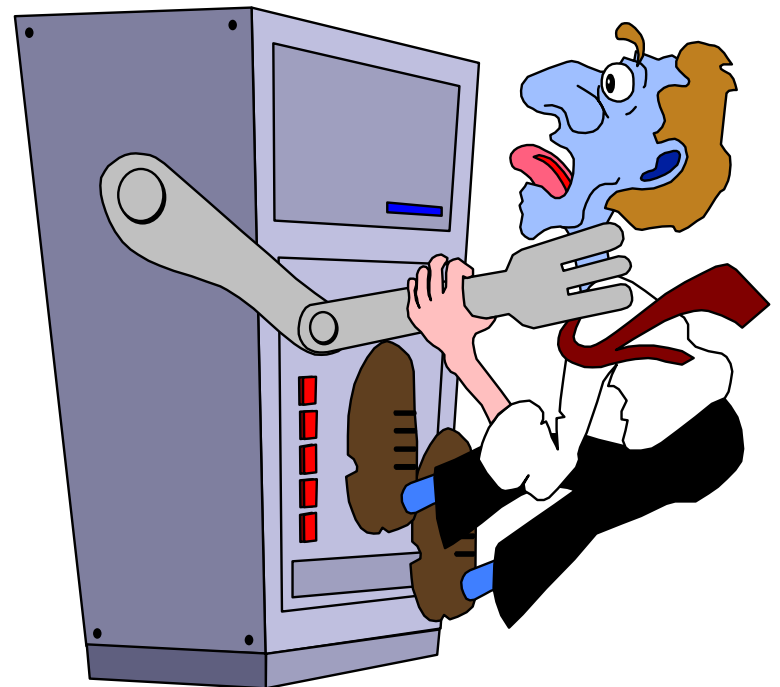# HP-UX SysAdmin Summer Camp

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Agenda

- Setting up new systems
- Standardizing for easy administration
- Performance and Kernel Tuning
- Memory Management
- Disk space management
- Logfile management
- Useful tools
- Additional resources

Setting up new systems

- Disk layout
  - Internal/external issues
  - VG00 design
  - Massive lvols, flat directories
- Networking
  - SAM, netconf, set_parms
  - 100BaseT issues
- Cron jobs
  - Logfiles, cleanup, backup

Setting up new systems

- Root's shell
  - /sbin/sh
  - POSIX /usr/bin/sh vs. Bourne
  - /usr/bin/sh vs. Korn shell
  - Users can change: chsh login-name /usr/bin/some_shell
- Login tty settings:
  - # is erase 1 char (backspace)
  - Fix all logins with a one-time command:

```
stty erase '^H' < /dev/ttyconf
```

  - Add others such as:

```
stty erase "^H" kill "^U" intr "^C" eof "^D" -parity ixoff
```
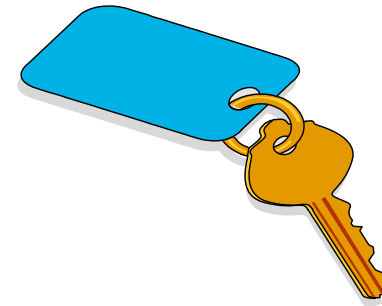
Setting up new systems

- **Basic security fixes**
  - `find /usr/local -type d -print -exec chmod 755 {} \;`
  - umask is missing in /etc/profile and /etc/csh.login
    - `umask 022`
    - `umask 077`
 - Search for world-write permissions in important directories:
    - `find /etc /usr /opt /dev /sbin /stand -perm -002`
    - Add: `\( -type d -o -type f \)` to look at just files and directories
   - Add secure database mountpoints, etc

Setting up new systems

- Basic security fixes (continued)
  - `/etc/path`
    - World-writable directories
    - `pwd` (`::` or `:.:` or `:.`)
    - Symlinks
    - Duplicate paths
    - Non-existent directories
  - Password and group file checks
    - `pwck`
    - `grpck`
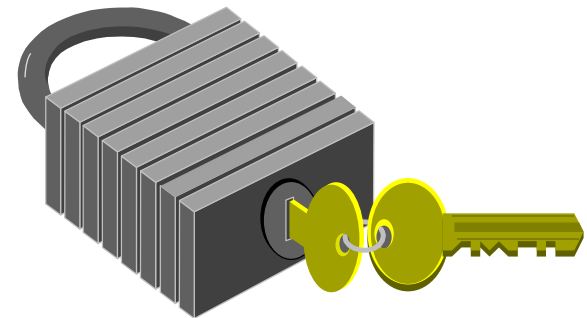
Setting up new systems

- Basic security fixes (continued)
  - `/etc/hosts.equiv .rhosts`
    - World-writable?
    - Valid user?
    - Root?
  - suid scripts/programs
    - No scripts allowed
    - Purpose
    - Owner
    - Location
    - `/etc/fstab`: `nosuid`
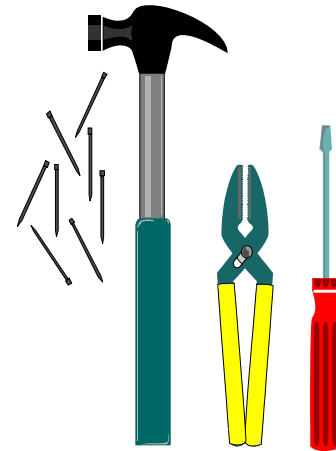
Standardizing for easy administration

- Login methods
  - telnet
  - remsh/rlogin
  - Xwindows
- Shells
  - POSIX (/usr/bin/sh)
  - Bourne (/usr/old/bin/sh)
  - Ksh (/use/bin/ksh)
  - Csh
  - Bash, tcsh, etc
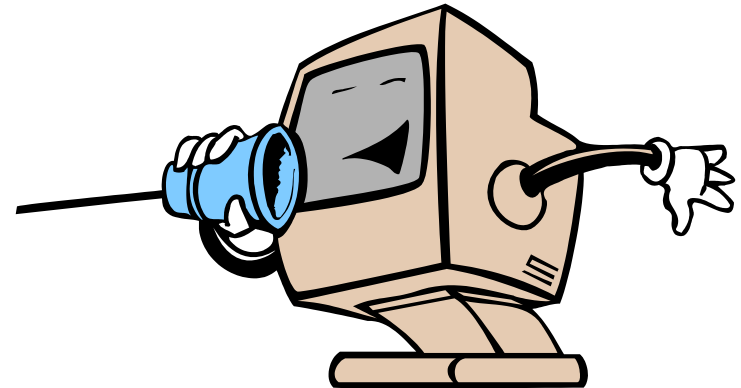
Standardizing for easy administration

- **Standard profiles**
  - set –u

  - ulimit settings:
    ```
    ulimit -a
    time(seconds)        unlimited
    file(blocks)         unlimited
    data(kbytes)         65536
    stack(kbytes)        8192
    memory(kbytes)       unlimited
    coredump(blocks)     0
    nofiles(descriptors) 60
    ```

  - Eliminate core files: `ulimit -Sc 0`
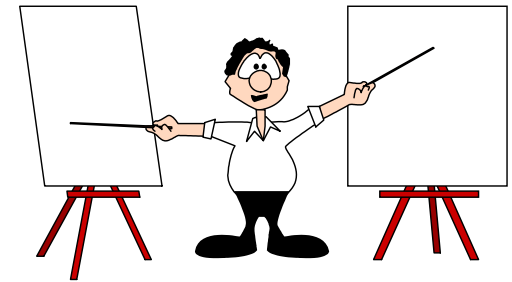
Standardizing for easy administration

- Standard profiles
  - Interactive versus batch
    - Errors: `stty: not a typewriter`
    - Separate the interactive commands:
      - Multiple `if interactive` statements
      - Or separate the interactive portion in a separate script
    - Interactive commands: `stty tput ttytype`
    - Interactive settings: `$TZ $DISPLAY`
  - Login controls: `/etc/nologin`
    - 11.0 with security patches, standard on 11i
    - Add: `NOLOGIN=1` to /etc/default/security

Standardizing for easy administration

- **Standard profiles**
  - `$HOME/.profile`
  - `/etc/skel` to standardize new users, or replace
  - Can't keep from being changed by users (`$HOME` must be writable which means no file is safe)
  - Same interactive issues with batch logins
  - May want to have `$HOME/.localprofile` for user mods
- **Download sample profiles:**

ftp://contrib:9unsupp8@hprc.external.hp.com/sysadmin/profiles

Standardizing for easy administration

- Other /etc/skel files:
  - `.exrc` (vi defaults)
    - `nows` (don't wrap searches around)
    - `ic` (ignore case on searches)
    - `ai` (follow prev left indent)
    - `aw` (update source at shell escapes: !)
    - `wm` (wrap to next line, =0 no wrap)
    - `report` (shows # of lines changed)
    - `showmode` (INPUT or REPLACE MODE tag)

```
set nows ic autoindent autowrite wrapmargin=2 …
```

