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THE EDUCATION CONSORTIUM OF SMART
MANUFACTURING AND ELECTRONICS



國立清華大學
NATIONAL TSING HUA UNIVERSITY

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Silicon to Software™

Workshop on Synopsys ARC CPU with TensorFlow Lite

Tutorial 2 - WE-I Project Environment Setup & Development Flow

主辦單位：國立清華大學電機系、新思科技

協辦單位：智慧製造電子應用聯盟

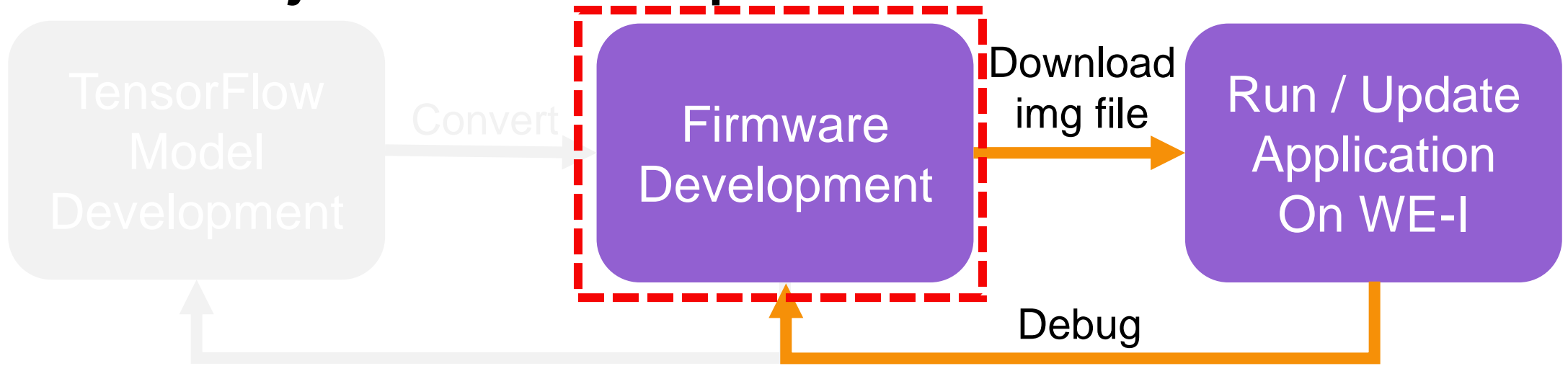
指導單位：教育部資訊及科技教育司

WE-I Project Development Flow



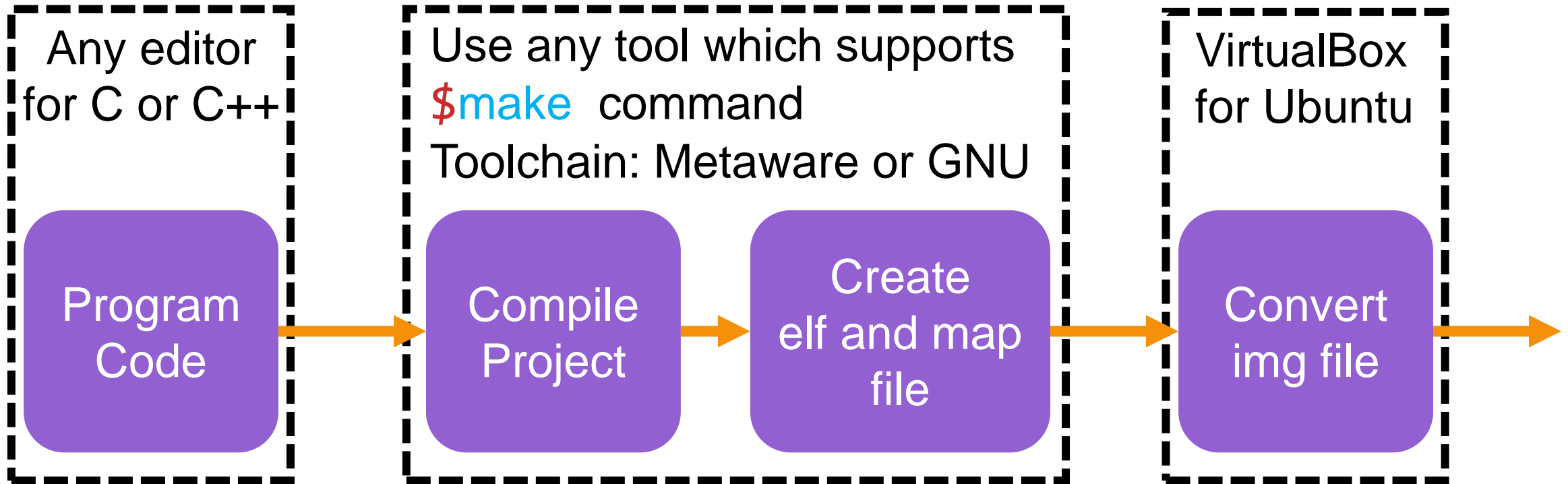
Stage	TensorFlow Model Development	Firmware Development	Run / Update Application On WE-I
Tool	Anaconda Cygwin	Cygwin Metaware or ARC GNU VirtualBox (Ubuntu 20.04)	Tera Term USB Micro
Language	Python 3	C language C++ language	

WE-I Project Development Flow



Stage	TensorFlow Model Development	Firmware Development	Run / Update Application On WE-I
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Firmware Development





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Download and Setup SDK



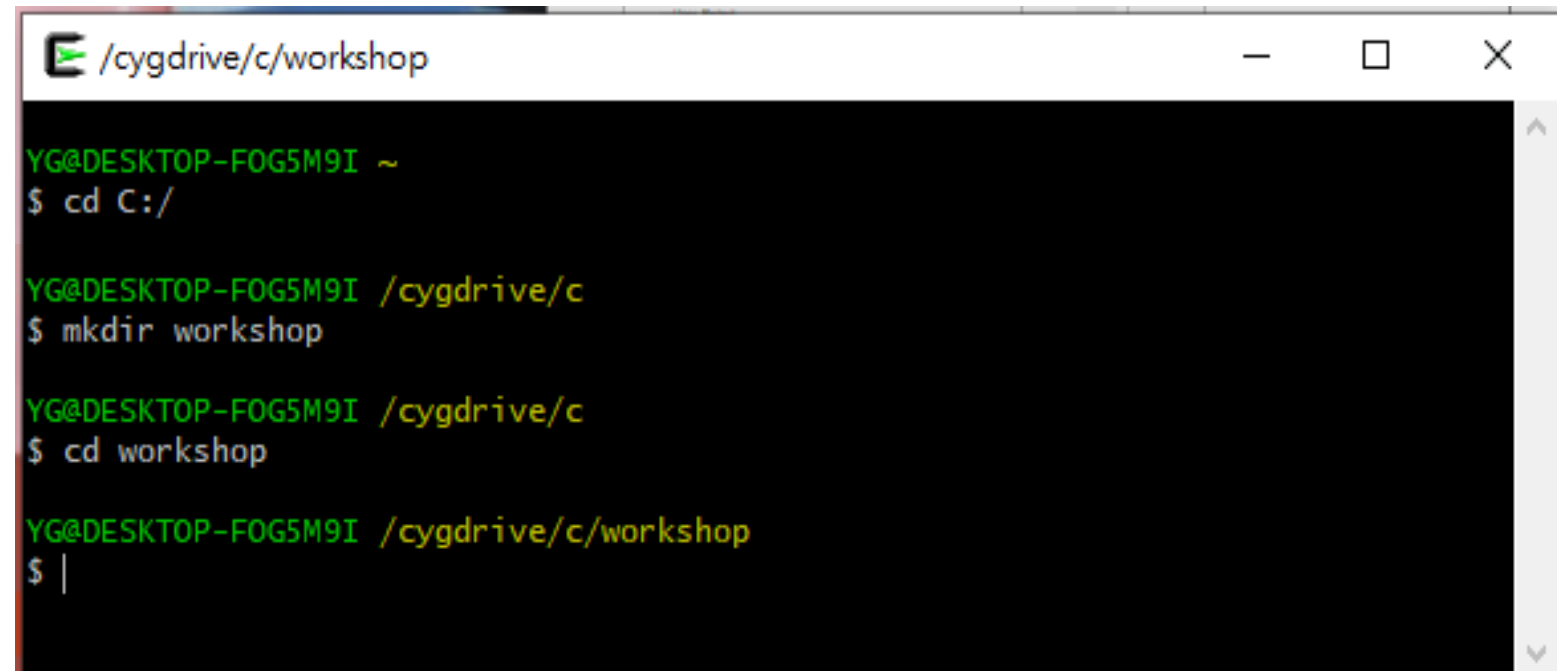
Download and Setup SDK

1. Open Cygwin64 Terminal

\$ **cd c:** (to your working file path)

\$ **mkdir workshop** (Suggest create a new folder named “workshop”)

\$ **cd workshop**



```
/cygdrive/c/workshop

YG@DESKTOP-FOG5M9I ~
$ cd C:/

YG@DESKTOP-FOG5M9I /cygdrive/c
$ mkdir workshop

YG@DESKTOP-FOG5M9I /cygdrive/c
$ cd workshop

YG@DESKTOP-FOG5M9I /cygdrive/c/workshop
$ |
```

Download and Setup SDK

Commands in cygwin64 terminal

2. Download SDK from Himax Github

```
$ git clone https://github.com/HimaxWiseEyePlus/himax\_tflm.git
```

3. Go to the root of Himax SDK

```
$ cd himax_tflm
```

4. Download third party files (3 packages)

```
$ make download
```

5. Download SDK from Synopsys Github

```
$ git clone https://github.com/worldskills2017tw/Synopsys\_WEI.git
```

Download and Setup SDK

After these steps, your file structure will be like:

