

# SD Card writing performance

Daniel Teubl, teubl.dani@gmail.com

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## Problem description

At some point during development, the measurement and logging system showed random reboot problems after a few minutes or few hours of run time.

Among some bad development practices, and constant changes of some of the core application parts, faulty hardware assembly and SD-Card quality got blamed. A longer investigation were done to collect data to help identify some of the underlying technical problem. After some of the underlying random restart problem is fixed, 0.5-1 day test runs were conducted to prove the stability of the system.

The data collected from the tens of hours of run time test indicates that the quality of the SD-Card matters a lot.

Original data and software can be found ACMU software. The results there are written as **notes to self** matter, to help focus the development.

## The system

An STM32F446RE MCU is used as the core of the system. The SD-Card connection is standard SPI. All of the boards as custom made, with small pcb orders, and assembled by hand.

The mbed-os 6.15 version is used as an RTOS and provider of file system, SD-Card and USB connection provider.

The system operates normally with 200 [Hz] sampling on each measurement points, and 600-1500 [ms] buffering cycle. It uses a double buffer configuration. The content of the read buffer is stored on an SD-Card. The storing starts after a full buffer event triggers exchange of the buffers.

The file writing time, data buffering and sampling cycles are logged on the SD-card.

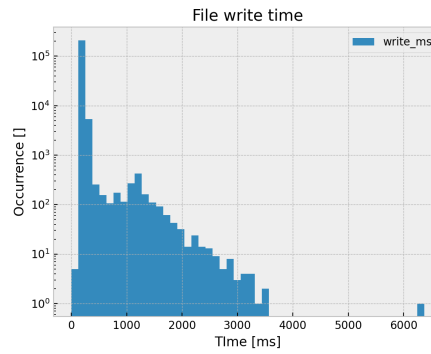
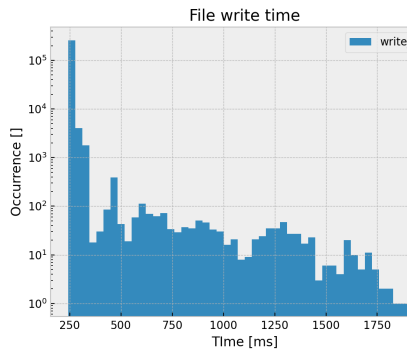
## Measurements

About 2.5 days of run time test were conducted with different SD-Cards. The same software version and configuration is used. The variation caused by the manufacturing of the ACMU boards is negligible, since the “high quality” cards showed similar results on other boards.

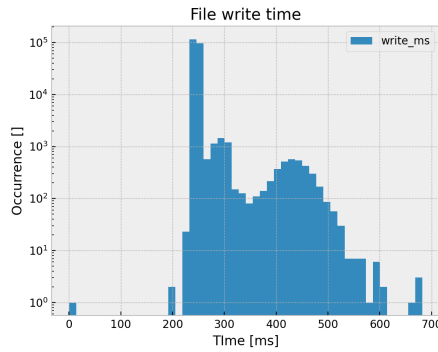
Board	SD-Card type	runtime
ACMUv1209	SanDisk ultra HC 10	~68.9 [h]
ACMUv1202	SanDisk ultra HC 10 a1	~69.0 [h]
ACMUv1204	SanDisk Industrial HC U1	~69.1 [h]

SanDisk Ultra HC 10

SanDisk Ultra HC 10 a1



SanDisk Industrial HC U1



## Discussion

The figures above indicates a huge deviation of the maximum file write times between the different SD-Card families. Seemingly, the **industrial** grade card, indicates some grantee to the maximum write time. The other two types does not.

No investigation were done on the underlying libraries and support code from the mbed-os stack.

## Conclusion

The type and quality of the SD-Card matters a lot when it comes to performance and write time grantees. Choose your SD-Card well for the task. Measure if you can before use, specially in critical system.

Old but relevant talk on the topic by Peter Chubb at [linux.conf.au](http://linux.conf.au) 2015