

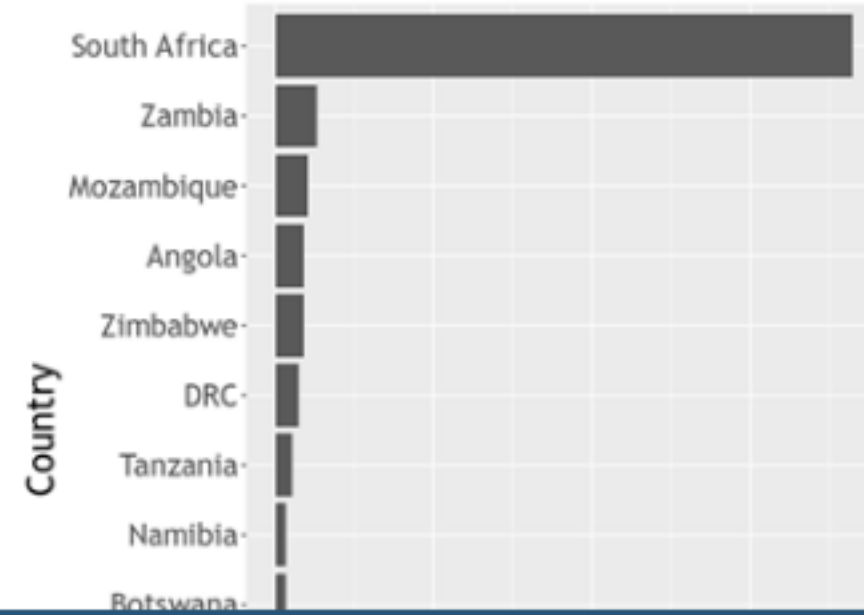
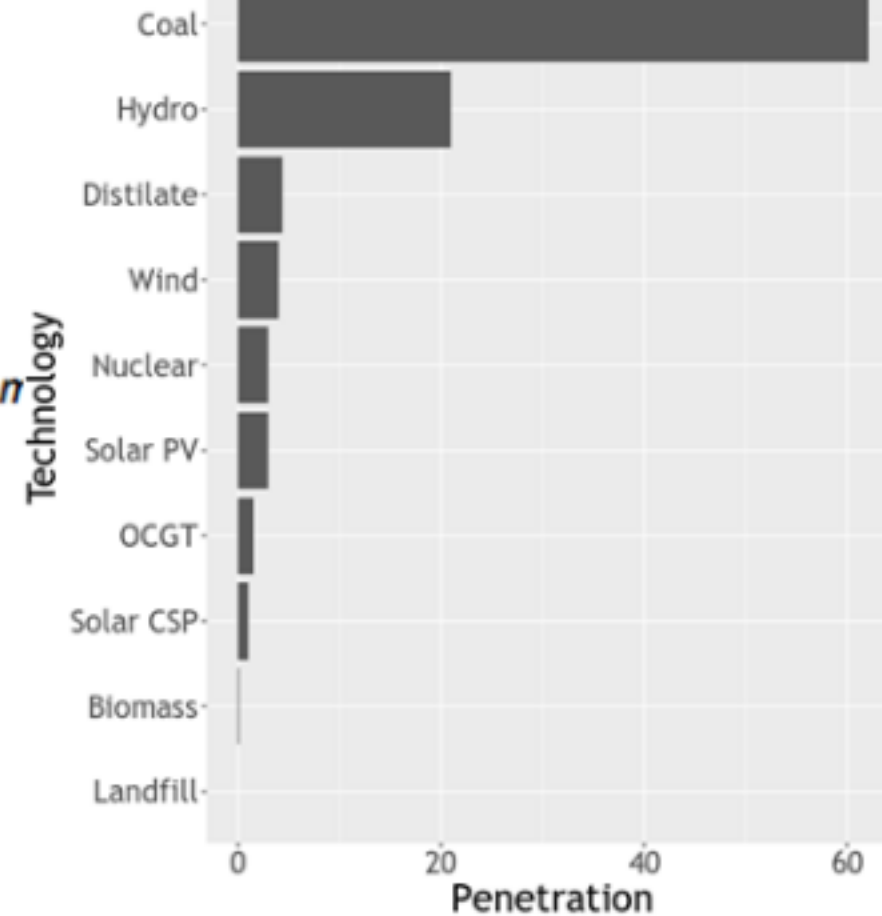
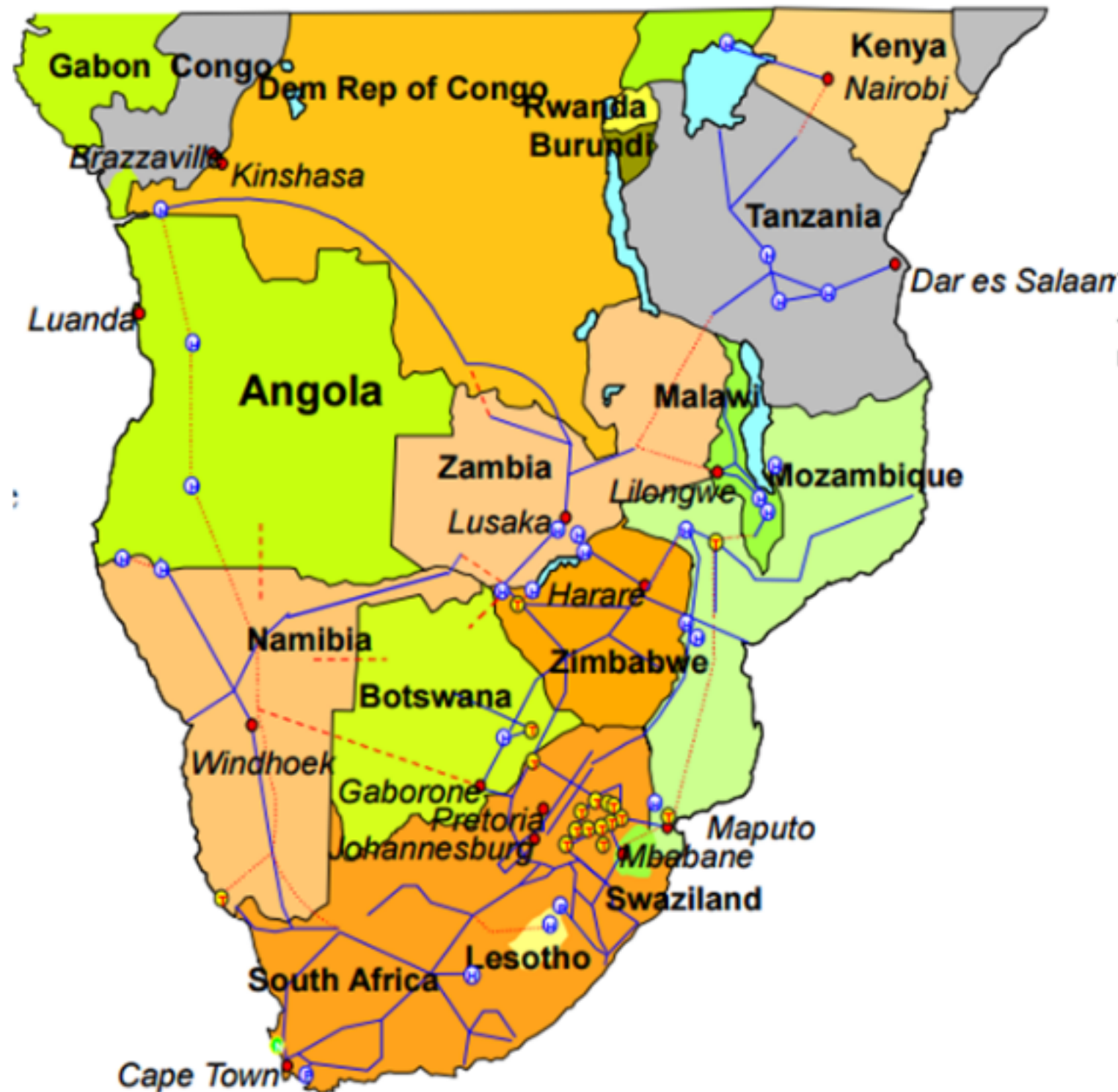
Energy planning for climate change using R, StarCluster and Shiny

