BOSC-E2014: Aflevering 3

Christian Cederquist, Daniel Larsen, Jonas Bredvig Bendix Nielsen

November 7, 2014

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Part I

Rapport

Chapter 1

Introduktion

Denne rapport undersøger Linux's kernemoduler og processer. Såkaldte Loadable Kernel Modules tillader en bruger at installere nye moduler i kernen uden at skulle genstarte og genopbygge operativsystemet. Vi bruger her disse kernemoduler til at udføre simple opgaver, så som printing af informationer i structs, og til at gennemgå systemets liste af processer, både ved lineær gennemgang og ved dybde-først søgning. Vi anvender de forskellige macros i de tilgængelige biblioteker til liste-gennemgang. Vi diskuterer til sidst fordele og ulemper ved kernemoduler, indbyggede kommandoer til at se processer og en sammenligning af førnævnte med vores implementation, samt ændringsforslag og muligheder for udvidelse eller optimeringer af kernemodulet. Vi konkluderer, at det nuværende modul ikke er lige så godt som ps-kommandoen, men at der er mange muligheder for at udvide og videreudvikle vores kernemodul.

1.1 Metode

1.1.1 Kernemoduler

Linuxkernen har et set af komponenter og forbindelser til andre sevices gennem en række moduler, som startes enten gennem opstart eller under kørsel. Kernemoduler kan installeres under kørsel, og bruges til diverse opgaver, så som enhedsdrivere eller filsystemer. Fordelen ved loadable kernemoduler i Linux er, at man ved ændringer i kernen ikke behøver at genstarte og genopbygge kernen, hvis et nyt modul skal tilføjes.

1.1.2 Listemacros

list_for_each(_entry)

list_for_each og list_for_each_entry er to macros defineret i list.h. Den første macro itererer over en liste, mens den anden itererer over en list_struct type i en liste. Disse er defineret følgende:

```
#define list_for_each(pos, head) \
        for (pos = (head)->next; pos != (head); pos = pos->next)
```

og

```
#define list_for_each_entry(pos, head, member)                          \
        for (pos = list_first_entry(head, typeof(*pos), member);        \
        &pos->member != (head);                                         \
        pos = list_next_entry(pos, member))
```

for_each_process

for_each_process er en macro defineret i sched.h. Denne macro itererer over operativsystemets liste af tasks, startende fra *init_task*. Denne macro er defineret følgende:

```
#define for_each_process(p) \
        for (p = &init_task ; (p = next_task(p)) != &init_task ; )
```

1.1.3 Processer

En proces er et program, der er under eksekvering. Det består af en stak, en hob, data og kode. I Linux representeres processer som task_structs i sched.h. Denne struktur indeholder al relevant information omkring processer, så som id, navn, barneprocesser, status, og en række andre informationer. Disse processers information kan tilgås ved at iterere over systemets processer ved hjælp af blandt andre for_each_process macroen.

1.1.4 Dybde-først søgealgoritme

Dybde-først søgning sker i en træstruktur ved, at man altid vælger det første barn af den node man befinder sig på, indtil man når en leaf node, hvorefter man går tilbage indtil man igen kan vælge et barn. Modsætningen til denne algoritme er bredde-først søgning, hvor man konsekvent holder sig tæt på den node man starter på. Her besøger man hvert barn, før man går videre til hvert barns barn. Disse algoritmer bruges også i udforskning af grafer og deres tilslutningsmuligheder.

Chapter 2

Implementation

Hvert af modulenerne har 2 funktioner med identifikatorene: *_init* og *_exit*. Disse 2 funktioner bruges til at initialisere og lukke et modul ned. Det særlige ved *_init* er at den bliver kasseret efter et succesfuldt load, da den ikke skal anvendes igen og optager dermed ikke unødig plads.

2.1 Simple

Simple er et modul som bruges til at lave en kædet liste ud fra en defineret datastruktur. Når modulet bliver initialiseret, skal den oprette en liste og udskrive alle elementer fra den den. Når modulet bliver fjernet skal den slette hele listen og frigøre pladsen.

Simple er implementeret ved først at definere en struct som indeholder de fornødne data, som man gerne vil have til at indgå i den kædede liste. Det særlige ved structen er, at den indeholder: *struct list_head list*. *list_head* er en del af *linux/types.h* package. Den indeholder 2 members: next og prev, som henholdsvis peger på den næste og det tidligere element i listen. Denne specifikke struktur gør det muligt at anvende macro-funktioner til at behandle den definerede datastruktur.

For at indsætte elementer i listen anvendes macroén: *list_add_tail*. Denne macro indsætter det nye element bagerst i listen.

For at iterere igennem listen og udskrive de forskellige elementer, anvendes macroen: *list_for_each_entry*.

For at slette elementer fra listen anvendes 2 macroer: *list_for_each_entry_safe*, som bruges til at iterere igennem listen, og *list_del* som anvendes til at slette elementer. Derudover anvendes også metoden kfree, som frigør den anvendte hukommelse.

2.2 Linear

Dette modul har til opgave at udskrive alle tasks, som Linux udfører på et pågældende tidspunkt.

I Linux er tasks repræsenterert ved hjælp af structen: *task_struct*. Implementationen af dette modul er meget simpel, da den kun har brug for at iterere igennem listen af tasks, som den får givet af systemet og derefter printe de fornødne informationer ud. For at udføre iterationen anvendes macroen: *for_each_process*.

Infos:

- Comm: Navnet på den specifikke process.
- State: Angiver hvilken tilstand den enkelte process er i. Stort set alle processerne som blev printet ud i vores test, havde tilstanden 1, som betyder at processen venter på at en opgave bliver færdig.
- Pid: Angiver den enkelte process unikke id.

2.3 DFS

Dette modul skal ligesom det foregående modul, udskrive alle tasks som Linux er igang med at udføre. Foreskellen er dog, at modulet ikke skal udskrive tasks linært, men derimod anvende en dybde-først søgning.

DFS er implementeret ved at lave et rekursivt metodekald af *dfs_list*. Metoden får en task som input, og itererer derefter over hvert enkelt barn af denne task. Under iterationen udskrives comm, state og pid for hvert barn, men før iterationen går videre til det næste barn, kaldes metoden *dfs_list* igen, nu bare med barnets barn som input.

Chapter 3

Test

3.1 Linux Kernel Modules

Kernemodulet er testet ved først at installere modulet ved brug af kommandoen: *sudo insmod simple.ko*.
Modulet skriver til kernel loggen ved initialiseringen. Outputtet fra kernel loggen indhentes ved hjælp af kommandoen dmesg:
dmesg

```
bosc@ubuntu:~/Desktop/obl3$ dmesg
[  477.092718] Loading Module
[  477.095316] Person 2-8-1995
[  477.095360] Person 4-9-1974
[  477.095367] Person 27-4-1958
[  477.095372] Person 15-3-1948
[  477.095377] Person 20-12-1990
```

Modulet slettes derefter ved hjælp af kommmandoen: *sudo rmmod simple*.

3.2 Lineær listing

Kernemodulet for den lineære gennemgang af processer er testet ved at installere modulet ved brug af kommandoen *sudo insmod cumlist.ko*.
Modulet skriver til kernel loggen ved initialiseringen. Outputtet fra kernel loggen indhentes ved hjælp af kommandoen dmesg:
sudo dmesg >linear.txt

3.2.1 Sammenligning af output

Resultatet sammenlignes med den indbyggede ps-kommando, med parametrene -el:
ps -el >pslinear.txt

PS:

```
F S   UID   PID  PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
4 S     0     1     0  0  80   0 -  1117 poll_s ?        00:00:08 init
1 S     0     2     0  0  80   0 -     0 kthrea ?        00:00:00 kthreadd
1 S     0     3     2  0  80   0 -     0 smpboo ?        00:00:02 ksoftirqd/0
1 S     0     5     2  0  60 -20 -     0 worker ?        00:00:00 kworker/0:0H
1 S     0     7     2  0  80   0 -     0 rcu_gp ?        00:00:09 rcu_sched
1 S     0     8     2  0  80   0 -     0 rcu_gp ?        00:00:00 rcu_bh
1 S     0     9     2  0 -40   - -     0 smpboo ?        00:00:00 migration/0
5 S     0    10     2  0 -40   - -     0 smpboo ?        00:00:30 watchdog/0
5 S     0    11     2  0 -40   - -     0 smpboo ?        00:00:03 watchdog/1
1 S     0    12     2  0 -40   - -     0 smpboo ?        00:00:00 migration/1
```

Implementation:

```
bosc@ubuntu:~/Desktop/obl3tasklist$ dmesg
[19635.864339] cumlist: module license 'DALARmusic' taints kernel.
[19635.864369] Disabling lock debugging due to kernel taint
[19636.049621] init: State is 1 and process id is 1
[19636.049636] kthreadd: State is 1 and process id is 2
[19636.049638] ksoftirqd/0: State is 1 and process id is 3
[19636.049640] kworker/0:0H: State is 1 and process id is 5
[19636.049642] rcu_sched: State is 1 and process id is 7
[19636.049643] rcu_bh: State is 1 and process id is 8
[19636.049645] migration/0: State is 1 and process id is 9
[19636.049647] watchdog/0: State is 1 and process id is 10
[19636.049648] watchdog/1: State is 1 and process id is 11
[19636.049650] migration/1: State is 1 and process id is 12
[19636.049652] ksoftirqd/1: State is 1 and process id is 13
```

Som det kan ses ud fra det udsnit som er taget, så har processerne de samme id i både det implementerede modul og i ps-kommandoen.

3.3 DFS listing

3.3.1 Setup

DFS kernemodulet er testet ved først at registere det med følgende kommando:
sudo insmod dfslist.ko

Efter som at modulet skriver til kernel loggen ved registrering, er indholdet hentet ud ved at køre kommandoen:
sudo dmesg >dfs.txt

Endelig skal resultaterne sammenlignes med den indbyggede ps kommando. Til dette køres følgende kommando for at hente de kørende processer i en træstruktur:
ps axjf >ps.txt

Se appendix B for output fra konsollen.

3.3.2 Sammenligning af output

DFS er kendetegnet ved, at første barns børn og børns børn itereres før de resterende børn (og tilsvarende, deres børn og børns børn) fra hovedknuden. Med andre ord forventes det af implementationen, at den udskriver processerne, men inden for hver process itereres ned over processens børn rekursivt og disse udskrives. For eksempel, hvis proceslisten består af process 1 og 2, og disse har børnene 1.1, 1.1.1 og 2.1, skal disse udskrives i rækkefølgen 1, 1.1, 1.1.1, 2, 2.1.

Dette viser sig tydeligt at være tilfældet for implementationen, idet processen med process-ID 1053 observeres fra ps.txt:

```
   1  1053  1053  1053 ?           -1 SLsl     0   0:00 lightdm
1053  1142  1142  1142 tty7      1142 Rs+      0   0:34  \_ /usr/bin/X -core :0 -seat seat0 -auth /var/run/lightdm/root/:0 -nolisten tcp vt7 -novtswitch
1053  1715  1053  1053 ?           -1 Sl       0   0:00  \_ lightdm --session-child 12 19
1715  2730  2730  2730 ?           -1 Ss    1000   0:00      \_ init --user
2730  2801  2801  2801 ?           -1 Ss    1000   0:00          \_ ssh-agent -s
2730  2807  2807  2807 ?           -1 Ss    1000   0:01          \_ dbus-daemon --fork --session --address=unix:abstract=/tmp/dbus-VLfuIwL5iq
2730  2815  2815  2815 ?           -1 Ss    1000   0:00          \_ upstart-event-bridge
2730  2819  2819  2819 ?           -1 Ss    1000   0:00          \_ /usr/lib/x86_64-linux-gnu/hud/window-stack-bridge
2730  2820  2820  2820 ?           -1 Ssl   1000   0:04          \_ /usr/bin/ibus-daemon --daemonize --xim
2820  2851  2820  2820 ?           -1 Sl    1000   0:00          |   \_ /usr/lib/ibus/ibus-dconf
2820  2854  2820  2820 ?           -1 Sl    1000   0:01          |   \_ /usr/lib/ibus/ibus-ui-gtk3
2820  2914  2820  2820 ?           -1 Sl    1000   0:00          |   \_ /usr/lib/ibus/ibus-engine-simple
2730  2829  2828  2828 ?           -1 S     1000   0:00          \_ upstart-file-bridge --daemon --user
2730  2835  2807  2807 ?           -1 Sl    1000   0:00          \_ /usr/lib/gvfs/gvfsd
2730  2836  2836  2836 ?           -1 Ssl   1000   0:00          \_ /usr/lib/unity-settings-daemon/unity-settings-daemon
2730  2842  2807  2807 ?           -1 Sl    1000   0:00          \_ /usr/lib/gvfs/gvfsd-fuse /run/user/1000/gvfs -f -o big_writes
2730  2845  2845  2845 ?           -1 Ssl   1000   0:01          \_ /usr/lib/x86_64-linux-gnu/hud/hud-service
2730  2849  2849  2849 ?           -1 Ssl   1000   0:00          \_ /usr/lib/at-spi2-core/at-spi-bus-launcher --launch-immediately
2849  2862  2849  2849 ?           -1 S     1000   0:00          |   \_ /bin/dbus-daemon --config-file=/etc/at-spi2/accessibility.conf --nofork --print-address 3
```

Her ses det, at process 1053 har en række børn (som også har børn), og af implementationen forventes det derfor, at disse udskrives i rækkefølge. Dette sammenlignes med en del af outputtet fra implementationen:

```
[ 5664.686470] lightdm: State is 1 and process id is 1053
[ 5664.686471] Xorg: State is 1 and process id is 1142
[ 5664.686473] lightdm: State is 1 and process id is 1715
[ 5664.686475] init: State is 1 and process id is 2730
[ 5664.686476] ssh-agent: State is 1 and process id is 2801
[ 5664.686478] dbus-daemon: State is 1 and process id is 2807
[ 5664.686480] upstart-event-b: State is 1 and process id is 2815
[ 5664.686481] window-stack-br: State is 1 and process id is 2819
[ 5664.686483] ibus-daemon: State is 1 and process id is 2820
[ 5664.686484] ibus-dconf: State is 1 and process id is 2851
[ 5664.686486] ibus-ui-gtk3: State is 1 and process id is 2854
[ 5664.686487] ibus-engine-sim: State is 1 and process id is 2914
[ 5664.686489] upstart-file-br: State is 1 and process id is 2829
[ 5664.686491] unity-settings-: State is 1 and process id is 2836
[ 5664.686493] gvfsd: State is 1 and process id is 2835
[ 5664.686494] gvfsd-fuse: State is 1 and process id is 2842
[ 5664.686496] hud-service: State is 1 and process id is 2845
[ 5664.686497] at-spi-bus-laun: State is 1 and process id is 2849
[ 5664.686499] dbus-daemon: State is 1 and process id is 2862
```

På skærmbilledet ses det, at processerne og deres børn udskrives i rækkefølge - som forventet.