himax_tflm

|

----*himax_we1_sdk*

----*image_gen_linux*

----*tensorflow*

----*third_party*

----*Synopsys_WEI*

|

----*Example_Project*

----*User_Project*

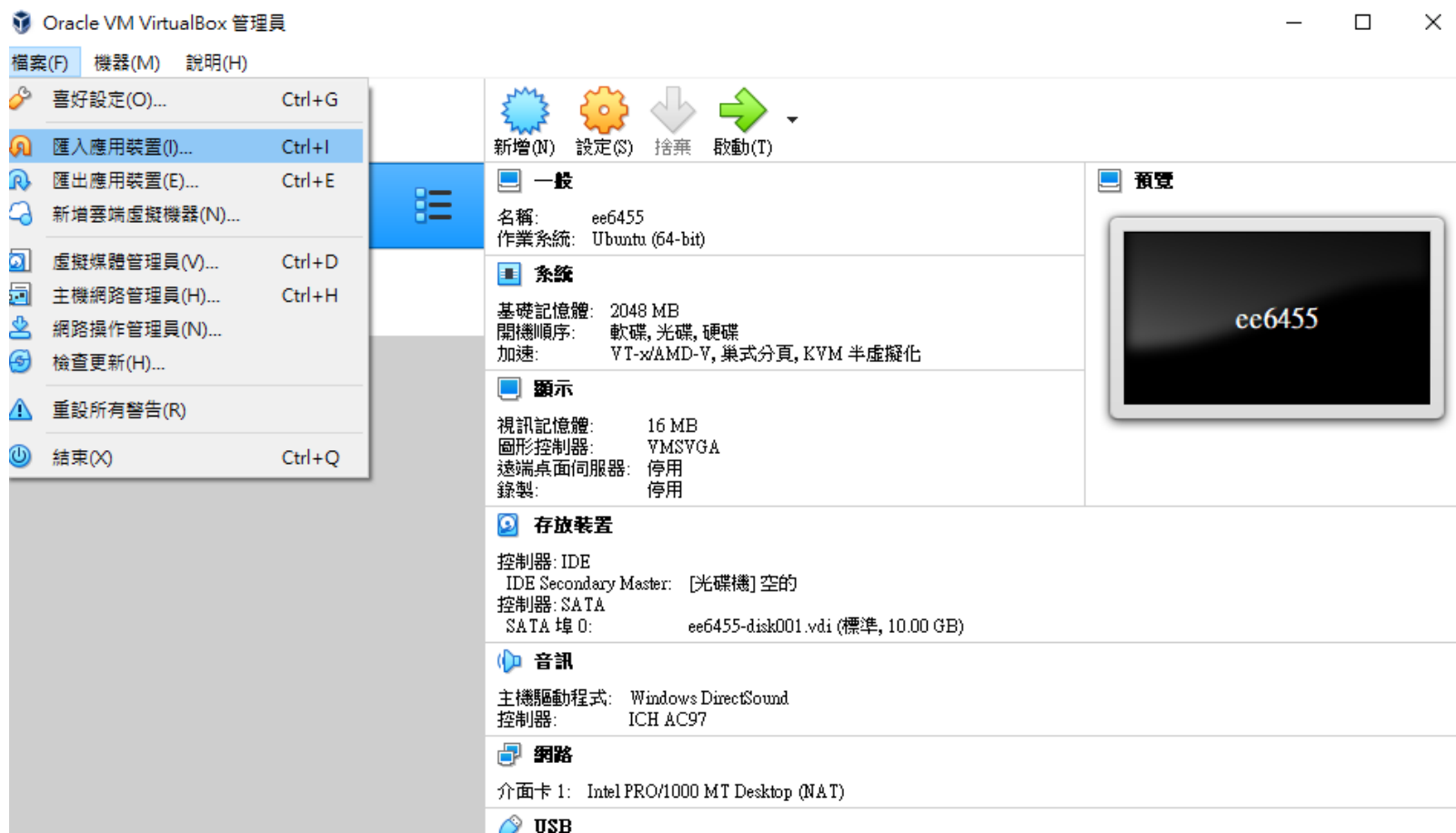
----*doc_tutorial*

----*arc_bin*

Download and Setup SDK

6. Setting Virtual Box

Open Virtual Box > 檔案 > 匯入應用裝置



Download and Setup SDK

解壓縮雲端下載的Workshop.zip 匯入workshop.ova

← 匯入虛擬應用裝置

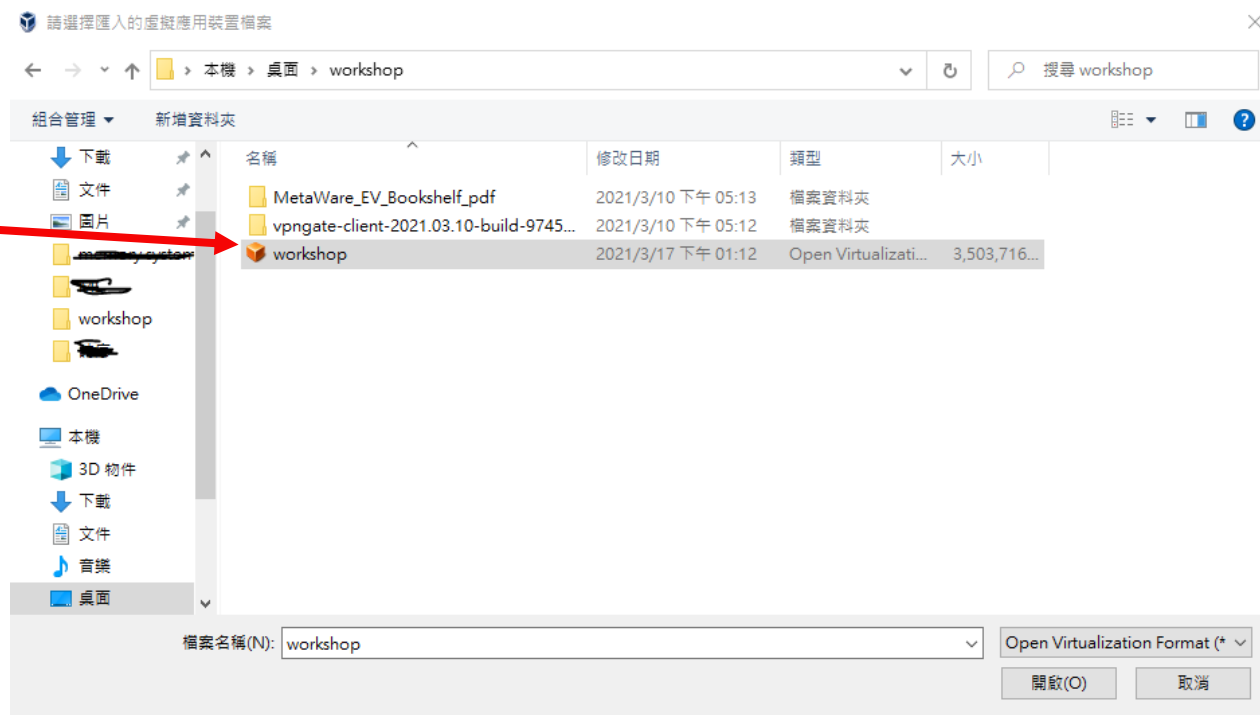
匯入的應用裝置

請選擇要從中匯入應用裝置的來源。這可以是本機檔案系統，用於匯入 OVF 存檔，也可以是一個已知的雲端服務提供商，用於匯入雲端虛擬機器。

來源(S): 本機檔案系統

請選擇要匯入虛擬應用裝置的檔案。VirtualBox 目前支援匯入以 Open Virtualization Format (OVF) 儲存的應用裝置。若要繼續，選取以下要匯入的檔案。

檔案(F):



專家模式(E) 下一個(N) 取消

Download and Setup SDK

下一個 > 匯入

匯入虛擬應用裝置

匯入的應用裝置

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檔案(F): C:\Users\w7\Desktop\workshop\workshop.ova

專家模式(E)

下一個(N)

取消

← 匯入虛擬應用裝置

應用裝置設定

這些是包含在應用裝置的虛擬機器和匯入 VirtualBox 機器的建議設定。您可以透過按兩下項目來變更顯示的許多內容，並使用以下的核取方塊停用其它內容。

虛擬系統 1	
名稱	workshop 1
客體作業系統類型	Ubuntu (64-bit)
CPU	1
RAM	2048 MB
DVD	<input checked="" type="checkbox"/>
USB 控制器	<input checked="" type="checkbox"/>
音效卡	<input checked="" type="checkbox"/> ICH AC97
網路卡	<input checked="" type="checkbox"/> Intel PRO/1000 MT Desktop (82540EM)
存放裝置控制器 (IDE)	PIIX4
存放裝置控制器 (IDE)	PIIX4
存放裝置控制器 (SATA)	AHCI
虛擬磁碟映像	workshop-disk002.vmdk
基礎資料夾	C:\Users\w7\VirtualBox VMs
主要群組	/

機器基礎資料夾(M): C:\Users\w7\VirtualBox VMs

MAC 位址原則(P): 只包含 NAT 網路卡 MAC 位址

額外選項: ☒ 匯入硬碟磁碟機作為 VDI(I)

應用裝置未簽署

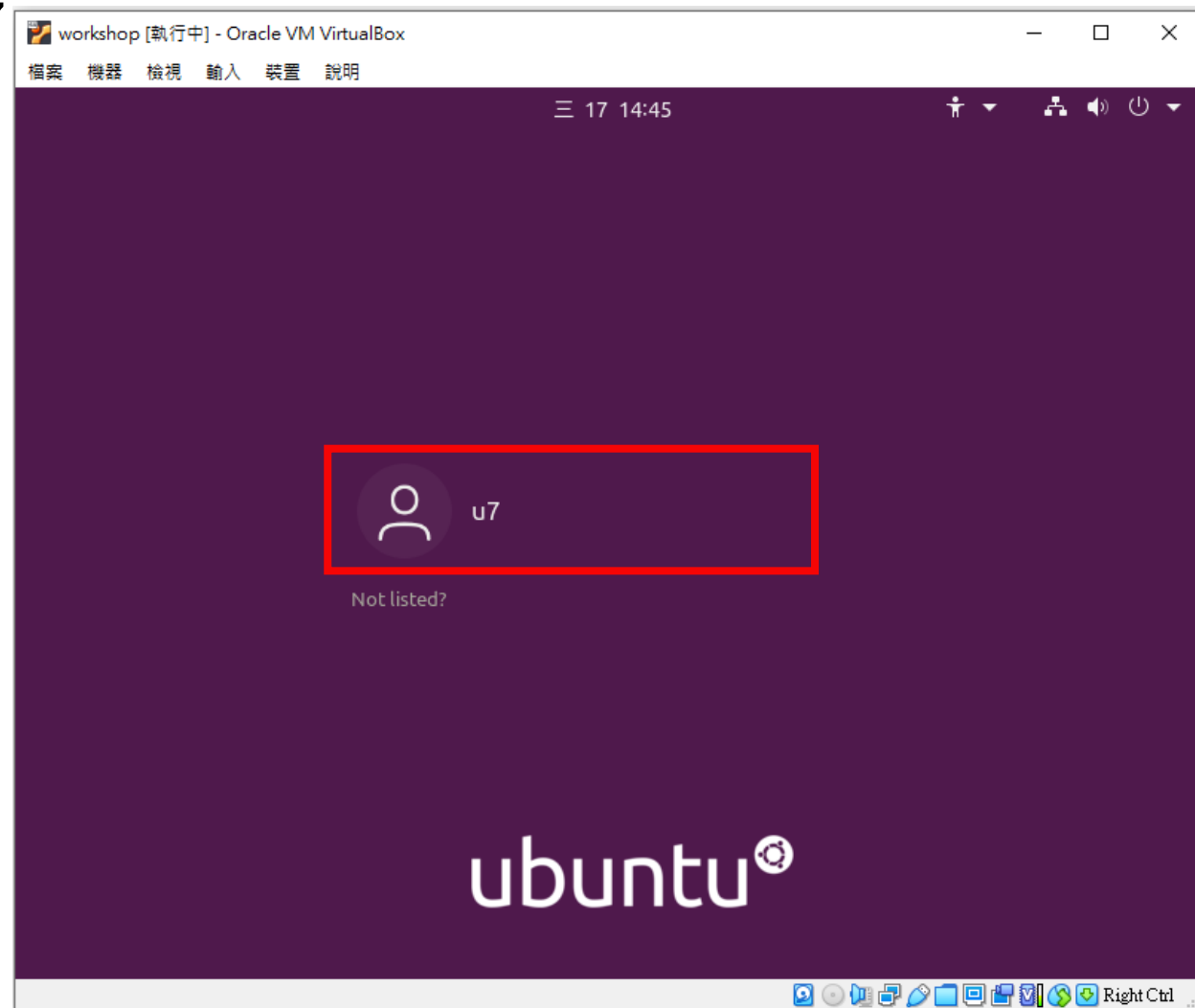
還原預設值

匯入

取消

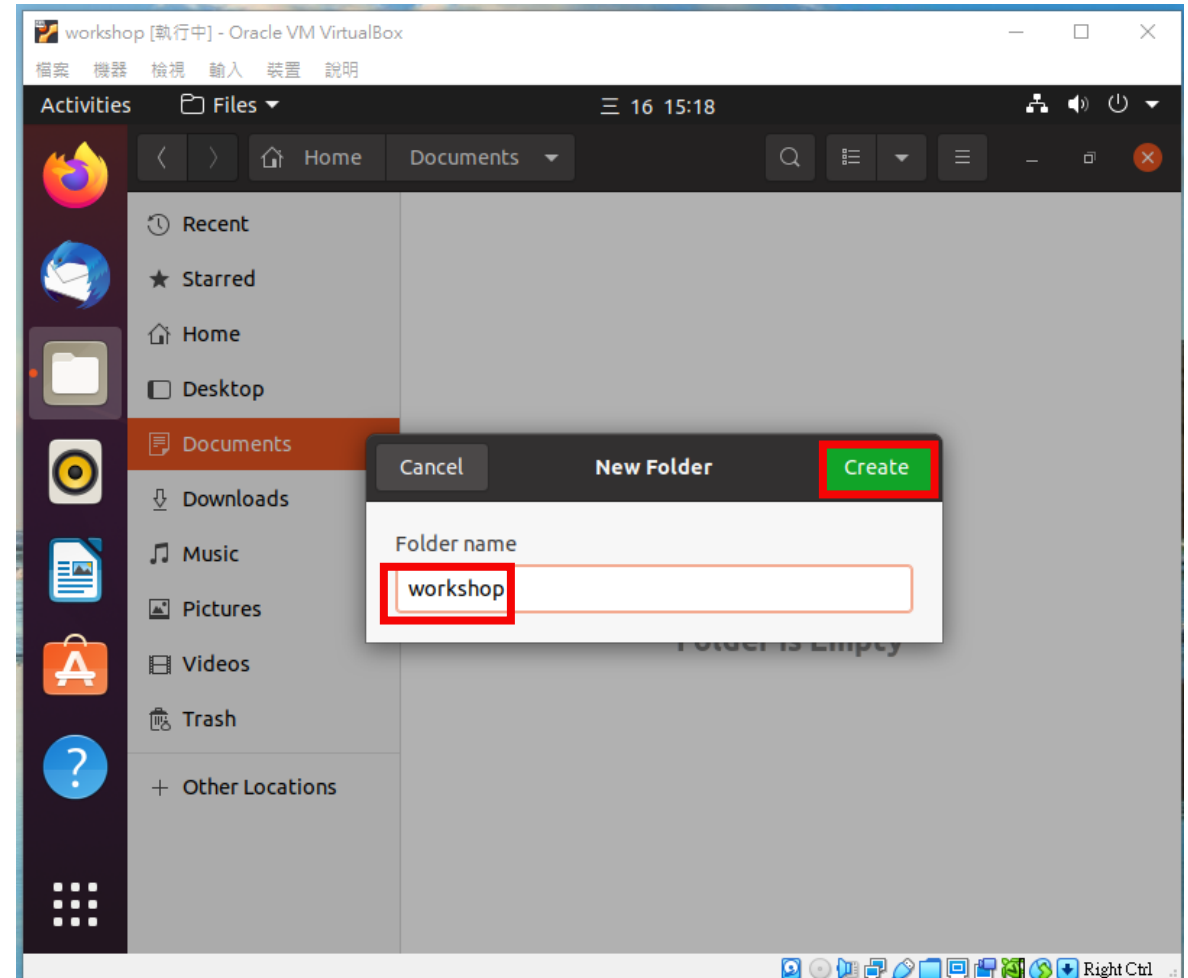
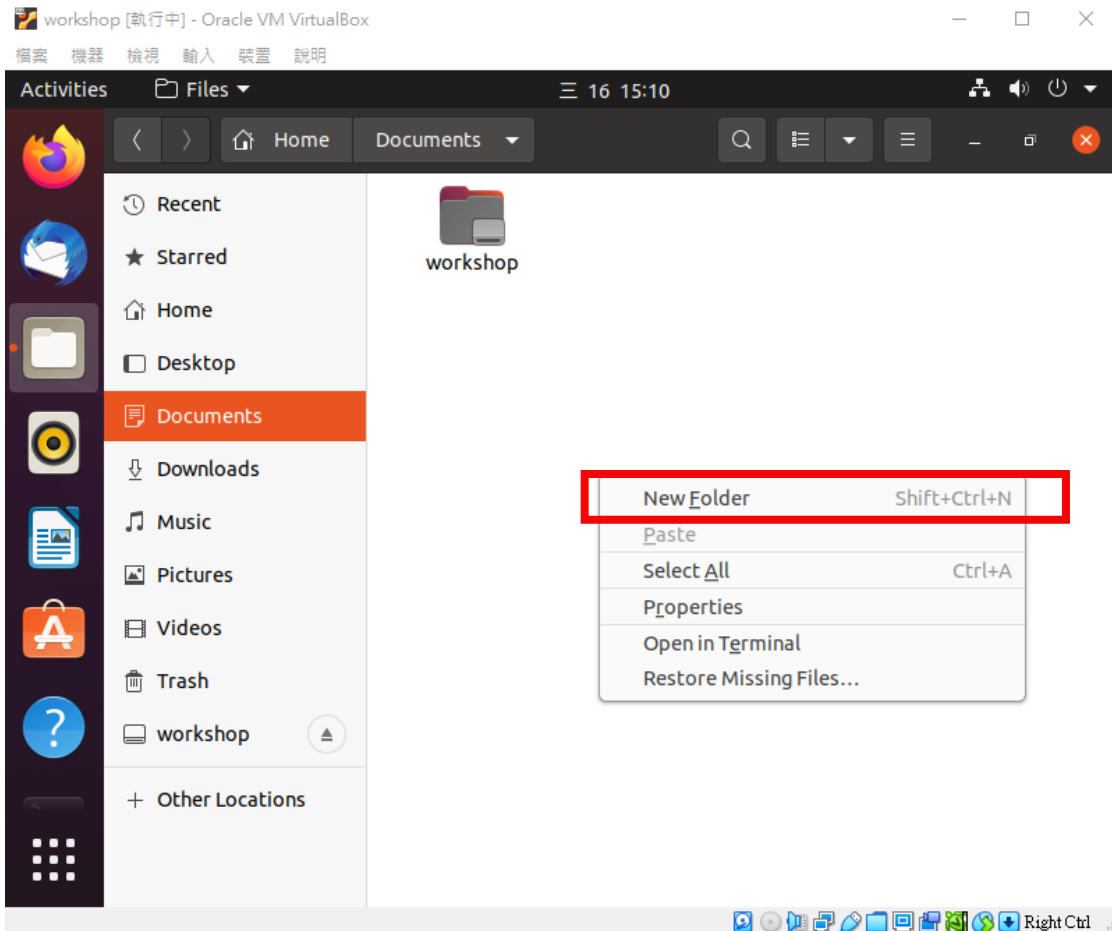
Download and Setup SDK

