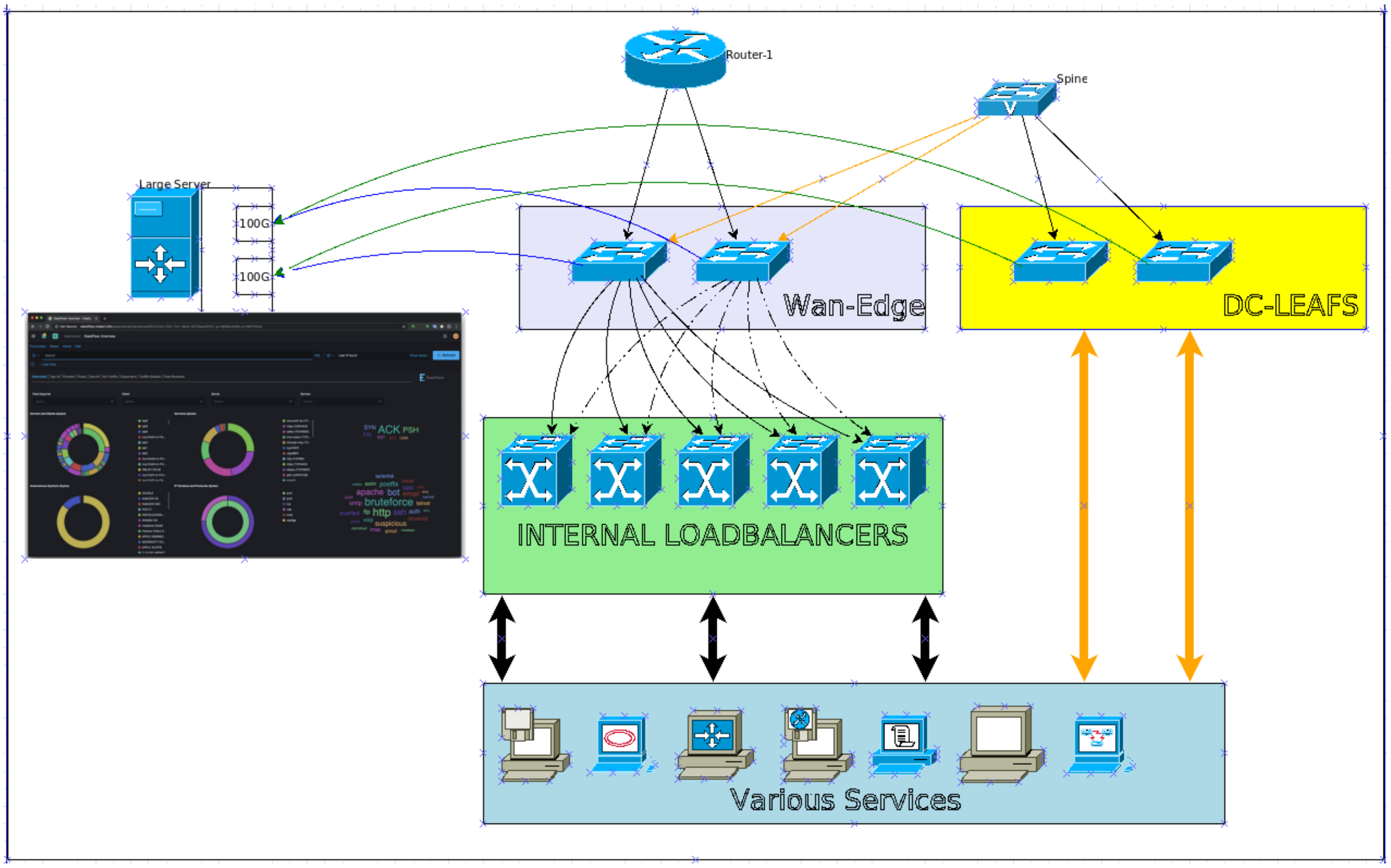
Generating 1:1 ipfix from 10g pipeline - Getting the data - Part 1



Goal : generate lossles ipfix flow's from distributed pipe to monitor application or network performance, identify bootlenecks and generate alerts if possible.