Chapter 4

Diskussion

4.1 Brugen af kernemoduler

Brugen af kernemoduler frem for almindelige systemkald har adskillige fordele[1]. Det er f.eks. muligt at indlæse vilkårlige dele af systemet som ønsket, og når først disse er indlæst, kører de i kontekst af kernen. Med andre ord har et kernemodul fuld adgang til systemets hardware. Netop dette har ulempen, at kernemodulet er i stand til at crashe systemet.

Alternativet til samme kontrol over hardwaren er at foretage kodeændringer direkte i kernen, men dette kræver rekompilering, genstart mv. af kernen, og brugen af kernemoduler er altså en betydeligt mere fleksibel fremgangsmåde.

4.2 Fordele ved ps

Vores implementation viser udelukkende navn, state og process-id for de kørende tasks. Den indbyggede *ps* kommando tilbyder betydeligt mere funktionalitet[2]. Den implementerede løsning betragtes altså ikke som erstatning for den indbyggede, men samme fremgangsmåde kan benyttes til at *udvide* den indbyggede kommando (se følgende afsnit).

4.3 Implementation af kode i init

Koden viser i øjeblikket en liste af tasks ved indlæsning af modulet. Dette virker i praksis ikke som et passende alternativ til *ps*, da listningen ikke kan ske uden at genindlæse modulet. Kernemodulet kunne i stedet udvikles til f.eks. et af følgende kernemodultyper[3]:

- Systemkald: Ved registrering af modulet kan det erstatte eksisterende systemkald eller tilbyde et nyt[4].
- Filsystem: Ved brug af *sysfs* kan indhold fra kernemodulet eksporteres gennem filsystemet[5], som vi f.eks. kender det fra første obligatoriske opgave ved læsning af hostnavn.

Idéen med brug af et systemkald kunne f.eks. være, at kaldet til den indbyggede *ps* kommando bliver erstattet af vores kode, som enten erstatter eller udvider funktionaliteten i *ps*. Ved udvidelse kunne vores kernemodul f.eks. implementere logningsfunktionalitet, som ved hvert brugerkald til *ps* ville resultere i en post i kerneloggen. Herefter kunne den indbyggede *ps* kaldes, og kernemodulet ville altså fungere transparent for brugeren.

Et eksempel på brugen af filsystemet kunne være, at outputtet fra kernemodulet nu ville eksistere i form af filer, som et brugerprogram kan indlæse til enhver tid. Indlæsning af procesoplysninger ville ikke længere være begrænset til indlæsning af modulet, men kunne udtrækkes på et vilkårligt tidspunkt ved at læse den registerede fil.

[1] Afsnit 16.3 i OSC International 9th
[2] https://www.kernel.org/doc/Documentation/filesystems/sysfs.txt
[3] Afsnit 2.7.4 i OSC
[4] http://linux.die.net/lkmpg/x978.html
[5] https://www.kernel.org/doc/Documentation/filesystems/sysfs.txt

Chapter 5

Konklusion

Formålet med denne rapport var at undersøge kernemoduler og processer i Linux. Baseret på litteraturens bageopskrifter blev 3 kernemodulløsninger implementeret.

Vi har her vist funktionaliteten for forskellige kernemoduler, samt deres afprøvelse. Vores kernemodul for processer fulgte samme princip som ps-kommandoen, dog med færre informationer. Vi opdagede under udviklingen også hvor let det var for kernemoduler at beskadige og crashe systemet under udviklingen.

Simple-modulet demonstrerede brug af hukommelsesallokering i kernen. Linear- og DFS-modulet demonstrerede anvendelse af liste-macroer til at gennemgå systemets processer. Disse to moduler viser ikke lige så megen information som ps, og har ej heller lige så megen funktionalitet, så der er stadig mange muligheder for videreudvikling og udvidelse af modulerne.

Som nævnt i diskussionsafsnittet åbner kernemoduludvikling op for muligheden for at udvide indbygget funktionalitet uden at rekompilere kernen. Udvidelsesscenariet omkring logning af indbyggede kommandoer blev diskuteret, men en egentlig implementation betragtes uden for scope af denne opgave.

Part II

Appendix

Appendix A

Resultatet fra Lineær listing

A.1 Linear

A.2 Implementation

```
bosc@ubuntu:~/Desktop/obl3tasklist$ dmesg
[19635.864339] cumlist: module license 'DALARmusic' taints kernel.
[19635.864369] Disabling lock debugging due to kernel taint
[19636.049621] init: State is 1 and process id is 1
[19636.049636] kthreadd: State is 1 and process id is 2
[19636.049638] ksoftirqd/0: State is 1 and process id is 3
[19636.049640] kworker/0:0H: State is 1 and process id is 5
[19636.049642] rcu_sched: State is 1 and process id is 7
[19636.049643] rcu_bh: State is 1 and process id is 8
[19636.049645] migration/0: State is 1 and process id is 9
[19636.049647] watchdog/0: State is 1 and process id is 10
[19636.049648] watchdog/1: State is 1 and process id is 11
[19636.049650] migration/1: State is 1 and process id is 12
[19636.049652] ksoftirqd/1: State is 1 and process id is 13
[19636.049653] kworker/1:0H: State is 1 and process id is 15
[19636.049655] khelper: State is 1 and process id is 16
[19636.049656] kdevtmpfs: State is 1 and process id is 17
[19636.049658] netns: State is 1 and process id is 18
[19636.049659] writeback: State is 1 and process id is 19
[19636.049661] kintegrityd: State is 1 and process id is 20
[19636.049665] bioset: State is 1 and process id is 21
[19636.049667] kworker/u17:0: State is 1 and process id is 22
[19636.049669] kblockd: State is 1 and process id is 23
[19636.049670] ata_sff: State is 1 and process id is 24
[19636.049672] khubd: State is 1 and process id is 25
[19636.049674] md: State is 1 and process id is 26
[19636.049675] devfreq_wq: State is 1 and process id is 27
[19636.049677] khungtaskd: State is 1 and process id is 30
[19636.049678] kswapd0: State is 1 and process id is 31
[19636.049680] ksmd: State is 1 and process id is 32
[19636.049682] khugepaged: State is 1 and process id is 33
[19636.049683] fsnotify_mark: State is 1 and process id is 34
[19636.049685] ecryptfs-kthrea: State is 1 and process id is 35
[19636.049687] crypto: State is 1 and process id is 37
[19636.049688] kthrotld: State is 1 and process id is 49
[19636.049710] scsi_eh_0: State is 1 and process id is 51
[19636.049712] scsi_eh_1: State is 1 and process id is 52
```

```
[19636.049714] deferwq: State is 1 and process id is 73
[19636.049716] charger_manager: State is 1 and process id is 74
[19636.049717] kworker/1:2: State is 1 and process id is 75
[19636.049721] mpt_poll_0: State is 1 and process id is 121
[19636.049723] mpt/0: State is 1 and process id is 122
[19636.049725] scsi_eh_2: State is 1 and process id is 130
[19636.049726] scsi_eh_3: State is 1 and process id is 131
[19636.049728] scsi_eh_4: State is 1 and process id is 132
[19636.049731] scsi_eh_5: State is 1 and process id is 133
[19636.049733] scsi_eh_6: State is 1 and process id is 134
[19636.049735] scsi_eh_7: State is 1 and process id is 135
[19636.049736] scsi_eh_8: State is 1 and process id is 136
[19636.049738] scsi_eh_9: State is 1 and process id is 137
[19636.049739] scsi_eh_10: State is 1 and process id is 138
[19636.049741] scsi_eh_11: State is 1 and process id is 139
[19636.049743] scsi_eh_12: State is 1 and process id is 140
[19636.049744] scsi_eh_13: State is 1 and process id is 141
[19636.049746] scsi_eh_14: State is 1 and process id is 142
[19636.049747] scsi_eh_15: State is 1 and process id is 143
[19636.049749] scsi_eh_16: State is 1 and process id is 144
[19636.049750] scsi_eh_17: State is 1 and process id is 145
[19636.049752] scsi_eh_18: State is 1 and process id is 146
[19636.049753] scsi_eh_19: State is 1 and process id is 147
[19636.049755] scsi_eh_20: State is 1 and process id is 148
[19636.049756] scsi_eh_21: State is 1 and process id is 149
[19636.049758] scsi_eh_22: State is 1 and process id is 150
[19636.049759] scsi_eh_23: State is 1 and process id is 151
[19636.049761] scsi_eh_24: State is 1 and process id is 152
[19636.049763] scsi_eh_25: State is 1 and process id is 153
[19636.049764] scsi_eh_26: State is 1 and process id is 154
[19636.049766] scsi_eh_27: State is 1 and process id is 155
[19636.049767] scsi_eh_28: State is 1 and process id is 156
[19636.049769] scsi_eh_29: State is 1 and process id is 157
[19636.049770] scsi_eh_30: State is 1 and process id is 158
[19636.049772] scsi_eh_31: State is 1 and process id is 159
[19636.049773] kpsmoused: State is 1 and process id is 188
[19636.049775] scsi_eh_32: State is 1 and process id is 189
[19636.049776] kworker/u17:1: State is 1 and process id is 192
[19636.049780] jbd2/sda1-8: State is 1 and process id is 205
[19636.049782] ext4-rsv-conver: State is 1 and process id is 206
[19636.049783] upstart-udev-br: State is 1 and process id is 349
[19636.049785] systemd-udevd: State is 130 and process id is 360
[19636.049788] upstart-file-br: State is 1 and process id is 440
[19636.049790] dbus-daemon: State is 1 and process id is 448
[19636.049791] rsyslogd: State is 1 and process id is 452
[19636.049793] bluetoothd: State is 1 and process id is 474
[19636.049795] systemd-logind: State is 1 and process id is 483
[19636.049796] avahi-daemon: State is 1 and process id is 486
[19636.049798] avahi-daemon: State is 1 and process id is 488
[19636.049801] krfcommd: State is 1 and process id is 510
[19636.049803] upstart-socket-: State is 1 and process id is 603
[19636.049805] ttm_swap: State is 1 and process id is 641
[19636.049806] ModemManager: State is 1 and process id is 705
[19636.049808] colord: State is 1 and process id is 848
[19636.049810] getty: State is 1 and process id is 867
[19636.049811] NetworkManager: State is 1 and process id is 871
```