Standardizing for easy administration

- Restricted access methods
  - Restricted shells: rsh, rksh, rcsh
    - $HOME is / for user
    - NO access to /usr or any other directrories
    - Must create a local bin with binaries and set $PATH
- Backup procedures
  - Classic tools: tar cpio pax dump
    - No index, no search, no error recovery, no changer support, no largefiles
  - fbackup/frecover
    - Index on every tape, high speed search, error recovery, change hooks, largefile-capable

Standardizing for easy administration

- Backup procedures (cont'd)
  - Features:
    - Largefiles, error recovery, changer support, parallel tape drives, network backup/restore, multi-platform, centralized indexing
  - Commercial backup programs
    - HiBack
    - OmniBack
    - Veritas
- Disaster recovery (loss of boot disk)
  - Mirroring
  - Ignite/UX
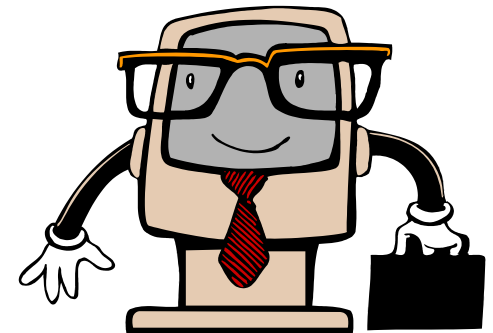
Standardizing for easy administration

- `print_manifest` (from Ignite/UX)

- from the contributed software archive:

  `ftp://contrib:9unsupp8@hprc.external.hp.com`

  - `gatherer.sh`

  - `nightowl`

  - `nickel` (HTML generator)

- Webmin: `www.webmin.com` (Perl-based)

Standardizing for easy administration

- `print_manifest` (from Ignite/UX)

Standardizing for easy administration

- Centralized patching
  - Pick a central server
  - Create a hierarchical structure (test, pre-production, production)
  - Use swcopy to add patches and patch depots
  - Use swreg to make the depot visible on the network (don't use NFS)
  - On clients, use swlist to view the remote depot(s)

    swlist –l depot @ patch_servername
  - Natwork installs:

    swinstall –s depot_name@patch_servername file_set (or *****)

Standardizing for easy administration

- **Spooler management**
  - Connections
    - Parallel, serial, SCSI, Network
      - Remote (Windows, Linux, solaris, AIX)
        - RFC 1179
        - Control files and options
        - Printer scripts and filters
      - Network (HP JetDirect)
        - Port 9100
        - Jetadmin now HP Printer Installer
        - addqueue, removequeue, transferqueue
  - Troubleshooting
    - Spoolkick procedure
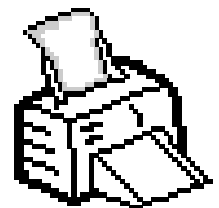
Performance and Kernel Tuning

- What can be changed
- Performance measurement
  - Built-in tools
  - SarCheck
  - MetaView, Performance Gallery
  - Glance/gpm, Measureware
- Kernel parameters
  - Filesystems
  - Processes
  - RAM and virtual memory
  - Network

Performance and Kernel Tuning

- **What can be changed**
  - Most kernel params size tables, provide limits or set behavior
  - CPU bound
    - Multi-CPU features
  - I/O bound
    - Disk
    - Swap (memory limited)
    - LAN
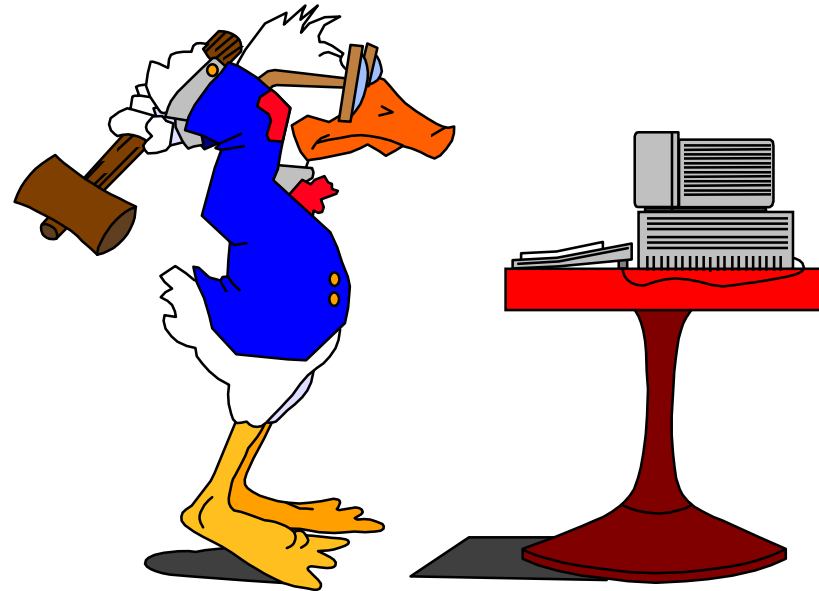
Performance and Kernel Tuning

Filesystem parameters

- **nfile:** 14min, no limit
  - Every opened file (including multiple opens)
  - Formula scales with maxusers
  - Every process has a minimum of 3
- **nflocks**: 2min, 200def, no limit
  - Maximum number of open file-locks
  - One file may have several locks
  - Application dependent
  - Databases may need hundreds

Performance and Kernel Tuning

Filesystem parameters

- **ninode:** 14min, no limit
  - In-memory cache of ***unique*** current and recent HFS file locations
  - Speeds re-open, multi-process file access
  - Indirectly controls the size of the DNLC, ncsize, ncdnode and vx_ninode.
  - 1000 to 8192, lower if ncsize is adjusted
  - Formula in SAM is not useful for large systems
  - Best recommendations are in NFS Performance book by Dave Olker

Performance and Kernel Tuning

Filesystem parameters

- **ncdnode:** 14min, no limit
  - In-memory cache of ***unique*** current and recent CDFS file locations (CDROM)
  - Speeds re-open, multi-process file access
  - Usually OK unless multiple user access needed for CDROM or multiple CDROM drives
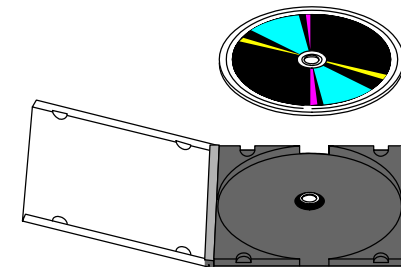
Performance and Kernel Tuning

Filesystem parameters

- **maxfiles:** 60 default
  - Maximum number of files opened by a single process
  - Used to control runaway processes
  - Override with setrlimit(2) system call or **ulimit –n**
  - Hard ceiling is **maxfiles_lim**
  - Commonly recommended too high (4096) by database vendors
  - Commonly recommended **maxfiles** = **maxfiles_lim** but not a good idea (use ulimit as needed)

Performance and Kernel Tuning

Filesystem parameters

■ fs_async:

- 0 = synchronous writes to directory structures
- 1 = async
  - Apx. 20-30% faster write speed (no read change)
  - Very high probability of data loss with a powerfail or system panic (fsck fails to fix)

■ Default_disk_ir:

- 0 = no immediate reporting (waits for writes to complete
- 1 = immediate reporting (disk buffers writes)
  - Applies to all disks including raw devices

