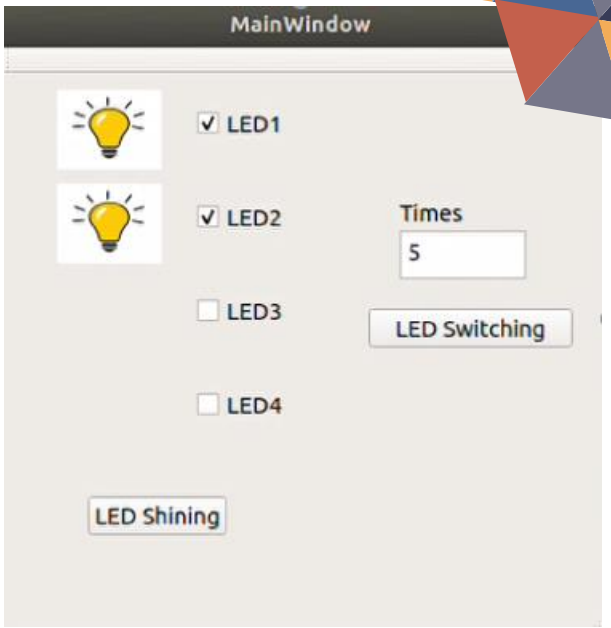
- 預設按鈕名稱為LED Shining
- 勾選需要點亮的燈號
- 點擊LED Shining按鈕，即可顯示相對應的LED(圖片)，反之，未被勾選的LED(圖片)則必須消失

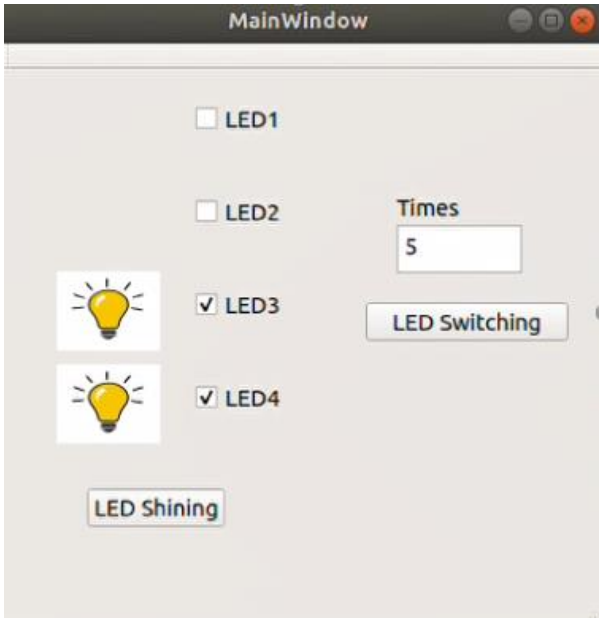
依據指定閃爍次數
控制LED開關

QT GUI設計

2. 依據指定閃爍次數控制LED開關

- 預設按鈕名稱為LED Switching，以及一個輸入框，輸入閃爍次數
- 閃爍以兩個LED為一組，且正在顯示的LED，所對應到的checkbox也必須被勾選，未顯示的則需要取消勾選。





QT GUI設計

- LED switching 可使用QTimer來撰寫。

Example for a one second (1000 millisecond) timer (from the Analog Clock example):

```
QTimer *timer = new QTimer(this);
connect(timer, SIGNAL(timeout()), this, SLOT(update()));
timer->start(1000);
```

- 參考資料：
https://doc.qt.io/archives/qt-5.5/qtimer.html?fbclid=IwAR17aSGCjBmgAg9IedcVfCaScf8QTr1FOueq7yRSiaa0_Nqz61KfC_Fg1iI