

目次

アップデート用ファームウェアの作成(クロス)	1
カスタマイズ	8
カーネルコンフィグのカスタマイズ	8
ファイルシステムのカスタマイズ	9
TIPS	9
ファームウェア容量の削減	9

アップデート用ファームウェアの作成(クロス)

“build_firm.sh” スクリプトにより、ファームウェアファイルを作ることができます。¹⁾
スクリプト本体は、[ダウンロード:MA-E3xxシリーズ](#) にあります。

```
root@lubuntu-vpc:/home/user1# ./build_firm.sh
MA-E3xx series Firmware build script
usage: build_firm.sh -k kernel_dir -r rootfs dir [-o firmware_file]
```

引数として、下記を指定します。

- **-k**: カーネルソースを展開したディレクトリ
- **-r**: root filesystemのアーカイブ²⁾を展開³⁾したディレクトリ
- **-o**: 出力ファームウェアファイル名 (省略可: 省略時、カレントディレクトリに “firmware_YYYYMMDD_hhmmss.img” 形式で作成します)

実行サンプルを示します。

```
root@lubuntu-vpc:/home/user1# ./build_firm.sh -k src/linux-kernel -r
work/rootfs
MA-E3xx series Firmware build script
* kernelrelease: 3.14.0-rc7+
CHK      include/config/kernel.release
CHK      include/generated/uapi/linux/version.h
CHK      include/generated/utsrelease.h
make[1]: `include/generated/mach-types.h' は更新済みです
CALL     scripts/checksyscalls.sh
CHK      include/generated/compile.h
SKIPPED  include/generated/compile.h
CHK      kernel/config_data.h
Kernel: arch/arm/boot/Image is ready
Building modules, stage 2.
Kernel: arch/arm/boot/zImage is ready
MODPOST 178 modules
CHK      include/config/kernel.release
CHK      include/generated/uapi/linux/version.h
CHK      include/generated/utsrelease.h
make[1]: `include/generated/mach-types.h' は更新済みです
CALL     scripts/checksyscalls.sh
CHK      include/generated/compile.h
SKIPPED  include/generated/compile.h
CHK      kernel/config_data.h
Kernel: arch/arm/boot/Image is ready
Kernel: arch/arm/boot/zImage is ready
Image arch/arm/boot/uImage is ready
* copying kernel image
* copying DeviceTree blob
* instal kernel modules to /home/user1/work/rootfs/lib/modules/3.14.0-rc7+
```

```
INSTALL drivers/crypto/omap-aes.ko
INSTALL drivers/crypto/omap-sham.ko
INSTALL drivers/misc/ti-st/st_drv.ko
INSTALL drivers/mtd/chips/map_ram.ko
INSTALL drivers/mtd/devices/block2mtd.ko
INSTALL drivers/mtd/devices/m25p80.ko
INSTALL drivers/mtd/devices/mtdram.ko
INSTALL drivers/mtd/maps/plat-ram.ko
INSTALL drivers/mtd/nand/nandsim.ko
INSTALL drivers/net/usb/asix.ko
INSTALL drivers/net/usb/ax88179_178a.ko
INSTALL drivers/net/usb/cdc_eem.ko
INSTALL drivers/net/usb/cdc_ether.ko
INSTALL drivers/net/usb/cdc_mbim.ko
INSTALL drivers/net/usb/cdc_ncm.ko
INSTALL drivers/rtc/rtc-omap.ko
INSTALL drivers/thermal/ti-soc-thermal/ti-soc-thermal.ko
INSTALL drivers/usb/class/cdc-wdm.ko
INSTALL lib/ts_bm.ko
INSTALL lib/ts_fsm.ko
INSTALL lib/ts_kmp.ko
INSTALL net/bridge/netfilter/ebt_802_3.ko
INSTALL net/bridge/netfilter/ebt_among.ko
INSTALL net/bridge/netfilter/ebt_arp.ko
INSTALL net/bridge/netfilter/ebt_arpreply.ko
INSTALL net/bridge/netfilter/ebt_dnat.ko
INSTALL net/bridge/netfilter/ebt_ip.ko
INSTALL net/bridge/netfilter/ebt_ip6.ko
INSTALL net/bridge/netfilter/ebt_limit.ko
INSTALL net/bridge/netfilter/ebt_log.ko
INSTALL net/bridge/netfilter/ebt_mark.ko
INSTALL net/bridge/netfilter/ebt_mark_m.ko
INSTALL net/bridge/netfilter/ebt_nflog.ko
INSTALL net/bridge/netfilter/ebt_pkttype.ko
INSTALL net/bridge/netfilter/ebt_redirect.ko
INSTALL net/bridge/netfilter/ebt_snat.ko
INSTALL net/bridge/netfilter/ebt_stp.ko
INSTALL net/bridge/netfilter/ebt_ulog.ko
INSTALL net/bridge/netfilter/ebt_vlan.ko
INSTALL net/bridge/netfilter/ebtable_filter.ko
INSTALL net/bridge/netfilter/ebtable_nat.ko
INSTALL net/bridge/netfilter/nf_tables_bridge.ko
INSTALL net/ipv4/netfilter/arp_tables.ko
INSTALL net/ipv4/netfilter/arpt_mangle.ko
INSTALL net/ipv4/netfilter/arptable_filter.ko
INSTALL net/ipv4/netfilter/ipt_CLUSTERIP.ko
INSTALL net/ipv4/netfilter/ipt_ECN.ko
INSTALL net/ipv4/netfilter/ipt_ah.ko
INSTALL net/ipv4/netfilter/ipt_rpfilter.ko
INSTALL net/ipv4/netfilter/iptables_raw.ko
```

```
INSTALL net/ipv4/netfilter/nf_nat_snmp_basic.ko
INSTALL net/ipv4/netfilter/nf_tables_arp.ko
INSTALL net/ipv4/netfilter/nf_tables_ipv4.ko
INSTALL net/ipv4/netfilter/nft_chain_nat_ipv4.ko
INSTALL net/ipv4/netfilter/nft_chain_route_ipv4.ko
INSTALL net/ipv4/netfilter/nft_reject_ipv4.ko
INSTALL net/ipv6/ah6.ko
INSTALL net/ipv6/esp6.ko
INSTALL net/ipv6/ip6_gre.ko
INSTALL net/ipv6/ip6_tunnel.ko
INSTALL net/ipv6/ipcomp6.ko
INSTALL net/ipv6/netfilter/ip6_tables.ko
INSTALL net/ipv6/netfilter/ip6t_MASQUERADE.ko
INSTALL net/ipv6/netfilter/ip6t_NPT.ko
INSTALL net/ipv6/netfilter/ip6t_REJECT.ko
INSTALL net/ipv6/netfilter/ip6t_SYNPROXY.ko