啟動 > 點選u7 > 輸入密碼: u1234567



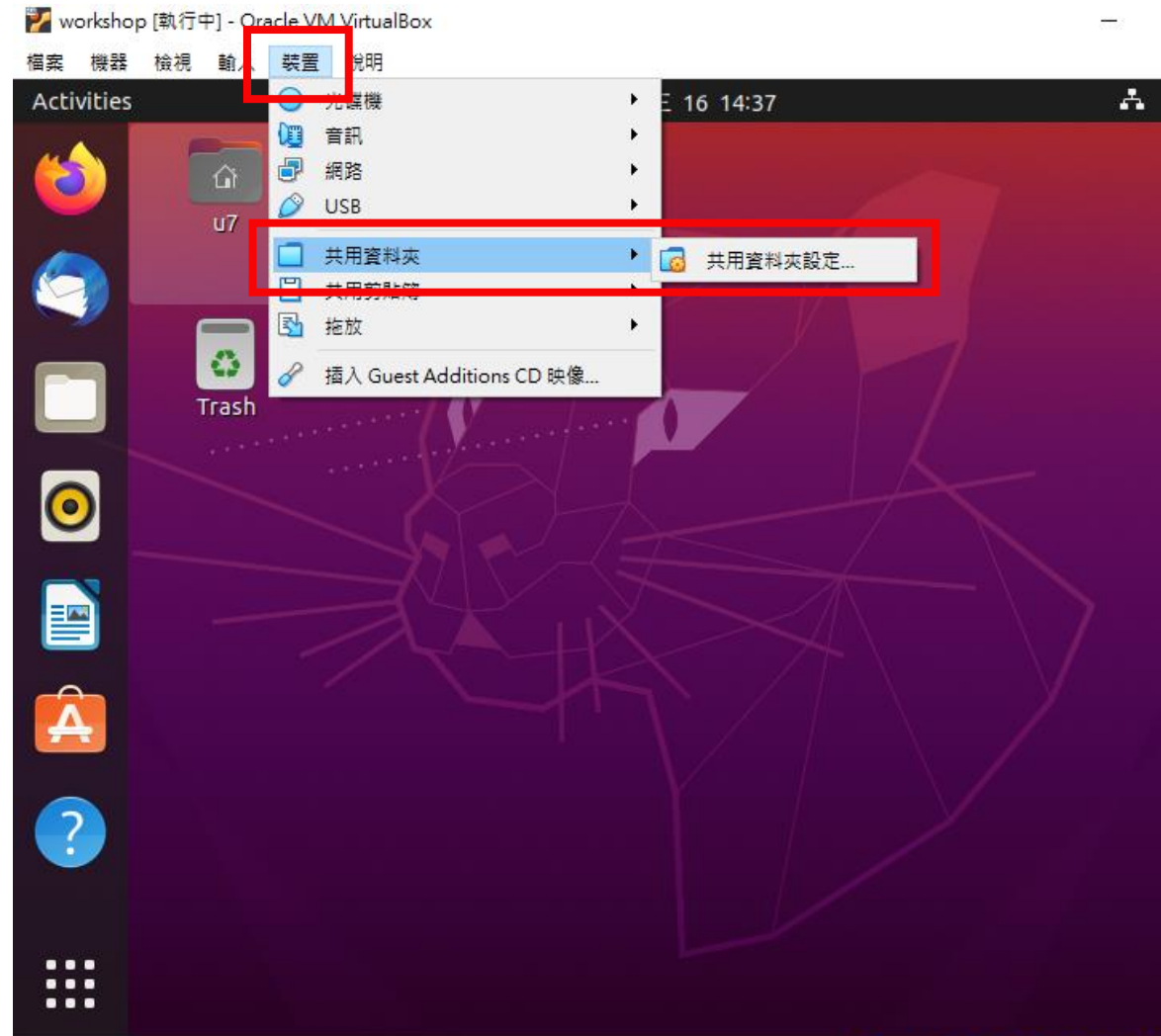
Download and Setup SDK

Create a new folder at Home/Documents
(Already done by out workshop.ova)