Why this way ? : It was expensive to do it with proprietary solutions. Plus we needed to have a flexible, open source option to work on. The closest solution cost was $1M

Challenges ;

- We are going to do it using cpu, so lot's of flows require lots of processing power,
- short flows create large ipfix messages than theirselves, any dns flow is is mostly 100 bytes long but a ipfix message for that flow costs us 1000 bytes
- many packets traversing the kernel would create losses so we needed to bypass that

- we need to create custom dashboards, or create alerts.
- deduplication

Plan :

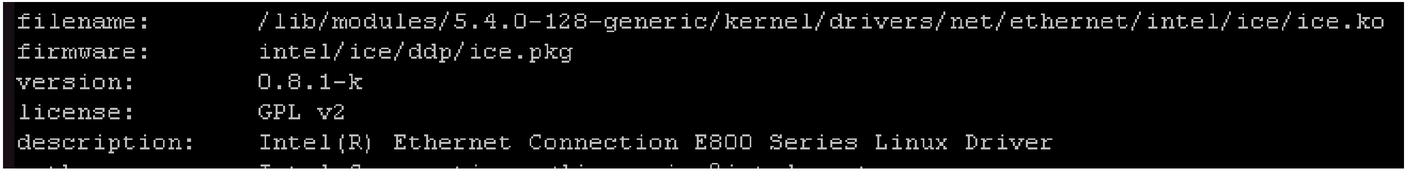
- get mirrors from devices
- produce ipfix from mirrors
- send ipfix data to elastiflow
- design custom dashboards
- design monitor and alerters

What happened along the way;

- Obviously there will be lot's of storage requirement and cpu requirements how ever the current write rate wasn't going to be deadly so we decided to go with using only one server with many ssd drives. We lost the array drives because of a failure in array controller
- We were going to aggregate mirrors from fabric using a Mellanox switch by utilizing it's bridge functions, the asic couldn't manage packet replication this step failed, we bought additional cards and skipped aggregation layer.
- The intel x810-CAQxx cards failed to go in Zero Copy mode, we needed to wait for 2 months for a new firmware from intel
- The tool that we used created problems with intel cards firmware and kernel module. We had to reflash them twice till we found a working state
- The tool had a bug with combining mirrors so we waited for a bugfix.

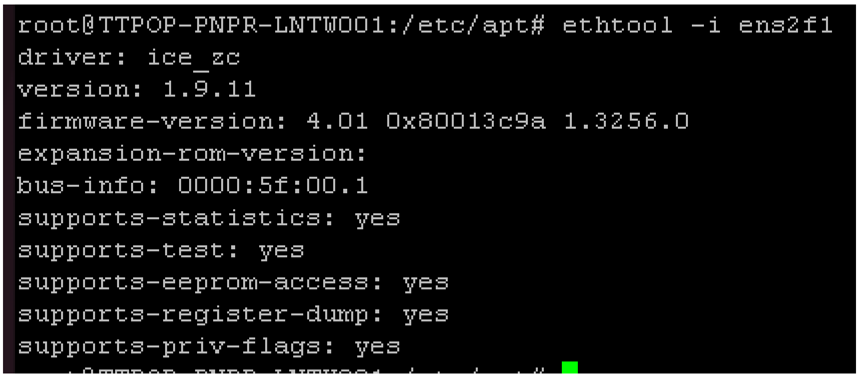
Current status

We have a working setup, using this version of intel module



```
filename:       /lib/modules/5.4.0-128-generic/kernel/drivers/net/ethernet/intel/ice/ice.ko
firmware:       intel/ice/ddp/ice.pkg
version:        0.8.1-k
license:        GPL v2
description:    Intel(R) Ethernet Connection E800 Series Linux Driver
```