Schalk Heunis

EOH-ESA

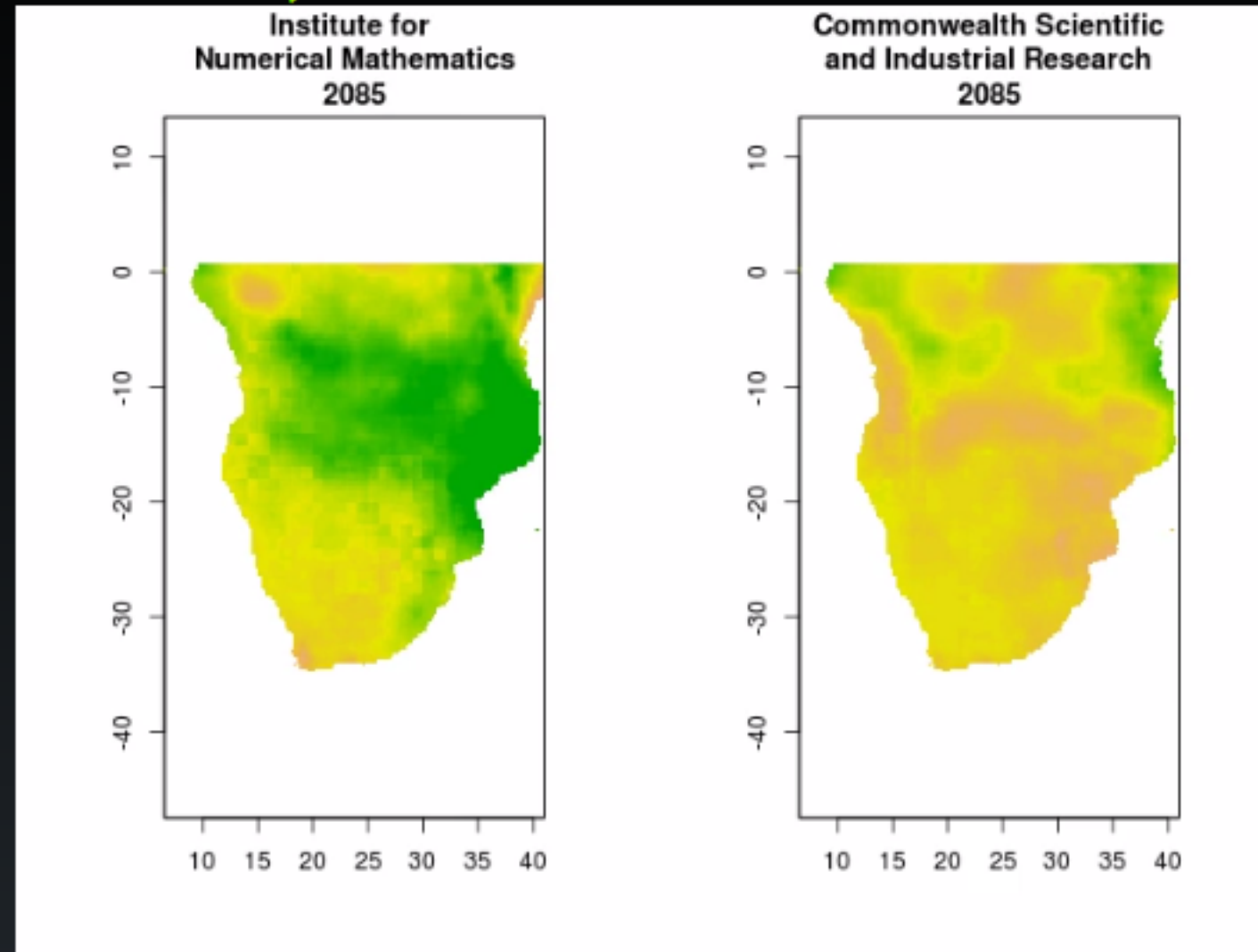
Long Term Electricity Planning

#SATRDAY

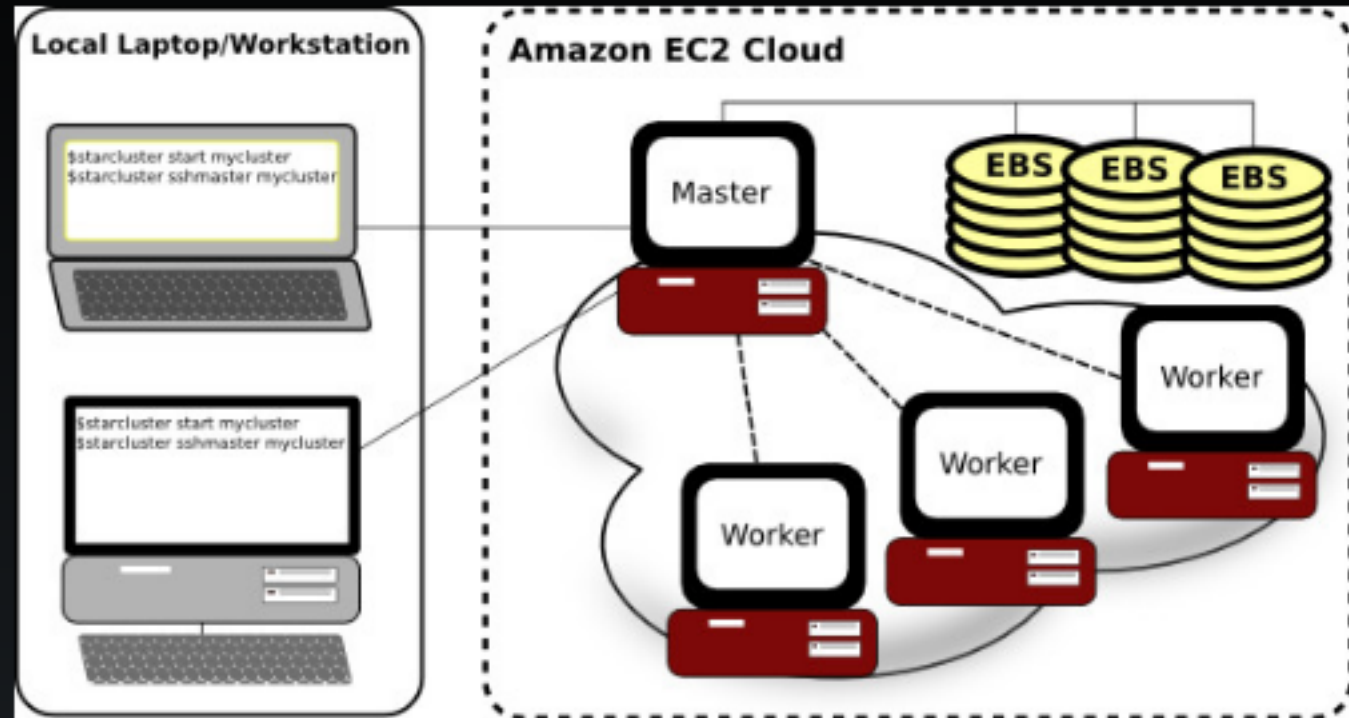


co.za

Rainfall (21 GCM's with two RCPs)