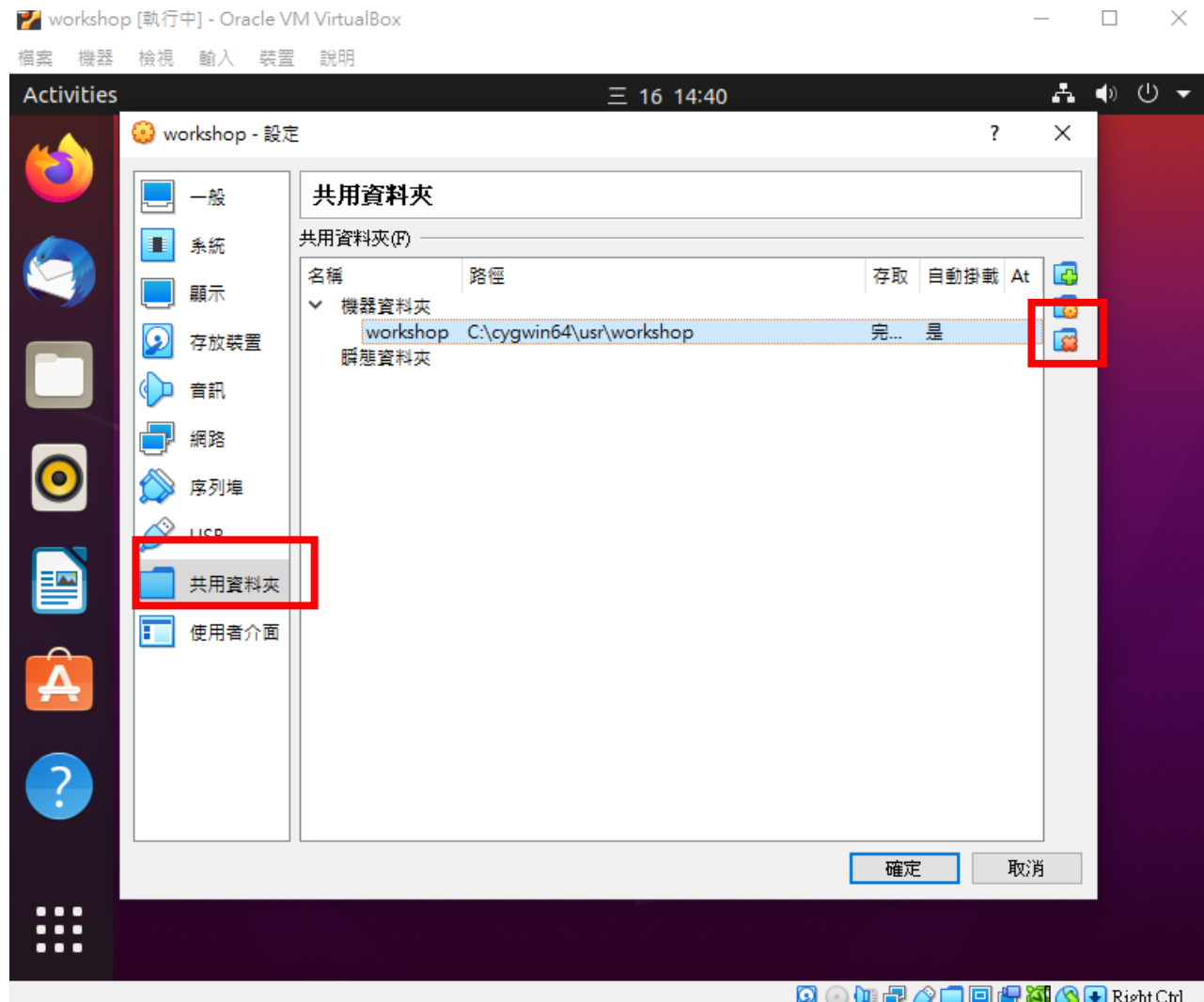
Download and Setup SDK

Set the folder to be shared



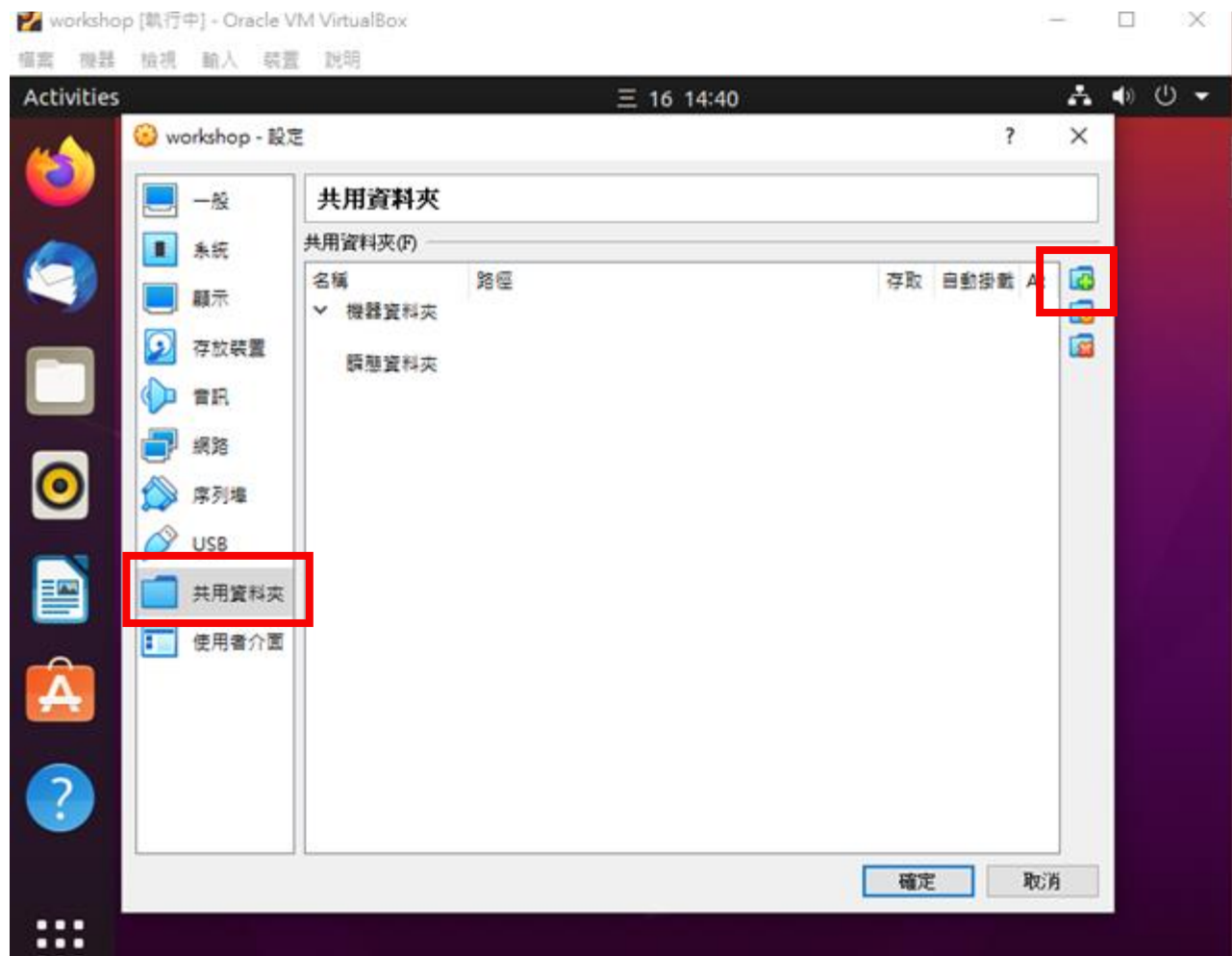
Download and Setup SDK

如果發現已經設定共用資料夾，請先刪除

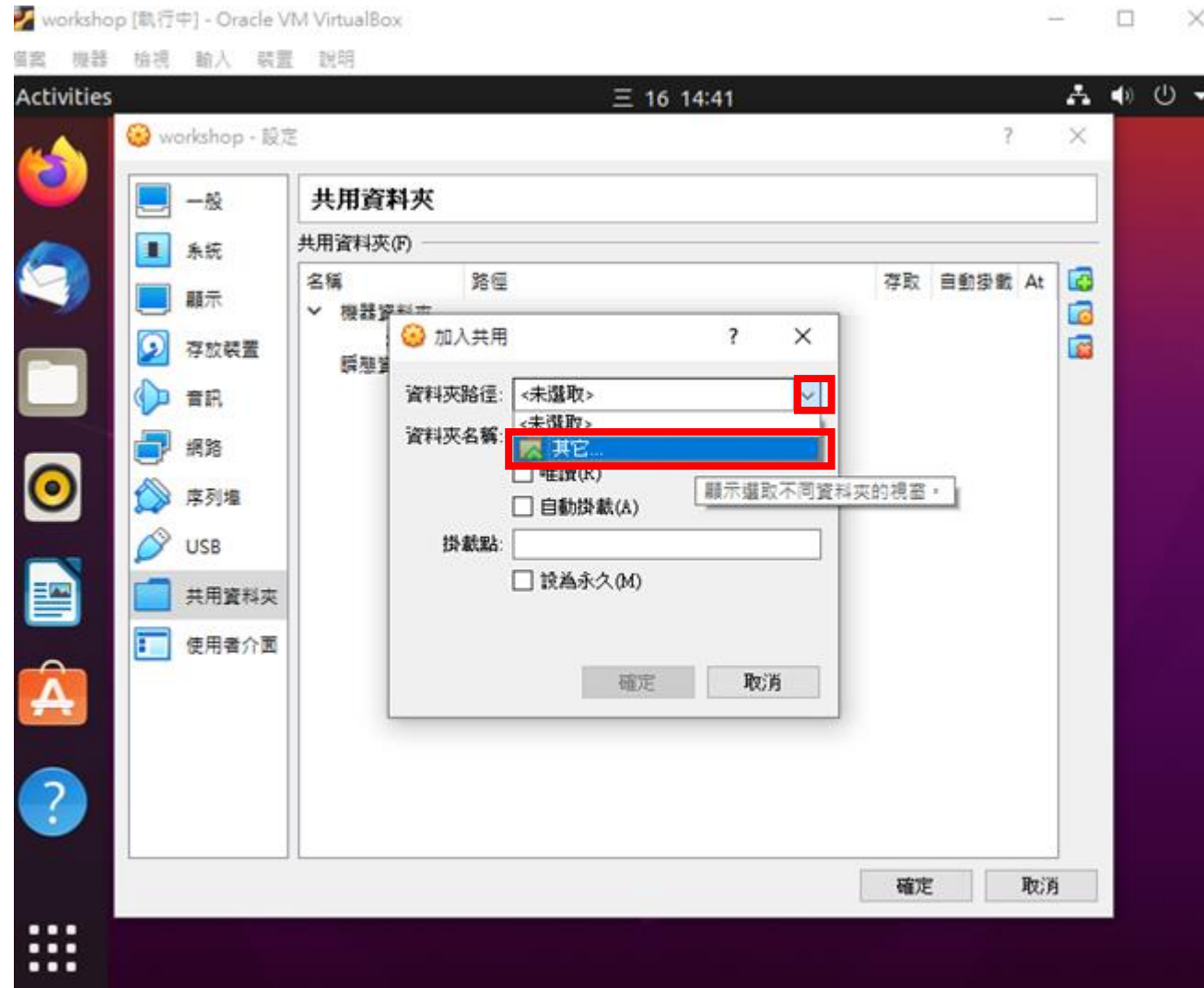


Download and Setup SDK

設定共用資料夾

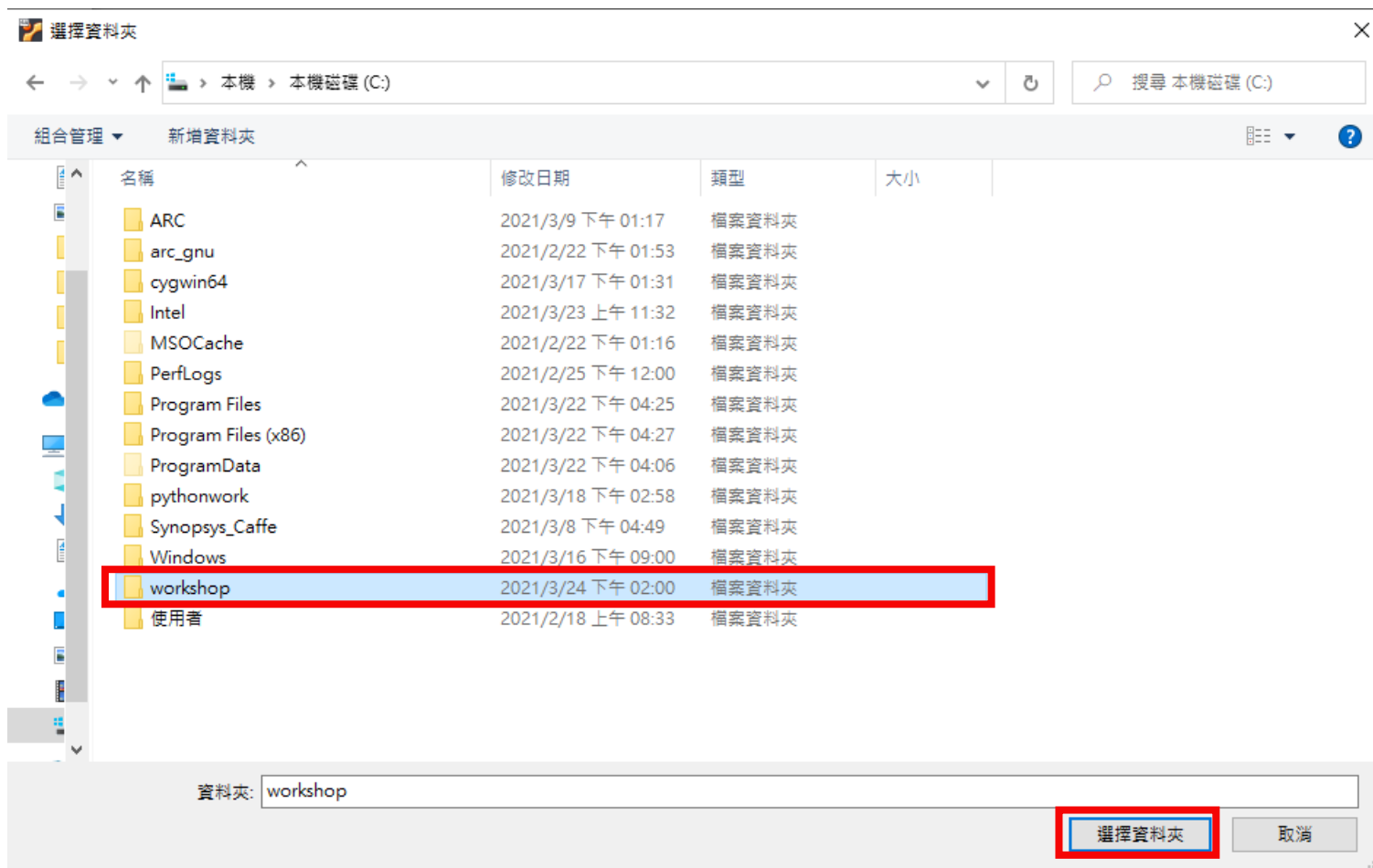


Download and Setup SDK

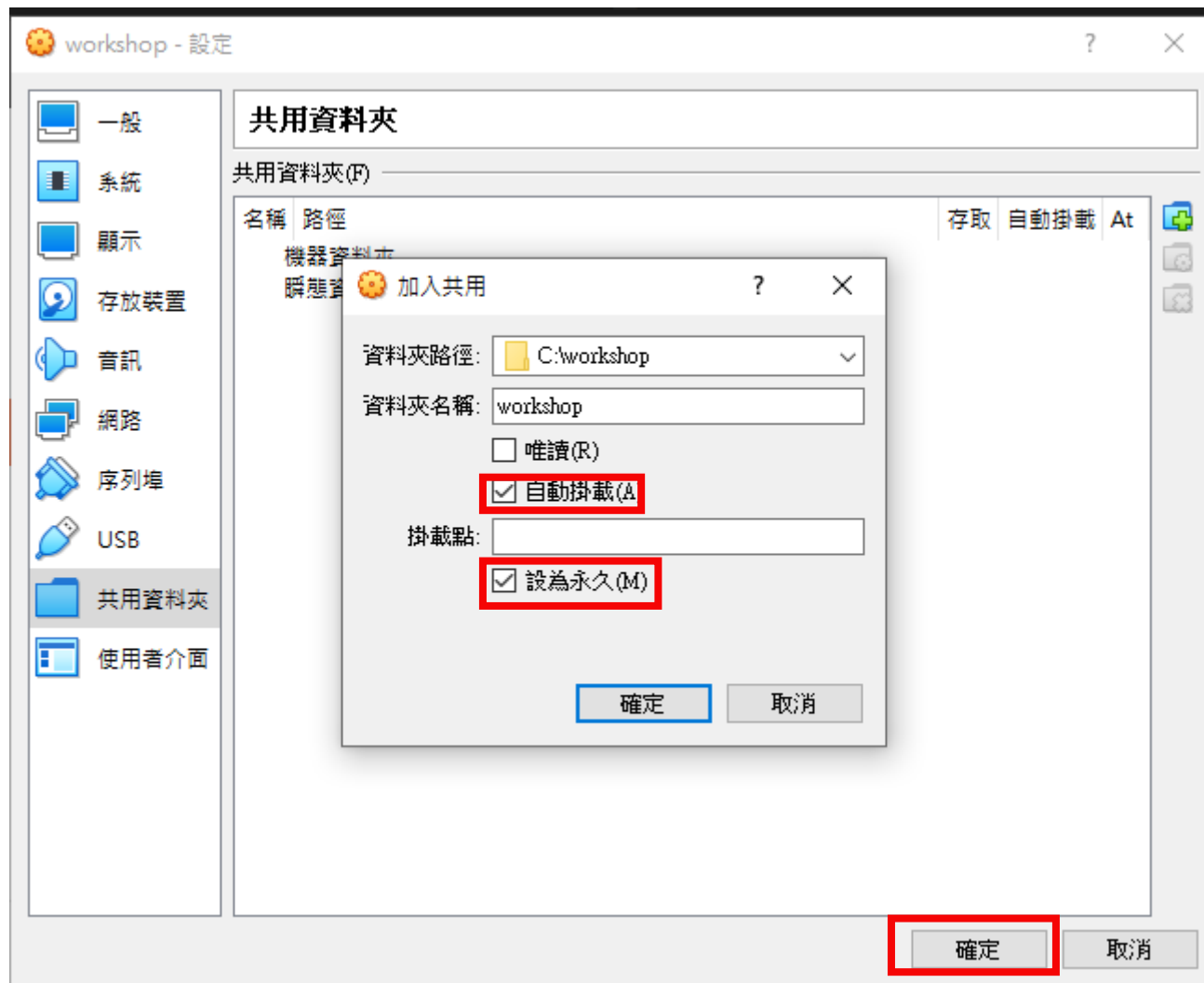


Download and Setup SDK

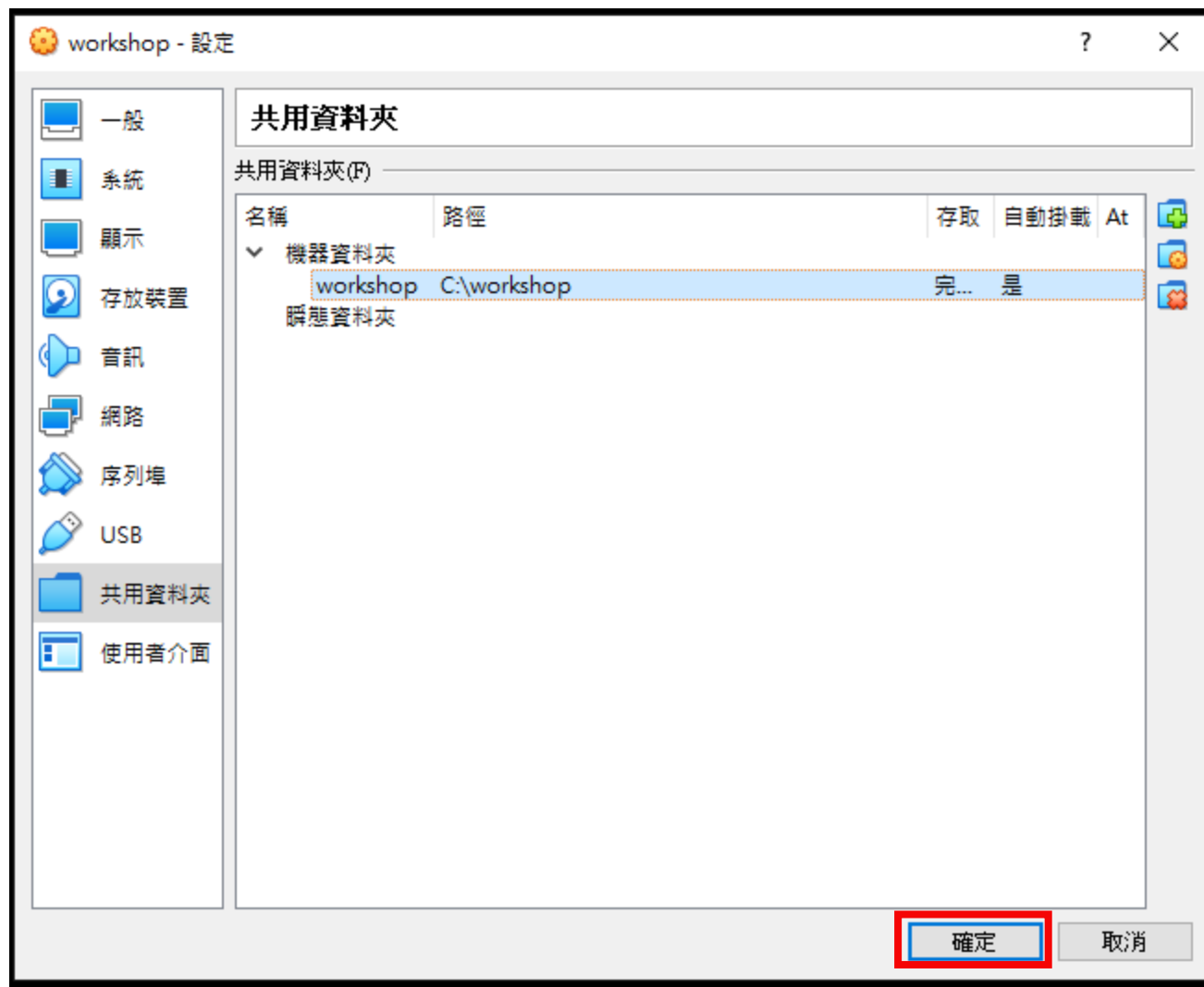
Path C:\workshop



Download and Setup SDK

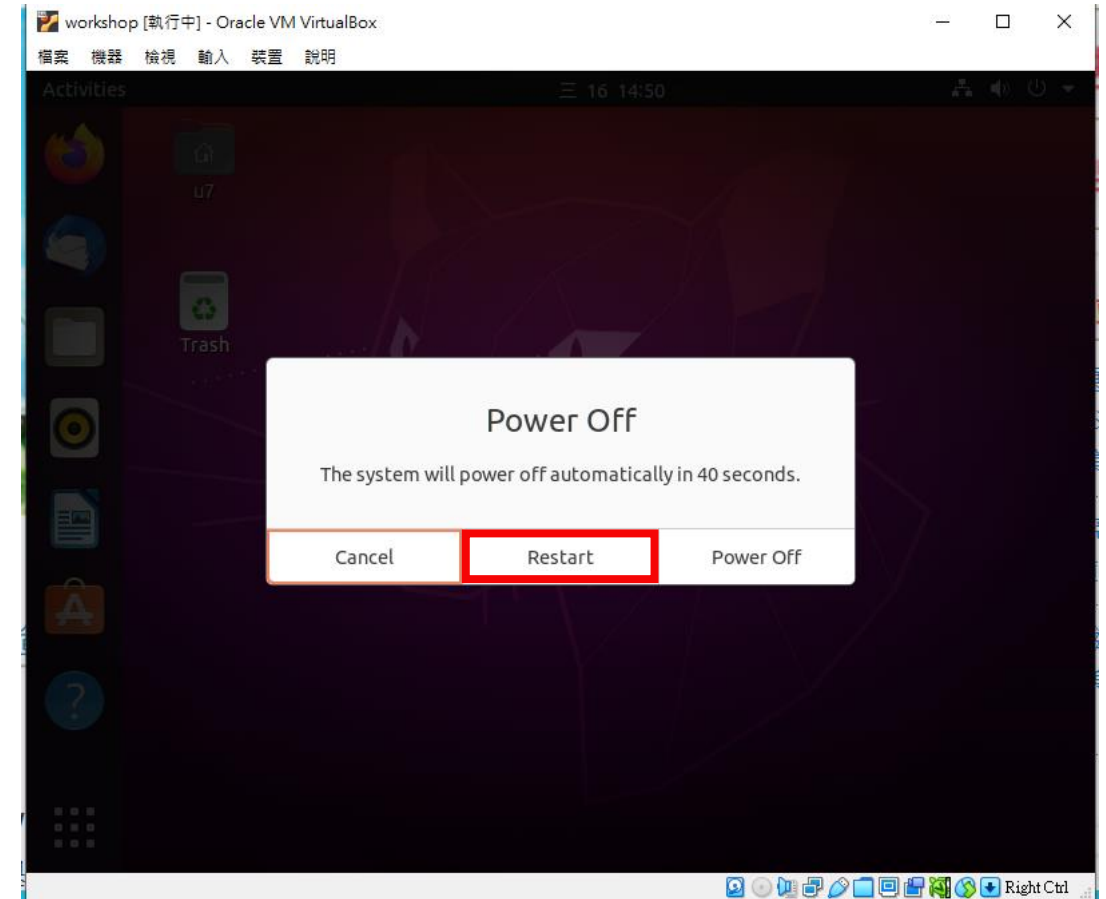
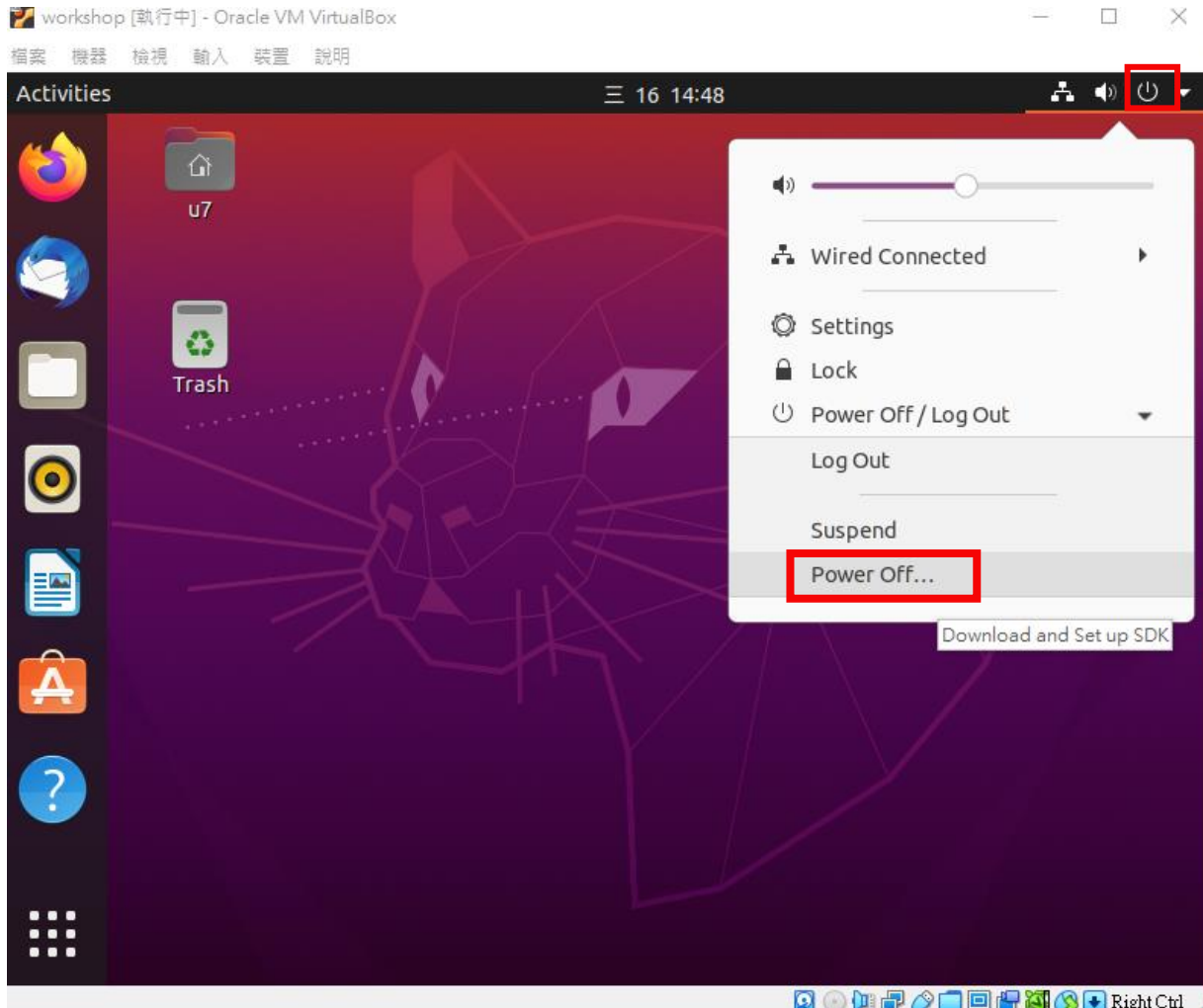


Download and Setup SDK



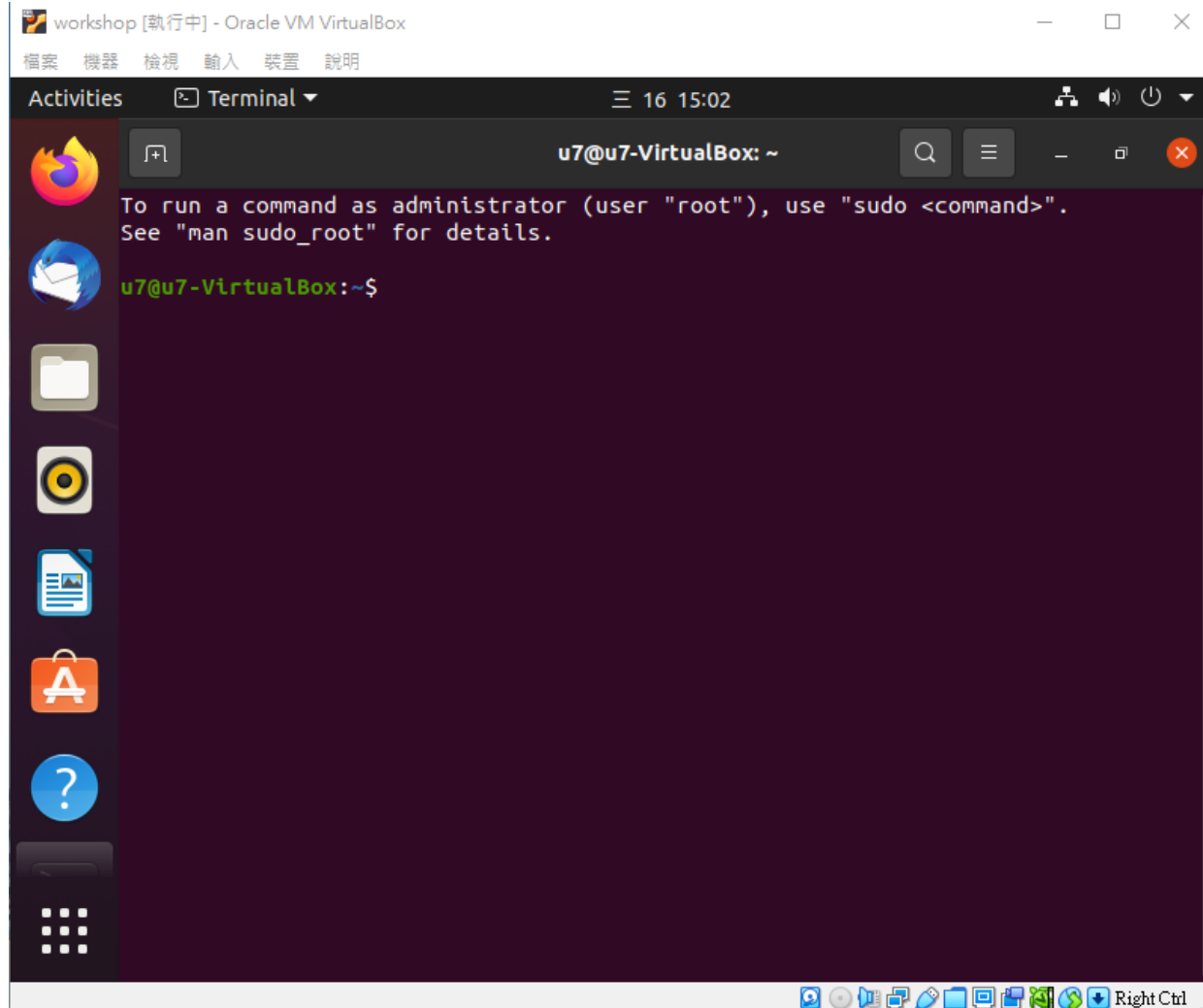
Download and Setup SDK

Restart 