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[19636.049813] getty: State is 1 and process id is 875
[19636.049814] getty: State is 1 and process id is 882
[19636.049816] getty: State is 1 and process id is 883
[19636.049818] getty: State is 1 and process id is 886
[19636.049819] cron: State is 1 and process id is 924
[19636.049822] sshd: State is 1 and process id is 929
[19636.049824] acpid: State is 1 and process id is 966
[19636.049826] irqbalance: State is 1 and process id is 986
[19636.049827] cups-browsed: State is 1 and process id is 1037
[19636.049829] lightdm: State is 1 and process id is 1098
[19636.049831] polkitd: State is 1 and process id is 1119
[19636.049832] Xorg: State is 1 and process id is 1133
[19636.049834] getty: State is 1 and process id is 1142
[19636.049835] whoopsie: State is 1 and process id is 1145
[19636.049837] accounts-daemon: State is 1 and process id is 1153
[19636.049841] dhclient: State is 1 and process id is 1341
[19636.049843] vmware-vmblock-: State is 1 and process id is 1392
[19636.049844] vmtoolsd: State is 1 and process id is 1410
[19636.049846] kauditd: State is 1 and process id is 1503
[19636.049847] dnsmasq: State is 1 and process id is 1513
[19636.049849] lightdm: State is 1 and process id is 1718
[19636.049864] upowerd: State is 1 and process id is 1766
[19636.049867] rtkit-daemon: State is 1 and process id is 1927
[19636.049869] gnome-keyring-d: State is 1 and process id is 2075
[19636.049872] init: State is 1 and process id is 2105
[19636.049874] ssh-agent: State is 1 and process id is 2178
[19636.049875] dbus-daemon: State is 1 and process id is 2180
[19636.049877] upstart-event-b: State is 1 and process id is 2189
[19636.049879] window-stack-br: State is 1 and process id is 2196
[19636.049880] ibus-daemon: State is 1 and process id is 2205
[19636.049882] gvfsd: State is 1 and process id is 2217
[19636.049883] ibus-dconf: State is 1 and process id is 2224
[19636.049885] gvfsd-fuse: State is 1 and process id is 2225
[19636.049888] ibus-ui-gtk3: State is 1 and process id is 2232
[19636.049890] ibus-x11: State is 1 and process id is 2234
[19636.049892] upstart-dbus-br: State is 1 and process id is 2241
[19636.049894] unity-settings-: State is 1 and process id is 2244
[19636.049897] at-spi-bus-laun: State is 1 and process id is 2246
[19636.049898] hud-service: State is 1 and process id is 2250
[19636.049900] dbus-daemon: State is 1 and process id is 2256
[19636.049902] at-spi2-registr: State is 1 and process id is 2259
[19636.049904] gnome-session: State is 1 and process id is 2268
[19636.049906] unity-panel-ser: State is 1 and process id is 2271
[19636.049908] upstart-dbus-br: State is 1 and process id is 2287
[19636.049910] upstart-file-br: State is 1 and process id is 2291
[19636.049912] ibus-engine-sim: State is 1 and process id is 2303
[19636.049913] bamfdaemon: State is 1 and process id is 2333
[19636.049915] indicator-keybo: State is 1 and process id is 2369
[19636.049917] indicator-messa: State is 1 and process id is 2371
[19636.049918] indicator-bluet: State is 1 and process id is 2372
[19636.049920] indicator-power: State is 1 and process id is 2375
[19636.049922] indicator-datet: State is 1 and process id is 2378
[19636.049923] indicator-sound: State is 1 and process id is 2379
[19636.049926] indicator-print: State is 1 and process id is 2381
[19636.049930] dconf-service: State is 1 and process id is 2388
[19636.049932] indicator-sessi: State is 1 and process id is 2396
```

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[19636.049933] indicator-appli: State is 1 and process id is 2399
[19636.049936] evolution-sourc: State is 1 and process id is 2406
[19636.049938] pulseaudio: State is 1 and process id is 2434
[19636.049940] notify-osd: State is 1 and process id is 2467
[19636.049941] compiz: State is 1 and process id is 2477
[19636.049943] evolution-calen: State is 1 and process id is 2546
[19636.049945] polkit-gnome-au: State is 1 and process id is 2549
[19636.049947] nautilus: State is 1 and process id is 2552
[19636.049948] unity-fallback-: State is 1 and process id is 2555
[19636.049950] vmtoolsd: State is 1 and process id is 2561
[19636.049951] nm-applet: State is 1 and process id is 2562
[19636.049953] gvfs-udisks2-vo: State is 1 and process id is 2579
[19636.049955] udisksd: State is 1 and process id is 2586
[19636.049956] gconfd-2: State is 1 and process id is 2592
[19636.049958] gvfs-mtp-volume: State is 1 and process id is 2601
[19636.049960] gvfs-afc-volume: State is 1 and process id is 2605
[19636.049961] gvfs-gphoto2-vo: State is 1 and process id is 2610
[19636.049963] gvfsd-trash: State is 1 and process id is 2622
[19636.049965] gvfsd-burn: State is 1 and process id is 2628
[19636.049966] gvfsd-metadata: State is 1 and process id is 2644
[19636.049968] telepathy-indic: State is 1 and process id is 2709
[19636.049970] mission-control: State is 1 and process id is 2716
[19636.049974] zeitgeist-datah: State is 1 and process id is 2725
[19636.049976] zeitgeist-daemo: State is 1 and process id is 2730
[19636.049977] zeitgeist-fts: State is 1 and process id is 2738
[19636.049979] cat: State is 1 and process id is 2754
[19636.049980] update-notifier: State is 1 and process id is 2790
[19636.049982] update-manager: State is 1 and process id is 2812
[19636.049984] deja-dup-monito: State is 1 and process id is 2840
[19636.049985] cupsd: State is 1 and process id is 3296
[19636.049987] dbus: State is 1 and process id is 3299
[19636.049989] tpvmlp: State is 1 and process id is 3335
[19636.049990] kworker/u16:2: State is 1 and process id is 6240
[19636.049992] kworker/u16:1: State is 1 and process id is 6302
[19636.049993] kworker/0:1: State is 1 and process id is 6500
[19636.049995] kworker/1:0: State is 1 and process id is 6548
[19636.049997] kworker/0:0: State is 1 and process id is 6549
[19636.049998] kworker/u16:3: State is 1 and process id is 6667
[19636.050000] systemd-hostnam: State is 1 and process id is 6758
[19636.050001] gnome-terminal: State is 1 and process id is 6761
[19636.050003] gnome-pty-helpe: State is 1 and process id is 6770
[19636.050005] bash: State is 1 and process id is 6771
[19636.050006] kworker/u16:0: State is 1 and process id is 6823
[19636.050008] sudo: State is 1 and process id is 7114
[19636.050009] insmod: State is 0 and process id is 7115
[19636.050022] Loading Module
```