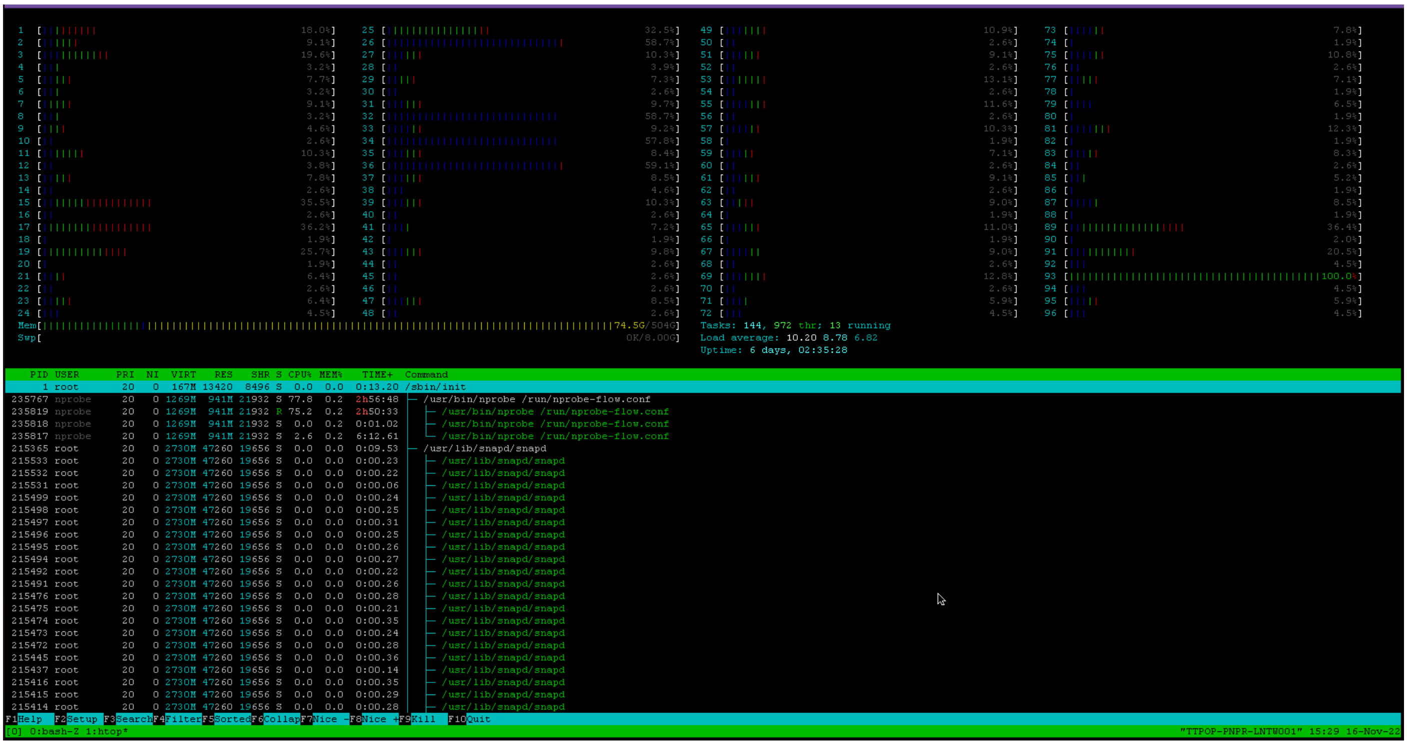
With this version of firmware



```
root@TTPOP-PNPR-LNTW001:/etc/apt# ethtool -i ens2f1
driver: ice_zc
version: 1.9.11
firmware-version: 4.01 0x80013c9a 1.3256.0
expansion-rom-version:
bus-info: 0000:5f:00.1
supports-statistics: yes
supports-test: yes
supports-eeprom-access: yes
supports-register-dump: yes
supports-priv-flags: yes
```

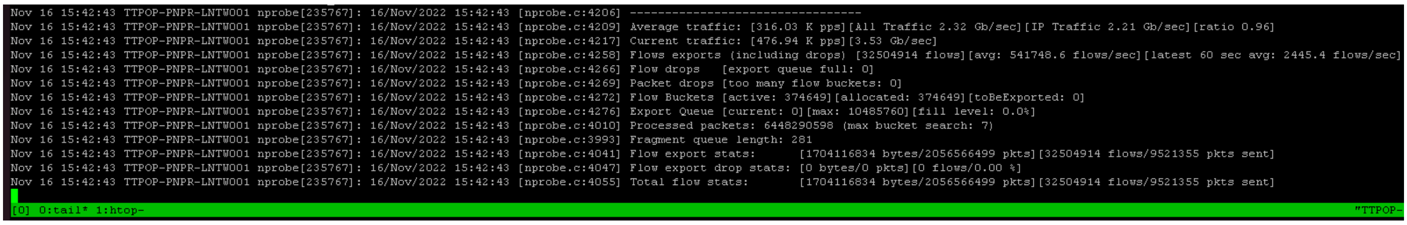
You can find some performance outputs as shown below