Performance and Kernel Tuning

Filesystem parameters

- **disksort_seconds:**
  - HP-UX gives priority to serial rd/wt queues
  - Intense serial I/O slows random I/O
  - Value in seconds to wait before changing priority
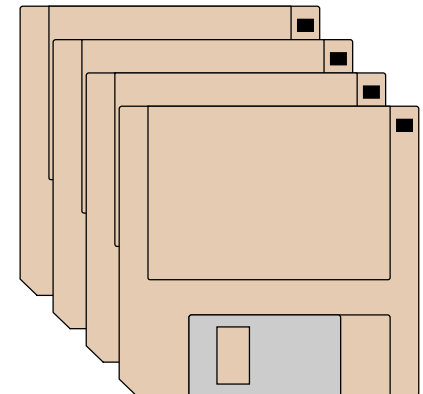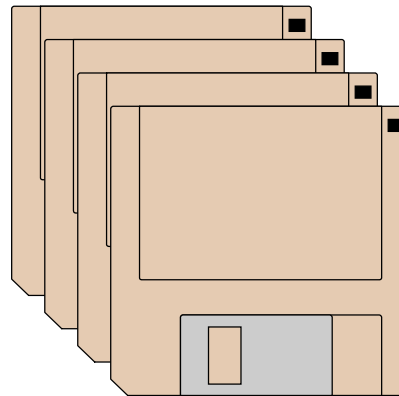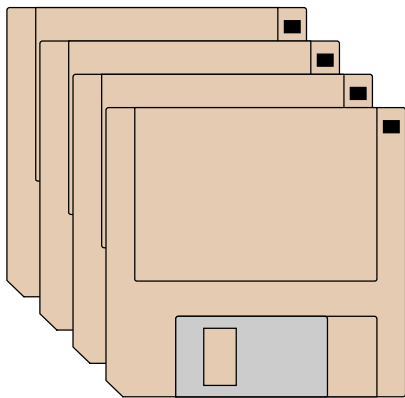
Performance and Kernel Tuning

Process parameters

- **nproc:**
  - Maximum processes to run at same time
  - Often way too low in servers

- **maxuprc:**
  - Maximum processes owned by a single UID
  - Collective, not per login
  - Generic logins can require hundreds or more

Performance and Kernel Tuning

Process parameters

- **maxdsiz:** 64 megs default
  - 32bit programs only
  - Max can be 2Gb but mapping limits are 960 and 1750 depending on compiler (pr chatr) options.
  - **ulimit –d** to create a lower limit
- **maxdsiz_64:** 64 megs default
  - 64bit programs only
  - Max is 4000 Gb

  Mem_mgt + proc_mgt note (/usr/share/doc – not 11i)

Performance and Kernel Tuning

Process parameters

- **maxssiz:** 8 megs default
  - 32bit programs only
  - Seldom needs changing
  - Exception for specialized programs or poor design (pass by data not address/pointer)

- **maxtsiz:** 64megs default
  - Maximum for unchanging instructions
  - Directly related to executable's file size
  - 2Gb max (32bit) or 4096Gb (64bit)

Performance and Kernel Tuning

Virtual memory parameters

- **maxswapchunks:**
  - Used to size maximum swap (32Gb)
  - Useable swap is:
    - maxswapchunks * swchunk * dev_bsize where: swchunk=2048 and dev_bsize=1024
    - Leave swchunk as default
    - Formula simplifies to: maxswapchunks=DESIRED-SWAP / 2097152

- **nswapdev, nswapfs:**
  - Maximum swap devices and filesystems

Performance and Kernel Tuning

Virtual memory parameters

RAM 1 Gb	SWAP 500 meg
Unusable for processes	
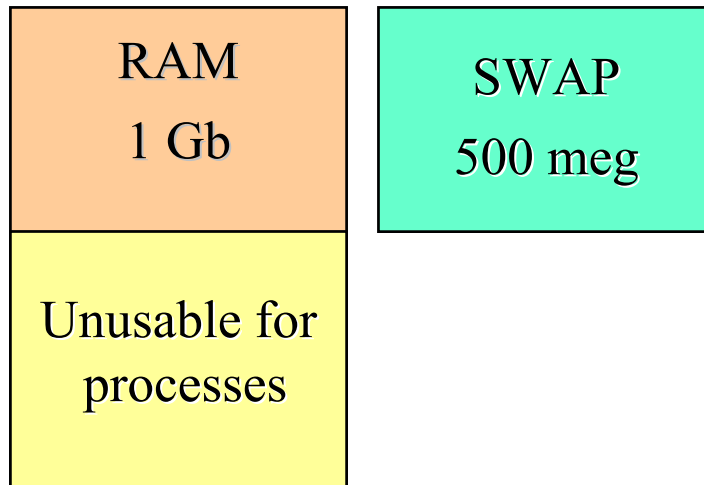
swapmem_on=0

In this example, only 500 megs is usable for processes since Virtual Memory is only 500 megs.

Virtual memory parameters

RAM 1 Gb	SWAP 1 Gb
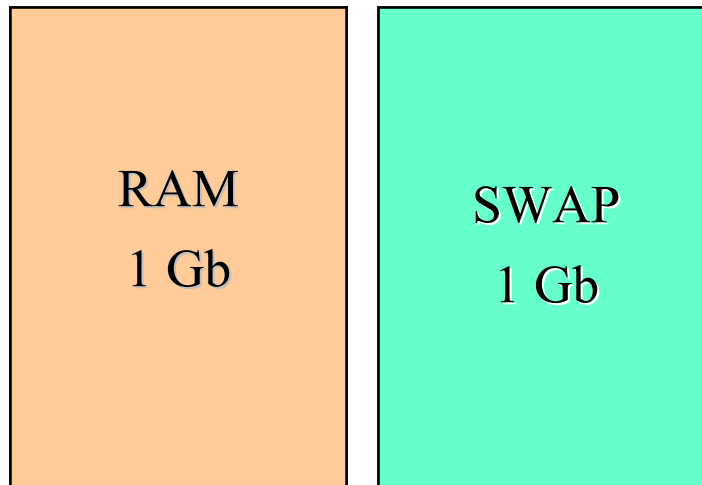
swapmem_on = 0

In this example, 1 Gb is usable for processes since Virtual Memory is 1 Gb too...but no paging will take place

Performance and Kernel Tuning

Virtual memory parameters

RAM
1 Gb
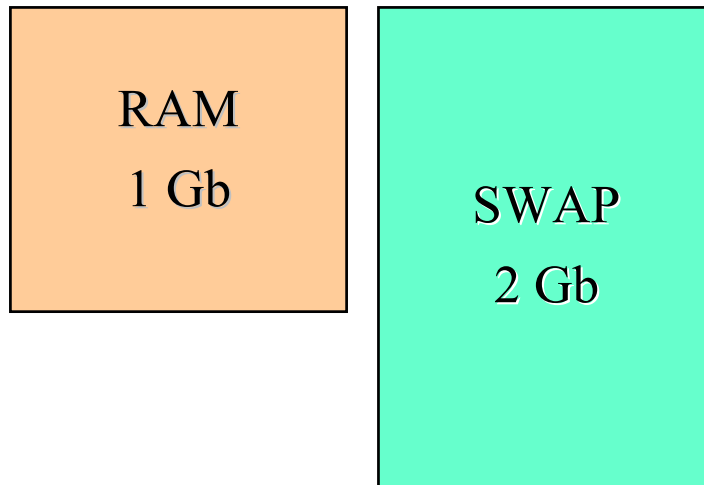
SWAP
2 Gb

swapmem_on = 0

In this example, 2 Gb is usable for processes since Virtual Memory is 2 Gb too...some paging may be take place

Performance and Kernel Tuning

Virtual memory parameters

RAM
1 Gb

SWAP
1 Gb

Total
Vmemory =
1750 megs
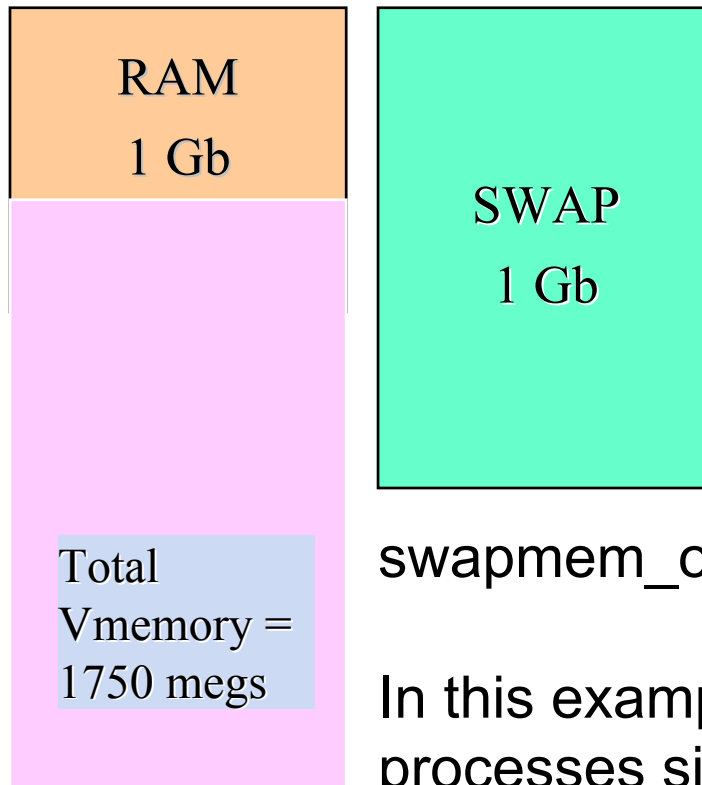
swapmem_on = 1