Download and Setup SDK

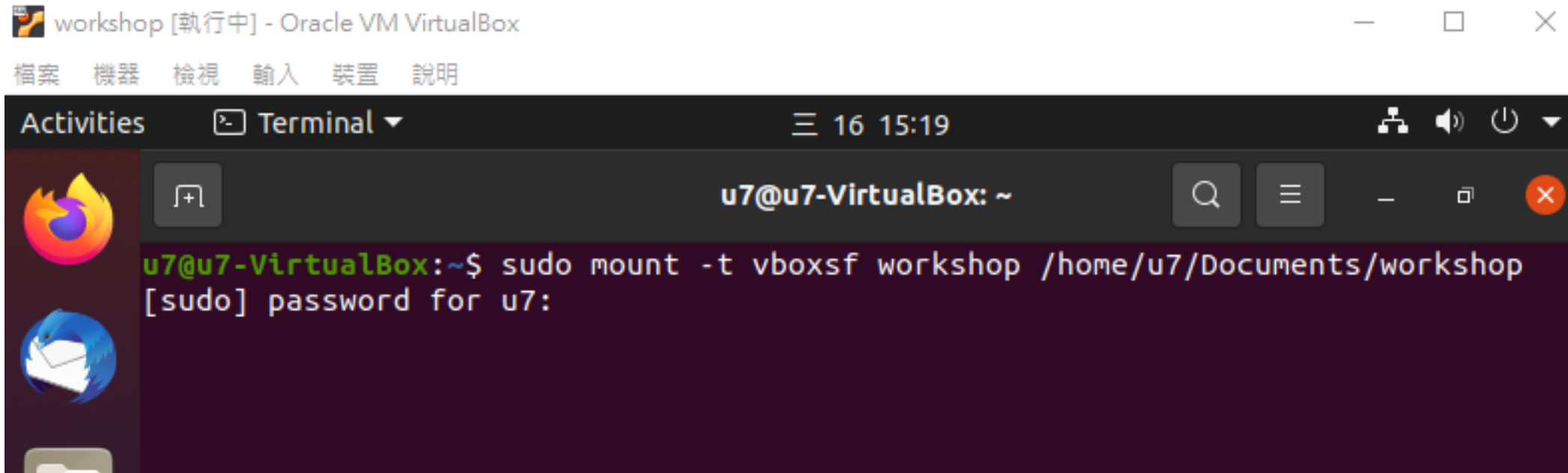
Open Ubuntu terminal: Ctrl+Alt+t



Download and Setup SDK

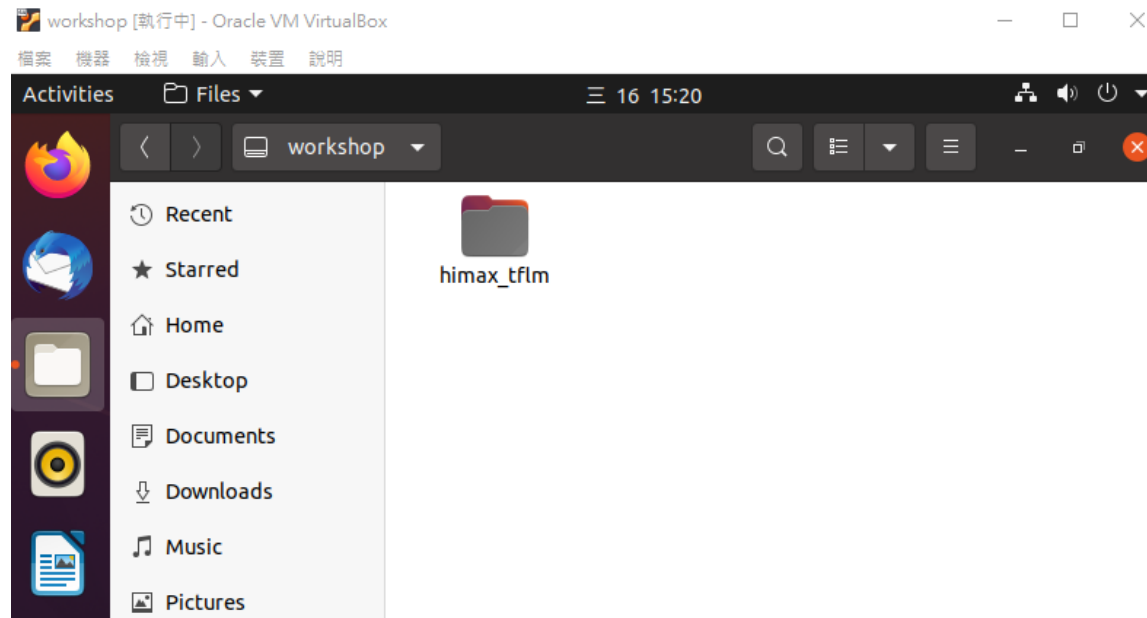
```
$ sudo mount -t vboxsf workshop /home/u7/Documents/workshop
```

password for u7: u1234567



Download and Setup SDK

7. Check workshop file again to confirm whether file is shared.
Step 8 & 9 has already done by workshop.ova file.
If you create Ubuntu by yourself, please do step 8 & 9.
8. (SKIP) Copy “...\\himax_tflm\\Synopsys_WE\\arc_bin” to
“*Home/arc_bin*”
9. (SKIP) Edit /home/.bashrc for setting environment variable, add
“*export PATH=\$PATH:\$HOME/arc_bin*” at the last line





