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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/iptable_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。

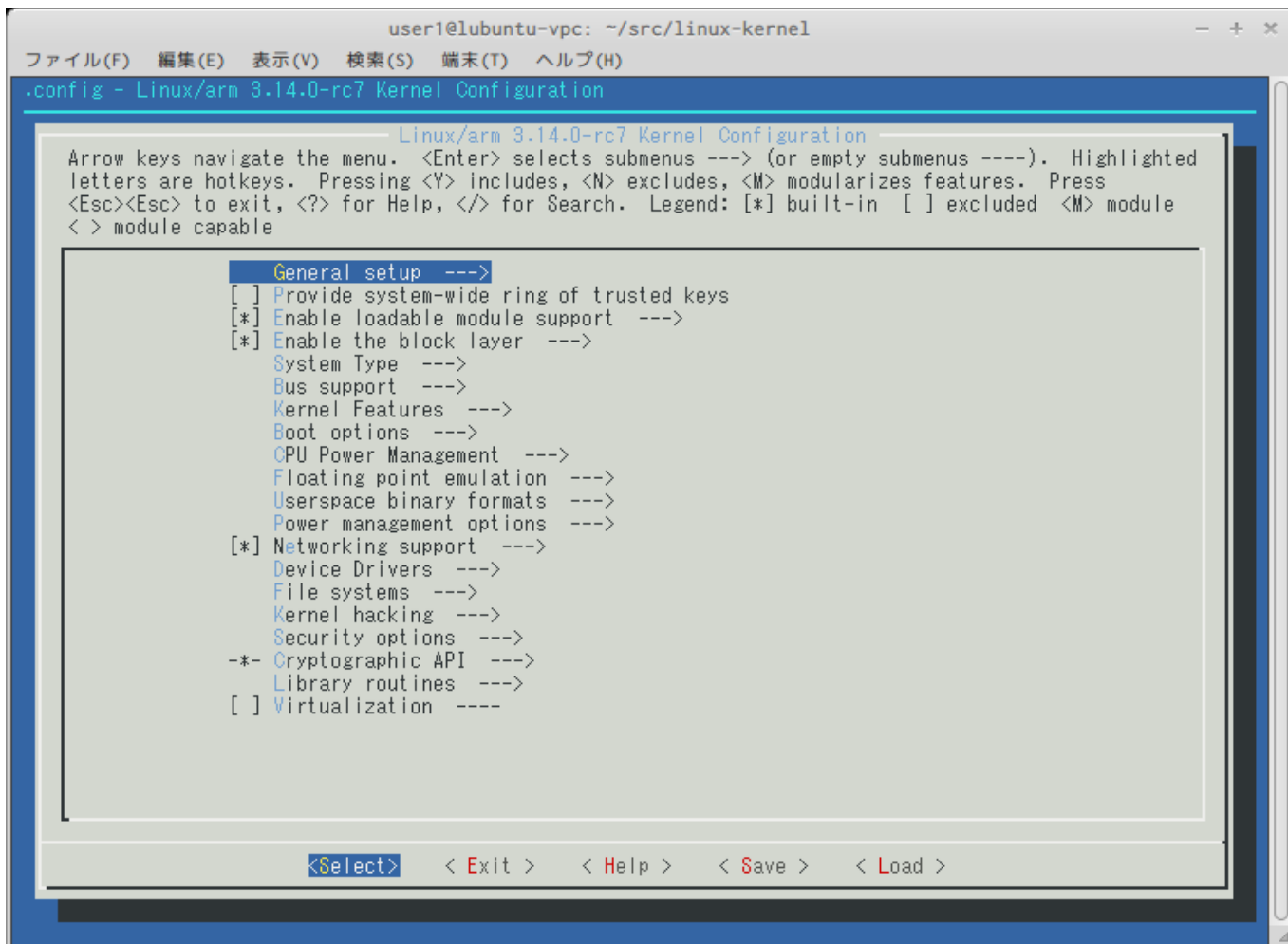
内容は下記のとおりとなっています。

```
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

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Permanent link:

https://ma-tech.centurysys.jp/doku.php?id=mae3xx_devel:build_firmware:start

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