Raspberry Pi - Optimization

- How to optimize the Raspberry Pi by putting temporary files in RAM.

Topic Outline

- Out-of-box configuration
- SD card limitations
- Configuring temporary file system
- Help – Apache doesn't work!

Raspberry Pi - OS

- Ships with NOOBS on SD card
- NOOBS
  - Recommended for beginners
  - Allows a choice of OS's
  - Raspbian installed by default in v1.3.10 (09/2014)
- Raspbian
  - Based on Debian
  - Best for using the Pi as a server
  - Applies to what follows

Out-of-Box Configuration

- Root file system gets mounted to SD card
- This includes the following directories
  - /tmp – temporary user and OS files
  - /var/tmp – temporary OS files
  - /var/log – system log files
  - /var/spool/mqueue – mail queue files
- All logs written to SD card!!

SD Card Limitations

- Up to 100K writes to a physical location
- Circuitry to manage “wear-leveling”
  - Spreads out writes to avoid “hot spots”
  - Routes around worn out memory cells
  - Prevents early failure of card
- Frequent writes will result in performance degradation
- Server and system logging results in frequent writes
- Performance degrades over a period of weeks or months with heavy usage

The Solution!

- Use RAM for temporary file system
- Raspberry Pi 3 has 949580 kB RAM
- Most logging requires only about 50 – 100 mB
- Downside of using RAM
  - On reboot all logs and temp files are lost!
  - If you need to keep logs, use a usb hard disk

Configuring Tmpfs

- Tmpfs – OS uses RAM for file system
- File access same as for SD card or hard disk
- Easy to configure
- Requires editing file system table - /etc/fstab

Editing /etc/fstab

- Acting as superuser add the following lines
  - tmpfs /tmp tmpfs defaults,noatime,nosuid,size=20m 0 0
  - tmpfs /var/tmp tmpfs defaults,noatime,nosuid,size=20m 0 0
  - tmpfs /var/log tmpfs defaults,noatime,nosuid,mode=0755,size=20m 0 0
  - tmpfs /var/spool/mqueue tmpfs defaults,noatime,nosuid,mode=0700,gid=12,size=10m 0 0

Review of fstab Entries

- defaults – default mount options
  - rw, suid, exec, auto, nouser, and async
- noatime – disable read access recording
- nosuid – prevents set user id files (security)
- mode – chmod access mode
- size – file system size in bytes
- 0 0
  - Disable file system checking and dumping

Help! Apache Doesn't Work!

- Apache2 writes logs to the directory /var/log/apache2
- Rebooting erases all tmpfs files and folders
- /var/log/apache2 lost on power down or reboot
- /var/log/apache2 must be re-created BEFORE apache service starts up in the boot sequence
- Can be fixed by editing apache environment variables file - /etc/apache2/envvars

Editing /etc/apache2/envvars

- Acting as superuser add the following lines near the top of the file
  - if [! -d /var/log/apache2]; then
  - mkdir /var/log/apache2
  - fi
- May be necessary to add

```
if [ ! -d /var/log/mysql ]; then
  mkdir /var/log/mysql
fi
```

Real Life Example

- Raspberry Pi HTTP Server
  - Uses temporary file system
  - Interfaces to Internet-of-Things device
  - Queries device and reports data in web page

References

- http://www.zdnet.com/article/raspberry-pi-extending-the-life-of-the-sd-card/
- https://www.raspberrypi.org/forums/viewtopic.php?f=27&t=29175/
- https://narcisocerezo.wordpress.com/2014/06/25/create-a-robust-raspberry-pi-setup-for-24x7-operation/

This Presentation on Github

- github.com/fractalxaos/barcamp/UsingRaspberryPiTmpfs.pdf