+ Adaptation(5 SSP) + Power System (27) + Trading (5) = 15 487 scenarios



Software Tools for Academics and Researchers

- Scripted EC2 compute cluster
- Manage placement, permissions and host names
- Based on Ubuntu AMI, pre-installed R, Spark etc.
- Installs and configures
 - Oracle Grid Engine
 - Network File Share
 - Plugins: e.g. spark

Using StarCluster with R (qsub)

#SATRDAY

```
lapply(1:15487, function(i) {  
  cmd <- "qsub -S /usr/bin/Rscript /nfs/run.r %d"  
  system( sprintf(cmd,i) )  
})
```

run.r

```
#!/usr/bin/Rscript  
i <- commandArgs(TRUE)  
result <- balance.supply.and.demand.scenario(i)  
fn <- sprintf("/nfs/%d.rdata",i)  
save(result, file=fn)
```

Using StarCluster with R (sparkR)

#SATRDAY

```
run.r <- function(i){  
  result <- balance.supply.and.demand.scenario(args)  
  fn <- sprintf("/nfs/%d.rdata",i)  
  save(result, file=fn)  
}  
spark.lapply(1:15487,run.r)
```

File Edit View Search Terminal Tabs Help

```
root@master: ~
```

```
× schalk@schalk-thinkpad: ~
```

✕

[illegible]

PID	USER	PRIO	NI	TGID	PPID	GR	S	PPR	NR	TIME	Command
17292	root	20	0	13609	18749	6188	S	200	3.8	0:48.73	/usr/lib/llvm/bin/clang -slave -no-restore -fi
17957	root	20	0	13609	18749	6192	S	200	1.8	1:12.73	/usr/lib/llvm/bin/clang -slave -no-restore -fi
17288	root	20	0	13609	18639	6188	S	95	1.7	0:47.17	/usr/lib/llvm/bin/clang -slave -no-restore -fi
17282	root	20	0	13649	18009	6192	S	86	1.8	0:46.28	/usr/lib/llvm/bin/clang -slave -no-restore -fi

PID (user)	PGID	NI	Umask	RGID	SRGID	CPUL	MEM%	TGID=	Command
6050 root	20	0	13070	1000H	6192	0	100	1.0	0:09.50 /usr/lib/R/bin/exec/R --slave --no-restore
7553 root	28	0	13050	1000H	6184	0	100	1.0	0:41.44 /usr/lib/R/bin/exec/R --slave --no-restore
7556 root	28	0	13060	1000H	6168	0	99.0	1.0	0:35.43 /usr/lib/R/bin/exec/R --slave --no-restore
7549 root	20	0	13070	1000H	6192	0	99.0	1.0	1:02.91 /usr/lib/R/bin/exec/R --slave --no-restore

[illegible]

PID	USER	PPID	NI	VIRT	RES	SHR S	%PR	%PU	TIME+	Command
7432	root	20	0	1360M	2063K	6172 K	101.	1.8	0:36.92	/usr/lib/R/bin/exec/R --slave --no-restore --fil
6860	root	20	0	1360M	2069K	5888 K	101.	1.8	0:54.30	/usr/lib/R/bin/exec/R --slave --no-restore --fil
6871	root	20	0	1420M	1340K	6292 K	101.	1.9	1:18.01	/usr/lib/R/bin/exec/R --slave --no-restore --fil
6866	root	20	0	1360M	2070K	6284 K	101.	1.8	0:36.80	/usr/lib/R/bin/exec/R --slave --no-restore --fil

```

1 | [|||||] 100.0% 9 | [|||||] 100.0% 17 | [|||||] 100.0% 25 | [|||||] 100.0%
2 | [|||||] 100.0% 10 | [|||||] 100.0% 18 | [|||||] 100.0% 26 | [|||||] 100.0%
3 | [|||||] 100.0% 11 | [|||||] 100.0% 19 | [|||||] 100.0% 27 | [|||||] 100.0%
4 | [|||||] 100.0% 12 | [|||||] 100.0% 20 | [|||||] 100.0% 28 | [|||||] 100.0%
5 | [|||||] 100.0% 13 | [|||||] 100.0% 21 | [|||||] 100.0% 29 | [|||||] 100.0%
6 | [|||||] 100.0% 14 | [|||||] 100.0% 22 | [|||||] 100.0% 30 | [|||||] 100.0%
7 | [|||||] 100.0% 15 | [|||||] 100.0% 23 | [|||||] 100.0% 31 | [|||||] 100.0%
8 | [|||||] 100.0% 16 | [|||||] 100.0% 24 | [|||||] 100.0% 32 | [|||||] 100.0%
Host: 20480-6012500
Swap: 0.000
Tasks: 285, 1287 thr, 31 running
Load average: 34.06 30.33 7.93
Uptime: 00:40:10

```

```

PID USER      PR  NI  VIRT  RES  SHR  S  CPU%   TIME+ Command
6319 root        0   0 1368M 1871M 6388  S  362.1  1:12.41 /usr/lib/R/bin/exec/R --slave --no-restore --fil
5811 root        0   0 1368M 1871M 6172  S  381.1  1:7:10.24 /usr/lib/R/bin/exec/R --slave --no-restore --fil
#findls -getopt #search #filter #tree #sort #rsize #size #all #idbit

