

## 퀘스트 2/7 - Yocto 환경 구축 및 STM32MP157C-DK2 보드 실행

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## Install &amp; Build the OpenSTLinux distribution

@ 아래 링크를 통해 OpenSTLinux distribution 를 받음

<https://make.e4ds.com/make/dist/layers.tar.gz>

@ \Distribution-Package\openstlinux-20-02-19 에 복사 후 압축해제

\$ tar xvf layers.tar.gz

@ 환경변수 설정 후 bitbake 빌드

\$ DISTRO=openstlinux-weston MACHINE=stm32mp1 source layers/meta-st/scripts/envsetup.sh

\$ bitbake st-image-weston

% 약 6시간 40분 정도 소요되었음

% 저장공간 용량 부족으로 저장공간 확보 후 다시 빌드 진행. 여유공간 25GByte 정도 필요

% 빌드시 Warning이 발생하였으나 재빌드시 성공함

```

user@ubuntu: ~/stm32mp1/Distribution-Package/openstlinux-20-02-19/build-openstlinuxweston-stm32mp1
File Edit View Search Terminal Help

You can now run 'bitbake <image>'
user@ubuntu:~/stm32mp1/Distribution-Package/openstlinux-20-02-19/build-openstlinux-20-02-19/build-openstlinuxweston-stm32mp1$ bitbake st-image-weston
NOTE: Started PRServer with DBfile: /home/user/stm32mp1/Distribution-Package/openstlinux-20-02-19/build-openstlinuxweston-stm32mp1/prserv.sqlite3, IP: 127.0.0.1, PORT: 34671, PID: 2457
Parsing recipes: 100% |#####|
Parsing of 2524 .bb files complete (0 cached, 2524 parsed). 3569 targets, 84 skipped, 0 masked, 0 errors.
NOTE: Resolving any missing task queue dependencies

Build Configuration:
BB_VERSION           = "1.40.0"
BUILD_SYS            = "x86_64-linux"
NATIVELSBSTRING      = "ubuntu-18.04"
TARGET_SYS           = "arm-ostl-linux-gnueabi"
MACHINE              = "stm32mp1"
DISTRO               = "openstlinux-weston"
DISTRO_VERSION        = "2.6-snapshot-20200428"
TUNE_FEATURES        = "arm armv7ve vfp thumb neon vfpv4 callconvention-hard cortexa7"
TARGET_FPU           = "hard"
DISTRO_CODENAME       = "thud"
ACCEPT_EULA_stm32mp1 = "0"
GCCVERSION           = "8.%"
PREFERRED_PROVIDER_virtual/kernel = "linux-stm32mp"
meta-python
meta-oe
meta-oe
meta-gnome
meta-xfce
meta-initramfs
meta-multimedia
meta-networking
meta-webserver
meta-fileystems
meta-perl
meta-python
meta-st-stm32mp
meta-qt5
meta-st-openstlinux
meta
= "<unknown>:<unknown>"

NOTE: Fetching uninative binary shim from http://downloads.yoctoproject.org/releases/uninative/2.7/x86_64-nativesdk-lib
6sum=9498d8bba047499999a7310ac2576d0796461184965351a56f6d32c888a1f216
Initialising tasks: 100% |#####|
Sstate summary: Wanted 3052 Found 0 Missed 3052 Current 0 (0% match, 0% complete)
NOTE: Executing SetScene Tasks
NOTE: Executing RunQueue Tasks
Currently 2 running tasks (210 of 8266) 2% |##
0: binutils-cross-arm-2.31.1-r0 do_fetch (pid 14332) 37% |#####|
1: gmp-native-6.1.2-r0 do_compile - 20s (pid 43437)