In this example, 1.75 Gb is usable for processes since Virtual Memory is 1 Gb plus .75 Gb in RAM which is not pageable

Performance and Kernel Tuning

Miscellaneous parameters

- **timezone, dst:**
  - Default value for environments without $TZ (daemons)
  - **dst** controls a limited number of daylight saving rules

- **npty nstrpty,nstrtel:**
  - Controls maximum interactive network sessions
  - Must match device files (insf)
  - Use SAM to handle device files automatically

- **maxusers:**
  - Not a parameter but a formula adjustment
  - No relation to user licenses or session limits

Performance and Kernel Tuning

Performance tuning

- Vocabulary
  - I/O Bound
  - Disk Thrashing
  - Swap Thrashing
  - Resource Limits
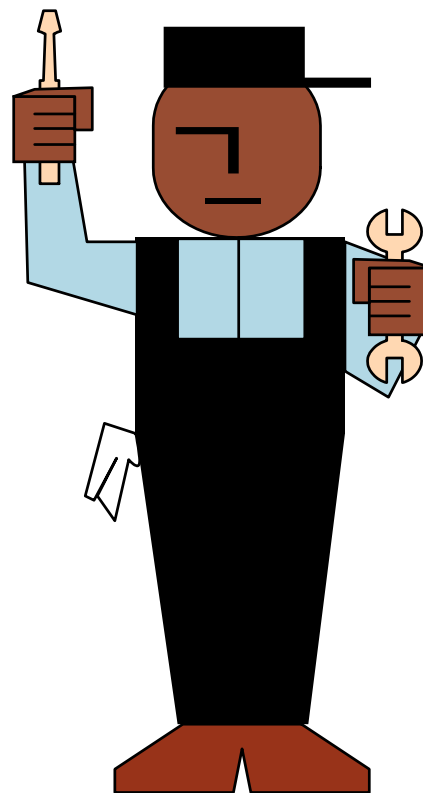
Performance and Kernel Tuning

Performance tuning

- Measurement:
  - **uptime**:
    - User count (standard logins)
    - Load average (**runqueue**)

```
uptime
    6:37pm  up 81 days, 23:43,  103 users,
    load average: 0.07, 0.08, 0.07


 uptime
    8:11pm  up 181 days, 23:43,  907 users,
    load average: 43.07, 22.08, 16.07
```

Performance tuning

- **sar** (system activity reporter)
  - **-b**   buffer cache activity
  - **-c**   System Calls
  - **-d**   Block Device Activity
  - **-u**   CPU Utilization

```
ATL

 File   Edit   Connection   Setup   Script   Window   Help

[ATL]:rc /root # sar -b 1 16

HP-UX rc B.10.20 A 9000/871     02/13/00

18:59:37 bread/s lread/s %rcache bwrit/s lwrit/s %wcache pread/s pwrit/s
18:59:38       0      95     100       0       2     100       0       0
18:59:39       0       0       0       0       0       0       0       0
18:59:40       0       8     100       1       0       0       0       0
18:59:41       0     608     100       0       1     100       0       0
18:59:42       0       0       0       0       0       0       0       0
18:59:43       0       7     100       0       0       0       0       0
18:59:44       0       0       0       0       0       0       0       0
18:59:45       0       0       0       0       0       0       0       0
18:59:46       0       5     100      15       0       0       0       0
18:59:47      12      17      29       0      29     100       0       0
18:59:48      16     660      98       0      57     100       0       0
18:59:49       0       0       0       0       0       0       0       0
18:59:50       0      10     100       0       0       0       0       0
18:59:51       0       0       0       0       0       0       0       0
18:59:52       0       1     100       0       0       0       0       0
18:59:53       0       7     100       0       0       0       0       0

Average        2      89      98       1       6      82       0       0
[ATL]:rc /root #

  123, 32          HP2392A -- rc.atl.hp.com via TELNET                    Num
```

```
[ATL]:rc /root # sar -c 1 16

HP-UX rc B.10.20 A 9000/871      02/13/00

19:13:37 scall/s   sread/s   swrit/s    fork/s    exec/s    rchar/s    wchar/s
19:13:38    4799        40        17      0.00      0.00   20145426          0
19:13:39    4321        31        14      0.00      0.00   29396911          0
19:13:40    4164       440       380      0.99      0.99   10951731       8111
19:13:41    4266       423       373      0.00      0.00   24076288      39936
19:13:42    4520        48        27      0.00      0.00   33132544      39936
19:13:43    3979        26        15      0.00      0.00   19338240          0
19:13:44    4200        33        17      0.00      0.00   19484672       8192
19:13:45    3764        26        10      0.00      0.00   15081188          0
19:13:46    4092        13        19      0.00      0.00   22126675          0
19:13:47    4046        35        16      0.00      0.00   16132562          0
19:13:48    4181        28        14      0.00      0.00   24333964          0
19:13:49    4154        31        14      0.00      0.00   24376269          0
19:13:50    3992        22        19      0.00      0.00   26704896     105472
19:13:51    3505        10         5      0.00      0.00   26141696          0
19:13:52    4006        38        19      0.00      0.00   21020962          0
19:13:53    4240        26        15      0.00      0.00   25302109          0

Average     4140        80        61      0.06      0.06   22345256      12592
[ATL]:rc /root #
```

```
[ATL]:rc /root # sar -d 1 8

HP-UX rc B.10.20 A 9000/871     02/13/00

19:16:59    device     %busy     avque     r+w/s     blks/s     avwait     avserv
19:17:00    c0t8d0      0.99      0.50         2         18       1.21       8.98
            c0t10d0    37.62      0.50        52        164       5.05       7.74
19:17:01    c0t8d0      7.07      0.50         5         10       3.91      13.76
            c0t10d0    22.22      0.50        25        121       4.04       8.27
19:17:02    c0t8d0     20.00      6.65        27        432      51.40      54.97
            c0t10d0    89.00     61.04       145       2250     344.68      52.39
19:17:03    c0t8d0      3.96      0.50         3          6       6.39      13.24
            c0t10d0    32.67      0.50        46        170      44.67      12.80
19:17:04    c0t10d0    49.00      0.50        63        236       4.85       7.26
19:17:05    c0t8d0      3.96      0.50         5         10       4.04      10.98
            c0t10d0    36.63      0.50        53        162       5.21       6.66
19:17:06    c0t8d0      3.03      0.50         2          4       3.70      15.35
            c0t10d0    32.32      0.50        36        117       4.95       9.11
19:17:07    c0t8d0     17.82      0.50        21         44       4.89       8.94
            c0t10d0    12.87      0.50        23         77       3.91       7.08


Average     c0t8d0      7.11      3.05         8         65      23.99      28.99
Average     c0t10d0    39.03     20.23        55        412     119.68      22.72
[ATL]:rc /root #
```

```
[ATL]:rc /root # sar -u 1 16

HP-UX rc B.10.20 A 9000/871     02/13/00

19:21:01     %usr     %sys     %wio     %idle
19:21:02        3       68       14       15
19:21:03        2       62       17       19
19:21:04        2       66       16       16
19:21:05        2       68       16       14
19:21:06        1       62       17       20
19:21:07        1       43       26       29
19:21:08        3       61       18       18
19:21:09        1       35       33       31
19:21:10        2       73       11       14
19:21:11        3       63       17       17
19:21:12        1       68       15       16
19:21:13        2       65       16       17
19:21:14        3       68       16       13
19:21:15        0       56       23       21
19:21:16        3       67       15       15
19:21:17        1       78        8       13

Average         2       63       17       18
[ATL]:rc /root #
```