```

```

PID USER      PRI  NI  VIRT   RES   SHR S  %CPU  %MEM     TIME+ Command
7682 root        20   0 1060M 1612M 616K R 101.  3.7   0:33.39 /usr/lib/bin/sync/R --slave --no-restore
6962 root        20   0 1000M 1000M 172 K 101.  1.8   0:13.91 /usr/lib/bin/sync/R --slave --no-restore
r1nlp r2netap 15  0 14.5M 14.5M 0 K   0   0.0   0:00.00 /usr/bin/r2netap -d /var/lib/r2netap -s /var/lib/r2netap

```

```

PID USER      PRI  NI  VIRT   RES   SHR  S  CPU%  MEM%   TIME+  Command
7555 root        20   0 136696 38576 6172  R   101.  1.8   0:14.86 /usr/lib/R/bin/exec/R --slave --no-restore --fil
6032 root        20   0 136696 38576 6188  R   101.  1.8   1:00.54 /usr/lib/R/bin/exec/R --slave --no-restore --fil

```

[illegible]

```

PID USER      PR  NI  VIRT  RES  SHR S  CPU%  MEM%   TTY+    Command
7668 root        0   0 1366M 1865M 6172 S 381.  1.8   0:15.00 /usr/lib/R/bin/exec/R --slave --no-restore --fil
7662 root        0   0 1366M 1877M 6172 S 99.0  1.8   0:21.20 /usr/lib/R/bin/exec/R --slave --no-restore --fil
#help #2 setup #2 search #2 filter #2 tree #2 sort #2 nice #2 kill #2 quit