```

```

user@ubuntu: ~/stm32mp1/Distribution-Package/openstlinux-20-02-19/build-openstlinuxweston-stm32mp1
File Edit View Search Terminal Help
st-example-image-qt - ST example of image based on Qt framework (require 'openstlinux-eglfs' dist
st-example-image-x11 - ST example of image based on X11 (require 'openstlinux-x11' dist
st-example-image-xfce - ST example of image based on XFCE framework (require 'openstlinux-x11' dist
and more images are available on meta-st-openstlinux/recipes-samples/images.

You can now run 'bitbake <image>'

user@ubuntu:~/stm32mp1/Distribution-Package/openstlinux-20-02-19/build-openstlinuxweston-stm32mp1$ bitbake st-i
NOTE: Started PRServer with DBfile: /home/user/stm32mp1/Distribution-Package/openstlinux-20-02-19/build-openstl
che/prserv.sqlite3, IP: 127.0.0.1, PORT: 40073, PID: 2877
Loading cache: 100% |#####| Time: 0:00:05
Loaded 3569 entries from dependency cache.
NOTE: Resolving any missing task queue dependencies

Build Configuration:
BB_VERSION = "1.40.0"
BUILD_SYS = "x86_64-linux"
NATIVELSBSTRING = "universal"
TARGET_SYS = "arm-ostl-linux-gnueabi"
MACHINE = "stm32mp1"
Distro = "openstlinux-weston"
Distro_VERSION = "2.6-snapshot-20200429"
TUNE_FEATURES = "arm armv7ve vfp thumb neon vfpv4 callconvention-hard cortexa7"
TARGET_FPU = "hard"
Distro_CODENAME = "thud"
ACCEPT_EULA_stm32mp1 = "0"
GCCVERSION = "8.%"
PREFERRED_PROVIDER_virtual/kernel = "linux-stm32mp"
meta-python
meta-oe
meta-oe
meta-gnome
meta-xfce
meta-initramfs
meta-multimedia
meta-networking
meta-webserver
meta-fileSystems
meta-perl
meta-python
meta-st-stm32mp
meta-qt5
meta-st-openstlinux
meta = "<unknown>:<unknown>"

Initialising tasks: 100% |#####|
Sstate summary: Wanted 741 Found 740 Missed 1 Current 2311 (99% match, 99% complete)
NOTE: Executing SetScene Tasks
NOTE: Executing RunQueue Tasks
NOTE: Tasks Summary: Attempted 8266 tasks of which 7947 didn't need to be rerun and all succeeded.
NOTE: Writing buildhistory
user@ubuntu:~/stm32mp1/Distribution-Package/openstlinux-20-02-19/build-openstlinuxweston-stm32mp1$

```

@ 너무 오래 걸려서 기다리는 동안 Touch Panel에 보호필름을 붙여줌



## Flashing the built Image

@ STM32CubeProgrammer 설치 전 필요한 Packages 설치 및 설정

```
$ sudo apt-get install openjdk-8-jre-headless
```

```
$ sudo update-alternatives --config java
```

☒ Select the java-8-openjdk configuration

```
user@ubuntu: ~
File Edit View Search Terminal Help
user@ubuntu:~$ sudo apt-get install openjdk-8-jre-headless
[sudo] password for user:
Reading package lists... Done
Building dependency tree
Reading state information... Done
openjdk-8-jre-headless is already the newest version (8u252-b09-1~18.04).
openjdk-8-jre-headless set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 8 not upgraded.
user@ubuntu:~$ sudo update-alternatives --config java
There are 2 choices for the alternative java (providing /usr/bin/java).

  Selection    Path                                          Priority  Status
  -----
* 0
ode           /usr/lib/jvm/java-11-openjdk-amd64/bin/java  1111    auto m
  1
mode         /usr/lib/jvm/java-11-openjdk-amd64/bin/java  1111    manual
  2
mode         /usr/lib/jvm/java-8-openjdk-amd64/jre/bin/java 1081    manual

Press <enter> to keep the current choice[*], or type selection number: 2
update-alternatives: using /usr/lib/jvm/java-8-openjdk-amd64/jre/bin/java to provide /usr/bin/java (java) in manual mode
user@ubuntu:~$ sudo apt purge openjfx
```

```
$ sudo apt purge openjfx
```

```
$ sudo apt install openjfx=8u161-b12-1ubuntu2 libopenjfx-jni=8u161-b12-1ubuntu2 libopenjfx-java=8u161-b12-1ubuntu2
```

```
$ sudo apt-mark hold openjfx libopenjfx-jni libopenjfx-java
```