Performance and Kernel Tuning

Performance tuning

- **sar** (system activity reporter)
  - **-a** File Access
  - **-v** Kernel Parameters

```
[ATL]:rc /root # sar -a 1 3

HP-UX rc B.10.20 A 9000/871      02/13/00

19:31:10   iget/s namei/s dirbk/s
19:31:11      0       10       6
19:31:12     29      129     306
19:31:13      9       18       5

Average       13       52     106
[ATL]:rc /root # du -s /home > /dev/null &
[1]      10380
[ATL]:rc /root # sar -a 1 5

HP-UX rc B.10.20 A 9000/871      02/13/00

19:31:23   iget/s namei/s dirbk/s
19:31:24    2639     2133      85
19:31:25    2672     2385     120
19:31:26    2607     2388     136
19:31:27    2683     2226     135
19:31:28    2682     2249      53

Average     2656     2275     106
```

```
[ATL]:rc /root # sar -v 1 16

HP-UX rc B.10.20 A 9000/871     02/13/00

19:35:13 text-sz  ov  proc-sz  ov  inod-sz  ov  file-sz  ov
19:35:14   N/A    N/A 585/2000  0  3995/4000  0  1919/6010  0
19:35:15   N/A    N/A 585/2000  0  3995/4000  0  1919/6010  0
19:35:16   N/A    N/A 585/2000  0  3995/4000  0  1919/6010  0
19:35:17   N/A    N/A 586/2000  0  4000/4000  0  1920/6010  0
19:35:18   N/A    N/A 585/2000  0  4000/4000  0  1919/6010  0
19:35:19   N/A    N/A 585/2000  0  4000/4000  0  1919/6010  0
19:35:20   N/A    N/A 585/2000  0  4000/4000  0  1919/6010  0
19:35:21   N/A    N/A 586/2000  0  4000/4000  0  1920/6010  0
19:35:22   N/A    N/A 585/2000  0  3999/4000  0  1919/6010  0
19:35:23   N/A    N/A 585/2000  0  3999/4000  0  1919/6010  0
19:35:24   N/A    N/A 594/2000  0  4000/4000  0  1948/6010  0
19:35:25   N/A    N/A 594/2000  0  4000/4000  0  1948/6010  0
19:35:26   N/A    N/A 594/2000  0  4000/4000  0  1949/6010  0
19:35:27   N/A    N/A 594/2000  0  4000/4000  0  1953/6010  0
19:35:28   N/A    N/A 594/2000  0  4000/4000  0  1956/6010  0
19:35:29   N/A    N/A 594/2000  0  4000/4000  0  1955/6010  0

[ATL]:rc /root #
```

Performance and Kernel Tuning

Performance tuning

- **iostat** - report I/O Statistics
  - Number of seeks per second
  - Kbytes transferred per second
  - Milliseconds per average seek

ATL

File   Edit   Connection   Setup   Script   Window   Help

```
[ATL]:rc /root # iostat 2 3

   device      bps      sps      msps

   c0t9d0       0      0.0      1.0
  c0t11d0       0      0.0      1.0
   c0t8d0       0      0.0      1.0
  c0t10d0       0      0.0      1.0
   c0t5d0       0      0.0      1.0


   c0t9d0       0      0.4      1.0
  c0t11d0     5112     10.2      1.0
   c0t8d0       0      0.0      1.0
   c0t5d0     5111      9.8      1.0


   c0t9d0       0      0.5      1.0
  c0t11d0     5554     10.8      1.0
   c0t8d0       1      0.0      1.0
   c0t5d0     5556     10.8      1.0

[ATL]:rc /root #
```

Run 1 = zeros

933, 18   HP2392A -- rc.atl.hp.com via TELNET   Num

Performance and Kernel Tuning

Performance tuning

- **vmstat**

  vmstat [-dnS] [interval [count]]

  vmstat -f | -s | -z

- Virtual Memory Statistics

  - **-d** Adds disk transfers per second

  - **-n** Format for 80 columns

  - **-S** Processes swapped rather than paging

```
[ATL]:rc /root # vmstat 1 18
        procs           memory                        page                              faults       cpu
    r   b   w    avm     free    re   at   pi   po   fr   de   sr     in     sy    cs   us  sy  id
    0   0   0  13331   67976     0    0    0    0    0    0    0      0      0     0   14  10  76
    1   0   0  13643   67946    14    5    0    0    0    0    0    347    660   100    3  -2  99
    1   0   0  13643   67946    11    4    0    0    0    0    0    347    602   109   11  -1  90
    1   0   0  13643   67946     9    3    0    0    0    0    0    350    572   113    5   0  95
    1   0   0  13643   67946     7    2    0    0    0    0    0    353    536   112   -3   1 102
    1   0   0  13643   67815    18    2    0    0    0    0    0    374   1065   139    0  91   9
    5   0   0  14100   67811    15    1    0    0    0    0    0    411   1527   188   11  83   7
    5   0   0  14100   67805    12    0    0    0    0    0    0    416   1996   207    6  87   6
    5   0   0  14100   67805     9    0    0    0    0    0    0    417   2375   226    1  92   7
    5   0   0  14100   67804     7    0    0    0    0    0    0    426   2520   239   11  82   7
    5   0   0  14100   67802     9    1    1    0    0    0    0    432   2722   251    6  89   5
    4   0   0  14492   67800     8    0    0    0    0    0    0    431   2672   256    0  94   6
    4   0   0  14492   67800     6    0    0    0    0    0    0    437   2688   261    2  93   6
    4   0   0  14492   67793     4    0    0    0    0    0    0    431   2670   262    5  89   6
    4   0   0  14492   67793     3    0    0    0    0    0    0    433   2808   266   -1  95   6
    4   0   0  14492   67790     2    0    0    0    0    0    0    427   2798   262    1  93   6
    5   0   0  14737   67790     1    0    0    0    0    0    0    427   2744   260    1  94   5
    5   0   0  14737   67790     0    0    0    0    0    0    0    441   2786   279    2  93   6
[ATL]:rc /root #
```

```
 ATL                                                                    [_][□][X]

 File    Edit   Connection    Setup   Script   Window    Help

   [ATL]:rc /root # vmstat -nd 1 2


  VM
        memory                          page                         faults
        avm      free     re    at     pi     po     fr     de     sr      in       sy      cs
       14082    68666     8     0      0      0      0      0      0      513     2791     298
  CPU
       cpu           procs
   us sy id      r        b        w
    4 93  3      5        0        0
    5 90  5


  Disk Transfers
     device    xfer/sec
     c0t9d0       18
    c0t11d0       17
     c0t8d0       16
    c0t10d0        8
     c0t5d0       31



   [ATL]:rc /root #


  713,1                    HP70092 -- rc.atl.hp.com via TELNET                    Num
```

Performance and Kernel Tuning

Performance tuning

- **vmstat** (cont)
  - **-f** fork and page summary:
    vmstat -f

    9043939 forks, 448300514 pages, average= 49.57
  - **-s** Summary
  - **-z** Zero kernel sums

File   Edit   Connection   Setup   Script   Window   Help

```
[ATL]:rc /root # vmstat -s
0 swap ins
0 swap outs
0 pages swapped in
0 pages swapped out
38679 total address trans. faults taken
13410 page ins
0 page outs
180 pages paged in
0 pages paged out
12738 reclaims from free list
13231 total page reclaims
0 intransit blocking page faults
24941 zero fill pages created
10379 zero fill page faults
9358 executable fill pages created
0 executable fill page faults
0 swap text pages found in free list
5636 inode text pages found in free list
0 revolutions of the clock hand
0 pages scanned for page out
0 pages freed by the clock daemon
210553 cpu context switches
809959 device interrupts
55205 traps
1572971 system calls
[ATL]:rc /root #
```

54, 18   HP70092 -- rc.atl.hp.com via TELNET   Num

Performance and Kernel Tuning

Performance tuning

- **top**:
  - System data - Summary
    - name and time
    - Load Average 1,5,15 minutes
    - % time in user,nice,system,idle,etc
  - Memory:Virtual and Real
  - Individual Processes

```
Reflection 1 - SETTINGS.R1W
```