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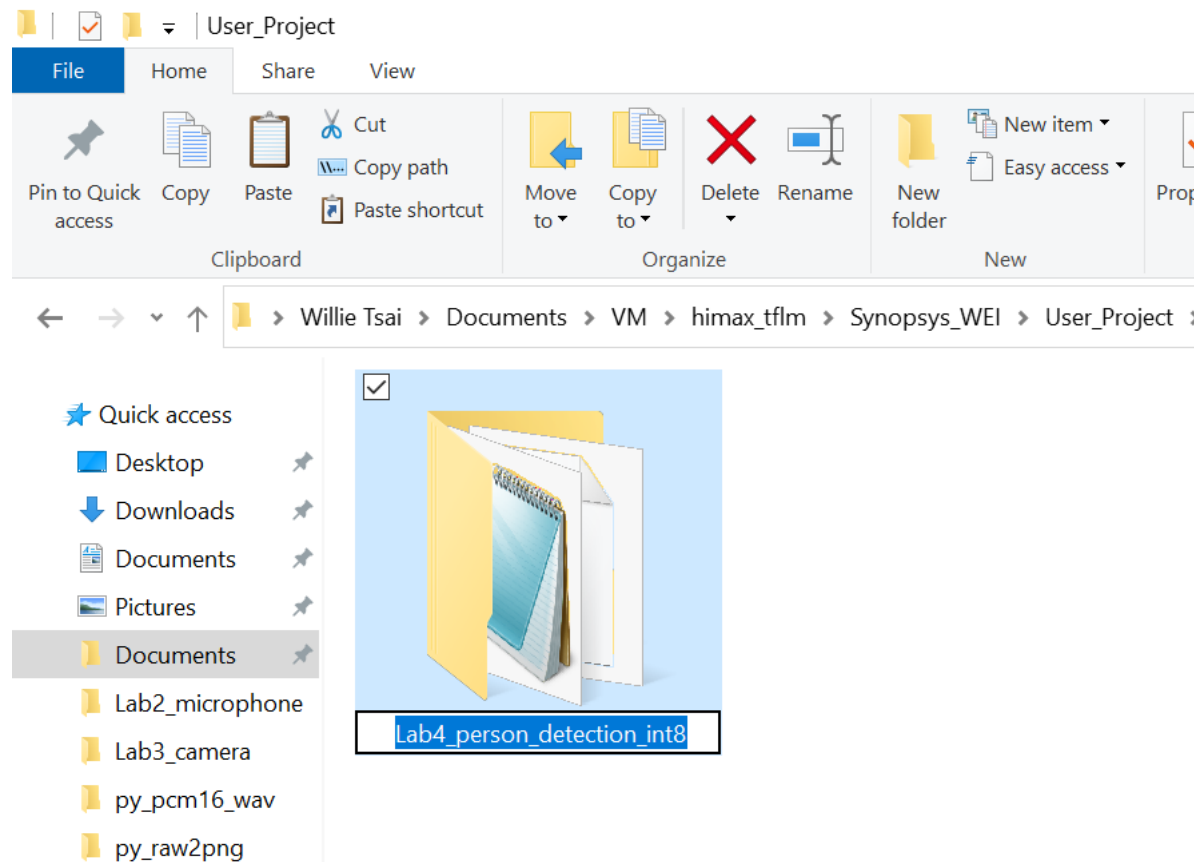
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Program Code & Make Project & Make Flash File



Program Code

1. Copy folder “*Synopsys_WEI/Example Project/Lab4_person_detection_int8*” to folder “*Synopsys_WEI/User Project/*”
2. Rename the folder “*Lab4_person_detection_int8*” to “*Flow_Test*”



Program Code

3. Go into folder “*Flow_Test*” you will see folder “src” and “inc”
“src” folder: always keep your .c and .cc file in here.
“inc” folder: always keep your .h file in here.
(c file: c language)
(cc file: c++ language)

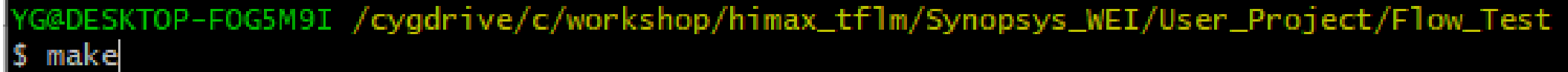
Make Project (By cygwin64)

4. Go to your project path in cygwin64 terminal

```
$ cd C:
```

```
$ cd /workshop/himax_tflm/Synopsys_WEI/User_Project/Flow_Test
```

```
$ make
```



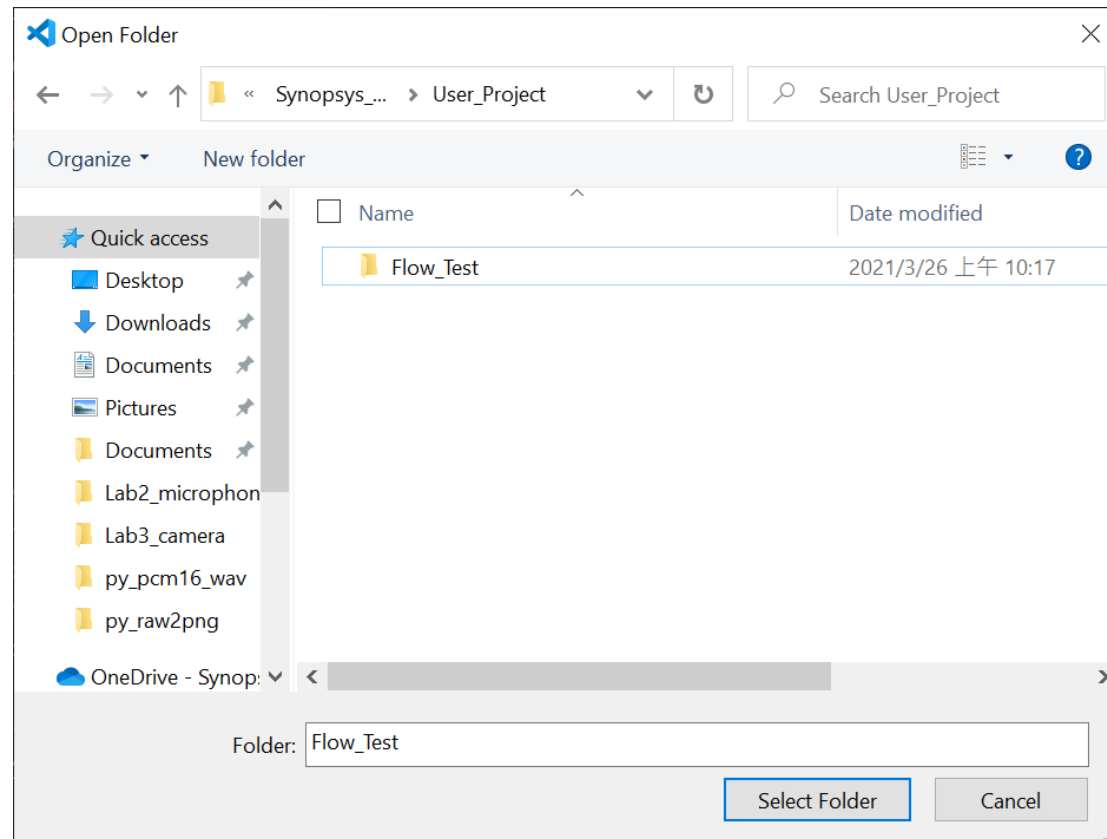
```
YG@DESKTOP-FOG5M9I /cygdrive/c/workshop/himax_tflm/Synopsys_WEI/User_Project/Flow_Test  
$ make|
```

Make Project (Visual Studio Code)

4. You can also use Visual Studio Code to make project.

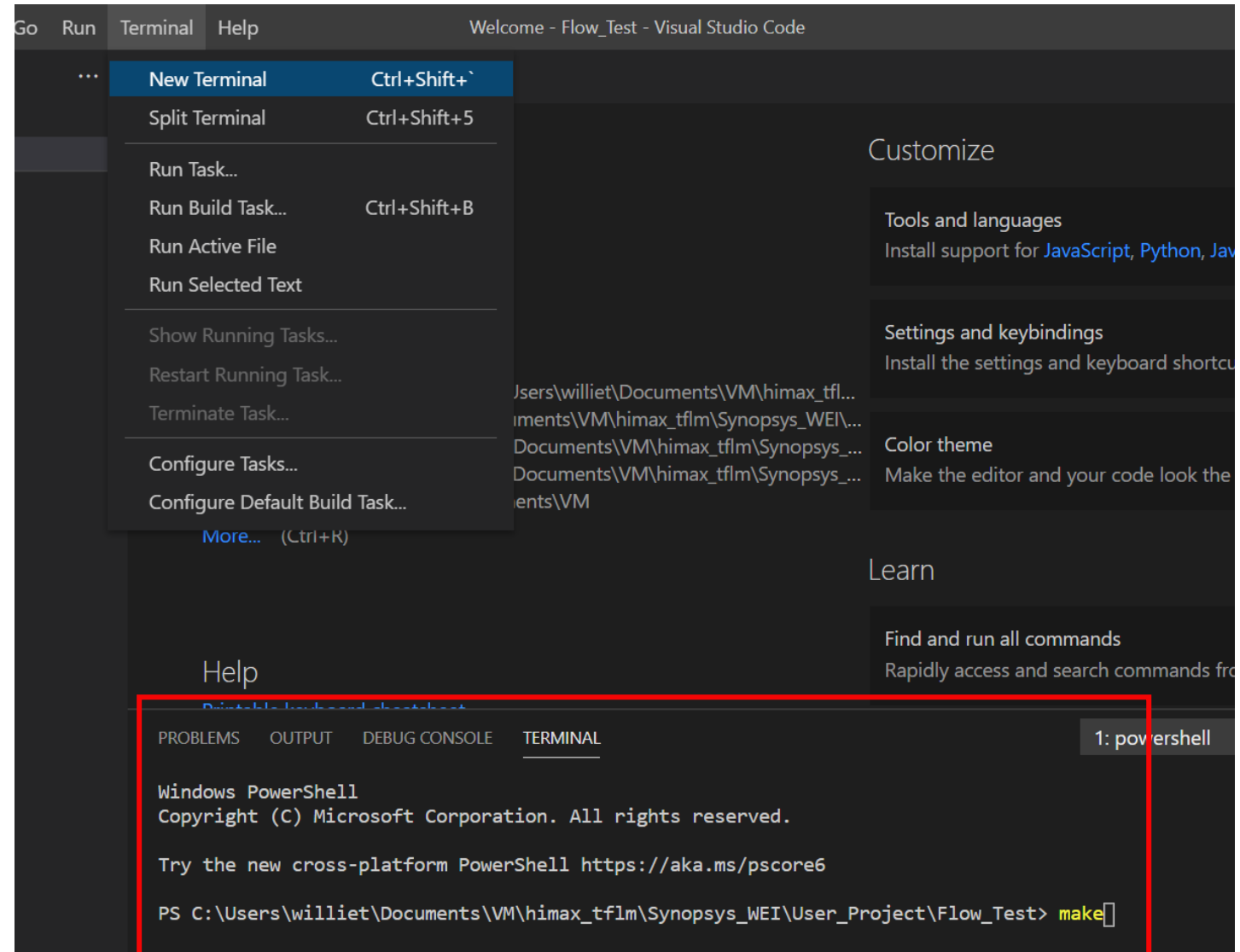
Open Folder and Select Folder:

/workshop/himax_tflm/Synopsys_WEI/User_Project/Flow_Tes



Make Project (Visual Studio Code)

Terminal > New Terminal
You will see terminal block.
Type command:
`$ make`

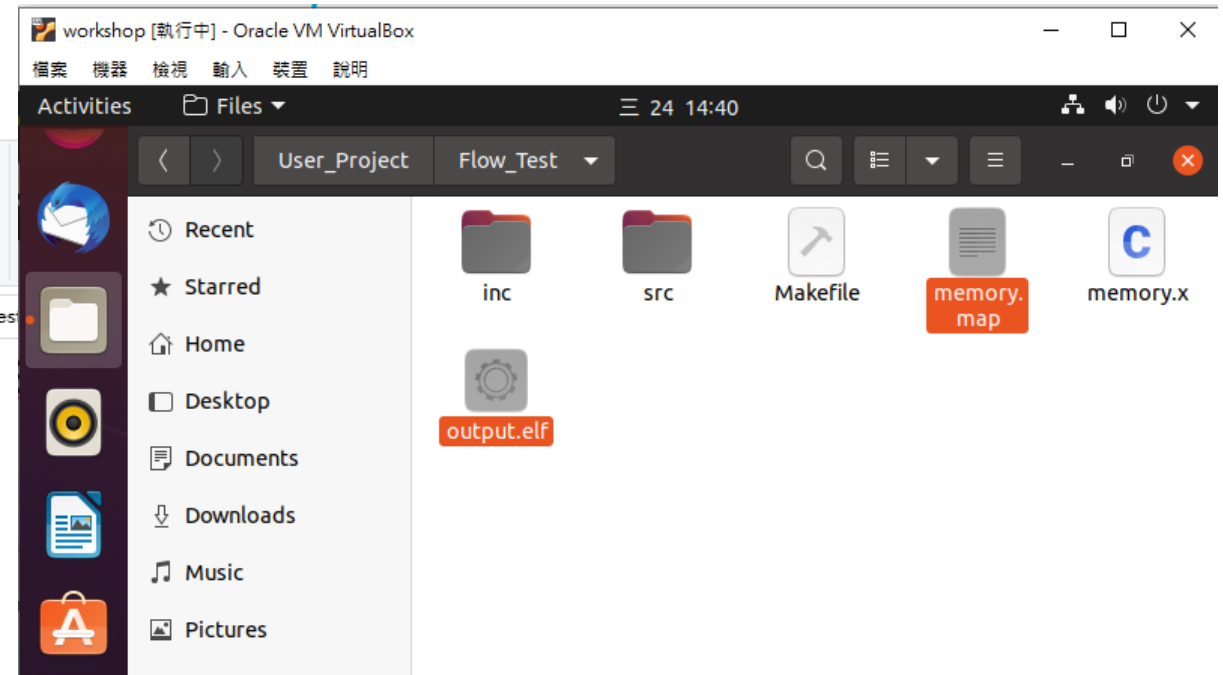
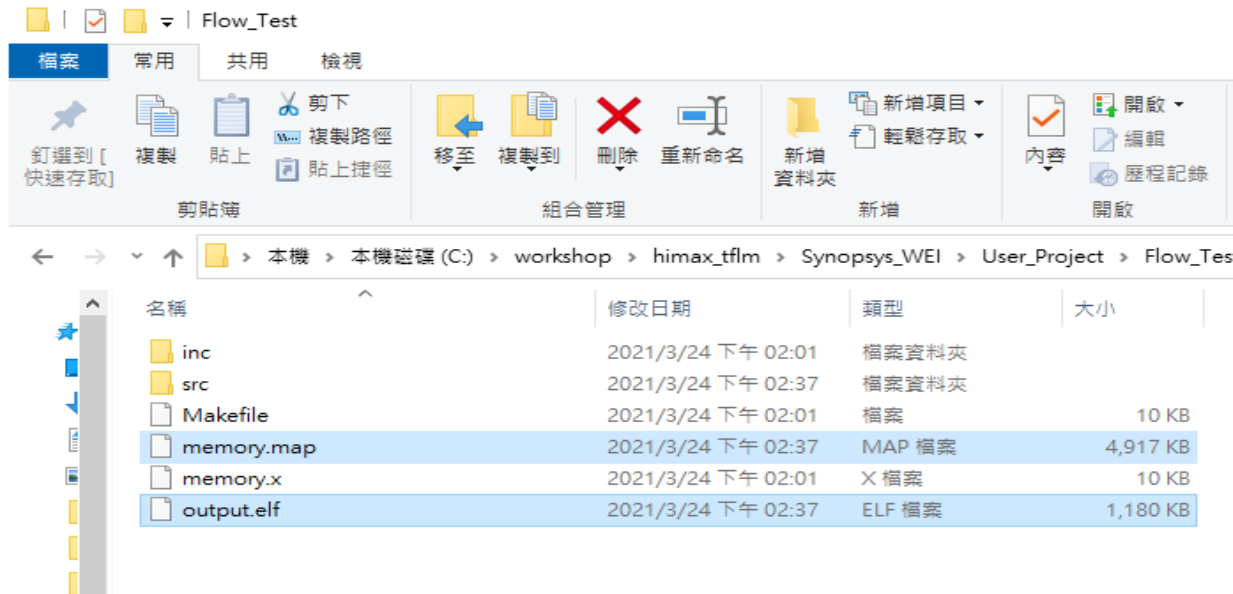