A.3 PS

F	S	UID	PID	PPID	C	PRI	NI	ADDR	SZ	WCHAN	TTY	TIME	CMD
4	S	0	1	0	0	80	0	-	1117	poll_s	?	00:00:08	init
1	S	0	2	0	0	80	0	-	0	kthrea	?	00:00:00	kthreadd
1	S	0	3	2	0	80	0	-	0	smpboo	?	00:00:02	ksoftirqd/0
1	S	0	5	2	0	60	-20	-	0	worker	?	00:00:00	kworker/0:0H
1	S	0	7	2	0	80	0	-	0	rcu_gp	?	00:00:09	rcu_sched
1	S	0	8	2	0	80	0	-	0	rcu_gp	?	00:00:00	rcu_bh

```
1 S     0     9     2  0 -40   - -     0 smpboo ?        00:00:00 migration/0
5 S     0    10     2  0 -40   - -     0 smpboo ?        00:00:30 watchdog/0
5 S     0    11     2  0 -40   - -     0 smpboo ?        00:00:03 watchdog/1
1 S     0    12     2  0 -40   - -     0 smpboo ?        00:00:00 migration/1
1 S     0    13     2  0  80   0 -     0 smpboo ?        00:00:02 ksoftirqd/1
1 S     0    15     2  0  60 -20 -     0 worker ?        00:00:00 kworker/1:0H
1 S     0    16     2  0  60 -20 -     0 rescue ?        00:00:00 khelper
5 S     0    17     2  0  80   0 -     0 devtmp ?        00:00:00 kdevtmpfs
1 S     0    18     2  0  60 -20 -     0 rescue ?        00:00:00 netns
1 S     0    19     2  0  60 -20 -     0 rescue ?        00:00:00 writeback
1 S     0    20     2  0  60 -20 -     0 rescue ?        00:00:00 kintegrityd
1 S     0    21     2  0  60 -20 -     0 rescue ?        00:00:00 bioset
1 S     0    22     2  0  60 -20 -     0 worker ?        00:00:00 kworker/u17
  :0
1 S     0    23     2  0  60 -20 -     0 rescue ?        00:00:00 kblockd
1 S     0    24     2  0  60 -20 -     0 rescue ?        00:00:00 ata_sff
1 S     0    25     2  0  80   0 -     0 hub_th ?        00:00:00 khubd
1 S     0    26     2  0  60 -20 -     0 rescue ?        00:00:00 md
1 S     0    27     2  0  60 -20 -     0 rescue ?        00:00:00 devfreq_wq
1 S     0    30     2  0  80   0 -     0 watchd ?        00:00:00 khungtaskd
1 S     0    31     2  0  80   0 -     0 kswapd ?        00:00:01 kswapd0
1 S     0    32     2  0  85   5 -     0 ksm_sc ?        00:00:00 ksmd
1 S     0    33     2  0  99  19 -     0 khugep ?        00:00:00 khugepaged
1 S     0    34     2  0  80   0 -     0 fsnoti ?        00:00:00
  fsnotify_mark
1 S     0    35     2  0  80   0 -     0 ecrypt ?        00:00:00 ecryptfs-
  kthre
1 S     0    37     2  0  60 -20 -     0 rescue ?        00:00:00 crypto
1 S     0    49     2  0  60 -20 -     0 rescue ?        00:00:00 kthrotld
1 S     0    51     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_0
1 S     0    52     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_1
1 S     0    73     2  0  60 -20 -     0 rescue ?        00:00:00 deferwq
1 S     0    74     2  0  60 -20 -     0 rescue ?        00:00:00
  charger_manage
1 S     0    75     2  0  80   0 -     0 worker ?        00:00:07 kworker/1:2
1 S     0   121     2  0  60 -20 -     0 rescue ?        00:00:00 mpt_poll_0
1 S     0   122     2  0  60 -20 -     0 rescue ?        00:00:00 mpt/0
1 S     0   130     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_2
1 S     0   131     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_3
1 S     0   132     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_4
1 S     0   133     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_5
1 S     0   134     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_6
1 S     0   135     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_7
1 S     0   136     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_8
1 S     0   137     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_9
1 S     0   138     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_10
1 S     0   139     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_11
1 S     0   140     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_12
1 S     0   141     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_13
1 S     0   142     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_14
1 S     0   143     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_15
1 S     0   144     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_16
1 S     0   145     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_17
1 S     0   146     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_18
1 S     0   147     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_19
1 S     0   148     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_20
```

```
1 S     0   149     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_21
1 S     0   150     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_22
1 S     0   151     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_23
1 S     0   152     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_24
1 S     0   153     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_25
1 S     0   154     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_26
1 S     0   155     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_27
1 S     0   156     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_28
1 S     0   157     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_29
1 S     0   158     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_30
1 S     0   159     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_31
1 S     0   188     2  0  60 -20 -     0 rescue ?        00:00:00 kpsmoused
1 S     0   189     2  0  80   0 -     0 scsi_e ?        00:00:00 scsi_eh_32
1 S     0   192     2  0  60 -20 -     0 worker ?        00:00:00 kworker/u17
    :1
1 S     0   205     2  0  80   0 -     0 kjourn ?        00:00:02 jbd2/sda1-8
1 S     0   206     2  0  60 -20 -     0 rescue ?        00:00:00 ext4-rsv-
    conve
1 S     0   349     1  0  80   0 -   786 poll_s ?        00:00:00 upstart-udev
    -b
5 S     0   360     1  0  80   0 -  3155 ep_pol ?        00:00:00 systemd-
    udevd
1 S     0   440     1  0  80   0 -   721 poll_s ?        00:00:00 upstart-file
    -b
5 S   102   448     1  0  80   0 -  1271 ep_pol ?        00:00:01 dbus-daemon
5 S   101   452     1  0  80   0 -  7843 poll_s ?        00:00:05 rsyslogd
5 S     0   474     1  0  80   0 -  1220 poll_s ?        00:00:00 bluetoothd
4 S     0   483     1  0  80   0 -  1073 ep_pol ?        00:00:00 systemd-
    logind
5 S   111   486     1  0  80   0 -   869 poll_s ?        00:00:00 avahi-daemon
1 S   111   488   486  0  80   0 -   869 unix_s ?        00:00:00 avahi-daemon
5 S     0   510     2  0  70 -10 -     0 rfcomm ?        00:00:00 krfcommd
1 S     0   603     1  0  80   0 -   718 poll_s ?        00:00:00 upstart-
    socket
1 S     0   641     2  0  60 -20 -     0 rescue ?        00:00:00 ttm_swap
4 S     0   705     1  0  80   0 -  9596 poll_s ?        00:00:00 ModemManager
4 S   113   848     1  0  80   0 -  9638 poll_s ?        00:00:00 colord
4 S     0   867     1  0  80   0 -  1162 n_tty_ tty4     00:00:00 getty
5 S     0   871     1  0  80   0 - 13610 poll_s ?        00:00:01
    NetworkManager
4 S     0   875     1  0  80   0 -  1162 n_tty_ tty5     00:00:00 getty
4 S     0   882     1  0  80   0 -  1162 n_tty_ tty2     00:00:00 getty
4 S     0   883     1  0  80   0 -  1162 n_tty_ tty3     00:00:00 getty
4 S     0   886     1  0  80   0 -  1162 n_tty_ tty6     00:00:00 getty
1 S     0   924     1  0  80   0 -   764 hrtime ?        00:00:00 cron
4 S     0   929     1  0  80   0 -  1949 poll_s ?        00:00:00 sshd
1 S     0   966     1  0  80   0 -   549 poll_s ?        00:00:01 acpid
5 S     0   986     1  0  80   0 -  1020 hrtime ?        00:00:21 irqbalance
4 S     0  1037     1  0  80   0 -  2213 poll_s ?        00:00:00 cups-browsed
4 S     0  1098     1  0  80   0 -  9201 poll_s ?        00:00:00 lightdm
4 S     0  1119     1  0  80   0 -  9440 poll_s ?        00:00:03 polkitd
4 R     0  1133  1098  4  80   0 - 42655 ?      tty7     00:15:18 Xorg
4 S     0  1142     1  0  80   0 -  1162 n_tty_ tty1     00:00:00 getty
1 S   109  1145     1  0  80   0 - 13506 poll_s ?        00:00:00 whoopsie
4 S     0  1153     1  0  80   0 -  9524 poll_s ?        00:00:01 accounts-
    daemo
```

```
4 S     0  1341   871  0  80   0 -  1379 poll_s ?        00:00:00 dhclient
1 S     0  1392     1  0  80   0 - 10618 futex_ ?        00:00:00 vmware-
  vmblock
4 S     0  1410     1  0  80   0 -  9134 poll_s ?        00:00:57 vmtoolsd
1 S     0  1503     2  0  80   0 -     0 kaudit ?        00:00:00 kauditd
4 S 65534  1513   871  0  80   0 -  1388 poll_s ?        00:00:00 dnsmasq
4 S     0  1718  1098  0  80   0 -  4456 wait   ?        00:00:00 lightdm
4 S     0  1766     1  0  80   0 -  9456 poll_s ?        00:00:00 upowerd
4 S   107  1927     1  0  81   1 -  5341 poll_s ?        00:00:56 rtkit-daemon
1 S  1000  2075     1  0  80   0 - 12103 poll_s ?        00:00:00 gnome-
  keyring-
4 S  1000  2105  1718  0  80   0 -  1536 poll_s ?        00:00:01 init
1 S  1000  2178  2105  0  80   0 -  1053 poll_s ?        00:00:00 ssh-agent
1 S  1000  2180  2105  0  80   0 -  1521 ep_pol ?        00:00:05 dbus-daemon
0 S  1000  2189  2105  0  80   0 -  1229 poll_s ?        00:00:00 upstart-
  event-
0 S  1000  2196  2105  0  80   0 -  9865 poll_s ?        00:00:00 window-stack
  -b
1 S  1000  2205  2105  0  80   0 - 12102 poll_s ?        00:00:28 ibus-daemon
0 S  1000  2217  2105  0  80   0 -  6937 poll_s ?        00:00:01 gvfsd
0 S  1000  2224  2205  0  80   0 -  9721 poll_s ?        00:00:00 ibus-dconf
0 S  1000  2225  2105  0  80   0 - 11245 futex_ ?        00:00:00 gvfsd-fuse
0 S  1000  2232  2205  0  80   0 - 29525 poll_s ?        00:00:09 ibus-ui-gtk3
0 S  1000  2234  2105  0  80   0 - 12927 poll_s ?        00:00:00 ibus-x11
1 S  1000  2241  2105  0  80   0 -  1230 poll_s ?        00:00:01 upstart-dbus
  -b
0 S  1000  2244  2105  0  80   0 - 39010 poll_s ?        00:00:03 unity-
  settings
0 S  1000  2246  2105  0  80   0 - 11575 poll_s ?        00:00:00 at-spi-bus-
  lau
0 S  1000  2250  2105  0  80   0 - 31171 poll_s ?        00:00:10 hud-service
0 S  1000  2256  2246  0  80   0 -  1124 ep_pol ?        00:00:00 dbus-daemon
0 S  1000  2259  2105  0  80   0 -  4341 poll_s ?        00:00:00 at-spi2-
  regist
0 S  1000  2268  2105  0  80   0 - 22125 poll_s ?        00:00:04 gnome-
  session
0 S  1000  2271  2105  0  80   0 - 29808 poll_s ?        00:00:10 unity-panel-
  se
1 S  1000  2287  2105  0  80   0 -  1230 poll_s ?        00:00:00 upstart-dbus
  -b
1 S  1000  2291  2105  0  80   0 -  1300 poll_s ?        00:00:00 upstart-file
  -b
0 S  1000  2303  2205  0  80   0 -  7395 poll_s ?        00:00:07 ibus-engine-
  si
0 S  1000  2333  2105  0  80   0 - 30679 poll_s ?        00:00:10 bamfdaemon
0 S  1000  2369  2105  0  80   0 - 35790 poll_s ?        00:00:01 indicator-
  keyb
0 S  1000  2371  2105  0  80   0 - 11751 poll_s ?        00:00:00 indicator-
  mess
0 S  1000  2372  2105  0  80   0 -  9724 poll_s ?        00:00:00 indicator-
  blue
0 S  1000  2375  2105  0  80   0 -  9720 poll_s ?        00:00:00 indicator-
  powe
0 S  1000  2378  2105  0  80   0 - 25294 poll_s ?        00:00:01 indicator-
  date
0 S  1000  2379  2105  0  80   0 - 29622 poll_s ?        00:00:00 indicator-
```

```
    soun
0 S  1000  2381  2105  0  80   0 - 14440 poll_s ?        00:00:00 indicator-
    prin
0 S  1000  2388  2105  0  80   0 -  6128 poll_s ?        00:00:00 dconf-
    service
0 S  1000  2396  2105  0  80   0 - 15936 poll_s ?        00:00:00 indicator-
    sess
0 S  1000  2399  2105  0  80   0 - 11899 poll_s ?        00:00:00 indicator-
    appl
0 S  1000  2406  2105  0  80   0 - 22586 poll_s ?        00:00:00 evolution-
    sour
1 S  1000  2434  2105  0  80   0 - 25016 poll_s ?        00:00:00 pulseaudio
0 S  1000  2467  2105  0  80   0 - 11189 poll_s ?        00:00:07 notify-osd
0 S  1000  2477  2268  1  80   0 - 75397 poll_s ?        00:03:35 compiz
0 S  1000  2546  2105  0  80   0 - 32489 poll_s ?        00:00:01 evolution-
    cale
0 S  1000  2549  2268  0  80   0 - 11065 poll_s ?        00:00:01 polkit-gnome
    -a
0 S  1000  2552  2268  0  80   0 - 56752 poll_s ?        00:00:22 nautilus
0 S  1000  2555  2268  0  80   0 - 13317 poll_s ?        00:00:07 unity-
    fallback
0 S  1000  2561  2105  0  80   0 - 20830 poll_s ?        00:01:06 vmtoolsd
0 S  1000  2562  2268  0  80   0 - 45678 poll_s ?        00:00:05 nm-applet
0 S  1000  2579  2105  0  80   0 - 10052 poll_s ?        00:00:00 gvfs-udisks2
    -v
4 S     0  2586     1  0  80   0 - 13549 poll_s ?        00:00:01 udisksd
0 S  1000  2592  2105  0  80   0 -  2398 poll_s ?        00:00:00 gconfd-2
0 S  1000  2601  2105  0  80   0 -  6798 poll_s ?        00:00:00 gvfs-mtp-
    volum
0 S  1000  2605  2105  0  80   0 -  9841 poll_s ?        00:00:00 gvfs-afc-
    volum
0 S  1000  2610  2105  0  80   0 -  7076 poll_s ?        00:00:00 gvfs-gphoto2
    -v
0 S  1000  2622  2105  0  80   0 - 13974 poll_s ?        00:00:00 gvfsd-trash
0 S  1000  2628  2105  0  80   0 -  9243 poll_s ?        00:00:00 gvfsd-burn
0 S  1000  2644  2105  0  80   0 -  4511 poll_s ?        00:00:00 gvfsd-
    metadata
0 S  1000  2709  2268  0  80   0 - 20850 poll_s ?        00:00:02 telepathy-
    indi
0 S  1000  2716  2105  0  80   0 - 11402 poll_s ?        00:00:00 mission-
    contro
0 S  1000  2725  2268  0  80   0 - 19528 poll_s ?        00:00:01 zeitgeist-
    data
0 S  1000  2730  2105  0  80   0 - 11563 poll_s ?        00:00:03 zeitgeist-
    daem
0 S  1000  2738  2105  0  80   0 - 14622 poll_s ?        00:00:03 zeitgeist-
    fts
0 S  1000  2754  2738  0  80   0 -  1062 unix_s ?        00:00:00 cat
0 S  1000  2790  2268  0  80   0 - 31463 poll_s ?        00:00:02 update-
    notifie
0 S  1000  2812  2105  0  90  10 - 49143 poll_s ?        00:00:09 update-
    manager
0 S  1000  2840  2268  0  80   0 - 12133 poll_s ?        00:00:00 deja-dup-
    monit
4 S     0  3296     1  0  80   0 -  2076 ep_pol ?        00:00:00 cupsd
4 S     7  3299  3296  0  80   0 -  1736 pipe_w ?        00:00:00 dbus
```

```
4 S     0  3335     1  0  80   0 -  3304 hrtime ?        00:00:05 tpvmlp
1 S     0  6240     2  0  80   0 -     0 worker ?        00:00:00 kworker/u16
    :2
1 S     0  6500     2  0  80   0 -     0 worker ?        00:00:00 kworker/0:1
1 S     0  6548     2  0  80   0 -     0 worker ?        00:00:00 kworker/1:0
1 S     0  6549     2  0  80   0 -     0 worker ?        00:00:00 kworker/0:0
1 S     0  6667     2  0  80   0 -     0 worker ?        00:00:00 kworker/u16
    :3
0 S  1000  6761  2105  0  80   0 - 34280 poll_s ?       00:00:03 gnome-
    terminal
0 S  1000  6770  6761  0  80   0 -   605 unix_s ?       00:00:00 gnome-pty-
    help
0 S  1000  6771  6761  0  80   0 -  1753 wait   pts/1    00:00:00 bash
1 S     0  6823     2  0  80   0 -     0 worker ?        00:00:00 kworker/u16
    :0
1 S     0  7172     2  0  80   0 -     0 worker ?        00:00:00 kworker/u16
    :1
0 R  1000  7186  6771  0  80   0 -  1247 -      pts/1    00:00:00 ps
```

Appendix B

Resultater fra DFS listing

B.1 DFS

```
[ 5647.241754] Removing Module
[ 5664.686377] Loading Module
[ 5664.686383] init: State is 1 and process id is 1
[ 5664.686386] upstart-udev-br: State is 1 and process id is 474
[ 5664.686388] systemd-udevd: State is 0 and process id is 483
[ 5664.686390] upstart-file-br: State is 1 and process id is 617
[ 5664.686392] dbus-daemon: State is 1 and process id is 632
[ 5664.686394] rsyslogd: State is 1 and process id is 678
[ 5664.686395] bluetoothd: State is 1 and process id is 697
[ 5664.686442] systemd-logind: State is 1 and process id is 713
[ 5664.686445] avahi-daemon: State is 1 and process id is 786
[ 5664.686447] avahi-daemon: State is 1 and process id is 792
[ 5664.686449] ModemManager: State is 1 and process id is 819
[ 5664.686451] upstart-socket-: State is 1 and process id is 844
[ 5664.686452] NetworkManager: State is 1 and process id is 923
[ 5664.686454] dhclient: State is 1 and process id is 1000
[ 5664.686456] dnsmasq: State is 1 and process id is 1490
[ 5664.686458] getty: State is 1 and process id is 968
[ 5664.686460] polkitd: State is 1 and process id is 935
[ 5664.686461] getty: State is 1 and process id is 974
[ 5664.686463] getty: State is 1 and process id is 980
[ 5664.686465] getty: State is 1 and process id is 982
[ 5664.686466] getty: State is 1 and process id is 985
[ 5664.686468] kerneloops: State is 1 and process id is 1040
[ 5664.686470] lightdm: State is 1 and process id is 1053
[ 5664.686471] Xorg: State is 1 and process id is 1142
[ 5664.686473] lightdm: State is 1 and process id is 1715
[ 5664.686475] init: State is 1 and process id is 2730
[ 5664.686476] ssh-agent: State is 1 and process id is 2801
[ 5664.686478] dbus-daemon: State is 1 and process id is 2807
[ 5664.686480] upstart-event-b: State is 1 and process id is 2815
[ 5664.686481] window-stack-br: State is 1 and process id is 2819
[ 5664.686483] ibus-daemon: State is 1 and process id is 2820
[ 5664.686484] ibus-dconf: State is 1 and process id is 2851
[ 5664.686486] ibus-ui-gtk3: State is 1 and process id is 2854
[ 5664.686487] ibus-engine-sim: State is 1 and process id is 2914
[ 5664.686489] upstart-file-br: State is 1 and process id is 2829
[ 5664.686491] unity-settings-: State is 1 and process id is 2836
[ 5664.686493] gvfsd: State is 1 and process id is 2835
```

```
[ 5664.686494] gvfsd-fuse: State is 1 and process id is 2842
[ 5664.686496] hud-service: State is 1 and process id is 2845
[ 5664.686497] at-spi-bus-laun: State is 1 and process id is 2849
[ 5664.686499] dbus-daemon: State is 1 and process id is 2862
[ 5664.686501] gnome-session: State is 1 and process id is 2858
[ 5664.686502] compiz: State is 0 and process id is 3039
[ 5664.686504] nm-applet: State is 1 and process id is 3077
[ 5664.686506] polkit-gnome-au: State is 1 and process id is 3078
[ 5664.686507] nautilus: State is 1 and process id is 3080
[ 5664.686509] unity-fallback-: State is 1 and process id is 3081
[ 5664.686511] telepathy-indic: State is 1 and process id is 3294
[ 5664.686512] zeitgeist-datah: State is 1 and process id is 3317
[ 5664.686514] update-notifier: State is 1 and process id is 3374
[ 5664.686515] deja-dup-monito: State is 1 and process id is 3426
[ 5664.686517] unity-panel-ser: State is 1 and process id is 2864
[ 5664.686519] ibus-x11: State is 1 and process id is 2865
[ 5664.686536] upstart-dbus-br: State is 1 and process id is 2870
[ 5664.686538] at-spi2-registr: State is 1 and process id is 2872
[ 5664.686540] upstart-dbus-br: State is 1 and process id is 2892
[ 5664.686542] bamfdaemon: State is 1 and process id is 2907
[ 5664.686544] indicator-messa: State is 1 and process id is 2922
[ 5664.686545] indicator-bluet: State is 1 and process id is 2924
[ 5664.686547] indicator-power: State is 1 and process id is 2931
[ 5664.686548] indicator-datet: State is 1 and process id is 2934
[ 5664.686550] indicator-sound: State is 1 and process id is 2937
[ 5664.686552] indicator-print: State is 1 and process id is 2946
[ 5664.686553] indicator-sessi: State is 1 and process id is 2950
[ 5664.686555] indicator-appli: State is 1 and process id is 2952
[ 5664.686556] dconf-service: State is 1 and process id is 2958
[ 5664.686558] pulseaudio: State is 1 and process id is 2997
[ 5664.686560] evolution-sourc: State is 1 and process id is 2976
[ 5664.686561] indicator-keybo: State is 1 and process id is 2921
[ 5664.686563] vmtoolsd: State is 1 and process id is 3086
[ 5664.686565] notify-osd: State is 1 and process id is 3032
[ 5664.686592] evolution-calen: State is 1 and process id is 3049
[ 5664.686595] gconfd-2: State is 1 and process id is 3193
[ 5664.686597] gvfs-udisks2-vo: State is 1 and process id is 3145
[ 5664.686598] gvfs-gphoto2-vo: State is 1 and process id is 3203
[ 5664.686600] gvfs-afc-volume: State is 1 and process id is 3209
[ 5664.686602] gvfs-mtp-volume: State is 1 and process id is 3214
[ 5664.686603] gvfsd-trash: State is 1 and process id is 3231
[ 5664.686605] gvfsd-burn: State is 1 and process id is 3261
[ 5664.686607] gvfsd-metadata: State is 1 and process id is 3282
[ 5664.686608] mission-control: State is 1 and process id is 3303
[ 5664.686610] zeitgeist-daemo: State is 1 and process id is 3322
[ 5664.686612] zeitgeist-fts: State is 1 and process id is 3328
[ 5664.686613] cat: State is 1 and process id is 3332
[ 5664.686615] unity-scope-hom: State is 1 and process id is 3524
[ 5664.686616] unity-files-dae: State is 1 and process id is 3538
[ 5664.686618] unity-music-dae: State is 1 and process id is 3565
[ 5664.686620] unity-scope-loa: State is 1 and process id is 3539
[ 5664.686622] gnome-terminal: State is 1 and process id is 3582
[ 5664.686623] gnome-pty-helpe: State is 1 and process id is 3590
[ 5664.686625] bash: State is 1 and process id is 3591
[ 5664.686626] bash: State is 1 and process id is 3706
[ 5664.686628] sudo: State is 1 and process id is 5713
```