File   Edit   Terminal   Connection   Options   Window   Help

```
System: hpuerca                              Mon Jun 12 23:47:05 1995
Load averages: 0.00, 0.02, 0.05
324 processes: 320 sleeping, 1 waiting, 3 starting
Cpu states:
CPU    LOAD    USER    NICE    SYS    IDLE    UNK5    UNK6    INTR    SSYS
 0     0.00    0.0%    0.0%   0.8%   99.2%   0.0%    0.0%    0.0%    0.0%
 1     0.00    0.4%    0.0%   1.4%   98.2%   0.0%    0.0%    0.0%    0.0%
---    ----    -----   -----  -----  -----   -----   -----   -----   -----
avg    0.00    0.2%    0.0%   1.0%   98.8%   0.0%    0.0%    0.0%    0.0%


Memory: 97564K (43988K) real, 89828K (48012K) virtual, 168952K free    Screen #
   1/21


CPU   TTY    PID USERNAME    PRI NI    SIZE    RESD STATE     TIME %WCPU    %CPU COMMAND
 0    p7 21345 blh           179 20    284K    324K wait      0:00  2.26    1.47 top
 0    p7 21327 blh           158 20    224K     80K sleep     0:00  0.68    0.48 -ksh
 1     ? 21263 mjb           156 20    388K    260K sleep     0:01  0.25    0.25 vi /tmp/
 0    p7 21326 root          154 20     52K    144K sleep     0:00  0.33    0.23 rlogind
 1     ?     3 root          128 20      0K      0K sleep    34:12  0.22    0.22 statdaem
 1     ?   231 root          154 20   7644K   7692K sleep    87:00  0.18    0.18 /etc/nam
 0     ?     0 root          128 20      0K      0K sleep    15:47  0.09    0.09 swapper
 1     ? 15996 lp            154 20     76K    188K sleep     0:16  0.09    0.09 /usr/lib
 1     ?   220 root          154 20     88K    184K sleep     7:03  0.08    0.08 /etc/ine
 1     ?    86 root          154 20     20K     72K sleep     8:33  0.07    0.07 syncer
```

```
System: vbox                                    Mon Feb 11 10:18:43 2002
Load averages: 1.13, 1.14, 1.14
155 processes: 136 sleeping, 19 running
Cpu states:
CPU    LOAD    USER    NICE     SYS    IDLE   BLOCK   SWAIT    INTR    SSYS
 0     3.00    0.0%   99.4%    0.6%    0.0%    0.0%    0.0%    0.0%    0.0%
 1     1.00    0.0%   98.0%    2.0%    0.0%    0.0%    0.0%    0.0%    0.0%
 2     1.00    0.0%  100.0%    0.0%    0.0%    0.0%    0.0%    0.0%    0.0%
 3     1.00    0.2%   98.6%    1.2%    0.0%    0.0%    0.0%    0.0%    0.0%
 4     1.00    0.2%   99.2%    0.6%    0.0%    0.0%    0.0%    0.0%    0.0%
 5     1.00    0.0%  100.0%    0.0%    0.0%    0.0%    0.0%    0.0%    0.0%
 6     1.01    0.0%  100.0%    0.0%    0.0%    0.0%    0.0%    0.0%    0.0%
 7     1.00    0.0%  100.0%    0.0%    0.0%    0.0%    0.0%    0.0%    0.0%
 8     1.00    0.0%  100.0%    0.0%    0.0%    0.0%    0.0%    0.0%    0.0%
 9     1.00    0.0%  100.0%    0.0%    0.0%    0.0%    0.0%    0.0%    0.0%
10     1.00    0.0%  100.0%    0.0%    0.0%    0.0%    0.0%    0.0%    0.0%
11     1.00    0.0%   99.6%    0.0%    0.4%    0.0%    0.0%    0.0%    0.0%
12     1.00    0.0%  100.0%    0.0%    0.0%    0.0%    0.0%    0.0%    0.0%
13     1.00    0.0%   99.0%    0.8%    0.2%    0.0%    0.0%    0.0%    0.0%
14     1.00    0.0%   98.4%    1.6%    0.0%    0.0%    0.0%    0.0%    0.0%
---    ----   -----   -----   -----   -----   -----   -----   -----   -----
avg    1.13    0.0%   99.4%    0.4%    0.2%    0.0%    0.0%    0.0%    0.0%

Memory: 270956K (251936K) real, 286788K (275892K) virtual, 15099772K free  Page
```

Performance and Kernel Tuning

Performance tuning

- **Glance/Plus**
  - HP measurement package
  - midaemon for better metrics
  - character mode interface
  - **gpm** for Xwindcows
  - Extensive measurement options
  - Alarms

File Edit Connection Setup Macro Window Help

```
B3692A GlancePlus C.03.35.00      10:10:26   hpuerci 9000/800      Current  Avg  High
----------------------------------------------------------------------------------------
CPU  Util   S            SNN                                          | 33%    25%   33%
Disk Util   F                                    F                    | 70%    78%   87%
Mem  Util   S      SU               UB                         B      | 88%    88%   88%
Swap Util   U            UR  R                                        | 34%    34%   34%
----------------------------------------------------------------------------------------
                            PROCESS LIST                          Users=   13
                              User       CPU Util      Cum     Disk          Block
Process Name    PID   PPID Pri Name    (   100% max)   CPU    IO Rate    RSS    On
----------------------------------------------------------------------------------------
du             1207  25100 148 root        29.7/20.6   2.0   108/ 112   196kb   IO
```

Page 1 of 1

| Process List | CPU Report | Memory Report | Disk Report | | Next Keys | Select Process | Help | Exit Glance |

File Edit Connection Setup Macro Window Help

```
B3692A GlancePlus C.03.35.00      10:11:39   hpuerci 9000/800     Current  Avg  High
-------------------------------------------------------------------------------------
Cpu  Util  SSN                                          N |100%   100%   100%
Disk Util  F        F                                     | 13%     7%    13%
Mem  Util  S        SU                  UB             B  | 88%    88%    88%
Swap Util  U              UR  R                           | 34%    34%    34%
-------------------------------------------------------------------------------------
                         PROCESS LIST                              Users=    13
                              User       CPU Util      Cum      Disk          Block
Process Name    PID   PPID Pri Name    (  100% max)    CPU    IO Rate    RSS     On
-------------------------------------------------------------------------------------
sh             1320  25100 237 root      97.1/95.0    5.7   0.0/ 0.0   196kb    PRI
```

Page 1 of 1

| Process List | CPU Report | Memory Report | Disk Report | | Next Keys | Select Process | Help | Exit Glance |

File Edit Connection Setup Macro Window Help

```
B3692A GlancePlus C.03.35.00      10:30:43        e35 9000/816    Current   Avg  High
---------------------------------------------------------------------------------------
CPU  Util   S           SARU  U                                  | 31%    13%   74%
Disk Util   F  FV           V                                    | 28%     7%   63%
Mem  Util   S       SU                                   UB   B  | 98%    96%  100%
Swap Util   U           UR                   R                   | 56%    56%   57%
---------------------------------------------------------------------------------------
                          MEMORY REPORT                          Users=      2
Event           Current   Cumulative   Current Rate   Cum Rate   High Rate
---------------------------------------------------------------------------------------

Page Faults       873       52674         174.6         52.6       440.3
Page In           187       15666          37.4         15.6       122.2
Page Out           78         439          15.6          0.4        22.2
KB Paged In      768kb      32.4mb        153.6         33.0       357.7
KB Paged Out     472kb       2.2mb         94.4          2.2        98.1
Reactivations       5         977           1.0          0.9         3.9
Deactivations       7         989           1.4          0.9         2.7
KB Deactivated    12kb        12kb          2.4          0.0         2.4
VM Reads           57        6467          11.4          6.4        29.6
VM Writes          52         394          10.4          0.3        19.8


Total VM :   27.6mb    Sys Mem  :   11.1mb   User Mem:  46.9mb   Phys Mem:  64.0mb
Active VM:   12.0mb    Buf Cache:    4.8mb   Free Mem:   1.3mb
V                                                                Page 1 of 1
```

| Process List | CPU Report | Memory Report | Disk Report | | Next Keys | Select Process | Help | Exit Glance |

SHADY

```
B3692A GlancePlus C.03.50.00        11:58:10      shady 9000/879      Current   Avg   High
-----------------------------------------------------------------------------------------
CPU  Util   SS                                              |    3%     8%    25%
Disk Util   F                                            F  |   98%    55%    98%
Mem  Util   S              SU   UB        B                 |   40%    32%    40%
Swap Util   U   URR                                        |   12%     8%    12%
-----------------------------------------------------------------------------------------
                          MEMORY REPORT                        Users=      2
Event          Current    Cumulative    Current Rate    Cum Rate    High Rate
-----------------------------------------------------------------------------------------
Page Faults       0           588           0.0           4.1         60.7
Page In           0            96           0.0           0.6         15.7
Page Out          0             0           0.0           0.0          0.0
KB Paged In      0kb         604kb          0.0           4.2        231.4
KB Paged Out     0kb          0kb           0.0           0.0          0.0
Reactivations     0             0           0.0           0.0          0.0
Deactivations     0             0           0.0           0.0          0.0
KB Deactivated   0kb          0kb           0.0           0.0          0.0
VM Reads          0            45           0.0           0.3         15.0
VM Writes         0             0           0.0           0.0          0.0


Total VM : 104.0mb    Sys Mem  : 159.0mb    User Mem:  56.5mb    Phys Mem: 768.0mb
Active VM:  57.7mb    Buf Cache:  94.7mb    Free Mem: 457.8mb

                                                             Page 1 of 1
```