```

```

PID USER      PRI  NI  VIRT   RES   SHR  S CPU% MEM%   TTY#  Command
18645 root        20   0 30608 10508 6168  R 181.  1.8  0:31.01 /usr/lib/bin/exec/R --slave --no-restore
7348  root        20   0 30608 11108 196  R 101.  1.0  1:22.20 /usr/lib/bin/exec/R --slave --no-restore
n1p1 f2setup f3board f4 site f5 f6 f7 f8 f9 f10 f11 f12 f13 f14 f15 f16 f17 f18 f19 f20 f21 f22 f23 f24 f25 f26 f27 f28 f29 f30 f31 f32 f33 f34 f35 f36 f37 f38 f39 f40 f41 f42 f43 f44 f45 f46 f47 f48 f49 f50 f51 f52 f53 f54 f55 f56 f57 f58 f59 f60 f61 f62 f63 f64 f65 f66 f67 f68 f69 f70 f71 f72 f73 f74 f75 f76 f77 f78 f79 f80 f81 f82 f83 f84 f85 f86 f87 f88 f89 f90 f91 f92 f93 f94 f95 f96 f97 f98 f99 f100 f101 f102 f103 f104 f105 f106 f107 f108 f109 f110 f111 f112 f113 f114 f115 f116 f117 f118 f119 f120 f121 f122 f123 f124 f125 f126 f127 f128 f129 f130 f131 f132 f133 f134 f135 f136 f137 f138 f139 f140 f141 f142 f143 f144 f145 f146 f147 f148 f149 f150 f151 f152 f153 f154 f155 f156 f157 f158 f159 f160 f161 f162 f163 f164 f165 f166 f167 f168 f169 f170 f171 f172 f173 f174 f175 f176 f177 f178 f179 f180 f181 f182 f183 f184 f185 f186 f187 f188 f189 f190 f191 f192 f193 f194 f195 f196 f197 f198 f199 f200 f201 f202 f203 f204 f205 f206 f207 f208 f209 f210 f211 f212 f213 f214 f215 f216 f217 f218 f219 f220 f221 f222 f223 f224 f225 f226 f227 f228 f229 f230 f231 f232 f233 f234 f235 f236 f237 f238 f239 f240 f241 f242 f243 f244 f245 f246 f247 f248 f249 f250 f251 f252 f253 f254 f255 f256 f257 f258 f259 f260 f261 f262 f263 f264 f265 f266 f267 f268 f269 f270 f271 f272 f273 f274 f275 f276 f277 f278 f279 f280 f281 f282 f283 f284 f285 f286 f287 f288 f289 f290 f291 f292 f293 f294 f295 f296 f297 f298 f299 f300 f301 f302 f303 f304 f305 f306 f307 f308 f309 f310 f311 f312 f313 f314 f315 f316 f317 f318 f319 f320 f321 f322 f323 f324 f325 f326 f327 f328 f329 f330 f331 f332 f333 f334 f335 f336 f337 f338 f339 f340 f341 f342 f343 f344 f345 f346 f347 f348 f349 f350 f351 f352 f353 f354 f355 f356 f357 f358 f359 f360 f361 f362 f363 f364 f365 f366 f367 f368 f369 f370 f371 f372 f373 f374 f375 f376 f377 f378 f379 f380 f381 f382 f383 f384 f385 f386 f387 f388 f389 f390 f391 f392 f393 f394 f395 f396 f397 f398 f399 f400 f401 f402 f403 f404 f405 f406 f407 f408 f409 f410 f411 f412 f413 f414 f415 f416 f417 f418 f419 f420 f421 f422 f423 f424 f425 f426 f427 f428 f429 f430 f431 f432 f433 f434 f435 f436 f437 f438 f439 f440 f441 f442 f443 f444 f445 f446 f447 f448 f449 f450 f451 f452 f453 f454 f455 f456 f457 f458 f459 f460 f461 f462 f463 f464 f465 f466 f467 f468 f469 f470 f471 f472 f473 f474 f475 f476 f477 f478 f479 f480 f481 f482 f483 f484 f485 f486 f487 f488 f489 f490 f491 f492 f493 f494 f495 f496 f497 f498 f499 f500 f501 f502 f503 f504 f505 f506 f507 f508 f509 f510 f511 f512 f513 f514 f515 f516 f517 f518 f519 f520 f521 f522 f523 f524 f525 f526 f527 f528 f529 f530 f531 f532 f533 f534 f535 f536 f537 f538 f539 f540 f541 f542 f543 f544 f545 f546 f547 f548 f549 f550 f551 f552 f553 f554 f555 f556 f557 f558 f559 f560 