INSTALL net/ipv6/netfilter/ip6t_ah.ko
INSTALL net/ipv6/netfilter/ip6t_eui64.ko
INSTALL net/ipv6/netfilter/ip6t_frag.ko
INSTALL net/ipv6/netfilter/ip6t_hbh.ko
INSTALL net/ipv6/netfilter/ip6t_ipv6header.ko
INSTALL net/ipv6/netfilter/ip6t_mh.ko
INSTALL net/ipv6/netfilter/ip6t_rpfilter.ko
INSTALL net/ipv6/netfilter/ip6t_rt.ko
INSTALL net/ipv6/netfilter/ip6table_filter.ko
INSTALL net/ipv6/netfilter/ip6table_mangle.ko
INSTALL net/ipv6/netfilter/ip6table_nat.ko
INSTALL net/ipv6/netfilter/ip6table_raw.ko
INSTALL net/ipv6/netfilter/nf_conntrack_ipv6.ko
INSTALL net/ipv6/netfilter/nf_defrag_ipv6.ko
INSTALL net/ipv6/netfilter/nf_nat_ipv6.ko
INSTALL net/ipv6/netfilter/nf_tables_ipv6.ko
INSTALL net/ipv6/netfilter/nft_chain_nat_ipv6.ko
INSTALL net/ipv6/netfilter/nft_chain_route_ipv6.ko
INSTALL net/ipv6/netfilter/nft_reject_ipv6.ko
INSTALL net/ipv6/sit.ko
INSTALL net/ipv6/tunnel6.ko
INSTALL net/ipv6/xfrm6_mode_beet.ko
INSTALL net/ipv6/xfrm6_mode_ro.ko
INSTALL net/ipv6/xfrm6_mode_transport.ko
INSTALL net/ipv6/xfrm6_mode_tunnel.ko
INSTALL net/ipv6/xfrm6_tunnel.ko
INSTALL net/netfilter/ipset/ip_set_bitmap_ip.ko
INSTALL net/netfilter/ipset/ip_set_bitmap_ipmac.ko
INSTALL net/netfilter/ipset/ip_set_bitmap_port.ko
INSTALL net/netfilter/ipset/ip_set_hash_ip.ko
INSTALL net/netfilter/ipset/ip_set_hash_ipport.ko
INSTALL net/netfilter/ipset/ip_set_hash_ipportip.ko
INSTALL net/netfilter/ipset/ip_set_hash_ipportnet.ko
INSTALL net/netfilter/ipset/ip_set_hash_net.ko
INSTALL net/netfilter/ipset/ip_set_hash_netiface.ko
```

```
INSTALL net/netfilter/ipset/ip_set_hash_netnet.ko
INSTALL net/netfilter/ipset/ip_set_hash_netport.ko
INSTALL net/netfilter/ipset/ip_set_hash_netportnet.ko
INSTALL net/netfilter/ipset/ip_set_list_set.ko
INSTALL net/netfilter/nf_tables.ko
INSTALL net/netfilter/nf_tables_inet.ko
INSTALL net/netfilter/nft_compat.ko
INSTALL net/netfilter/nft_counter.ko
INSTALL net/netfilter/nft_ct.ko
INSTALL net/netfilter/nft_exthdr.ko
INSTALL net/netfilter/nft_hash.ko
INSTALL net/netfilter/nft_limit.ko
INSTALL net/netfilter/nft_log.ko
INSTALL net/netfilter/nft_meta.ko
INSTALL net/netfilter/nft_nat.ko
INSTALL net/netfilter/nft_queue.ko
INSTALL net/netfilter/nft_rbtrees.ko
INSTALL net/netfilter/nft_reject.ko
INSTALL net/netfilter/nft_reject_inet.ko
INSTALL net/netfilter/xt_CHECKSUM.ko
INSTALL net/netfilter/xt_CLASSIFY.ko
INSTALL net/netfilter/xt_CT.ko
INSTALL net/netfilter/xt_DSCP.ko
INSTALL net/netfilter/xt_HL.ko
INSTALL net/netfilter/xt_HMARK.ko
INSTALL net/netfilter/xt_IDLETIMER.ko
INSTALL net/netfilter/xt_NETMAP.ko
INSTALL net/netfilter/xt_NFLOG.ko
INSTALL net/netfilter/xt_NFQUEUE.ko
INSTALL net/netfilter/xt_RATEEST.ko
INSTALL net/netfilter/xt_TCPMSS.ko
INSTALL net/netfilter/xt_TCPOPTSTRIP.ko
INSTALL net/netfilter/xt_TEE.ko
INSTALL net/netfilter/xt_TPROXY.ko
INSTALL net/netfilter/xt_TRACE.ko
INSTALL net/netfilter/xt_addrtype.ko
INSTALL net/netfilter/xt_bpf.ko
INSTALL net/netfilter/xt_cgroup.ko
INSTALL net/netfilter/xt_cluster.ko
INSTALL net/netfilter/xt_comment.ko
INSTALL net/netfilter/xt_connbytes.ko
INSTALL net/netfilter/xt_connlabel.ko
INSTALL net/netfilter/xt_connlimit.ko
INSTALL net/netfilter/xt_conntrack.ko
INSTALL net/netfilter/xt_cpu.ko
INSTALL net/netfilter/xt_dccp.ko
INSTALL net/netfilter/xt_devgroup.ko
INSTALL net/netfilter/xt_dscp.ko
INSTALL net/netfilter/xt_ecn.ko
INSTALL net/netfilter/xt_esp.ko
```

```
INSTALL net/netfilter/xt_hashlimit.ko
INSTALL net/netfilter/xt_helper.ko
INSTALL net/netfilter/xt_hl.ko
INSTALL net/netfilter/xt_iprange.ko
INSTALL net/netfilter/xt_length.ko
INSTALL net/netfilter/xt_limit.ko
INSTALL net/netfilter/xt_mac.ko
INSTALL net/netfilter/xt_multiport.ko
INSTALL net/netfilter/xt_nfacct.ko
INSTALL net/netfilter/xt_osf.ko
INSTALL net/netfilter/xt_owner.ko
INSTALL net/netfilter/xt_physdev.ko
INSTALL net/netfilter/xt_pkttype.ko
INSTALL net/netfilter/xt_policy.ko
INSTALL net/netfilter/xt_quota.ko
INSTALL net/netfilter/xt_rateest.ko
INSTALL net/netfilter/xt_realm.ko
INSTALL net/netfilter/xt_recent.ko
INSTALL net/netfilter/xt_sctp.ko
INSTALL net/netfilter/xt_set.ko
INSTALL net/netfilter/xt_socket.ko
INSTALL net/netfilter/xt_state.ko
INSTALL net/netfilter/xt_statistic.ko
INSTALL net/netfilter/xt_string.ko
INSTALL net/netfilter/xt_tcpmss.ko
INSTALL net/netfilter/xt_time.ko
INSTALL net/netfilter/xt_u32.ko
DEPMOD 3.14.0-rc7+
```