Server's status



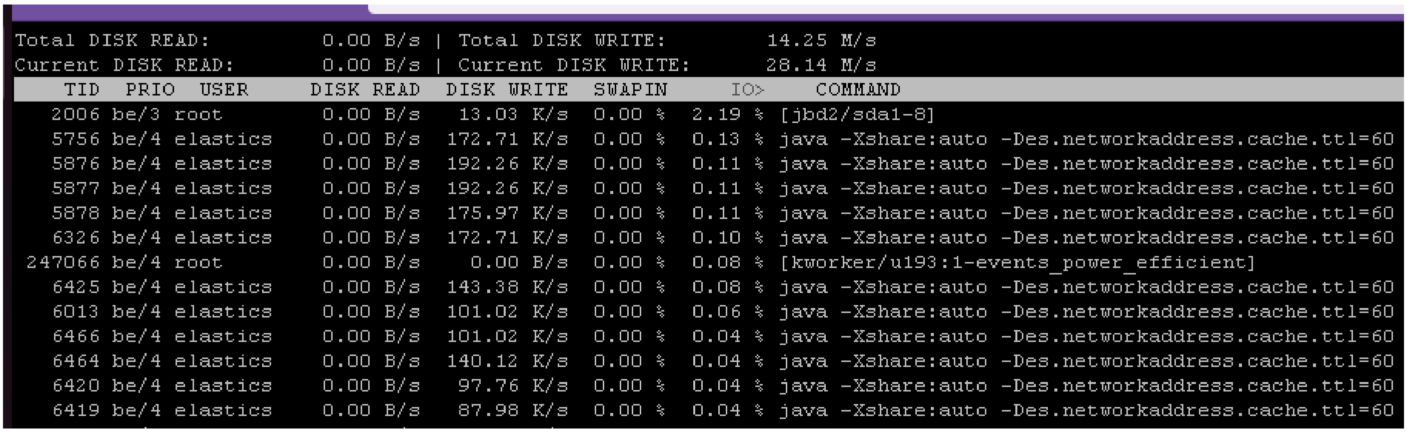
```
  1 [|||||||||                  18.0%]  25 [|||||||||||||||||           32.5%]  49 [|||||||                    10.9%]  73 [||||||                      7.8%]
  2 [||||||                      9.1%]  26 [|||||||||||||||||||||||||||||58.7%]  50 [||                          2.6%]  74 [|                           1.9%]
  3 [|||||||||||                19.6%]  27 [||||||                     10.3%]  51 [||||||                      9.1%]  75 [||||||                     10.8%]
  4 [|||                         3.2%]  28 [||                          3.9%]  52 [||                          2.6%]  76 [||                          2.6%]
  5 [|||||                       7.7%]  29 [|||||                       7.3%]  53 [|||||||                    13.1%]  77 [|||||                       7.1%]
  6 [|||                         3.2%]  30 [||                          2.6%]  54 [||                          2.6%]  78 [|                           1.9%]
  7 [|||||                       9.1%]  31 [||||||                      9.7%]  55 [|||||||                    11.6%]  79 [||||                        6.5%]
  8 [|||                         3.2%]  32 [||||||||||||||||||||||||||||58.7%]  56 [||                          2.6%]  80 [|                           1.9%]
  9 [||||                        4.6%]  33 [||||||                      9.2%]  57 [||||||                     10.3%]  81 [|||||||                    12.3%]
 10 [||                          2.6%]  34 [||||||||||||||||||||||||||||57.8%]  58 [|                           1.9%]  82 [|                           1.9%]
 11 [|||||||                    10.3%]  35 [||||||                      8.4%]  59 [|||||                       7.1%]  83 [|||||                       8.3%]
 12 [||                          3.8%]  36 [|||||||||||||||||||||||||||||59.1%]  60 [||                          2.6%]  84 [||                          2.6%]
 13 [|||||                       7.8%]  37 [||||||                      8.5%]  61 [||||||                      9.1%]  85 [|||                         5.2%]
 14 [||                          2.6%]  38 [|||                         4.6%]  62 [||                          2.6%]  86 [|                           1.9%]
 15 [||||||||||||||||||         35.5%]  39 [||||||                     10.3%]  63 [|||||                       9.0%]  87 [|||||                       8.5%]
 16 [||                          2.6%]  40 [||                          2.6%]  64 [|                           1.9%]  88 [|                           1.9%]
 17 [||||||||||||||||||         36.2%]  41 [||||                        7.2%]  65 [||||||                     11.0%]  89 [||||||||||||||||||         36.4%]
 18 [|                           1.9%]  42 [|                           1.9%]  66 [|                           1.9%]  90 [|                           2.0%]
 19 [||||||||||||||             25.7%]  43 [||||||                      9.8%]  67 [||||||                      9.0%]  91 [|||||||||||                20.5%]
 20 [|                           1.9%]  44 [||                          2.6%]  68 [||                          2.6%]  92 [|||                         4.5%]
 21 [||||                        6.4%]  45 [||                          2.6%]  69 [|||||||                    12.8%]  93 [|||||||||||||||||||||||||||||100.0%]
 22 [||                          2.6%]  46 [||                          2.6%]  70 [||                          2.6%]  94 [|||                         4.5%]
