



Request for Advice: How to Protect Data in eMMC on Embedded Devices

At The Linux Foundation CW Workgroup
Japan Technical Jamboree 63
Dec 1st, 2017

Daikin Industries, Ltd.
Gou NAKATSUKA

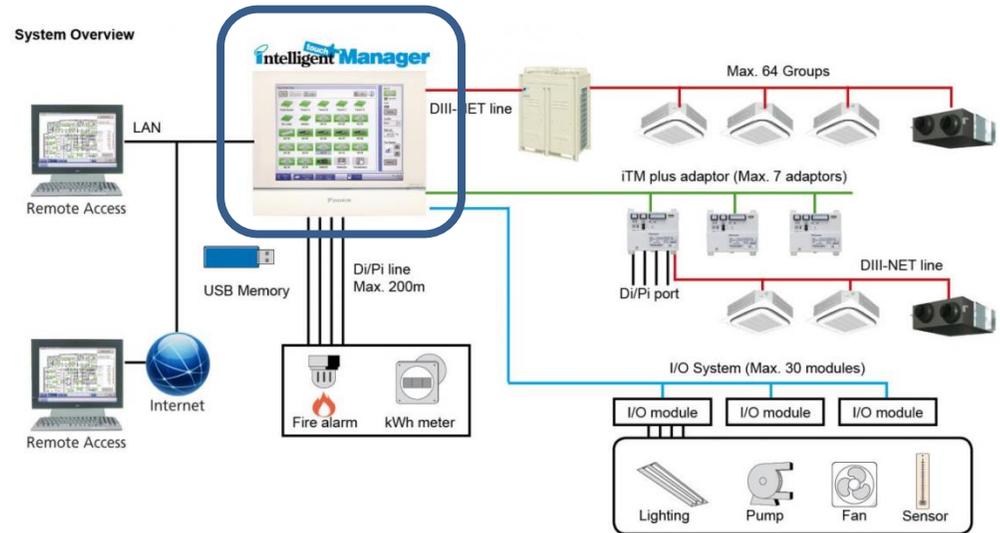
Background

We develop controllers for building equipment (especially air conditioners) control system.

We're trying adopting Linux to develop them quickly.

Conventionally its power is turned off suddenly (without shutdown process), so we have to protect data in Flash device (eMMC).

I'll introduce our past trouble and I'd like your advice.



Case study: we got an empty file!

After I turned off the device, then it cannot resolve “localhost” to 127.0.0.1.

I found an empty /etc/hosts, which had a “localhost” entry previously.

/etc/hosts is updated every boot time by init process with this command:

```
“mv /tmp/hosts /etc/hosts”
```

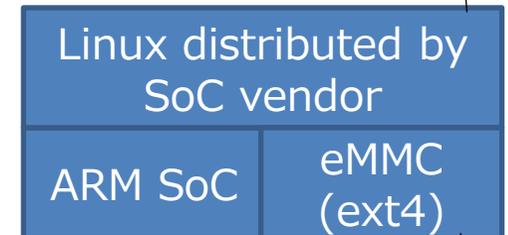
On ext3 we can get new one or old one, but with default ext4 configuration, this file keeps empty for 30 seconds because ext4 adopts “delayed allocation”.

This issue was reported in 2009 but we got this trouble in 2017..

<https://srad.jp/story/09/03/13/1311252/>

<https://linux.slashdot.org/story/09/03/11/2031231/apps-that-rely-on-ext3s-commit-interval-may-lose-data-in-ext4>

init process for network updates /etc/hosts every boot time



default journal mode (data=ordered)

Solutions for the issue

1. use “noatime” (no delayed allocation) option for ext4 mounting
 - using “data=journal” option makes this option enabled automatically
2. duplicate files on userland

```
if [ -f file.bak ]; then cp file.bak file; fi
cp file file.bak; sync
update file
rm file.bak
sync
```

- proper “sync” calls are needed
 - We had better flush devices’ buffer also
 - “ioctl(fd, BLKFLSBUF);” for C source codes
 - “hdparm -f /dev/xxx” for shell scripts
3. Better filesystem for eMMC and embedded device?

How can we avoid such trouble?

- Adopt well-supported Linux distribution
- Accumulate knowledge via these community
- Understand Linux deeply

- Any good ideas or solutions?

[Another problem we have]

- How should we check filesystem to manufacture and ship the Linux device from the factory?
 - compare hash (e.g. SHA256) of all files
 - check some files with right ones