合計 120

```
lrwxrwxrwx 1 root root    28  3月 19 10:19 build -> /home/user1/src/linux-
kernel
```

```
drwxr-xr-x 5 root root  4096  3月 19 10:19 kernel
```

```
-rw-r--r-- 1 root root 13800  3月 19 10:19 modules.alias
```

```
-rw-r--r-- 1 root root 20113  3月 19 10:19 modules.alias.bin
```

```
-rw-r--r-- 1 root root 11658  3月 19 10:19 modules.builtin
```

```
-rw-r--r-- 1 root root 14344  3月 19 10:19 modules.builtin.bin
```

```
-rw-r--r-- 1 root root   8612  3月 19 10:19 modules.dep
```

```
-rw-r--r-- 1 root root 15376  3月 19 10:19 modules.dep.bin
```

```
-rw-r--r-- 1 root root    52  3月 19 10:19 modules.devname
```

```
-rw-r--r-- 1 root root   6680  3月 19 10:19 modules.order
```

```
-rw-r--r-- 1 root root    131  3月 19 10:19 modules.softdep
```

```
-rw-r--r-- 1 root root   2764  3月 19 10:19 modules.symbols
```

```
-rw-r--r-- 1 root root   3735  3月 19 10:19 modules.symbols.bin
```

```
lrwxrwxrwx 1 root root    28  3月 19 10:19 source -> /home/user1/src/linux-
kernel
```