 23 [|||||                       6.4%]  47 [||||||                      8.5%]  71 [||||                        5.9%]  95 [|||||                       5.9%]
 24 [|||                         4.5%]  48 [||                          2.6%]  72 [|||                         4.5%]  96 [|||                         4.5%]
 Mem[|||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||74.5G/504G]  Tasks: 144, 972 thr; 13 running
 Swp[                                                                   0K/8.00G]  Load average: 10.20 8.78 6.82
                                                                                   Uptime: 6 days, 02:35:28

    PID USER      PRI  NI  VIRT   RES   SHR S CPU% MEM%   TIME+  Command
      1 root       20   0  167M 13420  8496 S  0.0  0.0  0:13.20 /sbin/init
 235767 nprobe     20   0 1269M  941M 21932 S 77.8  0.2  2h56:48 ├─ /usr/bin/nprobe /run/nprobe-flow.conf
 235819 nprobe     20   0 1269M  941M 21932 R 75.2  0.2  2h50:33 │  ├─ /usr/bin/nprobe /run/nprobe-flow.conf
 235818 nprobe     20   0 1269M  941M 21932 S  0.0  0.2  0:01.02 │  ├─ /usr/bin/nprobe /run/nprobe-flow.conf
 235817 nprobe     20   0 1269M  941M 21932 S  2.6  0.2  6:12.61 │  └─ /usr/bin/nprobe /run/nprobe-flow.conf
 215365 root       20   0 2730M 47260 19656 S  0.0  0.0  0:09.53 ├─ /usr/lib/snapd/snapd
 215533 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.23 │  ├─ /usr/lib/snapd/snapd
 215532 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.22 │  ├─ /usr/lib/snapd/snapd
 215531 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.06 │  ├─ /usr/lib/snapd/snapd
 215499 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.24 │  ├─ /usr/lib/snapd/snapd
 215498 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.25 │  ├─ /usr/lib/snapd/snapd
 215497 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.31 │  ├─ /usr/lib/snapd/snapd
 215496 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.25 │  ├─ /usr/lib/snapd/snapd
 215495 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.26 │  ├─ /usr/lib/snapd/snapd
 215494 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.27 │  ├─ /usr/lib/snapd/snapd
 215492 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.22 │  ├─ /usr/lib/snapd/snapd
 215491 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.26 │  ├─ /usr/lib/snapd/snapd
 215476 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.28 │  ├─ /usr/lib/snapd/snapd
 215475 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.21 │  ├─ /usr/lib/snapd/snapd
 215474 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.35 │  ├─ /usr/lib/snapd/snapd
 215473 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.24 │  ├─ /usr/lib/snapd/snapd
 215472 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.28 │  ├─ /usr/lib/snapd/snapd
 215445 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.36 │  ├─ /usr/lib/snapd/snapd
 215437 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.14 │  ├─ /usr/lib/snapd/snapd
 215416 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.35 │  ├─ /usr/lib/snapd/snapd
 215415 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.29 │  ├─ /usr/lib/snapd/snapd
 215414 root       20   0 2730M 47260 19656 S  0.0  0.0  0:00.28 │  ├─ /usr/lib/snapd/snapd
F1Help  F2Setup F3SearchF4FilterF5SortedF6CollapF7Nice -F8Nice +F9Kill  F10Quit
[0] 0:bash-Z 1:htop*                                                        "TTPOP-PNPR-LNTW001" 15:29 16-Nov-22
```