Make Project

5. Check your folder whether contains .elf and .map files.

GNU: output.elf & memory.map

MetaWare: output.elf & output.map

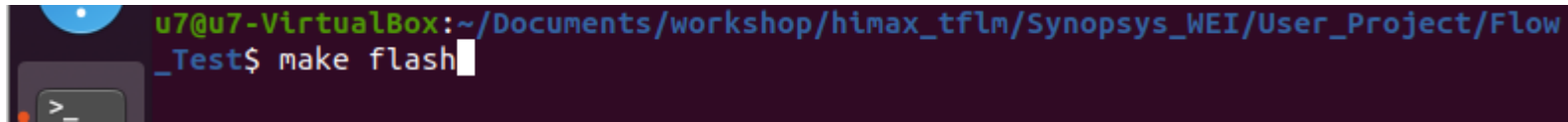


Make Flash File

6. Open terminal in VM, and go to the same path:

“Documents/workshop/himax_tflm/Synopsys_WEI/User_Project/Flow_Test”

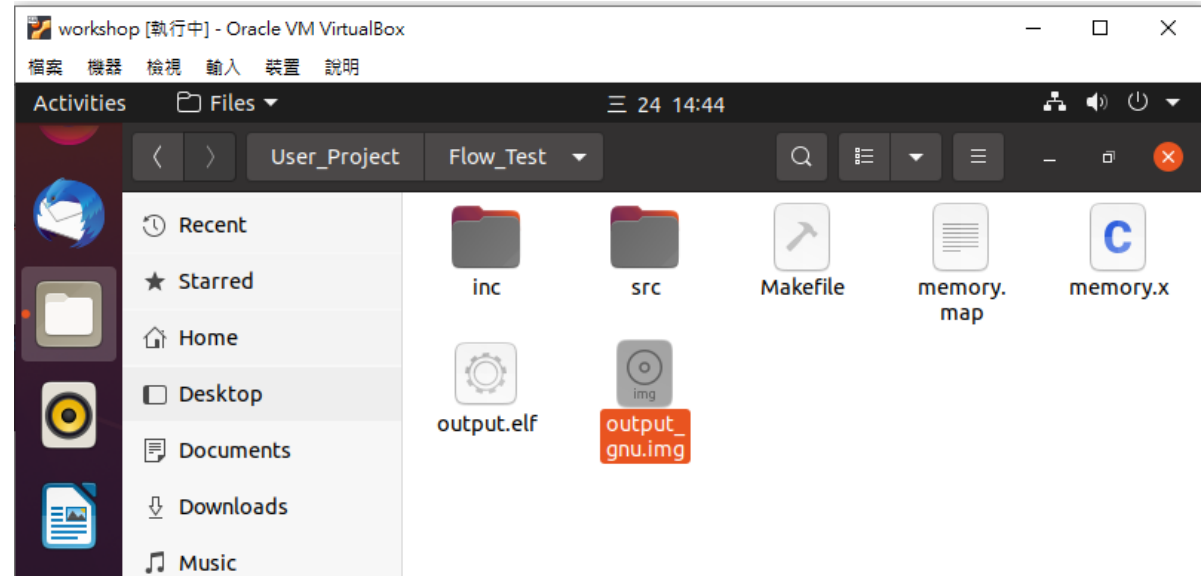
\$ make flash



7. Check your img file in directory, it will be downloaded to WE-I.

GNU: output_gnu.img

MetaWare: output_mwdt.img



Make Project and Flash File

There are some commands can be used,

\$ **make** : compile and link your project, then create .elf and .map file

\$ **make flash** : combine .elf and .map file to .img file

\$ **make clean** : remove all .o file of this project

\$ **make clean_all** : remove all .o file of this project and third party

You can add a command for changing toolchain

(default toolchain is gnu, define in makefile)

“ARC_TOOLCHAIN=mwdt”: compile with MetaWare

“ARC_TOOLCHAIN=gnu”: compile with ARC GNU Toolchain

Please use \$ **make clean_all** before you change toolchain.



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Update and Run Application On WE-I

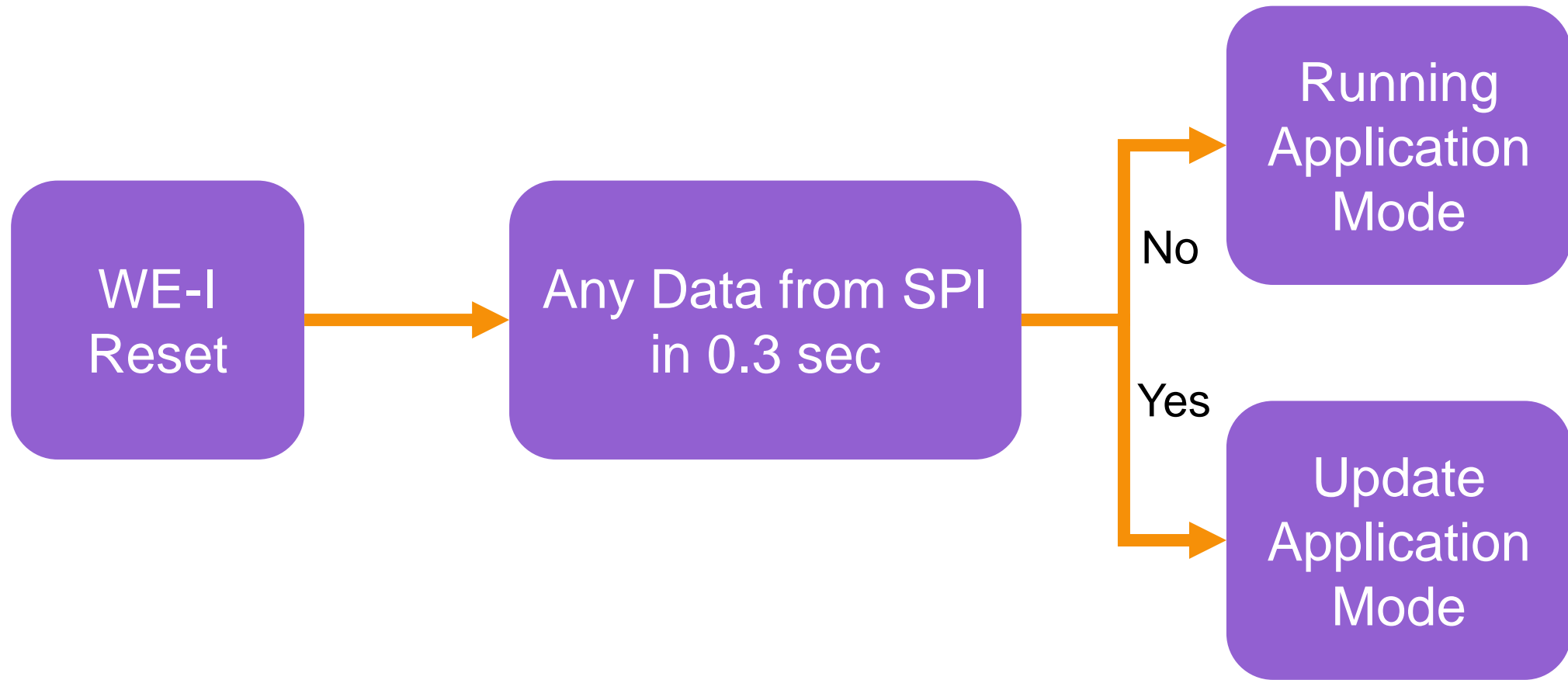


Project Development Flow

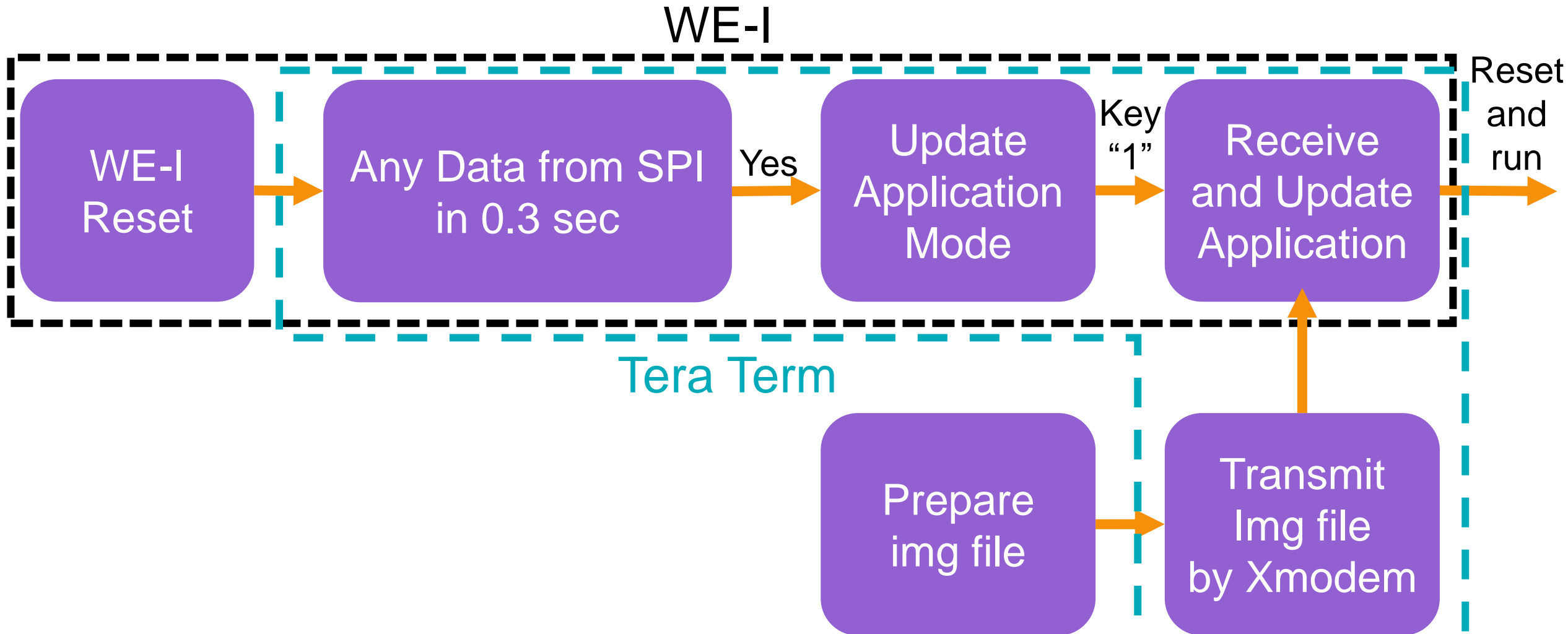


Stage	TensorFlow Model Development	Firmware Development	Run / Update Application On WE-I
Tool	Anaconda Cygwin	Cygwin Metaware or ARC GNU VirtualBox (Ubuntu 20.04)	Tera Term USB Micro
Language	Python 3	C language C++ language	

Run / Update Application On WE-I



Update Application On WE-I



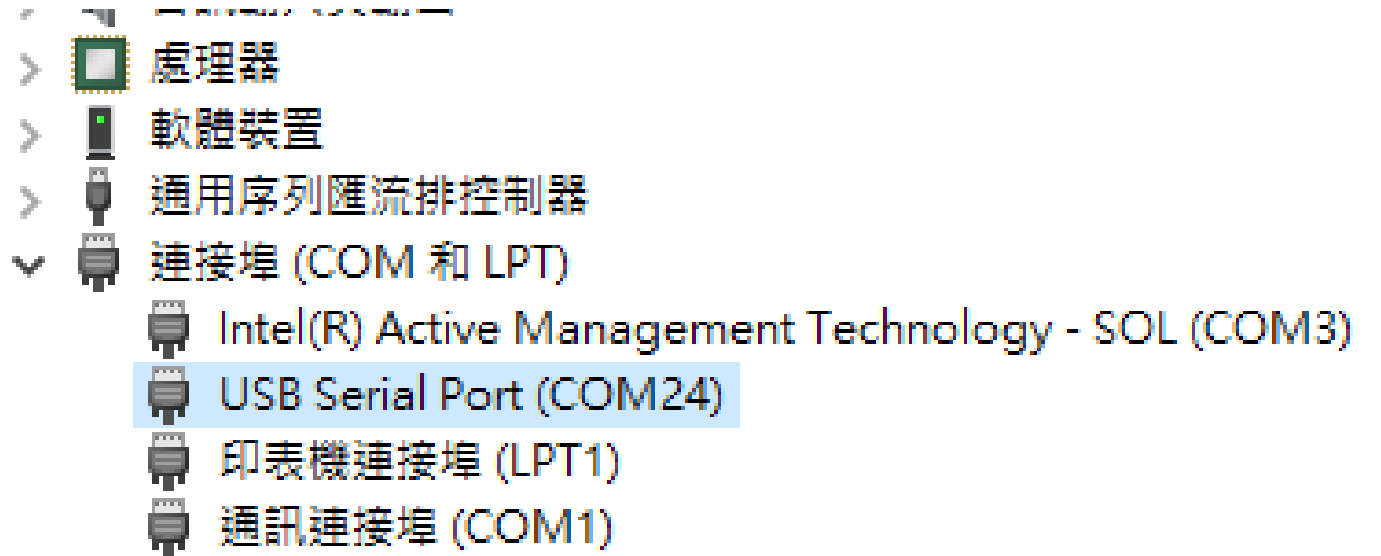
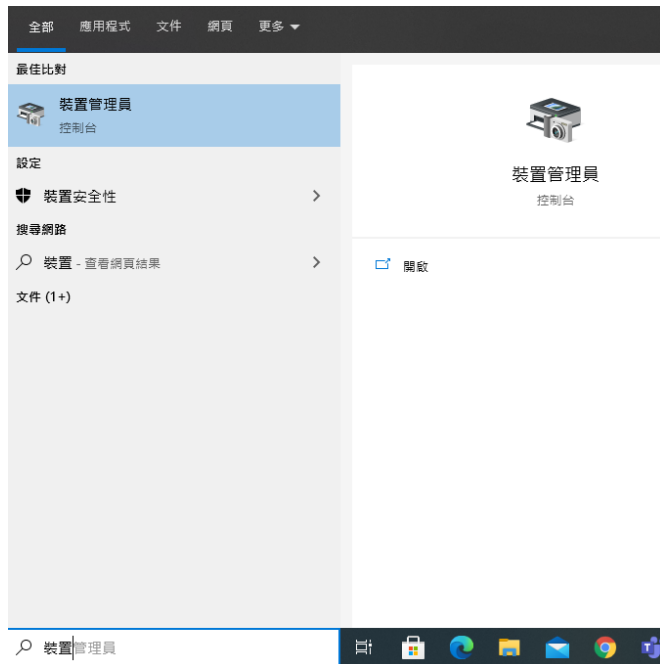
Update Application On WE-I