Parallel mksquashfs: Using 4 processors

Creating 4.0 filesystem on /home/user1/build_1395191930/kmod.img, block size 131072.

```
[=====
=====|] 189/189 100%
```

Exportable Squashfs 4.0 filesystem, xz compressed, data block size 131072
compressed data, compressed metadata, compressed fragments, compressed
xattrs

duplicates are removed

Filesystem size 422.11 Kbytes (0.41 Mbytes)

22.28% of uncompressed filesystem size (1894.33 Kbytes)

Inode table size 1506 bytes (1.47 Kbytes)

21.68% of uncompressed inode table size (6946 bytes)

Directory table size 2074 bytes (2.03 Kbytes)

43.61% of uncompressed directory table size (4756 bytes)

Number of duplicate files found 0

Number of inodes 217

Number of files 189

Number of fragments 17

Number of symbolic links 0

Number of device nodes 0

Number of fifo nodes 0

Number of socket nodes 0

Number of directories 28

Number of ids (unique uids + gids) 1

Number of uids 1

root (0)

Number of gids 1

root (0)

Parallel mksquashfs: Using 4 processors

Creating 4.0 filesystem on /home/user1/build_1395191930/rootfs.img, block
size 1048576.

[=====]
=====] 13028/13028 100%

Exportable Squashfs 4.0 filesystem, xz compressed, data block size 1048576
compressed data, compressed metadata, compressed fragments, compressed
xattrs

duplicates are removed

Filesystem size 54833.49 Kbytes (53.55 Mbytes)

25.27% of uncompressed filesystem size (217001.19 Kbytes)

Inode table size 160688 bytes (156.92 Kbytes)

24.11% of uncompressed inode table size (666530 bytes)

Directory table size 156848 bytes (153.17 Kbytes)

41.79% of uncompressed directory table size (375353 bytes)