Current traffic rate



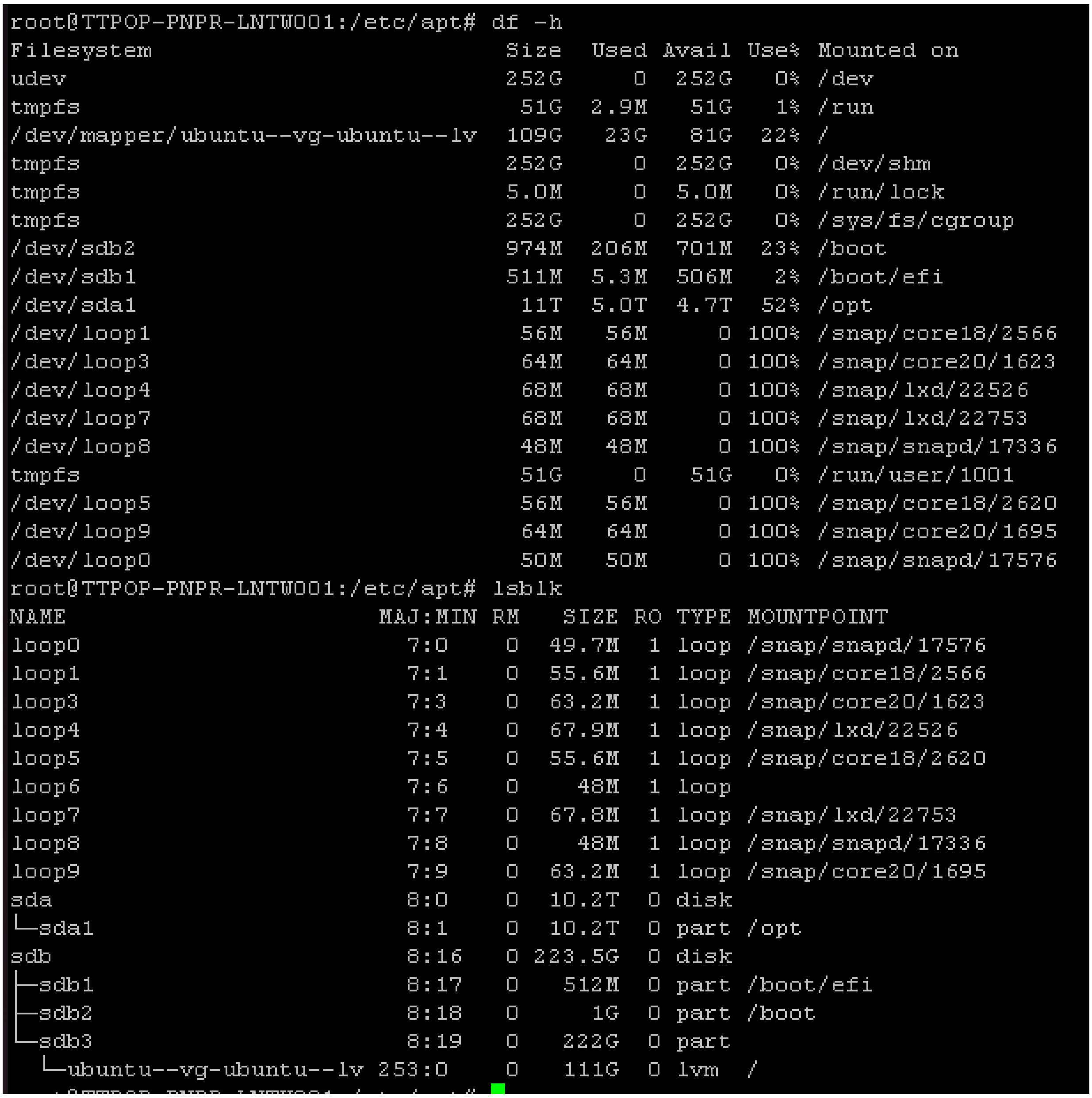
```
Nov 16 15:42:43 TTPOP-PNPR-LNTW001 nprobe[235767]: 16/Nov/2022 15:42:43 [nprobe.c:4206] ---------------------------------
Nov 16 15:42:43 TTPOP-PNPR-LNTW001 nprobe[235767]: 16/Nov/2022 15:42:43 [nprobe.c:4209] Average traffic: [316.03 K pps][All Traffic 2.32 Gb/sec][IP Traffic 2.21 Gb/sec][ratio 0.96]
Nov 16 15:42:43 TTPOP-PNPR-LNTW001 nprobe[235767]: 16/Nov/2022 15:42:43 [nprobe.c:4217] Current traffic: [476.94 K pps][3.53 Gb/sec]
Nov 16 15:42:43 TTPOP-PNPR-LNTW001 nprobe[235767]: 16/Nov/2022 15:42:43 [nprobe.c:4258] Flows exports (including drops) [32504914 flows][avg: 541748.6 flows/sec][latest 60 sec avg: 2445.4 flows/sec]
Nov 16 15:42:43 TTPOP-PNPR-LNTW001 nprobe[235767]: 16/Nov/2022 15:42:43 [nprobe.c:4266] Flow drops   [export queue full: 0]
Nov 16 15:42:43 TTPOP-PNPR-LNTW001 nprobe[235767]: 16/Nov/2022 15:42:43 [nprobe.c:4269] Packet drops [too many flow buckets: 0]
Nov 16 15:42:43 TTPOP-PNPR-LNTW001 nprobe[235767]: 16/Nov/2022 15:42:43 [nprobe.c:4272] Flow Buckets [active: 374649][allocated: 374649][toBeExported: 0]
Nov 16 15:42:43 TTPOP-PNPR-LNTW001 nprobe[235767]: 16/Nov/2022 15:42:43 [nprobe.c:4276] Export Queue [current: 0][max: 10485760][fill level: 0.0%]
Nov 16 15:42:43 TTPOP-PNPR-LNTW001 nprobe[235767]: 16/Nov/2022 15:42:43 [nprobe.c:4010] Processed packets: 6448290598 (max bucket search: 7)
Nov 16 15:42:43 TTPOP-PNPR-LNTW001 nprobe[235767]: 16/Nov/2022 15:42:43 [nprobe.c:3993] Fragment queue length: 281
Nov 16 15:42:43 TTPOP-PNPR-LNTW001 nprobe[235767]: 16/Nov/2022 15:42:43 [nprobe.c:4041] Flow export stats:      [1704116834 bytes/2056566499 pkts][32504914 flows/9521355 pkts sent]
Nov 16 15:42:43 TTPOP-PNPR-LNTW001 nprobe[235767]: 16/Nov/2022 15:42:43 [nprobe.c:4047] Flow export drop stats: [0 bytes/0 pkts][0 flows/0.00 %]
Nov 16 15:42:43 TTPOP-PNPR-LNTW001 nprobe[235767]: 16/Nov/2022 15:42:43 [nprobe.c:4055] Total flow stats:       [1704116834 bytes/2056566499 pkts][32504914 flows/9521355 pkts sent]

[0] 0:tail* 1:htop-                                                                                                                          "TTPOP-
```

