

# 目次

- Python3 の追加 ..... 3
- 手順 ..... 3
- root filesystem の準備 ..... 3
- root filesystem へ chroot ..... 3
- パッケージデータベースの更新 ..... 4
- Python3 パッケージの追加 ..... 4
- chroot 環境から出る ..... 6
- ファームウェアのビルド ..... 6
- 【参考】Python3 追加によるサイズ増分の確認 ..... 7**



# Python3 の追加

機械学習などで使われることも多く、現在もっとも書籍が多く出ていて取り組みやすい Python を追加したファームウェアを作成してみます。

## 手順

### root filesystem の準備

[root filesystem](#) を準備して、わかりやすいように名前を変更しておきます(Optional)[]

```
root@jammy64-dev:/home/user1/work/MAS1xx# ls -l mas1xx_jammy_python3_rootfs
total 72
drwxr-xr-x  2 root root 4096 Apr 15 10:48 bin
drwxr-xr-x  2 root root 4096 Apr 19 15:08 boot
drwxr-xr-x  4 root root 4096 Sep  7  2017 dev
drwxr-xr-x 82 root root 4096 Apr 25 09:54 etc
drwxr-xr-x  3 root root 4096 Aug 13  2021 home
drwxr-xr-x 15 root root 4096 Nov 11 09:29 lib
drwxr-xr-x  2 root root 4096 Sep  7  2017 media
drwxr-xr-x  7 root root 4096 May 29  2020 mnt
drwxr-xr-x  3 root root 4096 Jun  8  2020 opt
drwxr-xr-x  2 root root 4096 Apr 13  2016 proc
drwx----- 4 root root 4096 Apr  7 12:33 root
drwxr-xr-x 15 root root 4096 Nov 11 09:41 run
drwxr-xr-x  2 root root 4096 Apr 15 10:48 sbin
drwxr-xr-x  2 root root 4096 Sep  7  2017 srv
drwxr-xr-x  2 root root 4096 Feb  5  2016 sys
drwxrwxrwt  2 root root 4096 Apr 25 09:54 tmp
drwxr-xr-x 11 root root 4096 Aug 31  2021 usr
drwxr-xr-x 12 root root 4096 Aug 27  2018 var
root@jammy64-dev:/home/user1/work/MAS1xx#
```

### root filesystem ^ chroot

[chroot](#) のスクリプトを使用し、MA-S1xx の root filesystem へ入ります。

```
root@jammy64-dev:/home/user1/work/MAS1xx# ./chroot_arm.sh
mas1xx_jammy_python3_rootfs/
root@jammy64-dev:/# uname -a
Linux jammy64-dev 5.15.0-70-lowlatency #77~20.04.1-Ubuntu SMP PREEMPT Wed
Apr 5 18:52:27 UTC 2023 armv7l armv7l armv7l GNU/Linux
```

```
root@jammy64-dev:/#
```

## パッケージデータベースの更新

**apt update** でパッケージデータベースを更新し、必要であれば<sup>1)</sup>パッケージを更新しておきます。

```
root@jammy64-dev:/# apt update
Hit:1 http://ppa.launchpad.net/mosquitto-dev/mosquitto-ppa/ubuntu jammy InRelease
Hit:2 http://ports.ubuntu.com/ubuntu-ports jammy InRelease
Hit:3 http://ports.ubuntu.com/ubuntu-ports jammy-updates InRelease
Hit:4 http://ports.ubuntu.com/ubuntu-ports jammy-security InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
5 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

```
root@jammy64-dev:/# apt upgrade
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
The following packages have been kept back:
  initramfs-tools initramfs-tools-bin initramfs-tools-core kmod libkmod2
0 upgraded, 0 newly installed, 0 to remove and 5 not upgraded.
root@jammy64-dev:/#
```

## Python3 パッケージの追加

Python3 本体と、使用したいライブラリがあればそれらを **apt install** で追加します。

[例] Python3 本体と、シリアルポート通信用ライブラリ pyserial を追加する例です。