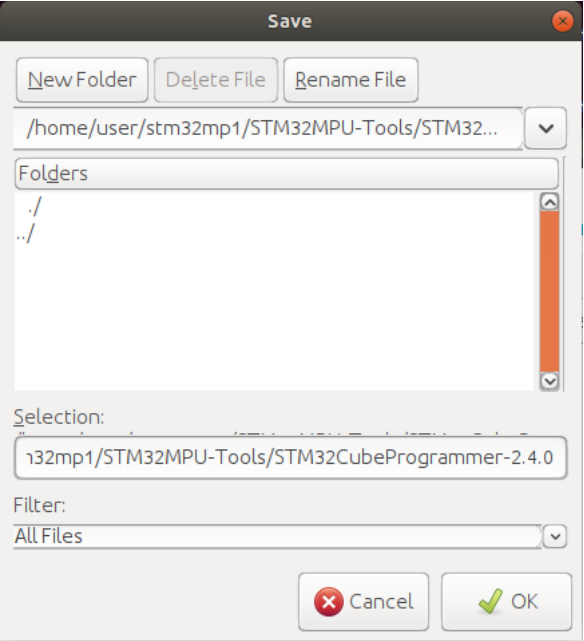
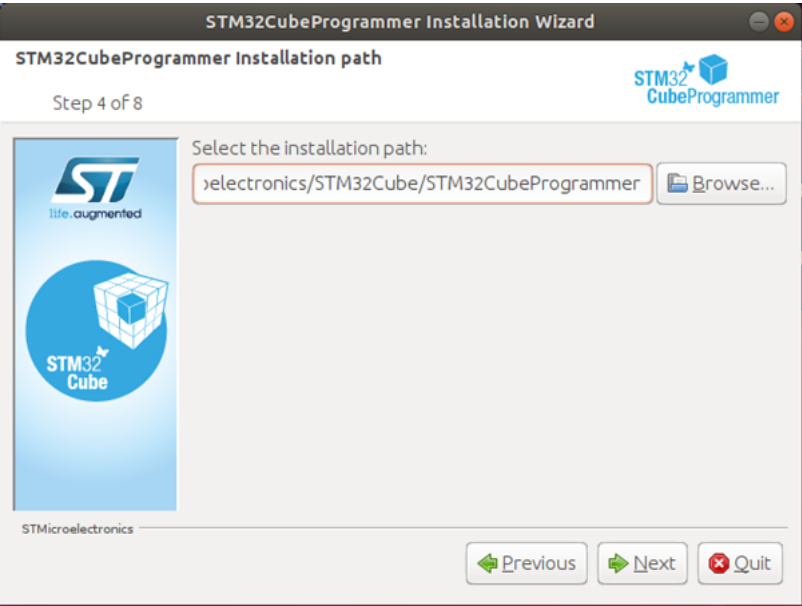
@ STM32CubeProgrammer 압축해제

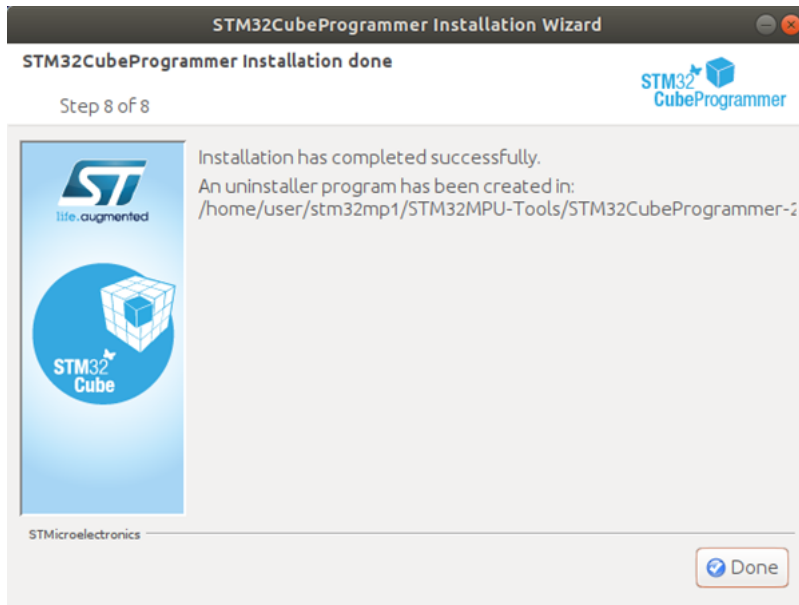
```
$ unzip en.stm32cubeprog_v2-4-0.zip -d stm32cubeprog_v2-4-0
```

@ STM32CubeProgrammer 설치

```
$ cd stm32cubeprog_v2-4-0
```

```
$ ./SetupSTM32CubeProgrammer-2.4.0.linux
```





@ STM32\_Programmer\_CLI의 PATH 추가

```
$ export PATH=$HOME/stm32mp1/STM32MPU-Tools/STM32CubeProgrammer-2.4.0/bin:$PATH
```

@ STM32\_Programmer\_CLI 설치 확인

```
user@ubuntu:~/stm32mp1/download/stm32cubeprog_v2-4-0$ export PATH=$HOME/stm32mp1/STM32MPU-Tools/STM32CubeProgrammer-2.4.0/bin:$PATH
user@ubuntu:~/stm32mp1/download/stm32cubeprog_v2-4-0$ STM32_Programmer_CLI --h
-----
STM32CubeProgrammer v2.4.0
-----
user@ubuntu:~/stm32mp1/download/stm32cubeprog_v2-4-0$
```