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[ 5664.686629] insmod: State is 0 and process id is 5714
[ 5664.686631] gvfsd-http: State is 1 and process id is 4373
[ 5664.686633] cron: State is 1 and process id is 1045
[ 5664.686634] irqbalance: State is 1 and process id is 1091
[ 5664.686636] cups-browsed: State is 1 and process id is 1191
[ 5664.686638] whoopsie: State is 1 and process id is 1198
[ 5664.686639] getty: State is 1 and process id is 1234
[ 5664.686641] accounts-daemon: State is 1 and process id is 1154
[ 5664.686642] acpid: State is 1 and process id is 1248
[ 5664.686644] vmware-vmblock-: State is 1 and process id is 1432
[ 5664.686645] vmtoolsd: State is 1 and process id is 1460
[ 5664.686647] upowerd: State is 1 and process id is 1738
[ 5664.686649] rtkit-daemon: State is 1 and process id is 1779
[ 5664.686650] colord: State is 1 and process id is 1982
[ 5664.686652] cupsd: State is 1 and process id is 2519
[ 5664.686653] tpvmlp: State is 1 and process id is 2557
[ 5664.686655] gnome-keyring-d: State is 1 and process id is 2725
[ 5664.686656] udisksd: State is 1 and process id is 3155
[ 5664.686658] kthreadd: State is 1 and process id is 2
[ 5664.686659] ksoftirqd/0: State is 1 and process id is 3
[ 5664.686661] kworker/0:0H: State is 1 and process id is 5
[ 5664.686662] rcu_sched: State is 1 and process id is 7
[ 5664.686664] rcuos/0: State is 1 and process id is 8
[ 5664.686665] rcuos/1: State is 1 and process id is 9
[ 5664.686667] rcuos/2: State is 1 and process id is 10
[ 5664.686669] rcuos/3: State is 1 and process id is 11
[ 5664.686703] rcuos/4: State is 1 and process id is 12
[ 5664.686707] rcuos/5: State is 1 and process id is 13
[ 5664.686709] rcuos/6: State is 1 and process id is 14
[ 5664.686711] rcuos/7: State is 1 and process id is 15
[ 5664.686713] rcuos/8: State is 1 and process id is 16
[ 5664.686714] rcuos/9: State is 1 and process id is 17
[ 5664.686716] rcuos/10: State is 1 and process id is 18
[ 5664.686718] rcuos/11: State is 1 and process id is 19
[ 5664.686719] rcuos/12: State is 1 and process id is 20
[ 5664.686721] rcuos/13: State is 1 and process id is 21
[ 5664.686722] rcuos/14: State is 1 and process id is 22
[ 5664.686724] rcuos/15: State is 1 and process id is 23
[ 5664.686725] rcuos/16: State is 1 and process id is 24
[ 5664.686727] rcuos/17: State is 1 and process id is 25
[ 5664.686728] rcuos/18: State is 1 and process id is 26
[ 5664.686730] rcuos/19: State is 1 and process id is 27
[ 5664.686732] rcuos/20: State is 1 and process id is 28
[ 5664.686733] rcuos/21: State is 1 and process id is 29
[ 5664.686735] rcuos/22: State is 1 and process id is 30
[ 5664.686736] rcuos/23: State is 1 and process id is 31
[ 5664.686738] rcuos/24: State is 1 and process id is 32
[ 5664.686739] rcuos/25: State is 1 and process id is 33
[ 5664.686741] rcuos/26: State is 1 and process id is 34
[ 5664.686742] rcuos/27: State is 1 and process id is 35
[ 5664.686744] rcuos/28: State is 1 and process id is 36
[ 5664.686745] rcuos/29: State is 1 and process id is 37
[ 5664.686747] rcuos/30: State is 1 and process id is 38
[ 5664.686748] rcuos/31: State is 1 and process id is 39
[ 5664.686750] rcuos/32: State is 1 and process id is 40
[ 5664.686751] rcuos/33: State is 1 and process id is 41
```

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[ 5664.686753] rcuos/34: State is 1 and process id is 42
[ 5664.686754] rcuos/35: State is 1 and process id is 43
[ 5664.686756] rcuos/36: State is 1 and process id is 44
[ 5664.686757] rcuos/37: State is 1 and process id is 45
[ 5664.686759] rcuos/38: State is 1 and process id is 46
[ 5664.686760] rcuos/39: State is 1 and process id is 47
[ 5664.686762] rcuos/40: State is 1 and process id is 48
[ 5664.686763] rcuos/41: State is 1 and process id is 49
[ 5664.686765] rcuos/42: State is 1 and process id is 50
[ 5664.686766] rcuos/43: State is 1 and process id is 51
[ 5664.686768] rcuos/44: State is 1 and process id is 52
[ 5664.686769] rcuos/45: State is 1 and process id is 53
[ 5664.686771] rcuos/46: State is 1 and process id is 54
[ 5664.686772] rcuos/47: State is 1 and process id is 55
[ 5664.686774] rcuos/48: State is 1 and process id is 56
[ 5664.686775] rcuos/49: State is 1 and process id is 57
[ 5664.686776] rcuos/50: State is 1 and process id is 58
[ 5664.686778] rcuos/51: State is 1 and process id is 59
[ 5664.686779] rcuos/52: State is 1 and process id is 60
[ 5664.686781] rcuos/53: State is 1 and process id is 61
[ 5664.686782] rcuos/54: State is 1 and process id is 62
[ 5664.686784] rcuos/55: State is 1 and process id is 63
[ 5664.686785] rcuos/56: State is 1 and process id is 64
[ 5664.686787] rcuos/57: State is 1 and process id is 65
[ 5664.686788] rcuos/58: State is 1 and process id is 66
[ 5664.686790] rcuos/59: State is 1 and process id is 67
[ 5664.686791] rcuos/60: State is 1 and process id is 68
[ 5664.686793] rcuos/61: State is 1 and process id is 69
[ 5664.686794] rcuos/62: State is 1 and process id is 70
[ 5664.686796] rcuos/63: State is 1 and process id is 71
[ 5664.686797] rcu_bh: State is 1 and process id is 72
[ 5664.686799] rcuob/0: State is 1 and process id is 73
[ 5664.686800] rcuob/1: State is 1 and process id is 74
[ 5664.686802] rcuob/2: State is 1 and process id is 75
[ 5664.686803] rcuob/3: State is 1 and process id is 76
[ 5664.686805] rcuob/4: State is 1 and process id is 77
[ 5664.686806] rcuob/5: State is 1 and process id is 78
[ 5664.686808] rcuob/6: State is 1 and process id is 79
[ 5664.686809] rcuob/7: State is 1 and process id is 80
[ 5664.686811] rcuob/8: State is 1 and process id is 81
[ 5664.686812] rcuob/9: State is 1 and process id is 82
[ 5664.686814] rcuob/10: State is 1 and process id is 83
[ 5664.686815] rcuob/11: State is 1 and process id is 84
[ 5664.686824] rcuob/12: State is 1 and process id is 85
[ 5664.686826] rcuob/13: State is 1 and process id is 86
[ 5664.686827] rcuob/14: State is 1 and process id is 87
[ 5664.686829] rcuob/15: State is 1 and process id is 88
[ 5664.686830] rcuob/16: State is 1 and process id is 89
[ 5664.686831] rcuob/17: State is 1 and process id is 90
[ 5664.686833] rcuob/18: State is 1 and process id is 91
[ 5664.686834] rcuob/19: State is 1 and process id is 92
[ 5664.686836] rcuob/20: State is 1 and process id is 93
[ 5664.686837] rcuob/21: State is 1 and process id is 94
[ 5664.686839] rcuob/22: State is 1 and process id is 95
[ 5664.686840] rcuob/23: State is 1 and process id is 96
[ 5664.686842] rcuob/24: State is 1 and process id is 97
```

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[ 5664.686843] rcuob/25: State is 1 and process id is 98
[ 5664.686845] rcuob/26: State is 1 and process id is 99
[ 5664.686881] rcuob/27: State is 1 and process id is 100
[ 5664.686935] rcuob/28: State is 1 and process id is 101
[ 5664.686937] rcuob/29: State is 1 and process id is 102
[ 5664.686939] rcuob/30: State is 1 and process id is 103
[ 5664.686940] rcuob/31: State is 1 and process id is 104
[ 5664.686942] rcuob/32: State is 1 and process id is 105
[ 5664.686943] rcuob/33: State is 1 and process id is 106
[ 5664.686945] rcuob/34: State is 1 and process id is 107
[ 5664.686946] rcuob/35: State is 1 and process id is 108
[ 5664.686947] rcuob/36: State is 1 and process id is 109
[ 5664.686949] rcuob/37: State is 1 and process id is 110
[ 5664.686950] rcuob/38: State is 1 and process id is 111
[ 5664.686952] rcuob/39: State is 1 and process id is 112
[ 5664.686953] rcuob/40: State is 1 and process id is 113
[ 5664.686955] rcuob/41: State is 1 and process id is 114
[ 5664.686956] rcuob/42: State is 1 and process id is 115
[ 5664.686958] rcuob/43: State is 1 and process id is 116
[ 5664.686959] rcuob/44: State is 1 and process id is 117
[ 5664.686960] rcuob/45: State is 1 and process id is 118
[ 5664.686962] rcuob/46: State is 1 and process id is 119
[ 5664.686963] rcuob/47: State is 1 and process id is 120
[ 5664.686965] rcuob/48: State is 1 and process id is 121
[ 5664.686966] rcuob/49: State is 1 and process id is 122
[ 5664.686968] rcuob/50: State is 1 and process id is 123
[ 5664.686969] rcuob/51: State is 1 and process id is 124
[ 5664.686970] rcuob/52: State is 1 and process id is 125
[ 5664.686972] rcuob/53: State is 1 and process id is 126
[ 5664.686973] rcuob/54: State is 1 and process id is 127
[ 5664.686975] rcuob/55: State is 1 and process id is 128
[ 5664.686976] rcuob/56: State is 1 and process id is 129
[ 5664.686978] rcuob/57: State is 1 and process id is 130
[ 5664.686979] rcuob/58: State is 1 and process id is 131
[ 5664.686981] rcuob/59: State is 1 and process id is 132
[ 5664.686982] rcuob/60: State is 1 and process id is 133
[ 5664.686984] rcuob/61: State is 1 and process id is 134
[ 5664.686985] rcuob/62: State is 1 and process id is 135
[ 5664.686987] rcuob/63: State is 1 and process id is 136
[ 5664.686988] migration/0: State is 1 and process id is 137
[ 5664.686990] watchdog/0: State is 1 and process id is 138
[ 5664.686991] watchdog/1: State is 1 and process id is 139
[ 5664.686993] migration/1: State is 1 and process id is 140
[ 5664.686994] ksoftirqd/1: State is 1 and process id is 141
[ 5664.686996] kworker/1:0: State is 1 and process id is 142
[ 5664.686998] kworker/1:0H: State is 1 and process id is 143
[ 5664.686999] khelper: State is 1 and process id is 144
[ 5664.687001] kdevtmpfs: State is 1 and process id is 145
[ 5664.687003] netns: State is 1 and process id is 146
[ 5664.687004] writeback: State is 1 and process id is 147
[ 5664.687006] kintegrityd: State is 1 and process id is 148
[ 5664.687007] bioset: State is 1 and process id is 149
[ 5664.687009] kworker/u129:0: State is 1 and process id is 150
[ 5664.687010] kblockd: State is 1 and process id is 151
[ 5664.687012] ata_sff: State is 1 and process id is 152
[ 5664.687014] khubd: State is 1 and process id is 153
```