| Process List | CPU Report | Memory Report | Disk Report | | Next Keys | Select Process | Help | Exit Glance |

```
B3692A GlancePlus C.03.50.00      11:59:52    shady 9000/879    Current   Avg  High
------------------------------------------------------------------------------------
CPU  Util  S         SU                                          | 26%    10%   44%
Disk Util  FV                                    V               | 74%    55%   98%
Mem  Util  S         SU                                    UBB   |100%    41%  100%
Swap Util  U  UR                  R                              | 39%    17%   39%
------------------------------------------------------------------------------------
                            MEMORY REPORT                          Users=     2
Event          Current     Cumulative    Current Rate   Cum Rate    High Rate
------------------------------------------------------------------------------------
Page Faults      27099        122876         4516.5       499.9       4516.5
Page In             28          7455            4.6        30.3        623.8
Page Out          1351          9360          225.1        38.0        238.1
KB Paged In      120kb         12.6mb          20.0        52.6        506.9
KB Paged Out    18.4mb        125.3mb        3136.0       521.8       3667.7
Reactivations        3            11            0.5         0.0          0.9
Deactivations        0            15            0.0         0.0          0.5
KB Deactivated    96kb          96kb           16.0         0.3         16.0
VM Reads            16          1143            2.6         4.6         39.8
VM Writes          988          9094          164.6        36.9        256.1


Total VM : 710.8mb    Sys Mem  : 161.1mb   User Mem: 566.1mb   Phys Mem: 768.0mb
Active VM: 671.3mb    Buf Cache:  38.4mb   Free Mem:   2.4mb

                                                              Page 1 of 1
```

| Process List | CPU Report | Memory Report | Disk Report | | Next Keys | Select Process | Help | Exit Glance |

File   Edit   Connection   Setup   Macro   Window   Help

B3692A GlancePlus C.03.50.00   12:55:40   shady 9000/879   Current   Avg   High
----
CPU Util   S   SU   U | 51%   5%   51%
Disk Util   V | 3%   6%   100%
Mem Util   S   SU   UB B | 95%   96%   100%
Swap Util   U   UR   R | 72%   54%   72%

                          PROCESS LIST   Users=   2
                                User   CPU Util   Cum   Disk   Thd
Process Name   PID   PPID Pri Name   (200% max)   CPU   IO Rate   RSS   Cnt
----
scrdaemon   1345   1 241 root   99.8/ 1.2   10.2   0.0/ 0.0   364kb   1
swapper   0   0 127 root   0.0/ 0.1   0.9   1.3/ 0.2   16kb   1
mallocbig   3315   1983 154 root   0.0/ 1.4   12.4   0.0/ 0.0 529.4mb   1

                                                              Page 1 of 1

| Process List | CPU Report | Memory Report | Disk Report | | Next Keys | Select Process | Help | Exit Glance |

| 62, 1 | HP70092 -- shady.atl.hp.com via TELNET | | Num |

```
 HP  SHADY                                                                 _ □ X

 File   Edit   Connection   Setup   Macro   Window   Help

 B3692A GlancePlus C.03.50.00      12:57:00    shady 9000/879   Current  Avg  High
 -----------------------------------------------------------------------------------
 CPU  Util    S            SU              U                  | 51%      9%   52%
 Disk Util                                                    |  0%      5%  100%
 Mem  Util    S       SU                             UB  B    | 95%     96%  100%
 Swap Util    U                    UR              R          | 72%     55%   72%
 -----------------------------------------------------------------------------------
 Resources PID:  3315, mallocbig      PPID:  1983 euid:     0 User: root
 -----------------------------------------------------------------------------------
 CPU Usage (util):        0.0 Log Reads :       0 Wait Reason    :    STRMS
 User/Nice/RT CPU:        0.0 Log Writes:       0 Total RSS/VSS  :529.4mb/ 1.27gb
 System CPU      :        0.0 Phy Reads :       0 Traps / Vfaults:      0/       0
 Interrupt CPU   :        0.0 Phy Writes:       0 Faults Mem/Disk:      0/       0
 Cont Switch CPU :        0.0 FS Reads  :       0 Deactivations  :      0
 Scheduler       :       HPUX FS Writes :       0 Forks & Vforks :      0
 Priority        :        154 VM Reads  :       0 Signals Recd   :      0
 Nice Value      :         20 VM Writes :       0 Mesg Sent/Recd :      0/       0
 Dispatches      :          0 Sys Reads :       0 Other Log Rd/Wt:      0/       0
 Forced CSwitch  :          0 Sys Writes:       0 Other Phy Rd/Wt:      0/       0
 VoluntaryCSwitch:          0 Raw Reads :       0 Proc Start Time
 Running CPU     :          0 Raw Writes:       0    Mon Feb 11 12:40:38 2002
 CPU Switches    :          0 Bytes Xfer:     0kb                :
 -----------------------------------------------------------------------------------
       C - cum/interval toggle   % - pct/absolute toggle          Page 1 of 1

 ┌──────────┐┌──────────┐┌──────────┐┌──────────┐  ┌──────────┐┌──────────┐┌──────────┐┌──────────┐
 │ Process  ││  Wait    ││ Memory   ││  Open    │  │  Next    ││ Process  ││          ││          │
 │ Resource ││ States   ││ Regions  ││  Files   │  │  Keys    ││ Syscalls ││          ││          │
 └──────────┘└──────────┘└──────────┘└──────────┘  └──────────┘└──────────┘└──────────┘└──────────┘

   62, 1            HP70092 -- shady.atl.hp.com via TELNET                      Num
```

File   Edit   Connection   Setup   Macro   Window   Help

B3692A GlancePlus C.03.35.00   10:34:13   e35 9000/816   Current   Avg   High

----

		Current	Avg	High
CPU Util	S SA	8%	14%	97%
Disk Util	V	2%	8%	67%
Mem Util	S SU UB B	83%	96%	100%
Swap Util	U UR R	53%	56%	59%

DISK REPORT   Users=   2

Req Type		Requests	%	Rate	Bytes	Cum Req	%	Cum Rate	Cum Byte
Local	Logl Rds	11	100.0	2.1	1kb	8231	99.4	6.7	119.9mb
	Logl Wts	0	0.0	0.0	0kb	50	0.6	0.0	50kb
	Phys Rds	8	88.9	1.5	60kb	9146	79.0	7.5	50.7mb
	Phys Wts	1	11.1	0.1	2kb	2438	21.0	2.0	9.4mb
	User	0	0.0	0.0	0kb	497	4.3	0.4	6.8mb
	Virt Mem	8	88.9	1.5	60kb	9478	81.8	7.8	50.2mb
	System	1	11.1	0.1	2kb	1609	13.9	1.3	3.1mb
	Raw	0	0.0	0.0	0kb	0	0.0	0.0	0kb
Remote	Logl Rds	0	0.0	0.0	0kb	0	0.0	0.0	0kb
	Logl Wts	0	0.0	0.0	0kb	0	0.0	0.0	0kb
	Phys Rds	0	0.0	0.0	0kb	0	0.0	0.0	0kb
	Phys Wts	0	0.0	0.0	0kb	0	0.0	0.0	0kb

Page 1 of 2

| Process List | CPU Report | Memory Report | Disk Report | | Next Keys | Select Process | Help | Exit Glance |

34, 1   HP70092 -- e35.atl.hp.com via TELNET   Num

File   Edit   Connection   Setup   Macro   Window   Help

B3692A GlancePlus C.03.35.00   10:36:10   e35 9000/816   Current   Avg   High

----

CPU Util   S   SAARU U | 53%   51%   53%
Disk Util   F   FV   V | 72%   82%   91%
Mem Util   S   SU   UB   B | 96%   97%   97%
Swap Util   U   UR   R | 60%   60%   60%

                          IO BY FILE SYSTEM   Users=   2

Idx   File System   Device   Type   Logl IO   Phys IO
----

   1 /   /dev/vg00/lvol3   vxfs   2.8/ 3.1   7.6/ 7.1
   2 /stand   /dev/vg00/lvol1   hfs   0.6/ 0.5   0.6/ 0.5
   3 /var   /dev/vg00/lvol8   vxfs   1.7/ 2.1   27.2/ 23.5
   4 /usr   /dev/vg00/lvol7   vxfs   2.6/ 2.9   58.5/ 56.3
   5 /tmp   /dev/vg00/lvol4   vxfs   0.0/ 0.0   0.0/ 0.0
   6 /opt   /dev/vg00/lvol6   vxfs   0.0/ 0.2   0.9/ 1.8
   7 /home   /dev/vg00/lvol5   vxfs   0.0/ 0.0   0.0/ 0.0
   8 lvm swap device   /dev/vg00/lvol2   hfs   0.0/ 0.0   10.4/ 13.3