```
root@jammy64-dev:/# apt install python3 python3-serial
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libmpdec3 libpython3-stdlib libpython3.10-minimal libpython3.10-stdlib
  media-types python3-minimal python3.10
  python3.10-minimal
Suggested packages:
  python3-doc python3-tk python3-venv python3-wxgtk3.0 | python3-wxgtk
```

```
python3.10-venv python3.10-doc binutils
  binfmt-support
The following NEW packages will be installed:
  libmpdec3 libpython3-stdlib libpython3.10-minimal libpython3.10-stdlib
media-types python3 python3-minimal
  python3-serial python3.10 python3.10-minimal
0 upgraded, 10 newly installed, 0 to remove and 5 not upgraded.
Need to get 5216 kB of archives.
After this operation, 18.3 MB of additional disk space will be used.
Do you want to continue? [Y/n]
```

※ Need to get 5216 kB of archives. というメッセージから、ファームウェア<sup>2)</sup> になった場合に増加するサイズをだいたい見積もることができます。

```
Need to get 5216 kB of archives.
After this operation, 18.3 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://ports.ubuntu.com/ubuntu-ports jammy-updates/main armhf
libpython3.10-minimal armhf 3.10.6-1~22.04.2ubuntu1 [794 kB]
Get:2 http://ports.ubuntu.com/ubuntu-ports jammy-updates/main armhf
python3.10-minimal armhf 3.10.6-1~22.04.2ubuntu1 [1941 kB]
Get:3 http://ports.ubuntu.com/ubuntu-ports jammy-updates/main armhf python3-
minimal armhf 3.10.6-1~22.04 [24.3 kB]
... 中略 ...
Preparing to unpack .../3-libpython3.10-
stdlib_3.10.6-1~22.04.2ubuntu1_armhf.deb ...
Unpacking libpython3.10-stdlib:armhf (3.10.6-1~22.04.2ubuntu1) ...
Selecting previously unselected package python3.10.
Preparing to unpack .../4-python3.10_3.10.6-1~22.04.2ubuntu1_armhf.deb ...
Unpacking python3.10 (3.10.6-1~22.04.2ubuntu1) ...
Selecting previously unselected package libpython3-stdlib:armhf.
Preparing to unpack .../5-libpython3-stdlib_3.10.6-1~22.04_armhf.deb ...
Unpacking libpython3-stdlib:armhf (3.10.6-1~22.04) ...
Setting up python3-minimal (3.10.6-1~22.04) ...
Selecting previously unselected package python3.
(Reading database ... 16354 files and directories currently installed.)
Preparing to unpack .../python3_3.10.6-1~22.04_armhf.deb ...
Unpacking python3 (3.10.6-1~22.04) ...
Selecting previously unselected package python3-serial.
Preparing to unpack .../python3-serial_3.5-1_all.deb ...
Unpacking python3-serial (3.5-1) ...
Setting up media-types (7.0.0) ...
Setting up libmpdec3:armhf (2.5.1-2build2) ...
Setting up libpython3.10-stdlib:armhf (3.10.6-1~22.04.2ubuntu1) ...
Setting up libpython3-stdlib:armhf (3.10.6-1~22.04) ...
Setting up python3.10 (3.10.6-1~22.04.2ubuntu1) ...
Setting up python3 (3.10.6-1~22.04) ...
running python rtupdate hooks for python3.10...
running python post-rtupdate hooks for python3.10...
Setting up python3-serial (3.5-1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.1) ...
```

```
root@jammy64-dev:/#
```

## chroot 環境から出る

**exit** で chroot 環境から出ます。

```
root@jammy64-dev:/# exit
exit
root@jammy64-dev:/home/user1/work/MAS1xx#
```

## ファームウェアのビルド

[ファームウェアの作成](#) のとおり、ファームウェアをビルドします。