Connect WE-I with Tera Term

1. Connect WE-I and PC by USB Cable
2. Check your WE-I usb port number

裝置管理員 > 連接埠 (COM & LPT) > USB Serial Port (COM~~x~~)

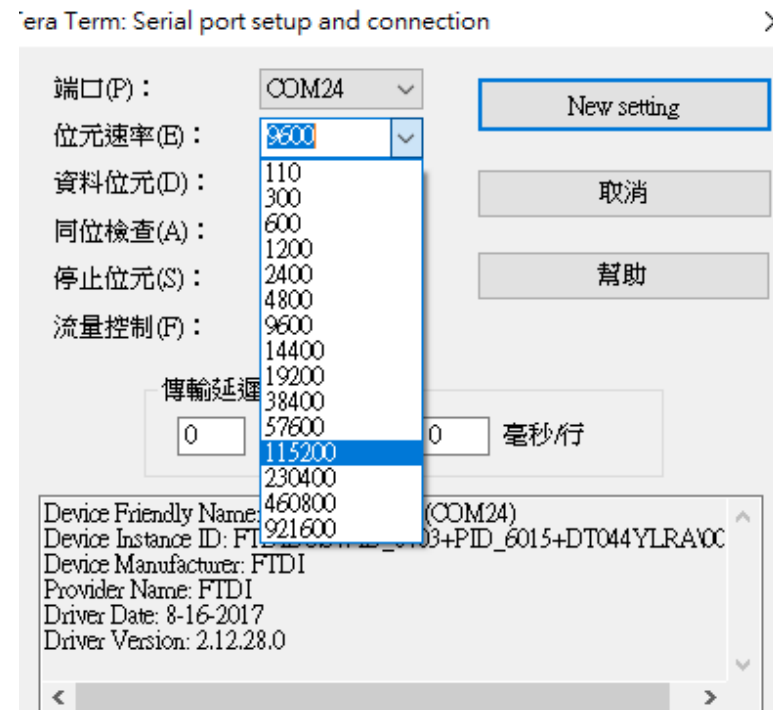
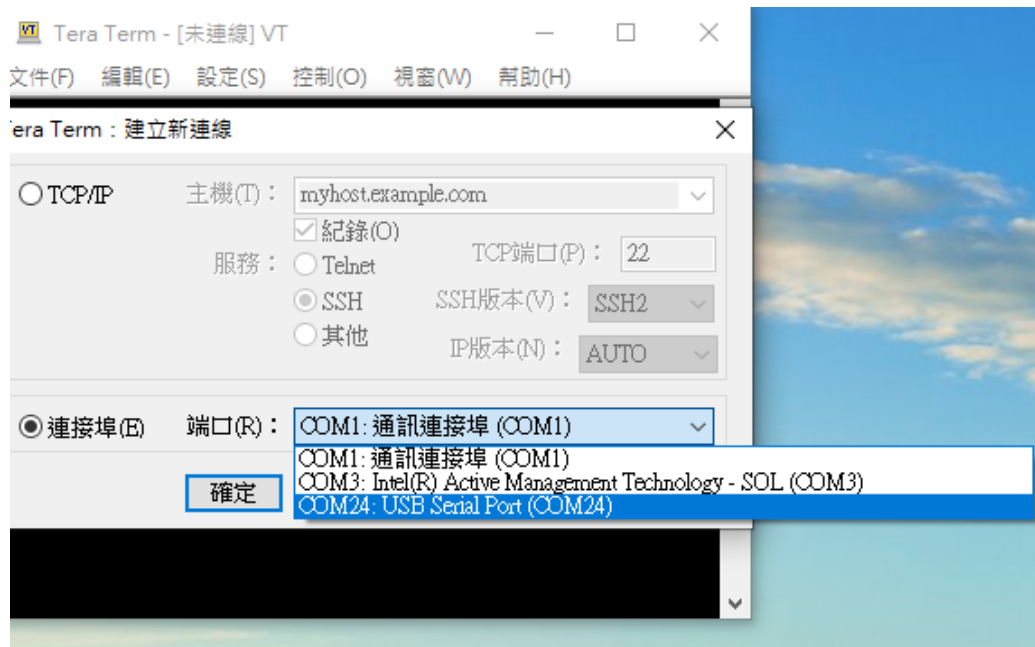
~~x~~: This is your WE-I usb port number



Update Application On WE-I

Connect WE-I with Tera Term

3. Open tera term and select “COMx: USB Serial Port (COMx)”
4. Tera term Setting > Com Port > Change Baud to 115200, and keep other setting.



Update Application On WE-I

Connect WE-I with Tera Term

5. Reset WE-I by pushing SW2, you will see startup information on tera term.



```
-----  
Himax WEI Boot loader  
-----  
  
enbARC Build Time: Jan  4 2021, 13:44:14  
Compiler Version: MetaWare, 4.2.1 Compatible Clang 8.0.1  
Boot loader Version : 1.4.4 (Date:Jan  4 2021)  
chip version : 0x8535a1  
cpu speed : 400000000 hz  
spi speed : 50000000 hz  
wake up evt:4  
...secure lib version = 352380df9a347b1187d2361bfcd4455178a1ebcb  
1st APPLICATION addr[31]=21000 (main-1966)  
Bootloader Done !!!!!  
jump to app FW : 0x10000004  
12 bytes lost due to alignment. To avoid this loss, please make sure the t  
HM0360 RevB,C,D Config  
person score:-2 no person score 2  
person score:-6 no person score 6
```


Enable Update Application Mode with Tera Term

1. Finish to connect WE-I with Tera Term
2. Click on any display area
3. Keep to press key “1” on the keyboard, and press reset button
4. WE-I will start to receive img file by Xmodem

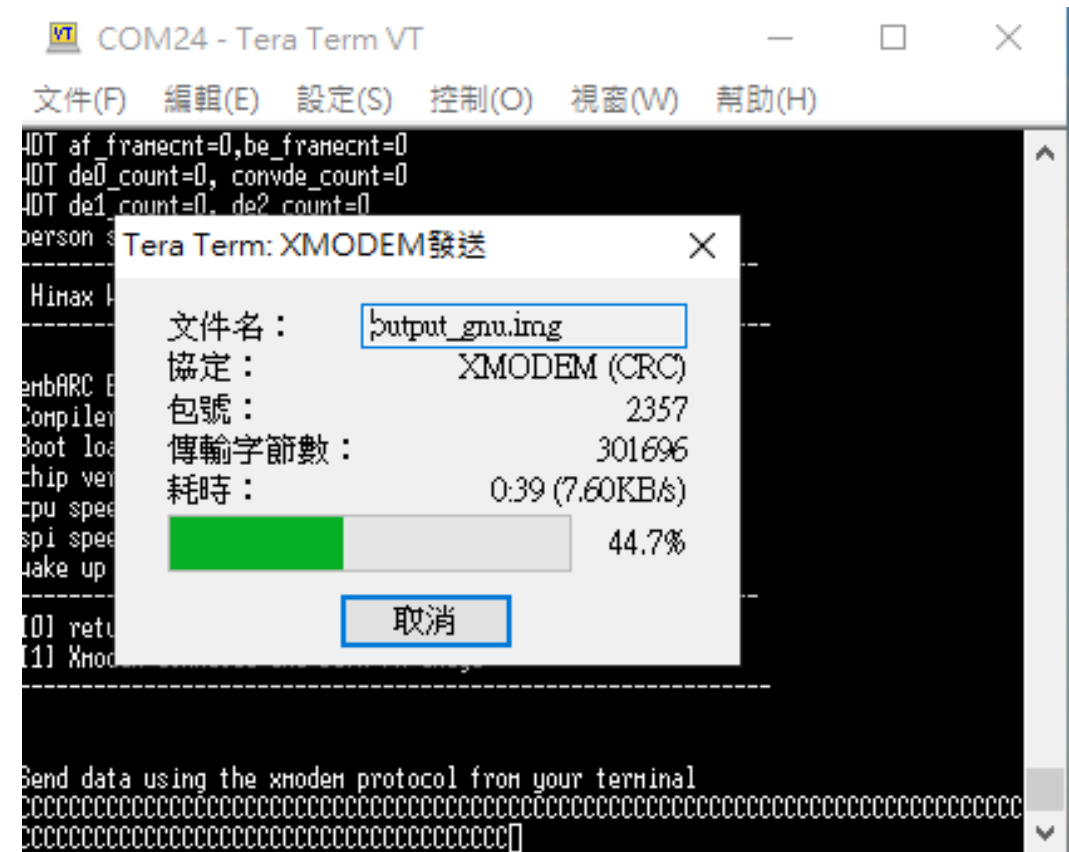
```
COM24 - Tera Term VT
文件(F) 編輯(E) 設定(S) 控制(O) 視窗(W) 幫助(H)
EDM HDT Timeout
HDT af_framecnt=0, be_framecnt=0
HDT de0_count=0, convde_count=0
HDT de1_count=0, de2_count=0
person score:106 no person score -106
-----
Himax HEI Boot loader
-----
embARC Build Time: Jan  4 2021, 13:44:14
Compiler Version: MetaWare, 4.2.1 Compatible Clang 8.0.1
Boot loader Version : 1.4.4 (Date:Jan  4 2021)
chip version : 0x8535a1
cpu speed : 400000000 hz
spi speed : 50000000 hz
wake up evt:4
-----
[0] return to bootup
[1] Xmodem download and burn FW image
-----
Send data using the xmodem protocol from your terminal
cccccccccccccccccccccccccccccccccccccccccccc
```

Update Application On WE-I

Enable Update Application Mode with Tera Term

5. Tera term File > Transmit > XMODEM > Transmit > select img file

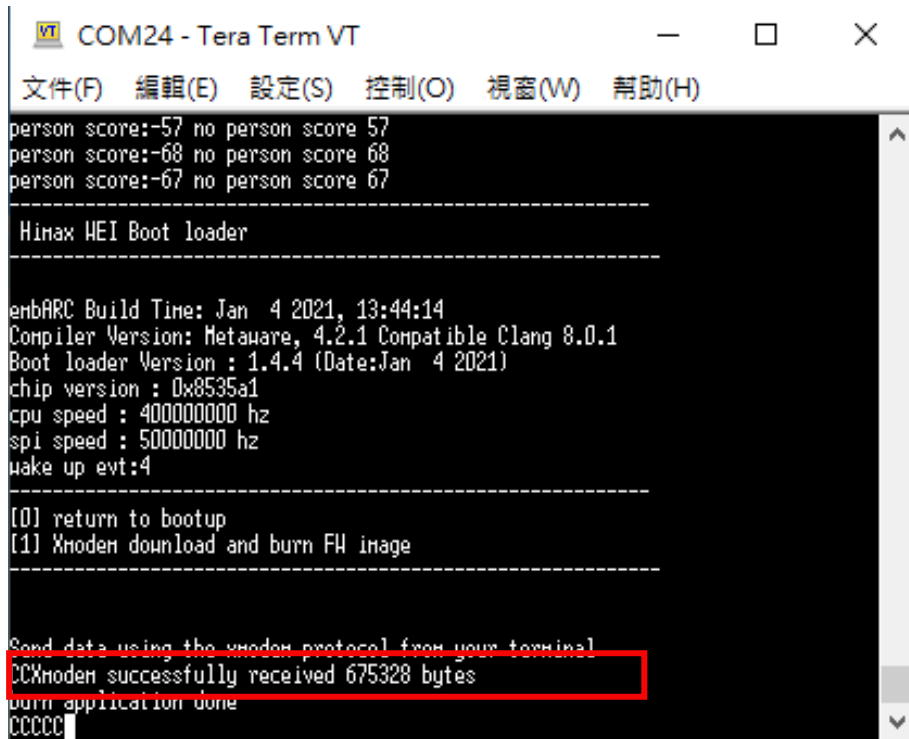
6. Wait for Transmit



Update Application On WE-I

Enable Update Application Mode with Tera Term

7. Terminal will show “Xmodem successfully received xxx bytes” after transmission
8. Press reset button to run your application



```
COM24 - Tera Term VT
文件(F) 編輯(E) 設定(S) 控制(O) 視窗(W) 幫助(H)
person score:-57 no person score 57
person score:-68 no person score 68
person score:-67 no person score 67
-----
Hinax WEI Boot loader
-----
enbARC Build Time: Jan  4 2021, 13:44:14
Compiler Version: MetaWare, 4.2.1 Compatible Clang 8.0.1
Boot loader Version : 1.4.4 (Date:Jan  4 2021)
chip version : 0x8535a1
cpu speed : 400000000 hz
spi speed : 50000000 hz
wake up evt:4
-----
[0] return to bootup
[1] Xmodem download and burn FH image
-----
Send data using the xmodem protocol from your terminal
Xmodem successfully received 675328 bytes
burn application done
CCCCC
```

Run Application On WE-I

1. Connect USB cable to power up WE-I
you can also power up by 2.54 pitch connector
2. For debug easily, suggest to use Tera Term and print date or result
3. Start to develop your project, and debug your code