```
[ 5664.687015] md: State is 1 and process id is 154
[ 5664.687017] devfreq_wq: State is 1 and process id is 155
[ 5664.687018] kworker/0:1: State is 1 and process id is 157
[ 5664.687020] khungtaskd: State is 1 and process id is 159
[ 5664.687022] kswapd0: State is 1 and process id is 160
[ 5664.687023] ksmd: State is 1 and process id is 161
[ 5664.687025] khugepaged: State is 1 and process id is 162
[ 5664.687026] fsnotify_mark: State is 1 and process id is 163
[ 5664.687028] ecryptfs-kthrea: State is 1 and process id is 164
[ 5664.687030] crypto: State is 1 and process id is 165
[ 5664.687031] kthrotld: State is 1 and process id is 177
[ 5664.687033] scsi_eh_0: State is 1 and process id is 179
[ 5664.687034] scsi_eh_1: State is 1 and process id is 180
[ 5664.687036] deferwq: State is 1 and process id is 201
[ 5664.687064] charger_manager: State is 1 and process id is 202
[ 5664.687067] kworker/1:2: State is 1 and process id is 203
[ 5664.687068] mpt_poll_0: State is 1 and process id is 255
[ 5664.687070] mpt/0: State is 1 and process id is 257
[ 5664.687071] scsi_eh_2: State is 1 and process id is 258
[ 5664.687073] kpsmoused: State is 1 and process id is 259
[ 5664.687075] scsi_eh_3: State is 1 and process id is 260
[ 5664.687076] scsi_eh_4: State is 1 and process id is 261
[ 5664.687078] scsi_eh_5: State is 1 and process id is 262
[ 5664.687079] scsi_eh_6: State is 1 and process id is 263
[ 5664.687080] scsi_eh_7: State is 1 and process id is 264
[ 5664.687082] scsi_eh_8: State is 1 and process id is 265
[ 5664.687084] scsi_eh_9: State is 1 and process id is 266
[ 5664.687085] scsi_eh_10: State is 1 and process id is 267
[ 5664.687087] scsi_eh_11: State is 1 and process id is 268
[ 5664.687088] scsi_eh_12: State is 1 and process id is 269
[ 5664.687090] scsi_eh_13: State is 1 and process id is 270
[ 5664.687092] scsi_eh_14: State is 1 and process id is 271
[ 5664.687093] scsi_eh_15: State is 1 and process id is 272
[ 5664.687095] scsi_eh_16: State is 1 and process id is 273
[ 5664.687096] scsi_eh_17: State is 1 and process id is 274
[ 5664.687098] scsi_eh_18: State is 1 and process id is 275
[ 5664.687099] scsi_eh_19: State is 1 and process id is 276
[ 5664.687101] scsi_eh_20: State is 1 and process id is 277
[ 5664.687103] scsi_eh_21: State is 1 and process id is 278
[ 5664.687104] scsi_eh_22: State is 1 and process id is 279
[ 5664.687105] scsi_eh_23: State is 1 and process id is 280
[ 5664.687107] scsi_eh_24: State is 1 and process id is 281
[ 5664.687109] scsi_eh_25: State is 1 and process id is 282
[ 5664.687110] scsi_eh_26: State is 1 and process id is 283
[ 5664.687111] scsi_eh_27: State is 1 and process id is 284
[ 5664.687113] scsi_eh_28: State is 1 and process id is 285
[ 5664.687115] scsi_eh_29: State is 1 and process id is 286
[ 5664.687116] scsi_eh_30: State is 1 and process id is 287
[ 5664.687118] scsi_eh_31: State is 1 and process id is 288
[ 5664.687119] scsi_eh_32: State is 1 and process id is 317
[ 5664.687121] kworker/0:2: State is 1 and process id is 318
[ 5664.687122] jbd2/sda1-8: State is 1 and process id is 332
[ 5664.687124] ext4-rsv-conver: State is 1 and process id is 333
[ 5664.687126] ttm_swap: State is 1 and process id is 560
[ 5664.687127] krfcommd: State is 1 and process id is 734
[ 5664.687129] kauditd: State is 1 and process id is 1440
```

```
[ 5664.687131] kworker/u128:3: State is 1 and process id is 3925
[ 5664.687133] kworker/u128:2: State is 1 and process id is 5416
[ 5664.687134] kworker/u128:1: State is 1 and process id is 5626
[ 5664.687136] kworker/u128:0: State is 1 and process id is 5658
```

B.2 PS

PPID	PID	PGID	SID	TTY	TPGID	STAT	UID	TIME	COMMAND
0	2	0	0	?	−1	S	0	0:00	[kthreadd]
2	3	0	0	?	−1	S	0	0:00	_ [ksoftirqd/0]
2	5	0	0	?	−1	S<	0	0:00	_ [kworker/0:0H]
2	7	0	0	?	−1	S	0	0:01	_ [rcu_sched]
2	8	0	0	?	−1	S	0	0:00	_ [rcuos/0]
2	9	0	0	?	−1	S	0	0:00	_ [rcuos/1]
2	10	0	0	?	−1	S	0	0:00	_ [rcuos/2]
2	11	0	0	?	−1	S	0	0:00	_ [rcuos/3]
2	12	0	0	?	−1	S	0	0:00	_ [rcuos/4]
2	13	0	0	?	−1	S	0	0:00	_ [rcuos/5]
2	14	0	0	?	−1	S	0	0:00	_ [rcuos/6]
2	15	0	0	?	−1	S	0	0:00	_ [rcuos/7]
2	16	0	0	?	−1	S	0	0:00	_ [rcuos/8]
2	17	0	0	?	−1	S	0	0:00	_ [rcuos/9]
2	18	0	0	?	−1	S	0	0:00	_ [rcuos/10]
2	19	0	0	?	−1	S	0	0:00	_ [rcuos/11]
2	20	0	0	?	−1	S	0	0:00	_ [rcuos/12]
2	21	0	0	?	−1	S	0	0:00	_ [rcuos/13]
2	22	0	0	?	−1	S	0	0:00	_ [rcuos/14]
2	23	0	0	?	−1	S	0	0:00	_ [rcuos/15]
2	24	0	0	?	−1	S	0	0:00	_ [rcuos/16]
2	25	0	0	?	−1	S	0	0:00	_ [rcuos/17]
2	26	0	0	?	−1	S	0	0:00	_ [rcuos/18]
2	27	0	0	?	−1	S	0	0:00	_ [rcuos/19]
2	28	0	0	?	−1	S	0	0:00	_ [rcuos/20]
2	29	0	0	?	−1	S	0	0:00	_ [rcuos/21]
2	30	0	0	?	−1	S	0	0:00	_ [rcuos/22]
2	31	0	0	?	−1	S	0	0:00	_ [rcuos/23]
2	32	0	0	?	−1	S	0	0:00	_ [rcuos/24]
2	33	0	0	?	−1	S	0	0:00	_ [rcuos/25]
2	34	0	0	?	−1	S	0	0:00	_ [rcuos/26]
2	35	0	0	?	−1	S	0	0:00	_ [rcuos/27]
2	36	0	0	?	−1	S	0	0:00	_ [rcuos/28]
2	37	0	0	?	−1	S	0	0:00	_ [rcuos/29]
2	38	0	0	?	−1	S	0	0:00	_ [rcuos/30]
2	39	0	0	?	−1	S	0	0:00	_ [rcuos/31]
2	40	0	0	?	−1	S	0	0:00	_ [rcuos/32]
2	41	0	0	?	−1	S	0	0:00	_ [rcuos/33]
2	42	0	0	?	−1	S	0	0:00	_ [rcuos/34]
2	43	0	0	?	−1	S	0	0:00	_ [rcuos/35]
2	44	0	0	?	−1	S	0	0:00	_ [rcuos/36]
2	45	0	0	?	−1	S	0	0:00	_ [rcuos/37]
2	46	0	0	?	−1	S	0	0:00	_ [rcuos/38]
2	47	0	0	?	−1	S	0	0:00	_ [rcuos/39]
2	48	0	0	?	−1	S	0	0:00	_ [rcuos/40]
2	49	0	0	?	−1	S	0	0:00	_ [rcuos/41]
2	50	0	0	?	−1	S	0	0:00	_ [rcuos/42]
2	51	0	0	?	−1	S	0	0:00	_ [rcuos/43]

```
2     52     0     0 ?           -1 S     0   0:00 \_ [rcuos/44]
2     53     0     0 ?           -1 S     0   0:00 \_ [rcuos/45]
2     54     0     0 ?           -1 S     0   0:00 \_ [rcuos/46]
2     55     0     0 ?           -1 S     0   0:00 \_ [rcuos/47]
2     56     0     0 ?           -1 S     0   0:00 \_ [rcuos/48]
2     57     0     0 ?           -1 S     0   0:00 \_ [rcuos/49]
2     58     0     0 ?           -1 S     0   0:00 \_ [rcuos/50]
2     59     0     0 ?           -1 S     0   0:00 \_ [rcuos/51]
2     60     0     0 ?           -1 S     0   0:00 \_ [rcuos/52]
2     61     0     0 ?           -1 S     0   0:00 \_ [rcuos/53]
2     62     0     0 ?           -1 S     0   0:00 \_ [rcuos/54]
2     63     0     0 ?           -1 S     0   0:00 \_ [rcuos/55]
2     64     0     0 ?           -1 S     0   0:00 \_ [rcuos/56]
2     65     0     0 ?           -1 S     0   0:00 \_ [rcuos/57]
2     66     0     0 ?           -1 S     0   0:00 \_ [rcuos/58]
2     67     0     0 ?           -1 S     0   0:00 \_ [rcuos/59]
2     68     0     0 ?           -1 S     0   0:00 \_ [rcuos/60]
2     69     0     0 ?           -1 S     0   0:00 \_ [rcuos/61]
2     70     0     0 ?           -1 S     0   0:00 \_ [rcuos/62]
2     71     0     0 ?           -1 S     0   0:00 \_ [rcuos/63]
2     72     0     0 ?           -1 S     0   0:00 \_ [rcu_bh]
2     73     0     0 ?           -1 S     0   0:00 \_ [rcuob/0]
2     74     0     0 ?           -1 S     0   0:00 \_ [rcuob/1]
2     75     0     0 ?           -1 S     0   0:00 \_ [rcuob/2]
2     76     0     0 ?           -1 S     0   0:00 \_ [rcuob/3]
2     77     0     0 ?           -1 S     0   0:00 \_ [rcuob/4]
2     78     0     0 ?           -1 S     0   0:00 \_ [rcuob/5]
2     79     0     0 ?           -1 S     0   0:00 \_ [rcuob/6]
2     80     0     0 ?           -1 S     0   0:00 \_ [rcuob/7]
2     81     0     0 ?           -1 S     0   0:00 \_ [rcuob/8]
2     82     0     0 ?           -1 S     0   0:00 \_ [rcuob/9]
2     83     0     0 ?           -1 S     0   0:00 \_ [rcuob/10]
2     84     0     0 ?           -1 S     0   0:00 \_ [rcuob/11]
2     85     0     0 ?           -1 S     0   0:00 \_ [rcuob/12]
2     86     0     0 ?           -1 S     0   0:00 \_ [rcuob/13]
2     87     0     0 ?           -1 S     0   0:00 \_ [rcuob/14]
2     88     0     0 ?           -1 S     0   0:00 \_ [rcuob/15]
2     89     0     0 ?           -1 S     0   0:00 \_ [rcuob/16]
2     90     0     0 ?           -1 S     0   0:00 \_ [rcuob/17]
2     91     0     0 ?           -1 S     0   0:00 \_ [rcuob/18]
2     92     0     0 ?           -1 S     0   0:00 \_ [rcuob/19]
2     93     0     0 ?           -1 S     0   0:00 \_ [rcuob/20]
2     94     0     0 ?           -1 S     0   0:00 \_ [rcuob/21]
2     95     0     0 ?           -1 S     0   0:00 \_ [rcuob/22]
2     96     0     0 ?           -1 S     0   0:00 \_ [rcuob/23]
2     97     0     0 ?           -1 S     0   0:00 \_ [rcuob/24]
2     98     0     0 ?           -1 S     0   0:00 \_ [rcuob/25]
2     99     0     0 ?           -1 S     0   0:00 \_ [rcuob/26]
2    100     0     0 ?           -1 S     0   0:00 \_ [rcuob/27]
2    101     0     0 ?           -1 S     0   0:00 \_ [rcuob/28]
2    102     0     0 ?           -1 S     0   0:00 \_ [rcuob/29]
2    103     0     0 ?           -1 S     0   0:00 \_ [rcuob/30]
2    104     0     0 ?           -1 S     0   0:00 \_ [rcuob/31]
2    105     0     0 ?           -1 S     0   0:00 \_ [rcuob/32]
2    106     0     0 ?           -1 S     0   0:00 \_ [rcuob/33]
2    107     0     0 ?           -1 S     0   0:00 \_ [rcuob/34]
```