@ USB Driver 설치

```
$ sudo apt install libusb-1.0-0
$ cd /STM32MPU-Tools/STM32CubeProgrammer-2.4.0/Drivers/rules
$ sudo cp *.*/etc/udev/rules.d/
```

@ STM32MP157C-DK2 USB 확인

% 위는 Debug Mode  
% 아래는 DFU Mode

```
user@ubuntu: ~/stm32mp1/Starter-Package/stm32mp1-openstlinux-20-02-19/images/stm32...
File Edit View Search Terminal Help
user@ubuntu:~/stm32mp1/Starter-Package/stm32mp1-openstlinux-20-02-19/images/stm32mp1$ STM32_Programmer_CLI -l usb
-----
STM32CubeProgrammer v2.4.0
-----

===== DFU Interface =====

No STM32 device in DFU mode connected

user@ubuntu:~/stm32mp1/Starter-Package/stm32mp1-openstlinux-20-02-19/images/stm32mp1$ STM32_Programmer_CLI -l usb
-----
STM32CubeProgrammer v2.4.0
-----

===== DFU Interface =====

Total number of available STM32 device in DFU mode: 1

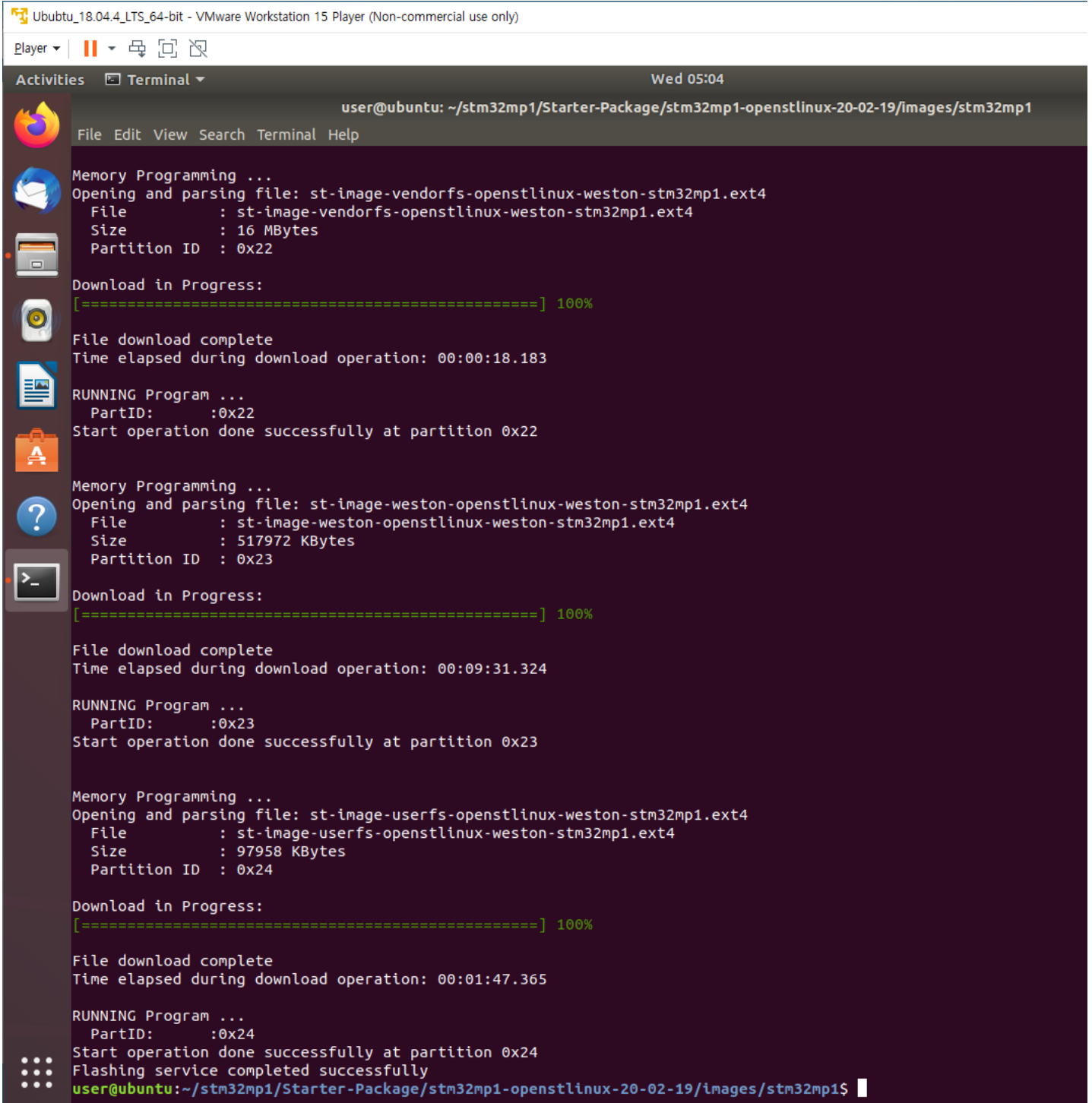
Device Index      : USB1
USB Bus Number    : 001
USB Address Number : 001
Product ID        : DFU in HS Mode @Device ID /0x500, @Revision ID /0x000
Serial number     : 002A00443438510538333630
Firmware version  : 0x0110
Device ID         : 0x0500

user@ubuntu:~/stm32mp1/Starter-Package/stm32mp1-openstlinux-20-02-19/images/stm32mp1$
user@ubuntu:~/stm32mp1/Starter-Package/stm32mp1-openstlinux-20-02-19/images/stm32mp1$
```