f561 f562 f563 f564 f565 f566 f567 f568 f569 f570 f571 f572 f573 f574 f575 f576 f577 f578 f579 f580 f581 f582 f583 f584 f585 f586 f587 f588 f589 f590 f591 f592 f593 f594 f595 f596 f597 f598 f599 f600 f601 f602 f603 f604 f605 f606 f607 f608 f609 f610 f611 f612 f613 f614 f615 f616 f617 f618 f619 f620 f621 f622 f623 f624 f625 f626 f627 f628 f629 f630 f631 f632 f633 f634 f635 f636 f637 f638 f639 f640 f641 f642 f643 f644 f645 f646 f647 f648 f649 f650 f651 f652 f653 f654 f655 f656 f657 f658 f659 f660 f661 f662 f663 f664 f665 f666 f667 f668 f669 f670 f671 f672 f673 f674 f675 f676 f677 f678 f679 f680 f681 f682 f683 f684 f685 f686 f687 f688 f689 f690 f691 f692 f693 f694 f695 f696 f697 f698 f699 f700 f701 f702 f703 f704 f705 f706 f707 f708 f709 f710 f711 f712 f713 f714 f715 f716 f717 f718 f719 f720 f721 f722 f723 f724 f725 f726 f727 f728 f729 f730 f731 f732 f733 f734 f735 f736 f737 f738 f739 f740 f741 f742 f743 f744 f745 f746 f747 f748 f749 f750 f751 f752 f753 f754 f755 f756 f757 f758 f759 f760 f761 f762 f763 f764 f765 f766 f767 f768 f769 f770 f771 f772 f773 f774 f775 f776 f777 f778 f779 f780 f781 f782 f783 f784 f785 f786 f787 f788 f789 f790 f791 f792 f793 f794 f795 f796 f797 f798 f799 f800 f801 f802 f803 f804 f805 f806 f807 f808 f809 f810 f811 f812 f813 f814 f815 f816 f817 f818 f819 f820 f821 f822 f823 f824 f825 f826 f827 f828 f829 f830 f831 f832 f833 f834 f835 f836 f837 f838 f839 f840 f841 f842 f843 f844 f845 f846 f847 f848 f849 f850 f851 f852 f853 f854 f855 f856 f857 f858 f859 f860 f861 f862 f863 f864 f865 f866 f867 f868 f869 f870 f871 f872 f873 f874 f875 f876 f877 f878 f879 f880 f881 f882 f883 f884 f885 f886 f887 f888 f889 f890 f891 f892 f893 f894 f895 f896 f897 f898 f899 f900 f901 f902 f903 f904 f905 f906 f907 f908 f909 f910 f911 f912 f913 f914 f915 f916 f917 f918 f919 f920 f921 f922 f923 f924 f925 f926 f927 f928 f929 f930 f931 f932 f933 f934 f935 f936 f937 f938 f939 f940 f941 f942 f943 f944 f945 f946 f947 f948 f949 f950 f951 f952 f953 f954 f955 f956 f957 f958 f959 f960 f961 f962 f963 f964 f965 f966 f967 f968 f969 f970 f971 f972 f973 f974 f975 f976 f977 f978 f979 f980 f981 f982 f983 f984 f985 f986 f987 f988 f989 f990 f991 f992 f993 f994 f995 f996 f997 f998 f999

```

```

1 | [|||||] 37.25 | 9 | [|||||] 120.90 | 17 | [|||||] 98.40 | 25 | [|||||] 37.10 |
2 | [|||||] 46.10 | 10 | [|||||] 98.40 | 18 | [|||||] 100.00 | 26 | [|||||] 100.00 |
3 | [|||||] 100.00 | 11 | [|||||] 98.40 | 19 | [|||||] 37.70 | 27 | [|||||] 100.70 |
4 | [|||||] 100.00 | 12 | [|||||] 98.40 | 20 | [|||||] 100.00 | 28 | [|||||] 100.00 |
5 | [|||||] 98.40 | 13 | [|||||] 98.40 | 21 | [|||||] 98.40 | 29 | [|||||] 98.40 |
6 | [|||||] 98.90 | 14 | [|||||] 37.10 | 22 | [|||||] 98.40 | 30 | [|||||] 98.40 |
7 | [|||||] 37.30 | 15 | [|||||] 37.40 | 23 | [|||||] 37.40 | 31 | [|||||] 100.00 |
8 | [|||||] 98.40 | 16 | [|||||] 100.90 | 24 | [|||||] 98.90 | 32 | [|||||] 98.40 |
Host: 206.16.46.150
Shell: 0/0PE
Tasks: 428, 1350 thr; 37 running
Load average: 31.34 24.91 10.90
Uptime: 00:49:11