Number of duplicate files found 477

Number of inodes 18471

Number of files 13019

Number of fragments 139

Number of symbolic links 4034

Number of device nodes 0

Number of fifo nodes 0

Number of socket nodes 0

Number of directories 1418

Number of ids (unique uids + gids) 18


```
Number of uids 8
  root (0)
  kikuchi (1000)
  libuuid (100)
  dnsmasq (104)
  syslog (101)
  ntp (105)
  www-data (33)
  usbmux (103)
Number of gids 16
  root (0)
  dip (30)
  shadow (42)
  kikuchi (1000)
  users (100)
  netdev (102)
  mail (8)
  utmp (43)
  syslog (104)
  tty (5)
  staff (50)
  libuuid (101)
  fuse (105)
  nogroup (65534)
  ssl-cert (107)
  adm (4)
* create initramfs ...
update-initramfs: Generating /boot/initrd.img-3.14.0-rc7+
/bin/df: Warning: cannot read table of mounted file systems: No such file or
directory
warning: failed to read mtab
  adding: kernel.img (stored 0%)
  adding: kmod.img (stored 0%)
  adding: initramfs.img (stored 0%)
  adding: rootfs.img (stored 0%)
  adding: dtb.img (deflated 78%)
* Firmware filename: /home/user1/firmware_20140319_102118.img
done.
please remove working directory '/home/user1/build_1395191930' manually.
root@lubuntu-vpc:/home/user1#
```

できあがったファームウェアファイルは以下のとおりです。

```
root@lubuntu-vpc:/home/user1# ls -l /home/user1/firmware_20140319_102118.img
-rw-r--r-- 1 root root 61781549  3月 19 10:21
/home/user1/firmware_20140319_102118.img
```

ファームウェアファイルはZIPアーカイブ形式となっています。

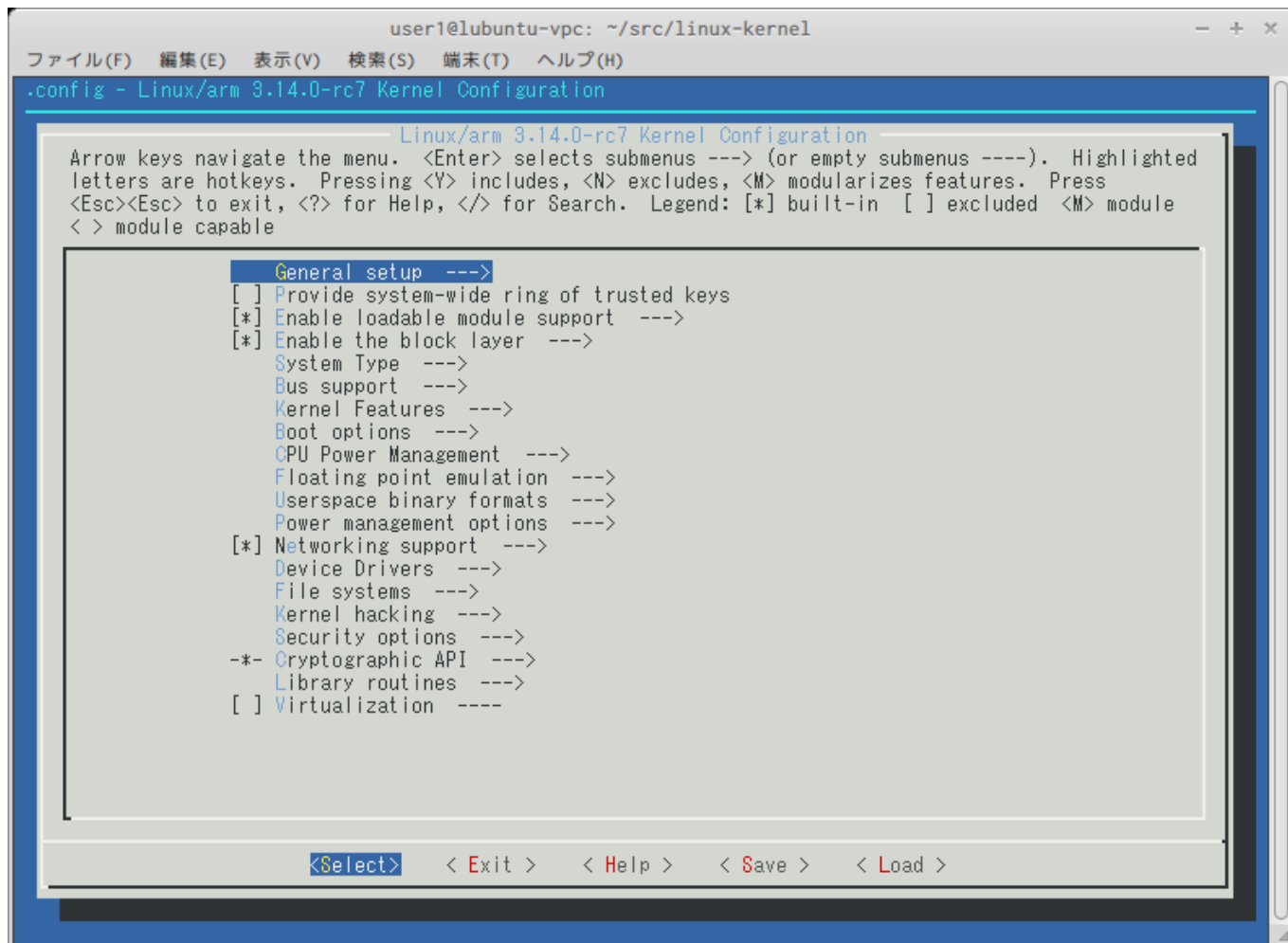
内容は下記のとおりとなっています。

```
root@lubuntu-vpc:/home/user1# unzip -v firmware_20140319_102118.img
Archive:  firmware_20140319_102118.img
  Length  Method      Size  Cmpr   Date   Time   CRC-32   Name
  -----  -----  -----  ---
 3431840  Stored    3431840   0% 2014-03-19 10:19 d27c200d kernel.img
  434176  Stored    434176   0% 2014-03-19 10:19 2b8250dd kmod.img
 1754748  Stored   1754748   0% 2014-03-19 10:21 481c2b99 initramfs.img
56152064  Stored  56152064   0% 2014-03-19 10:20 4f4a0761 rootfs.img
   36000  Defl:N      7963  78% 2014-03-19 10:19 336cb54e dtb.img
  -----  -----  -----  ---
61808828          61780791   0%
root@lubuntu-vpc:/home/user1#
```