```
2   108     0     0 ?           -1 S       0   0:00 \_ [rcuob/35]
2   109     0     0 ?           -1 S       0   0:00 \_ [rcuob/36]
2   110     0     0 ?           -1 S       0   0:00 \_ [rcuob/37]
2   111     0     0 ?           -1 S       0   0:00 \_ [rcuob/38]
2   112     0     0 ?           -1 S       0   0:00 \_ [rcuob/39]
2   113     0     0 ?           -1 S       0   0:00 \_ [rcuob/40]
2   114     0     0 ?           -1 S       0   0:00 \_ [rcuob/41]
2   115     0     0 ?           -1 S       0   0:00 \_ [rcuob/42]
2   116     0     0 ?           -1 S       0   0:00 \_ [rcuob/43]
2   117     0     0 ?           -1 S       0   0:00 \_ [rcuob/44]
2   118     0     0 ?           -1 S       0   0:00 \_ [rcuob/45]
2   119     0     0 ?           -1 S       0   0:00 \_ [rcuob/46]
2   120     0     0 ?           -1 S       0   0:00 \_ [rcuob/47]
2   121     0     0 ?           -1 S       0   0:00 \_ [rcuob/48]
2   122     0     0 ?           -1 S       0   0:00 \_ [rcuob/49]
2   123     0     0 ?           -1 S       0   0:00 \_ [rcuob/50]
2   124     0     0 ?           -1 S       0   0:00 \_ [rcuob/51]
2   125     0     0 ?           -1 S       0   0:00 \_ [rcuob/52]
2   126     0     0 ?           -1 S       0   0:00 \_ [rcuob/53]
2   127     0     0 ?           -1 S       0   0:00 \_ [rcuob/54]
2   128     0     0 ?           -1 S       0   0:00 \_ [rcuob/55]
2   129     0     0 ?           -1 S       0   0:00 \_ [rcuob/56]
2   130     0     0 ?           -1 S       0   0:00 \_ [rcuob/57]
2   131     0     0 ?           -1 S       0   0:00 \_ [rcuob/58]
2   132     0     0 ?           -1 S       0   0:00 \_ [rcuob/59]
2   133     0     0 ?           -1 S       0   0:00 \_ [rcuob/60]
2   134     0     0 ?           -1 S       0   0:00 \_ [rcuob/61]
2   135     0     0 ?           -1 S       0   0:00 \_ [rcuob/62]
2   136     0     0 ?           -1 S       0   0:00 \_ [rcuob/63]
2   137     0     0 ?           -1 S       0   0:00 \_ [migration/0]
2   138     0     0 ?           -1 S       0   0:00 \_ [watchdog/0]
2   139     0     0 ?           -1 S       0   0:00 \_ [watchdog/1]
2   140     0     0 ?           -1 S       0   0:00 \_ [migration/1]
2   141     0     0 ?           -1 S       0   0:00 \_ [ksoftirqd/1]
2   142     0     0 ?           -1 S       0   0:00 \_ [kworker/1:0]
2   143     0     0 ?           -1 S<      0   0:00 \_ [kworker/1:0H]
2   144     0     0 ?           -1 S<      0   0:00 \_ [khelper]
2   145     0     0 ?           -1 S       0   0:00 \_ [kdevtmpfs]
2   146     0     0 ?           -1 S<      0   0:00 \_ [netns]
2   147     0     0 ?           -1 S<      0   0:00 \_ [writeback]
2   148     0     0 ?           -1 S<      0   0:00 \_ [kintegrityd]
2   149     0     0 ?           -1 S<      0   0:00 \_ [bioset]
2   150     0     0 ?           -1 S<      0   0:00 \_ [kworker/u129:0]
2   151     0     0 ?           -1 S<      0   0:00 \_ [kblockd]
2   152     0     0 ?           -1 S<      0   0:00 \_ [ata_sff]
2   153     0     0 ?           -1 S       0   0:00 \_ [khubd]
2   154     0     0 ?           -1 S<      0   0:00 \_ [md]
2   155     0     0 ?           -1 S<      0   0:00 \_ [devfreq_wq]
2   157     0     0 ?           -1 S       0   0:02 \_ [kworker/0:1]
2   159     0     0 ?           -1 S       0   0:00 \_ [khungtaskd]
2   160     0     0 ?           -1 S       0   0:00 \_ [kswapd0]
2   161     0     0 ?           -1 SN      0   0:00 \_ [ksmd]
2   162     0     0 ?           -1 SN      0   0:00 \_ [khugepaged]
2   163     0     0 ?           -1 S       0   0:00 \_ [fsnotify_mark]
2   164     0     0 ?           -1 S       0   0:00 \_ [ecryptfs-kthrea]
2   165     0     0 ?           -1 S<      0   0:00 \_ [crypto]
```

```
2   177     0     0 ?           -1 S<       0   0:00  \_ [kthrotld]
2   179     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_0]
2   180     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_1]
2   201     0     0 ?           -1 S<       0   0:00  \_ [deferwq]
2   202     0     0 ?           -1 S<       0   0:00  \_ [charger_manager]
2   203     0     0 ?           -1 S        0   0:00  \_ [kworker/1:2]
2   255     0     0 ?           -1 S<       0   0:00  \_ [mpt_poll_0]
2   257     0     0 ?           -1 S<       0   0:00  \_ [mpt/0]
2   258     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_2]
2   259     0     0 ?           -1 S<       0   0:00  \_ [kpsmoused]
2   260     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_3]
2   261     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_4]
2   262     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_5]
2   263     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_6]
2   264     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_7]
2   265     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_8]
2   266     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_9]
2   267     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_10]
2   268     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_11]
2   269     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_12]
2   270     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_13]
2   271     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_14]
2   272     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_15]
2   273     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_16]
2   274     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_17]
2   275     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_18]
2   276     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_19]
2   277     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_20]
2   278     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_21]
2   279     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_22]
2   280     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_23]
2   281     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_24]
2   282     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_25]
2   283     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_26]
2   284     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_27]
2   285     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_28]
2   286     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_29]
2   287     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_30]
2   288     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_31]
2   317     0     0 ?           -1 S        0   0:00  \_ [scsi_eh_32]
2   318     0     0 ?           -1 S        0   0:00  \_ [kworker/0:2]
2   332     0     0 ?           -1 S        0   0:00  \_ [jbd2/sda1-8]
2   333     0     0 ?           -1 S<       0   0:00  \_ [ext4-rsv-conver]
2   560     0     0 ?           -1 S<       0   0:00  \_ [ttm_swap]
2   734     0     0 ?           -1 S<       0   0:00  \_ [krfcommd]
2  1440     0     0 ?           -1 S        0   0:00  \_ [kauditd]
2  3925     0     0 ?           -1 S        0   0:00  \_ [kworker/u128:3]
2  5416     0     0 ?           -1 S        0   0:00  \_ [kworker/u128:2]
2  5626     0     0 ?           -1 S        0   0:00  \_ [kworker/u128:1]
2  5658     0     0 ?           -1 S        0   0:00  \_ [kworker/u128:0]
0     1     1     1 ?           -1 Ss       0   0:01 /sbin/init
1   474   472   472 ?           -1 S        0   0:00 upstart-udev-bridge
    --daemon
1   483   483   483 ?           -1 Ss       0   0:00 /lib/systemd/systemd-
    udevd --daemon
1   617   615   615 ?           -1 S        0   0:00 upstart-file-bridge
```

```
    --daemon
  1   632   632   632 ?           -1 Ss      102   0:00 dbus-daemon --system
    --fork
  1   678   678   678 ?           -1 Ssl     101   0:00 rsyslogd
  1   697   697   697 ?           -1 Ss        0   0:00 /usr/sbin/bluetoothd
  1   713   713   713 ?           -1 Ss        0   0:00 /lib/systemd/systemd-
    logind
  1   786   778   778 ?           -1 S       111   0:00 avahi-daemon: running
    [ubuntu.local]
786   792   778   778 ?           -1 S       111   0:00  \_ avahi-daemon:
   chroot helper
  1   819   819   819 ?           -1 Ssl       0   0:00 /usr/sbin/
    ModemManager
  1   844   843   843 ?           -1 S         0   0:00 upstart-socket-bridge
    --daemon
  1   923   923   923 ?           -1 Ssl       0   0:00 NetworkManager
923  1000  1000   923 ?           -1 S         0   0:00  \_ /sbin/dhclient -d
    -sf /usr/lib/NetworkManager/nm-dhcp-client.action -pf /run/sendsigs.
   omit.d/network-manager.dhclient-eth0.pid -lf /var/lib/NetworkManager/
   dhclient-0b6e09d1-e573-4c09-8537-a1ee394209a9-eth0.lease -cf /var/lib/
   NetworkManager/dhclient-eth0.conf eth0
923  1490  1490   923 ?           -1 S     65534   0:00  \_ /usr/sbin/dnsmasq
    --no-resolv --keep-in-foreground --no-hosts --bind-interfaces --pid-
   file=/run/sendsigs.omit.d/network-manager.dnsmasq.pid --listen-address
   =127.0.1.1 --conf-file=/var/run/NetworkManager/dnsmasq.conf --cache-size
   =0 --proxy-dnssec --enable-dbus=org.freedesktop.NetworkManager.dnsmasq
   --conf-dir=/etc/NetworkManager/dnsmasq.d
  1   935   632   632 ?           -1 Sl        0   0:00 /usr/lib/policykit-1/
    polkitd --no-debug
  1   968   968   968 tty4       968 Ss+       0   0:00 /sbin/getty -8 38400
    tty4
  1   974   974   974 tty5       974 Ss+       0   0:00 /sbin/getty -8 38400
    tty5
  1   980   980   980 tty2       980 Ss+       0   0:00 /sbin/getty -8 38400
    tty2
  1   982   982   982 tty3       982 Ss+       0   0:00 /sbin/getty -8 38400
    tty3
  1   985   985   985 tty6       985 Ss+       0   0:00 /sbin/getty -8 38400
    tty6
  1  1040  1040  1040 ?           -1 Ss      106   0:00 /usr/sbin/kerneloops
  1  1045  1045  1045 ?           -1 Ss        0   0:00 cron
  1  1053  1053  1053 ?           -1 SLsl      0   0:00 lightdm
1053  1142  1142  1142 tty7      1142 Rs+       0   0:34  \_ /usr/bin/X -core
   :0 -seat seat0 -auth /var/run/lightdm/root/:0 -nolisten tcp vt7 -
   novtswitch
1053  1715  1053  1053 ?           -1 Sl        0   0:00  \_ lightdm --session
   -child 12 19
1715  2730  2730  2730 ?           -1 Ss     1000   0:00      \_ init --user
2730  2801  2801  2801 ?           -1 Ss     1000   0:00          \_ ssh-agent
    -s
2730  2807  2807  2807 ?           -1 Ss     1000   0:01          \_ dbus-
   daemon --fork --session --address=unix:abstract=/tmp/dbus-VLfuIwL5iq
2730  2815  2815  2815 ?           -1 Ss     1000   0:00          \_ upstart-
   event-bridge
2730  2819  2819  2819 ?           -1 Ss     1000   0:00          \_ /usr/lib/
   x86_64-linux-gnu/hud/window-stack-bridge
```