```

```

720 USER      PRI NI VIRT RES SHR S CPU% MEM%   TIME+ Command
7295 root        0  0 1869M 3819K 6172 R 182.  1.7  0:18.09 /usr/lib/R/bin/exec/R --slave --no-restore --fil
7294 root        0  0 1869M 2070K 6288 R 100.  1.8  0:54.17 /usr/lib/R/bin/exec/R --slave --no-restore --fil
#ls -la #Setup #Search #Free #Sort #Size #File #IO #H

```

```

1 | ██████████ [100.00%] 9 | ██████████ [100.00%] 17 | ██████████ [100.00%] 25 | ██████████ [100.00%]
2 | ██████████ [100.00%] 10 | ██████████ [100.00%] 18 | ██████████ [100.00%] 26 | ██████████ [100.00%]
3 | ██████████ [100.00%] 11 | ██████████ [100.00%] 19 | ██████████ [100.00%] 27 | ██████████ [100.00%]
4 | ██████████ [100.00%] 12 | ██████████ [100.00%] 20 | ██████████ [100.00%] 28 | ██████████ [100.00%]
5 | ██████████ [100.00%] 13 | ██████████ [100.00%] 21 | ██████████ [100.00%] 29 | ██████████ [100.00%]
6 | ██████████ [100.00%] 14 | ██████████ [100.00%] 22 | ██████████ [100.00%] 30 | ██████████ [100.00%]
7 | ██████████ [100.00%] 15 | ██████████ [100.00%] 23 | ██████████ [100.00%] 31 | ██████████ [100.00%]
8 | ██████████ [100.00%] 16 | ██████████ [100.00%] 24 | ██████████ [100.00%] 32 | ██████████ [100.00%]
Host: ██████████ 32GB/64GB/128GB
Swap: ██████████ 0.00%
Tasks: 417 1386 thr: 43 running
Load average: 50.42 22.06 10.13
Uptime: 00:49:10

