Hardware

This is the list of hardware I'm going to use (you can achieve this with one worker, or two)

- **9x Raspberry Pi 4** (4GB Ram version) – 1pc = 68.90,-Eur
- **9x 32GB USB Disk** (Samsung USB 3.1 32 GB Fit Plus) – 1pc = 10.90,-Eur
- **9x 64GB USB Disk** (Samsung USB 3.1 64 GB Fit Plus) – 1pc = 19.50,-Eur
- 1x WiFi router TP-Link TL-WR902AC – 1pc = 34.90,- Eur (*Later I changed from WiFi to LAN cables and* **Mikrotik 10 port Router**, *ostly because of storage. Storage is network driven, and the faster the connection you have the better. However, for basic testing WiFi will do just fine*)
- **2x I-TEC USB 3.0 Charging HUB 16port** + Power Adapter 90 W – 1pc = 54.90,-Eur (*One is not enough (One is not enough to power 9x Rpi, since we also power USB disks, and for just 1x Rpi you need around 15W (5V x 3A) [* **all together 9x Rpi can draw up to 135W** *]. Therefore,I'm adding one more of the same USB hub to help, but if possible, go with a PoE solution if you can get a cheap PoE switch.*).

In total: 1 036.15,- Eur (shit, that much?!? I have bought these components over time... but fuck me, for that I could get HP G6 or G7 2U server, second hand 😝)

Regarding the USB disks – The bigger ones 64GB) are to be used as persistent storage for pods. I was experimenting with GlusterFS storage, some CEPH + ROOK and ended with Longhorn.

The smaller ones are boot USB disks. This way, I hope it will live much longer than an SD card 😊

Speed benchmarks

Speed benchmarks between USB drive and SD card.

SD Card (Kingston Canvas Select Plus micro SDHC 16GB Class 10 UHS-I):

```
   Category            Test              Result
HDParm            Disk Read             41.25 MB/s
HDParm            Cached Disk Read      37.70 MB/s
DD                Disk Write            9.9 MB/s
FIO               4k random read        2910 IOPS (11642 KB/s)
FIO               4k random write       657 IOPS (2630 KB/s)
IOZone            4k read               10288 KB/s
IOZone            4k write              2340 KB/s
IOZone            4k random read        7832 KB/s
IOZone            4k random write       2404 KB/s

                  Score: 963
```

USB Flash Drive 64GB (Samsung USB 3.1 64 GB Fit Plus):

```
   Category            Test              Result
HDParm            Disk Read             33.92 MB/s
HDParm            Cached Disk Read      25.00 MB/s
DD                Disk Write            16.2 MB/s
FIO               4k random read        1713 IOPS (6855 KB/s)
FIO               4k random write       1722 IOPS (6890 KB/s)
IOZone            4k read               12017 KB/s
IOZone            4k write              8285 KB/s
IOZone            4k random read        10110 KB/s
IOZone            4k random write       9038 KB/s

                  Score: 1917
```

USB Flash Drive 256GB (Samsung USB 3.1 256 GB Fit Plus):

```
   Category            Test              Result
HDParm            Disk Read             69.28 MB/s
HDParm            Cached Disk Read      70.57 MB/s
DD                Disk Write            24.4 MB/s
FIO               4k random read        2960 IOPS (11841 KB/s)
FIO               4k random write       2932 IOPS (11731 KB/s)
IOZone            4k read               13793 KB/s
IOZone            4k write              13249 KB/s
IOZone            4k random read        10692 KB/s
IOZone            4k random write       11654 KB/s

                  Score: 2524
```

As you can see, this is not a miracle speedup, but it is better than an SD card, and hopefully a USB flash drive can survive a bit longer. Of course, if you would use any actual SSD drive the score would be something above 6000. Or, you can boot from a network, which also avoids SD cards, but for that you need a beefier PXE boot server.

Script used for testing: https://github.com/TheRemote/PiBenchmarks

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[Name]

cmonty14 • a year ago
Hello,
this how-to guide is very impressive.
Great work!

However, I have this question regarding your hardware selection:
What makes you believe that a 32/64 GB USB Stick will be more robust or live longer than a SD card?

What kill a SD card is the (limited) number of IO write operations.
This limit exists for (standard) USB sticks, too.

Most USB memory sticks use MLC memory cells that survive up to 15.000 write IOs.
The more expensive SLC memory cells survive up to 1.000.000 write IOs.

In my opinion it makes no sense to use an USB stick with MLC memory cells as a system disk.
If you do so, you should consider to write log to RAM, e.g. https://github.com/azlux/lo…

Regards
Thomas

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vladoportos Mod → cmonty14 • a year ago
Man I did not click "read more" :D Regarding the SD card and USB, Its just my personal experience. I have drawer full of SD cards from SanDisk, Kingston, AData that simply died after random times (this might be just my bad luck, but I have like 10 dead one). So I decided give USB a chance and so far so good also the speed seems to be higher. Logging to RAM was considered but RAM is at premium with RPI and some logs (Kubernetes ones) can reach big sizes quick when something breaks. Kubernetes just start vomiting so much info into log non stop its crazy :D Although maybe reserving like 100MB in ram for log and than dump it to disk at once would help with wear and tear of storage medium. Its worth to look into.

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vladoportos Mod → cmonty14 • a year ago
Thanks :)

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