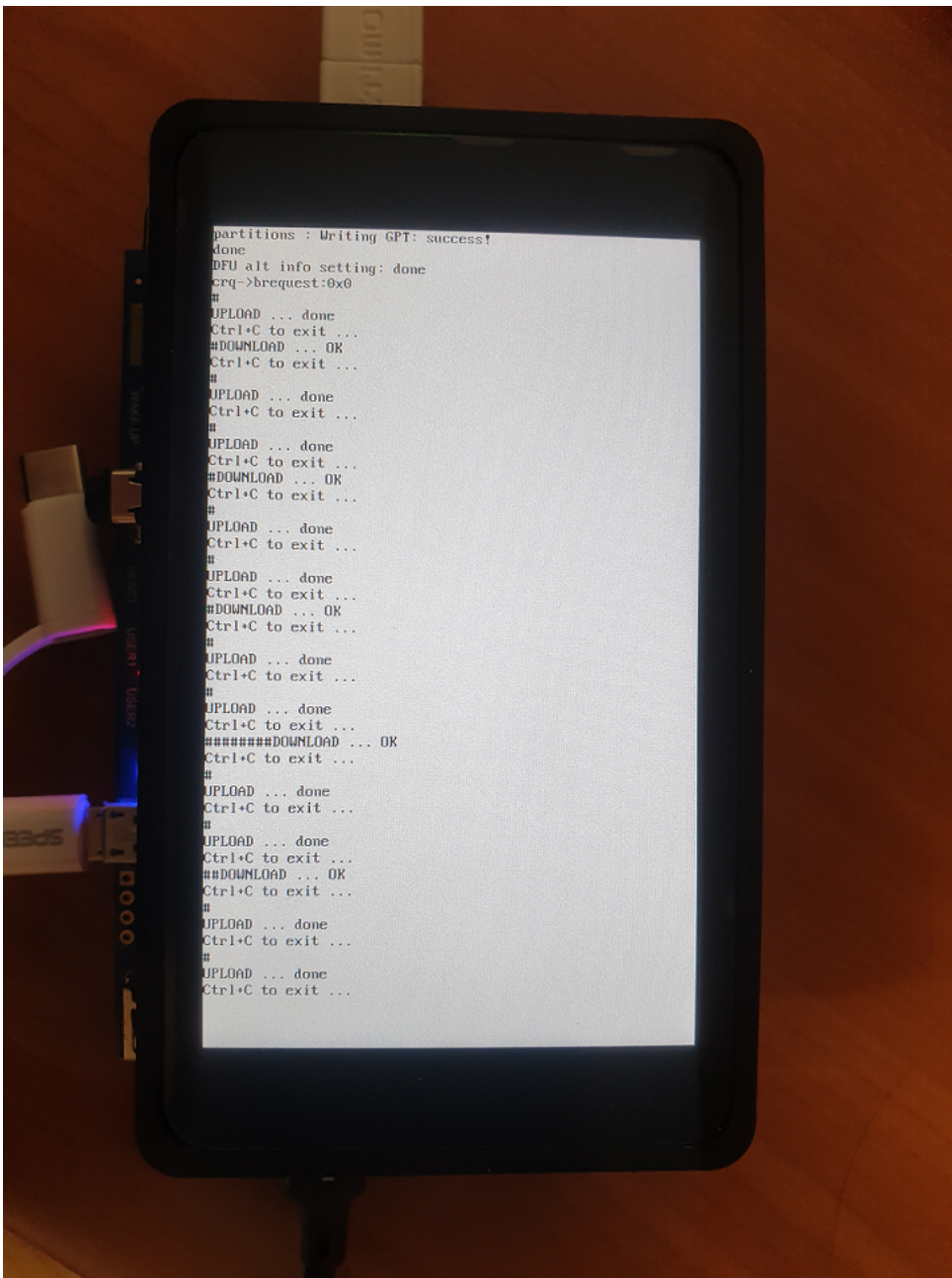
@ STM32\_Programmer\_CLI를 이용한 Flashing

```
$ STM32_Programmer_CLI -c port=usb1 -w flashlayout_st-image-weston/FlashLayout_sdcard_stm32mp157c-dk2-trusted.tsv
```





```
Ubutu_18.04.4_LTS_64-bit - VMware Workstation 15 Player (Non-commercial use only)
Player
Activities Terminal Wed 05:04
user@ubuntu: ~/stm32mp1/Starter-Package/stm32mp1-openstlinux-20-02-19/images/stm32mp1
File Edit View Search Terminal Help
Memory Programming ...
Opening and parsing file: st-image-vendorfs-openstlinux-weston-stm32mp1.ext4
File      : st-image-vendorfs-openstlinux-weston-stm32mp1.ext4
Size      : 16 MBytes
Partition ID : 0x22
Download in Progress:
[=====] 100%
File download complete
Time elapsed during download operation: 00:00:18.183
RUNNING Program ...
PartID:    :0x22
Start operation done successfully at partition 0x22
Memory Programming ...
Opening and parsing file: st-image-weston-openstlinux-weston-stm32mp1.ext4
File      : st-image-weston-openstlinux-weston-stm32mp1.ext4
Size      : 517972 KBytes
Partition ID : 0x23
Download in Progress:
[=====] 100%
File download complete
Time elapsed during download operation: 00:09:31.324
RUNNING Program ...
PartID:    :0x23
Start operation done successfully at partition 0x23
Memory Programming ...
Opening and parsing file: st-image-userfs-openstlinux-weston-stm32mp1.ext4
File      : st-image-userfs-openstlinux-weston-stm32mp1.ext4
Size      : 97958 KBytes
Partition ID : 0x24
Download in Progress:
[=====] 100%
File download complete
Time elapsed during download operation: 00:01:47.365
RUNNING Program ...
PartID:    :0x24
Start operation done successfully at partition 0x24
Flashing service completed successfully
user@ubuntu:~/stm32mp1/Starter-Package/stm32mp1-openstlinux-20-02-19/images/stm32mp1$
```