```
2730  2820  2820  2820 ?           -1 Ssl    1000   0:04          \_ /usr/bin/
    ibus-daemon --daemonize --xim
2820  2851  2820  2820 ?           -1 Sl     1000   0:00          |   \_ /usr/
    lib/ibus/ibus-dconf
2820  2854  2820  2820 ?           -1 Sl     1000   0:01          |   \_ /usr/
    lib/ibus/ibus-ui-gtk3
2820  2914  2820  2820 ?           -1 Sl     1000   0:00          |   \_ /usr/
    lib/ibus/ibus-engine-simple
2730  2829  2828  2828 ?           -1 S      1000   0:00          \_ upstart-
    file-bridge --daemon --user
2730  2835  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    gvfs/gvfsd
2730  2836  2836  2836 ?           -1 Ssl    1000   0:00          \_ /usr/lib/
    unity-settings-daemon/unity-settings-daemon
2730  2842  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    gvfs/gvfsd-fuse /run/user/1000/gvfs -f -o big_writes
2730  2845  2845  2845 ?           -1 Ssl    1000   0:01          \_ /usr/lib/
    x86_64-linux-gnu/hud/hud-service
2730  2849  2849  2849 ?           -1 Ssl    1000   0:00          \_ /usr/lib/
    at-spi2-core/at-spi-bus-launcher --launch-immediately
2849  2862  2849  2849 ?           -1 S      1000   0:00          |   \_ /bin/
    dbus-daemon --config-file=/etc/at-spi2/accessibility.conf --nofork --
    print-address 3
2730  2858  2858  2858 ?           -1 Ssl    1000   0:00          \_ gnome-
    session --session=ubuntu
2858  3039  2858  2858 ?           -1 Sl     1000   0:29          |   \_
    compiz
2858  3077  2858  2858 ?           -1 Sl     1000   0:00          |   \_ nm-
    applet
2858  3078  2858  2858 ?           -1 Sl     1000   0:00          |   \_ /usr/
    lib/policykit-1-gnome/polkit-gnome-authentication-agent-1
2858  3080  2858  2858 ?           -1 Sl     1000   0:08          |   \_
    nautilus -n
2858  3081  2858  2858 ?           -1 Sl     1000   0:00          |   \_ /usr/
    lib/unity-settings-daemon/unity-fallback-mount-helper
2858  3294  2858  2858 ?           -1 Sl     1000   0:00          |   \_
    telepathy-indicator
2858  3317  2858  2858 ?           -1 Sl     1000   0:00          |   \_
    zeitgeist-datahub
2858  3374  2858  2858 ?           -1 Sl     1000   0:00          |   \_
    update-notifier
2858  3426  2858  2858 ?           -1 Sl     1000   0:00          |   \_ /usr/
    lib/x86_64-linux-gnu/deja-dup/deja-dup-monitor
2730  2864  2864  2864 ?           -1 Ssl    1000   0:01          \_ /usr/lib/
    unity/unity-panel-service
2730  2865  2820  2820 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    ibus/ibus-x11 --kill-daemon
2730  2870  2868  2868 ?           -1 S      1000   0:00          \_ upstart-
    dbus-bridge --daemon --session --user --bus-name session
2730  2872  2849  2849 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    at-spi2-core/at-spi2-registryd --use-gnome-session
2730  2892  2891  2891 ?           -1 S      1000   0:00          \_ upstart-
    dbus-bridge --daemon --system --user --bus-name system
2730  2907  2807  2807 ?           -1 Sl     1000   0:01          \_ /usr/lib/
    x86_64-linux-gnu/bamf/bamfdaemon
2730  2921  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
```

```
    x86_64-linux-gnu/indicator-keyboard-service --use-gtk
2730  2922  2922  2922 ?           -1 Ssl    1000   0:00          \_ /usr/lib/
    x86_64-linux-gnu/indicator-messages/indicator-messages-service
2730  2924  2924  2924 ?           -1 Ssl    1000   0:00          \_ /usr/lib/
    x86_64-linux-gnu/indicator-bluetooth/indicator-bluetooth-service
2730  2931  2931  2931 ?           -1 Ssl    1000   0:00          \_ /usr/lib/
    x86_64-linux-gnu/indicator-power/indicator-power-service
2730  2934  2934  2934 ?           -1 Ssl    1000   0:00          \_ /usr/lib/
    x86_64-linux-gnu/indicator-datetime/indicator-datetime-service
2730  2937  2937  2937 ?           -1 Ssl    1000   0:00          \_ /usr/lib/
    x86_64-linux-gnu/indicator-sound/indicator-sound-service
2730  2946  2946  2946 ?           -1 Ssl    1000   0:00          \_ /usr/lib/
    x86_64-linux-gnu/indicator-printers/indicator-printers-service
2730  2950  2950  2950 ?           -1 Ssl    1000   0:00          \_ /usr/lib/
    x86_64-linux-gnu/indicator-session/indicator-session-service
2730  2952  2952  2952 ?           -1 Ssl    1000   0:00          \_ /usr/lib/
    x86_64-linux-gnu/indicator-application/indicator-application-service
2730  2958  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    dconf/dconf-service
2730  2976  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    evolution/evolution-source-registry
2730  2997  2996  2996 ?           -1 S<l    1000   0:00          \_ /usr/bin/
    pulseaudio --start --log-target=syslog
2730  3032  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    x86_64-linux-gnu/notify-osd
2730  3049  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    evolution/evolution-calendar-factory
2730  3086  2858  2858 ?           -1 Sl     1000   0:04          \_ /usr/lib/
    vmware-tools/sbin64/vmtoolsd -n vmusr --blockFd 3
2730  3145  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    gvfs/gvfs-udisks2-volume-monitor
2730  3193  2807  2807 ?           -1 S      1000   0:00          \_ /usr/lib/
    x86_64-linux-gnu/gconf/gconfd-2
2730  3203  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    gvfs/gvfs-gphoto2-volume-monitor
2730  3209  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    gvfs/gvfs-afc-volume-monitor
2730  3214  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    gvfs/gvfs-mtp-volume-monitor
2730  3231  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    gvfs/gvfsd-trash --spawner :1.3 /org/gtk/gvfs/exec_spaw/0
2730  3261  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    gvfs/gvfsd-burn --spawner :1.3 /org/gtk/gvfs/exec_spaw/1
2730  3282  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    gvfs/gvfsd-metadata
2730  3303  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    telepathy/mission-control-5
2730  3322  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/bin/
    zeitgeist-daemon
2730  3328  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    x86_64-linux-gnu/zeitgeist-fts
3328  3332  2807  2807 ?           -1 S      1000   0:00          |   \_ /bin/
    cat
2730  3524  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
    x86_64-linux-gnu/unity-scope-home/unity-scope-home
2730  3538  2807  2807 ?           -1 Sl     1000   0:00          \_ /usr/lib/
```

```
    x86_64-linux-gnu/unity-lens-files/unity-files-daemon
2730  3539  2807  2807 ?           -1 Sl    1000   0:00          \_ /usr/bin/
    unity-scope-loader applications/applications.scope applications/scopes.
    scope commands.scope
2730  3565  2807  2807 ?           -1 Sl    1000   0:00          \_ /usr/lib/
    x86_64-linux-gnu/unity-lens-music/unity-music-daemon
2730  3582  2858  2858 ?           -1 Sl    1000   0:08          \_ gnome-
    terminal
3582  3590  2858  2858 ?           -1 S     1000   0:00          |   \_ gnome
    -pty-helper
3582  3591  3591  3591 pts/0     5710 Ss    1000   0:00          |   \_ bash
3591  5710  5710  3591 pts/0     5710 R+    1000   0:00          |   |   \_
    ps axjf
3582  3706  3706  3706 pts/6     3706 Ss+   1000   0:00          |   \_ bash
2730  4373  2807  2807 ?           -1 Sl    1000   0:00          \_ /usr/lib/
    gvfs/gvfsd-http --spawner :1.3 /org/gtk/gvfs/exec_spaw/2
   1  1091  1091  1091 ?           -1 Ss       0   0:03 /usr/sbin/irqbalance
   1  1154   632   632 ?           -1 Sl       0   0:00 /usr/lib/
       accountsservice/accounts-daemon
   1  1191  1191  1191 ?           -1 Ss       0   0:00 /usr/sbin/cups-
       browsed
   1  1198  1198  1198 ?           -1 Ssl    109   0:00 whoopsie
   1  1234  1234  1234 tty1      1234 Ss+      0   0:00 /sbin/getty -8 38400
       tty1
   1  1248  1248  1248 ?           -1 Ss       0   0:00 acpid -c /etc/acpi/
       events -s /var/run/acpid.socket
   1  1432  1432  1432 ?           -1 Ssl      0   0:00 /usr/sbin/vmware-
       vmblock-fuse -o subtype=vmware-vmblock,default_permissions,allow_other
        /var/run/vmblock-fuse
   1  1460  1459  1459 ?           -1 Sl       0   0:05 /usr/sbin/vmtoolsd
   1  1738   632   632 ?           -1 Sl       0   0:00 /usr/lib/upower/
       upowerd
   1  1779   632   632 ?           -1 SNl    107   0:00 /usr/lib/rtkit/rtkit-
       daemon
   1  1982   632   632 ?           -1 Sl     113   0:00 /usr/lib/colord/
       colord
   1  2519  2519  2519 ?           -1 Ss       0   0:00 /usr/sbin/cupsd -f
   1  2557  2557  2557 ?           -1 Ss       0   0:00 tpvmlpd2
   1  2725  2724  2724 ?           -1 Sl    1000   0:00 /usr/bin/gnome-
       keyring-daemon --daemonize --login
   1  3155   632   632 ?           -1 Sl       0   0:00 /usr/lib/udisks2/
       udisksd --no-debug
```

Appendix C

Kildekode

C.1 Simple

C.1.1 Main

```
#include <linux/init.h>
#include <linux/module.h>
#include <linux/kernel.h>
#include <linux/slab.h>
#include <linux/types.h>

struct birthday {
  int day;
  int month;
  int year;
  struct list_head list;
};

static LIST_HEAD(birthday_list);

/* This function is called when the module is loaded. */
int simple_init(void)
{


        LIST_HEAD(listhead);
        struct birthday *ptr;
        struct birthday *person;

        struct birthday *othera;
        struct birthday *otherb;
        struct birthday *otherc;
        struct birthday *otherd;
        printk(KERN_INFO "Loading Module\n");
        person = kmalloc(sizeof(*person), GFP_KERNEL);
        person->day=2;
        person->month=8;
        person->year=1995;

        othera = kmalloc(sizeof(*othera), GFP_KERNEL);
        otherb = kmalloc(sizeof(*otherb), GFP_KERNEL);
        otherc = kmalloc(sizeof(*otherc), GFP_KERNEL);
```

```
        otherd = kmalloc(sizeof(*otherd), GFP_KERNEL);

        othera->day = 4;
        otherb->day = 27;
        otherc->day = 15;
        otherd->day = 20;
        othera->month = 9;
        otherb->month = 4;
        otherc->month = 3;
        otherd->month = 12;
        othera->year = 1974;
        otherb->year = 1958;
        otherc->year = 1948;
        otherd->year = 1990;




        INIT_LIST_HEAD(&person->list);
        INIT_LIST_HEAD(&othera->list);
        INIT_LIST_HEAD(&otherb->list);
        INIT_LIST_HEAD(&otherc->list);
        INIT_LIST_HEAD(&otherd->list);

        list_add_tail(&person->list, &birthday_list);
        list_add_tail(&othera->list, &birthday_list);
        list_add_tail(&otherb->list, &birthday_list);
        list_add_tail(&otherc->list, &birthday_list);
        list_add_tail(&otherd->list, &birthday_list);

        list_for_each_entry(ptr, &birthday_list, list){
          printk(KERN_INFO "Person %d-%d-%d\n", ptr->day, ptr->month, ptr->year
              );
        }


        return 0;
}

/* This function is called when the module is removed. */
void simple_exit(void) {
         struct birthday *ptr, *next;
         printk(KERN_INFO "Removing Module\n");
         list_for_each_entry_safe(ptr, next, &birthday_list, list){
           list_del(&ptr->list);
           kfree(ptr);
         }
}

/* Macros for registering module entry and exit points. */
module_init( simple_init );
module_exit( simple_exit );

MODULE_LICENSE("GPL");
MODULE_DESCRIPTION("Simple Module");
MODULE_AUTHOR("SGG");
```

C.1.2 Makefile

```
obj-m += simple.o
all:
	make -C /lib/modules/$(shell uname -r)/build M=$(PWD) modules
clean:
	make -C /lib/modules/$(shell uname -r)/build M=$(PWD) clean
```

C.2 Linear Iteration

C.2.1 Main

```
#include <linux/init.h>
#include <linux/module.h>
#include <linux/kernel.h>
#include <linux/slab.h>
#include <linux/sched.h>
#include <linux/types.h>



/* This function is called when the module is loaded. */
int listcum_init(void)
{
        struct task_struct *task;

        for_each_process(task){
          printk(KERN_INFO "%s: State is %ld and process id is %d\n",task->
              comm,task->state,task->pid);
        }

        printk(KERN_INFO "Loading Module\n");
        return 0;
}

/* This function is called when the module is removed. */
void listcum_exit(void) {
        printk(KERN_INFO "Removing Module\n");
}

/* Macros for registering module entry and exit points. */
module_init( listcum_init );
module_exit( listcum_exit );

MODULE_LICENSE("DALARmusic");
MODULE_DESCRIPTION("List Module");
MODULE_AUTHOR("DALARmusic");
```

C.2.2 Makefile

```
obj-m += cumlist.o
all:
	make -C /lib/modules/$(shell uname -r)/build M=$(PWD) modules
clean:
	make -C /lib/modules/$(shell uname -r)/build M=$(PWD) clean
```

C.3 DFS Iteration

C.3.1 Main

```
#include <linux/init.h>
#include <linux/module.h>
#include <linux/kernel.h>
#include <linux/slab.h>
#include <linux/sched.h>

int dfs_list(struct task_struct *task){
        struct list_head *list;
        struct task_struct *child;

        list_for_each(list, &task->children){
          child = list_entry(list, struct task_struct, sibling);
          printk(KERN_INFO "%s: State is %ld and process id is %d\n",child->
              comm,child->state,child->pid);
          dfs_list(child);
        }

  return 0;
}

/* This function is called when the module is loaded. */
int listdfs_init(void)
{
        printk(KERN_INFO "Loading Module\n");
        dfs_list(&init_task);

        return 0;
}

/* This function is called when the module is removed. */
void listdfs_exit(void) {
        printk(KERN_INFO "Removing Module\n");
}

/* Macros for registering module entry and exit points. */
module_init( listdfs_init );
module_exit( listdfs_exit );

MODULE_LICENSE("DELERmusic");
MODULE_DESCRIPTION("DFS Module");
MODULE_AUTHOR("DELERmusic");
```

C.3.2 Makefile

```
obj-m += dfslist.o
all:
        make -C /lib/modules/$(shell uname -r)/build M=$(PWD) modules
clean:
        make -C /lib/modules/$(shell uname -r)/build M=$(PWD) clean
```