カスタマイズ

カーネルコンフィグのカスタマイズ

カーネルソースのディレクトリに “.config” ファイルがない場合、デフォルトのコンフィグを使用します。
組み込むドライバを変更するなどのカスタマイズは、“build_firm” スクリプト実行前に “make menuconfig” などで
実行しておいてください。



ファイルシステムのカスタマイズ

ターゲット用ファイルシステムのカスタマイズ (パッケージ追加など) を行い、ファームウェアにすることも可能です。

[PC上で root filesystem を変更する\(QEMU使用\)](#) を参照してください。

TIPS

ファームウェア容量の削減

v2.5.0 あたりから Python 起動高速化のため module のキャッシュをファームウェアに含めています (pycache ディレクトリ)。

これが原因で追加パッケージ類が容量オーバーで入らなくなった場合、キャッシュを削除することで4MB程度容量を稼ぐことが可能です。

```
# find mae320_trusty_rootfs/usr -name __pycache__
mae320_trusty_rootfs/usr/lib/python3.4/urllib/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/ctypes/__pycache__
```

```
mae320_trusty_rootfs/usr/lib/python3.4/email/mime/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/email/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/wsgiref/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/plat-arm-linux-gnueabi/hf/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/concurrent/futures/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/concurrent/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/idlelib/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/unittest/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/curses/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/multiprocessing/dummy/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/multiprocessing/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/pydoc_data/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/json/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/xmlrpc/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/logging/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/xml/parsers/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/xml/etree/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/xml/dom/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/xml/sax/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/xml/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/encodings/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/dbm/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/importlib/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/sqlite3/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/test/support/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/test/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/lib2to3/fixes/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/lib2to3/pgen2/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/lib2to3/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/tkinter/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/http/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/collections/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/venv/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/asyncio/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/html/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/distutils/command/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/distutils/__pycache__
mae320_trusty_rootfs/usr/lib/python3.4/__pycache__
```

pycache ディレクトリ以下を削除します。

```
# find mae320_trusty_rootfs/usr -name __pycache__ | xargs rm -rf
```

削除前 後での rootfs.img の容量は下記ようになります。

- 削除前

63057920	2016-10-03 10:20	rootfs.img
----------	------------------	------------

- 削除後

59187200	2016-10-04 09:45	rootfs.img
----------	------------------	------------

1) 3)

root 権限での作業が必要です

2)

[MA-E3xx シリーズ](#) からダウンロードできます

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=mae3xx_devel:build_firmware:start

Last update: **2019/01/11 23:19**