Current io rate



```
Total DISK READ:        0.00 B/s | Total DISK WRITE:        14.25 M/s
Current DISK READ:      0.00 B/s | Current DISK WRITE:      28.14 M/s
    TID  PRIO  USER     DISK READ  DISK WRITE  SWAPIN     IO>    COMMAND
   2006 be/3 root        0.00 B/s   13.03 K/s  0.00 %  2.19 % [jbd2/sda1-8]
   5756 be/4 elastics    0.00 B/s  172.71 K/s  0.00 %  0.13 % java -Xshare:auto -Des.networkaddress.cache.ttl=60
   5876 be/4 elastics    0.00 B/s  192.26 K/s  0.00 %  0.11 % java -Xshare:auto -Des.networkaddress.cache.ttl=60
   5877 be/4 elastics    0.00 B/s  192.26 K/s  0.00 %  0.11 % java -Xshare:auto -Des.networkaddress.cache.ttl=60
   5878 be/4 elastics    0.00 B/s  175.97 K/s  0.00 %  0.11 % java -Xshare:auto -Des.networkaddress.cache.ttl=60
   6326 be/4 elastics    0.00 B/s  172.71 K/s  0.00 %  0.10 % java -Xshare:auto -Des.networkaddress.cache.ttl=60
 247066 be/4 root        0.00 B/s    0.00 B/s  0.00 %  0.08 % [kworker/u193:1-events_power_efficient]
   6425 be/4 elastics    0.00 B/s  143.38 K/s  0.00 %  0.08 % java -Xshare:auto -Des.networkaddress.cache.ttl=60
   6013 be/4 elastics    0.00 B/s  101.02 K/s  0.00 %  0.06 % java -Xshare:auto -Des.networkaddress.cache.ttl=60
   6466 be/4 elastics    0.00 B/s  101.02 K/s  0.00 %  0.04 % java -Xshare:auto -Des.networkaddress.cache.ttl=60
   6464 be/4 elastics    0.00 B/s  140.12 K/s  0.00 %  0.04 % java -Xshare:auto -Des.networkaddress.cache.ttl=60
   6420 be/4 elastics    0.00 B/s   97.76 K/s  0.00 %  0.04 % java -Xshare:auto -Des.networkaddress.cache.ttl=60
   6419 be/4 elastics    0.00 B/s   87.98 K/s  0.00 %  0.04 % java -Xshare:auto -Des.networkaddress.cache.ttl=60
```