% 새 이미지 Flashing 전 booting Message

Ubuntu\_18.04.4\_LTS\_64-bit - VMware Workstation 15 Player (Non-commercial use only)

Player ▾ | |

Activities ▾ | Terminal ▾ | Wed 04:49

user@ubuntu: ~

```

File Edit View Search Terminal Help
[ OK ] Started Enable USB Ethernet gadget.
[ 10.092202] Gcnano is present and activated
[ OK ] Started Netdata, Real-time performance monitoring.
[ OK ] Started Weston Wayland Compositor.
[ 14.897956] dwc2 49000000.usb-otg: new device is high-speed
[ 14.951968] dwc2 49000000.usb-otg: new address 4
[ 15.140998] configfs-gadget gadget: high-speed config #1: c
[ 15.145572] IPv6: ADDRCONF(NETDEV_CHANGE): usb0: link becomes ready
Starting Bluetooth service...
[ OK ] Listening on Load/Save RF Kill Switch Status /dev/rfkill Watch.
Starting Save/Restore Sound Card State...
Stopping Network Service...
[ OK ] Created slice system-systemd\x2dbacklight.slice.
Starting Load/Save Screen Backlight state of backlight:5a000000.dsi.0...
[ OK ] Stopped Network Service.
[ OK ] Started Save/Restore Sound Card State.
[ OK ] Started Load/Save Screen Backlight state of backlight:5a000000.dsi.0.
[ OK ] Started Bluetooth service.
Starting Hostname Service...
[ OK ] Reached target Bluetooth.
Starting Load/Save RF Kill Switch Status...
[ OK ] Reached target Sound Card.
Starting Network Service...
[ OK ] Started Load/Save RF Kill Switch Status.
[ OK ] Started Login Service.
[ OK ] Started Network Service.
Starting Wait for Network to be Configured...
Starting Network Name Resolution...
[ OK ] Started Hostname Service.
[ OK ] Started Network Name Resolution.
Starting Avahi mDNS/DNS-SD Stack...
[ OK ] Reached target Host and Network Name Lookups.
[ OK ] Reached target Network.
Starting Permit User Sessions...
[ OK ] Started IIO Daemon.
Starting Target Communication Framework agent...
[ OK ] Started Permit User Sessions.
[ OK ] Started Avahi mDNS/DNS-SD Stack.
[ OK ] Started Target Communication Framework agent.
[ OK ] Started Serial Getty on ttySTM0.
[ OK ] Started Getty on tty1.
[ OK ] Reached target Login Prompts.
[ OK ] Reached target Multi-User System.
Starting Update UTMP about System Runlevel Changes...
[ OK ] Started Update UTMP about System Runlevel Changes.

ST OpenSTLinux - Weston - (A Yocto Project Based Distro) 2.6-openstlinux-19-02-20-github-display-fix stm32mp1 t
stm32mp1 login: root (automatic login)

root@stm32mp1:~#
CTRL-A Z for help | 115200 8N1 | NOR | Minicom 2.7.1 | VT102 | Offline | ttyACM0