```
root@jammy64-dev:/home/user1/work/MAS1xx# ./build_firm.sh -k
/home/user1/src/MAS1xx/linux-kernel-mchp -r mas1xx_jammy_python3_rootfs -o
firmware/mas1xx_jammy_python3_v6_0_0.img
MA-S1xx series Firmware build script
* kernelrelease: 6.1.22-linux4microchip-2023.04-rc3
  SYNC    include/config/auto.conf.cmd
... 中略 ...
  unknown (119)
  staff (50)
  adm (4)
* create initramfs ...
update-initramfs: Generating /boot/initrd.img-6.1.22-
linux4microchip-2023.04-rc3
/bin/sed: can't read /var/tmp/mkinitramfs_qHsu3k/scripts/init-top/udev: No
such file or directory
  adding: kernel.img (stored 0%)
  adding: kmod.img (stored 0%)
  adding: initramfs.img (stored 0%)
  adding: rootfs.img (stored 0%)
  adding: .config (deflated 77%)
  adding: at91-centurysys-gemini-00.dtb (deflated 77%)
  adding: at91-centurysys-gemini-01.dtb (deflated 77%)
  adding: at91-centurysys-gemini-01.dtbo (deflated 64%)
  adding: at91-centurysys-gemini-02.dtb (deflated 77%)
  adding: at91-centurysys-gemini-02.dtbo (deflated 63%)
  adding: at91-centurysys-gemini-03.dtb (deflated 77%)
  adding: at91-centurysys-gemini-03.dtbo (deflated 63%)
  adding: at91-centurysys-gemini-07.dtbo (deflated 71%)
* Firmware filename:
/home/user1/work/MAS1xx/firmware/mas1xx_jammy_python3_v6_0_0.img
```

```
done.  
please remove working directory '/home/user1/work/MAS1xx/build_1682386233'  
manually.  
root@jammy64-dev:/home/user1/work/MAS1xx#
```

ファームウェアのビルドが完了しました。

```
root@jammy64-dev:/home/user1/work/MAS1xx# ls -l  
firmware/mas1xx_jammy_python3_v6_0_0.img  
-rw-r--r-- 1 root root 93494104 Apr 25 10:31  
firmware/mas1xx_jammy_python3_v6_0_0.img  
root@jammy64-dev:/home/user1/work/MAS1xx#
```

ビルドに出ているメッセージのとおり、作業ディレクトリを削除しておきます。

```
root@jammy64-dev:/home/user1/work/MAS1xx# rm -rf build_1682386233/  
root@jammy64-dev:/home/user1/work/MAS1xx#
```

## 【参考】Python3 追加によるサイズ増分の確認

さきほどの見積もりでは **5216 kB** ほど増加すると見積もりましたが、実際にどの程度サイズが増えたか確認してみます。

- ベースにした標準ファームウェアの root filesystem

```
# unzip -lv firmware/mas1xx_jammy_v6_0_0.img|grep rootfs  
78942208  Stored 78942208   0% 2023-04-19 15:08 8c166045  rootfs.img
```

- Python3 を追加したファームウェアの root filesystem

```
# unzip -lv firmware/mas1xx_jammy_python3_v6_0_0.img|grep rootfs  
84148224  Stored 84148224   0% 2023-04-25 10:31 7634ca56  rootfs.img
```

84148224 - 78942208 = 5206016 と 5084KiB(5206KB) となり、だいたい見積もりしたくらいサイズが増えていることが確認できました。

1)

重大なセキュリティアップデートなど

2)

圧縮ファイルシステム

Last update: 2024/08/06 16:52 mas1xx\_devel:customize\_firmware:add\_python3:start [https://ma-tech.centurysys.jp/doku.php?id=mas1xx\\_devel:customize\\_firmware:add\\_python3:start](https://ma-tech.centurysys.jp/doku.php?id=mas1xx_devel:customize_firmware:add_python3:start)

From: <https://ma-tech.centurysys.jp/> - **MA-X/MA-S/MA-E/IP-K Developers' Wiki**

Permanent link: [https://ma-tech.centurysys.jp/doku.php?id=mas1xx\\_devel:customize\\_firmware:add\\_python3:start](https://ma-tech.centurysys.jp/doku.php?id=mas1xx_devel:customize_firmware:add_python3:start)

Last update: **2024/08/06 16:52**