Disk config



```
root@TTPOP-PNPR-LNTW001:/etc/apt# df -h
Filesystem                         Size  Used Avail Use% Mounted on
udev                               252G     0  252G   0% /dev
tmpfs                               51G  2.9M   51G   1% /run
/dev/mapper/ubuntu--vg-ubuntu--lv  109G   23G   81G  22% /
tmpfs                              252G     0  252G   0% /dev/shm
tmpfs                              5.0M     0  5.0M   0% /run/lock
tmpfs                              252G     0  252G   0% /sys/fs/cgroup
/dev/sdb2                          974M  206M  701M  23% /boot
/dev/sdb1                          511M  5.3M  506M   2% /boot/efi
/dev/sda1                           11T  5.0T  4.7T  52% /opt
/dev/loop1                          56M   56M     0 100% /snap/core18/2566
/dev/loop3                          64M   64M     0 100% /snap/core20/1623
/dev/loop4                          68M   68M     0 100% /snap/lxd/22526
/dev/loop7                          68M   68M     0 100% /snap/lxd/22753
/dev/loop8                          48M   48M     0 100% /snap/snapd/17336
tmpfs                               51G     0   51G   0% /run/user/1001
/dev/loop5                          56M   56M     0 100% /snap/core18/2620
/dev/loop9                          64M   64M     0 100% /snap/core20/1695
/dev/loop0                          50M   50M     0 100% /snap/snapd/17576
root@TTPOP-PNPR-LNTW001:/etc/apt# lsblk
NAME                          MAJ:MIN RM   SIZE RO TYPE MOUNTPOINT
loop0                           7:0    0  49.7M  1 loop /snap/snapd/17576
loop1                           7:1    0  55.6M  1 loop /snap/core18/2566
loop3                           7:3    0  63.2M  1 loop /snap/core20/1623
loop4                           7:4    0  67.9M  1 loop /snap/lxd/22526
loop5                           7:5    0  55.6M  1 loop /snap/core18/2620
loop6                           7:6    0    48M  1 loop
loop7                           7:7    0  67.8M  1 loop /snap/lxd/22753
loop8                           7:8    0    48M  1 loop /snap/snapd/17336
loop9                           7:9    0  63.2M  1 loop /snap/core20/1695
sda                             8:0    0  10.2T  0 disk
└─sda1                          8:1    0  10.2T  0 part /opt
sdb                             8:16   0 223.5G  0 disk
├─sdb1                          8:17   0   512M  0 part /boot/efi
├─sdb2                          8:18   0     1G  0 part /boot
└─sdb3                          8:19   0   222G  0 part
  └─ubuntu--vg-ubuntu--lv 253:0    0   111G  0 lvm  /
```

What's Next:

Well, we started to deep dive into traffic and analyze, create widgets and all the necessary stuff to have a Management dashboard. We saw some interesting stuff too which will need a lot of troubleshooting and investigation.

Revision #9
Created 16 November 2022 15:27:33 by Mesut Bayrak
Updated 17 November 2022 16:50:33 by Mesut Bayrak