```

% 새 이미지 Flashing 이후 Booting Message



```

[ 19.881141] EXT4-fs (mmcblk0p7): resizing filesystem from 97956 to 14709724 blocks
Starting Bluetooth service...
[ OK ] Listening on Load/Save RF Kill Switch Status /dev/rfkill Watch.
Starting Save/Restore Sound Card State...
[ OK ] Reached target Host and Network Name Lookups.
[ OK ] Reached target Network.
Starting Target Communication Framework agent...
Starting Permit User Sessions...
[ OK ] Started IIO Daemon.
Starting Sound Service...
Starting Avahi mDNS/DNS-SD Stack...
[ OK ] Created slice system-systemd\x2dbus.slice.
Starting Load/Save Screen Backlight...
[ OK ] Started Save/Restore Sound Card State.
[ OK ] Started Permit User Sessions.
Starting Load/Save RF Kill Switch Status...
[ OK ] Started Getty on tty1.
[ OK ] Reached target Sound Card.
[ OK ] Started Target Communication Framework agent.
[ OK ] Started Load/Save RF Kill Switch Status.
[ OK ] Started Load/Save Screen Backlight...
[ OK ] Started Bluetooth service.
[ OK ] Started Avahi mDNS/DNS-SD Stack.
Starting Hostname Service...
[ OK ] Reached target Bluetooth.
[ OK ] Started Hostname Service.
[ OK ] Started Sound Service.
[ 30.765397] EXT4-fs (mmcblk0p7): resized to 1703937 blocks
[ * ] (1 of 2) A start job is running for...
[ 33.113728] vref: supplied by vdd
[ 33.117043] vref: disabling
[ 33.119663] vdda: disabling
[ ** ] (2 of 2) A start job is running for...
[ *** ] (1 of 2) A start job is running for...
[ *** ] (2 of 2) A start job is running for...
[ ** ] (1 of 2) A start job is running for...
[ ** ] (2 of 2) A start job is running for...
[ *** ] (1 of 2) A start job is running for...
[ ** ] (2 of 2) A start job is running for...
[ 104.338520] EXT4-fs (mmcblk0p7): resized filesystem to 14709724
[ *** ] (2 of 2) A start job is running for...
[ OK ] Started Resize root filesystem to fit available disk space.
Starting Netdata, Real-time performance monitoring...
[ OK ] Started Serial Getty on ttySTM0.
[ OK ] Reached target Login Prompts.

ST OpenSTLinux - Weston - (A Yocto Project Based Distro) 2.6-openstlinux-20-02-19 stm32mp1 ttySTM0

stm32mp1 login: root (automatic login)

root@stm32mp1:~#
CTRL-A Z for help | 115200 8N1 | NOR | Minicom 2.7.1 | VT102 | Offline | ttyACM0


```

## Hello world 어플리케이션 작성 예제

```

@ hello_world_example 예제 작성
$ mkdir hello_world_example
$ cd hello_world_example

```



```
// SPDX-identifier: GPL-2.0
/*
 * Copyright (C) STMicroelectronics SA 2018
 * Authors: Jean-Christophe Trotin <jean-christophe.trocin@st.com>
 */

#include <stdio.h>
#include <unistd.h>

int main(int argc, char **argv)
{
    int i = 11;

    printf("\nUser space example: hello world from STMicroelectronics\n");
    setbuf(stdout, NULL);
    while (i-- > 0) {
        printf("%i ", i);
        sleep(1);
    }
    printf("\nUser space example: goodbye from STMicroelectronics\n");

    return(0);
}
```