```

```

PID USER      PR1  NI  VIRT  RES  SHR  S  CPU   MEM%   TIO+ Command
7442 root        20   0 1366M 1063M 6856  S  300.  1.8  0.29.16 /usr/lib/krb5/bin/krcc -s slave -no-restore -fil
*help *setup *search *filter *res *ortho *dice *dice *call *list
startlink @node1 1a112 2master @node000 1a112 @node001 1a112 @node002 1a112 @node003 1a112 @node004 1a112 @node005 1a112 @node006 1a112 @node007 1a112 @node008 1a112 @node009 1a112 @node010 1a112 @node011 1a112 @node012 1a112 @node013 1a112 @node014 1a112 @node015 1a112 @node016 1a112 @node017 1a112 @node018 1a112 @node019 1a112 @node020 1a112 @node021 1a112 @node022 1a112 @node023 1a112 @node024 1a112 @node025 1a112 @node026 1a112 @node027 1a112 @node028 1a112 @node029 1a112 @node030 1a112 @node031 1a112 @node032 1a112 @node033 1a112 @node034 1a112 @node035 1a112 @node036 1a112 @node037 1a112 @node038 1a112 @node039 1a112 @node040 1a112 @node041 1a112 @node042 1a112 @node043 1a112 @node044 1a112 @node045 1a112 @node046 1a112 @node047 1a112 @node048 1a112 @node049 1a112 @node050 1a112 @node051 1a112 @node052 1a112 @node053 1a112 @node054 1a112 @node055 1a112 @node056 1a112 @node057 1a112 @node058 1a112 @node059 1a112 @node060 1a112 @node061 1a112 @node062 1a112 @node063 1a112 @node064 1a112 @node065 1a112 @node066 1a112 @node067 1a112 @node068 1a112 @node069 1a112 @node070 1a112 @node071 1a112 @node072 1a112 @node073 1a112 @node074 1a112 @node075 1a112 @node076 1a112 @node077 1a112 @node078 1a112 @node079 1a112 @node080 1a112 @node081 1a112 @node082 1a112 @node083 1a112 @node084 1a112 @node085 1a112 @node086 1a112 @node087 1a112 @node088 1a112 @node089 1a112 @node090 1a112 @node091 1a112 @node092 1a112 @node093 1a112 @node094 1a112 @node095 1a112 @node096 1a112 @node097 1a112 @node098 1a112 @node099 1a112 @node100 1a112 @node101 1a112 @node102 1a112 @node103 1a112 @node104 1a112 @node105 1a112 @node106 1a112 @node107 1a112 @node108 1a112 @node109 1a112 @node110 1a112 @node111 1a112 @node112 1a112 @node113 1a112 @node114 1a112 @node115 1a112 @node116 1a112 @node117 1a112 @node118 1a112 @node119 1a112 @node120 1a112 @node121 1a112 @node122 1a112 @node123 1a112 @node124 1a112 @node125 1a112 @node126 1a112 @node127 1a112 @node128 1a112 @node129 1a112 @node130 1a112 @node131 1a112 @node132 1a112 @node133 1a112 @node134 1a112 @node135 1a112 @node136 1a112 @node137 1a112 @node138 1a112 @node139 1a112 @node140 1a112 @node141 1a112 @node142 1a112 @node143 1a112 @node144 1a112 @node145 1a112 @node146 1a112 @node147 1a112 @node148 1a112 @node149 1a112 @node150 1a112 @node151 1a112 @node152 1a112 @node153 1a112 @node154 1a112 @node155 1a112 @node156 1a112 @node157 1a112 @node158 1a112 @node159 1a112 @node160 1a112 @node161 1a112 @node162 1a112 @node163 1a112 @node164 1a112 @node165 1a112 @node166 1a112 @node167 1a112 @node168 1a112 @node169 1a112 @node170 1a112 @node171 1a112 @node172 1a112 @node173 1a112 @node174 1a112 @node175 1a112 @node176 1a112 @node177 1a112 @node178 1a112 @node179 1a112 @node180 1a112 @node181 1a112 @node182 1a112 @node183 1a112 @node184 1a112 @node185 1a112 @node186 1a112 @node187 1a112 @node188 1a112 @node189 1a112 @node190 1a112 @node191 1a112 @node192 1a112 @node193 1a112 @node194 1a112 @node195 1a112 @node196 1a112 @node197 1a112 @node198 1a112 @node199 1a112 @node200 1a112 @node201 1a112 @node202 1a112 @node203 1a112 @node204 1a112 @node205 1a112 @node206 1a112 @node207 1a112 @node208 1a112 @node209 1a112 @node210 1a112 @node211 1a112 @node212 1a112 @node213 1a112 @node214 1a112 @node215 1a112 @node216 1a112 @node217 1a112 @node218 1a112 @node219 1a112 @node220 1a112 @node221 1a112 @node222 1a112 @node223 1a112 @node224 1a112 @node225 1a112 @node226 1a112 @node227 1a112 @node228 1a112 @node229 1a112 @node230 1a112 @node231 1a112 @node232 1a112 @node233 1a112 @node234 1a112 @node235 1a112 @node236 1a112 @node237 1a112 @node238 1a112 @node239 1a112 @node240 1a112 @node241 1a112 @node242 1a112 @node243 1a112 @node244 1a112 @node245 1a112 @node246 1a112 @node247 1a112 @node248 1a112 @node249 1a112 @node250 1a112 @node251 1a112 @node252 1a112 @node253 1a112 @node254 1a112 @node255 1a112 @node256 1a112 @node257 1a112 @node258 1a112 @node259 1a112 @node260 1a112 @node261 1a112 @node262 1a112 @node263 1a112 @node264 1a112 @node265 1a112 @node266 1a112 @node267 1a112 @node268 1a112 @node269 1a112 @node270 1a112 @node271 1a112 @node272 1a112 @node273 1a112 @node274 1a112 @node275 1a112 @node276 1a112 @node277 1a112 @node278 1a112 @node279 1a112 @node280 1a112 @node281 1a112 @node282 1a112 @node283 1a112 @node284 1a112 @node285 1a112 @node286 1a112 @node287 1a112 @node288 1a112 @node289 1a112 @node290 1a112 @node291 1a112 @node292 1a112 @node293 1a112 @node294 1a112 @node295 1a112 @node296 1a112 @node297 1a112 @node298 1a112 @node299 1a112 @node300 1a112 @node301 1a112 @node302 1a112 @node303 1a112 @node304 1a112 @node305 1a112 @node306 1a112 @node307 1a112 @node308 1a112 @node309 1a112 @node310 1a112 @node311 1a112 @node312 1a112 @node313 1a112 @node314 1a112 @node315 1a112 @node316 1a112 @node317 1a112 @node318 1a112 @node319 1a112 @node320 1a112 @node321 1a112 @node322 1a112 @node323 1a112 @node324 1a112 @node325 1a112 @node326 1a112 @node327 1a112 @node328 1a112 @node329 1a112 @node330 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```

```
PID USER      PRI NI VIRT   RES    SHR S CPU% MEM%   TRES Command
7496 root         0  0 136M 1812M 6192 K 100  1.7 1.02 30 /usr/lib%/bin/rwec/R -slave -no-restore
24 wpd  #status 2 search 2 filter 2 free 2 orth 2 nice 2 nice +99 kill 21 just
28 node0001 11 node000 12 node010 13 node011 14 ssh*
```

```

PID USER      PRI  NI  VIRT   RES   SHR S  CPU% MEM%   TIME+  Command
6299 root        20   0 3160M 3079M 6588 R   101.8  0:44.00  sge shepherd-l16 -bg
[?]elp [?]setup [?]search [?]filter [?]free [?]sortby [?]size [?]size + [?]kill [?]quit
"master" 00:44:01.20

```


#SATRDAY