@ devtool을 이용한 Build 및 배포

```
$ devtool add myhelloworld hello_world_example
```

```
$ devtool edit-recipe myhelloworld
```

```

myhelloworld.bb
~/stm32mp1/Distribution-Package/openstlinu...on-stm32mp1/workspace/recipes/myhelloworld
Save
# Recipe created by recipetool
# This is the basis of a recipe and may need further editing in order to be fully functional.
# (Feel free to remove these comments when editing.)

# Unable to find any files that looked like license statements. Check the accompanying
# documentation and source headers and set LICENSE and LIC_FILES_CHKSUM accordingly.
#
# NOTE: LICENSE is being set to "CLOSED" to allow you to at least start building - if
# this is not accurate with respect to the licensing of the software being built (it
# will not be in most cases) you must specify the correct value before using this
# recipe for anything other than initial testing/development!
LICENSE = "CLOSED"
LIC_FILES_CHKSUM = ""

# No information for SRC_URI yet (only an external source tree was specified)
SRC_URI = ""

# NOTE: no Makefile found, unable to determine what needs to be done

do_configure () {
    # Specify any needed configure commands here
    :
}

do_compile () {
    # Specify compilation commands here
    cd ${S}
    ${CC} hello_world_example.c -o hello_world_example
}

do_install () {
    # Specify install commands here
    install -d ${D}${bindir}
    install -m 755 ${S}/hello_world_example ${D}${bindir}/
}

Plain Text Tab Width: 8 Ln 34, Col 48 INS

```

\$ bitbake myhelloworld

```

user@ubuntu: ~/stm32mp1/Distribution-Package/openstlinux-20-02-19/build-openstlinuxw...
File Edit View Search Terminal Help
meta-xfce
meta-initramfs
meta-multimedia
meta-networking
meta-webserver
meta-filesystems
meta-perl
meta-python
meta-st-stm32mp
meta-qt5
meta-st-openstlinux
meta
workspace = "<unknown>:<unknown>"

Initialising tasks: 100% |#####| Time: 0:00:00
Sstate summary: Wanted 4 Found 4 Missed 0 Current 187 (100% match, 100% complete)
)
NOTE: Executing SetScene Tasks
NOTE: Executing RunQueue Tasks
NOTE: Tasks Summary: Attempted 662 tasks of which 662 didn't need to be rerun and all succeeded.
NOTE: Writing buildhistory
user@ubuntu:~/stm32mp1/Distribution-Package/openstlinux-20-02-19/build-openstlinuxweston-stm32mp1$

```

\$ devtool deploy-target -s myhelloworld root@192.168.35.189

```

user@ubuntu: ~/stm32mp1/Distribution-Package/openstlinux-20-02-19/build-openstlinuxw...
File Edit View Search Terminal Help
NOTE: Starting bitbake server...
NOTE: Started PRServer with DBfile: /home/user/stm32mp1/Distribution-Package/openstlinux-20-02-19/build-openstlinuxweston-stm32mp1/cache/prserv.sqlite3, IP: 127.0.0.1, PORT: 34951, PID: 11147
Loading cache: 100% |#####| Time: 0:00:01
Loaded 3569 entries from dependency cache.
Parsing recipes: 100% |#####| Time: 0:00:08
Parsing of 2525 .bb files complete (2524 cached, 1 parsed). 3570 targets, 84 skipped, 0 masked, 0 errors.
The authenticity of host '192.168.35.189 (192.168.35.189)' can't be established.
RSA key fingerprint is SHA256:z1+aM19wK4pbZhnMyz+Fakr5e57c7ML/BgGEwzfWs1Q.
Are you sure you want to continue connecting (yes/no)?
Warning: Permanently added '192.168.35.189' (RSA) to the list of known hosts.
devtool_deploy.list          100% 35 22.0KB/s 00:00
devtool_deploy.sh           100% 1017 654.2KB/s 00:00
./
./usr/
./usr/bin/
./usr/bin/hello_world_example
NOTE: Successfully deployed /home/user/stm32mp1/Distribution-Package/openstlinux-20-02-19/build-openstlinuxweston-stm32mp1/tmp-glibc/work/cortexa7t2hf-neon-vfpv4-ostl-linux-gnueabi/myhelloworld/1.0-r0/image
user@ubuntu:~/stm32mp1/Distribution-Package/openstlinux-20-02-19/build-openstlinuxweston-stm32mp1$

```

% 192.168.35.189 는 STM32MP157C-DK2의 IP Address

% 호스트와 DK2 보드를 연결하여 터미널에서 ifconfig를 통해 IP Address 확인함

@ hello\_world\_example 실행

\$ ./hello\_world\_example

```

user@ubuntu: ~
File Edit View Search Terminal Help

root@stm32mp1:/usr/bin#
root@stm32mp1:/usr/bin# ./hello_world_example

User space example: hello world from STMicroelectronics
10 9 8 7 6 5 4 3 2 1 0
User space example: goodbye from STMicroelectronics
root@stm32mp1:/usr/bin#

```