Top disk user: PID 24075, du   82.7 IOs/sec   S - Select a Disk
                                                         Page 1 of 1

| IO By | IO By | IO By | Swap | | Next | CPU By | Alarm | Select |
| File Sys | Disk | Logl Vol | Space | | Keys | Processr | History | |

```
B3692A GlancePlus C.02.30.00      22:09:54      rc 9000/871    Current  Avg  High
--------------------------------------------------------------------------------
Cpu  Util  S                                           SAU    | 96%   97%  100%
Disk Util  F             F                                    | 25%   22%   25%
Mem  Util  S     SU                     UB      B            | 59%   59%   59%
Swap Util  U UR       R                                       | 18%   18%   18%
--------------------------------------------------------------------------------
                              DISK REPORT                       Users=   103
Req Type        Requests    %     Rate   Bytes   Cum Req    %  Cum Rate Cum Byte
--------------------------------------------------------------------------------
Local   Logl Rds    14 100.0    2.0   421kb     265  99.6    35.8    4.7mb
        Logl Wts     0   0.0    0.0     0kb       1   0.4     0.1     0kb
        Phys Rds   891 100.0  132.9   2.7mb     963 100.0   130.1    2.9mb
        Phys Wts     0   0.0    0.0     0kb       0   0.0     0.0     0kb
        User       637  71.5   95.0   701kb     683  70.9    92.2   751kb
        Virt Mem     0   0.0    0.0     0kb       0   0.0     0.0     0kb
        System     254  28.5   37.9   2.0mb     280  29.1    37.8    2.2mb
        Raw          0   0.0    0.0     0kb       0   0.0     0.0     0kb
Remote  Logl Rds     0   0.0    0.0     0kb       0   0.0     0.0     0kb
        Logl Wts     0   0.0    0.0     0kb       0   0.0     0.0     0kb
        Phys Rds     0   0.0    0.0     0kb       0   0.0     0.0     0kb
        Phys Wts     0   0.0    0.0     0kb       0   0.0     0.0     0kb
```

Page 1 of 2

Process List	CPU Report	Memory Report	Disk Report		Next Keys	Select Process	Help	Exit Glance

File   Edit   Connection   Setup   Script   Window   Help

```
B3692A GlancePlus C.02.30.00      22:11:18       rc 9000/871      Current  Avg   High

CPU  Util   S                                          SU              | 66%   82%   100%
Disk Util   F                        F                                 | 37%   30%    46%
Mem  Util   S       SU                      UB        B                | 59%   59%    59%
Swap Util   U UR          R                                            | 18%   18%    18%
--------------------------------------------------------------------------------------
                                  IO BY DISK                        Users=   103
Idx   Device              Util    Qlen      KB/Sec       Logl IO     Phys IO
--------------------------------------------------------------------------------------
  1 8/4.9.0               1/ 12    0.0     4.7/   52.8   8.1/  28.0   0.6/ 15.8
  2 8/4.5.0               0/ 11    0.0     1.8/   91.5   0.0/   3.4   0.4/ 17.1
  3 8/4.8.0               4/ 14    0.0    23.8/   60.5   na/    na    3.8/ 16.2
  4 8/4.10.0             36/ 22   10.4   196.3/  103.3   na/    na   48.1/ 29.9
  5 8/4.11.0             37/ 28    2.0   152.9/  135.4   0.0/   0.0  54.3/ 39.7
```

Top disk user: PID 13978, du   54.7 IOs/sec   S - Select a Disk

Page 1 of 1

| IO By File Sys | IO By Disk | IO By Logl Vol | Swap Space | | Next Keys | CPU By Processr | Alarm History | Select |

File   Edit   Connection   Setup   Script   Window   Help

B3692A GlancePlus C.02.30.00   22:12:17   rc 9000/871   Current   Avg   High
----

CPU Util   S   SU | 62%   72%   100%
Disk Util   F   F | 40%   35%   53%
Mem Util   S   SU   UB   B | 59%   59%   59%
Swap Util   U UR   R | 18%   18%   18%

                        SYSTEM TABLES REPORT   Users=   103

System Table   Available   Used   Utilization   High(%)

Proc Table (nproc)   2000   590   30   30
File Table (nfile)   6010   1940   32   33
Shared Mem Table (shmmni)   200   9   5   5
Message Table (msgmni)   50   2   4   4
Semaphore Table (semmni)   64   8   13   13
File Locks (nflocks)   500   65   13   13
Pseudo Terminals (npty)   1400   148   11   11
Buffer Headers (nbuf)   23556   23556   100   100

                                                              Page 1 of 2

| Global Waits | Global Syscalls | DCE Global | System Tables | | Next Keys | Netwk By Intrface | NFS Global | NFS By System |

53, 1   HP70092 -- rc.atl.hp.com via TELNET   Num

Performance and Kernel Tuning

Performance tuning

- **gpm: Xwindows interface**
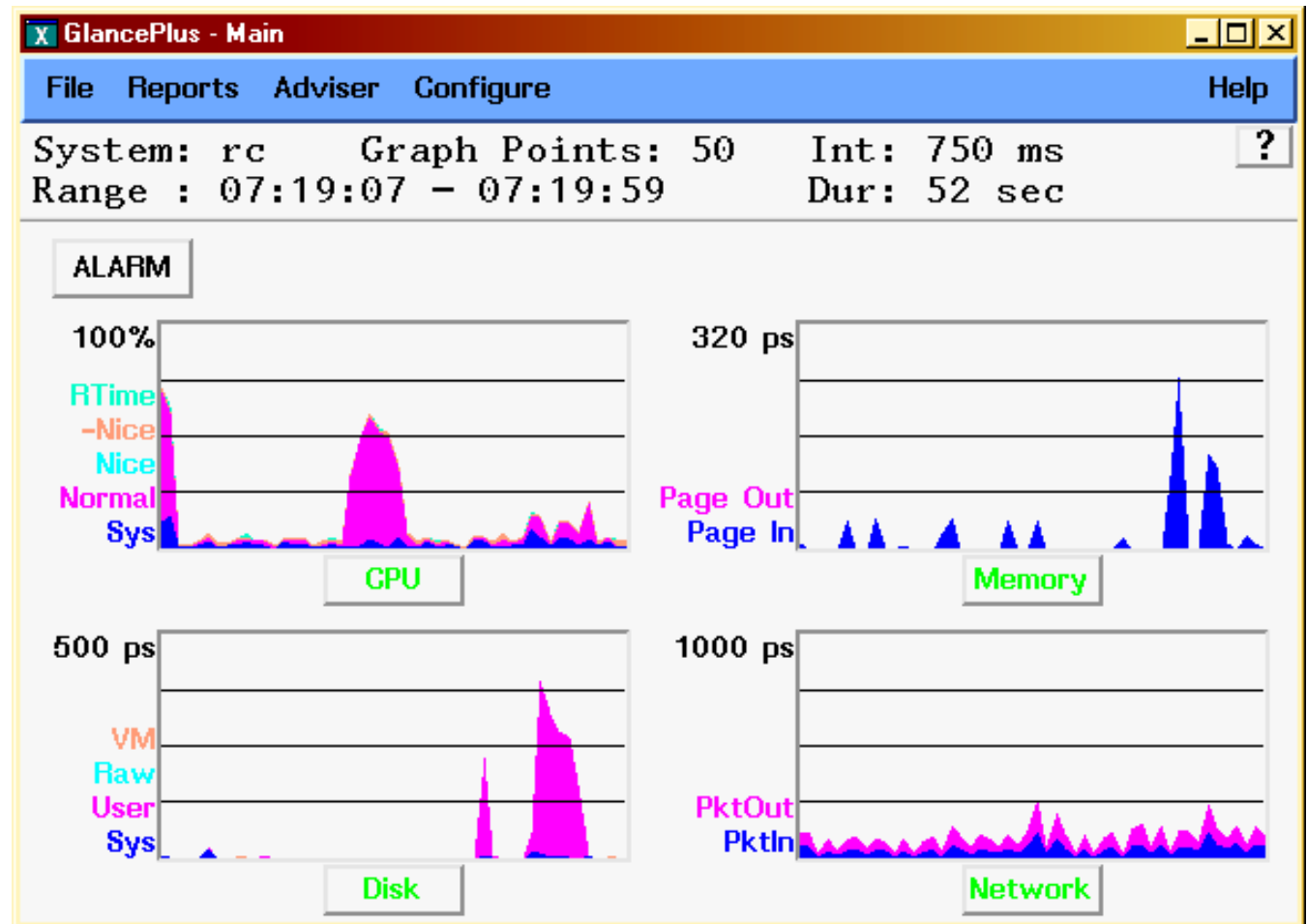
Performance and Kernel Tuning
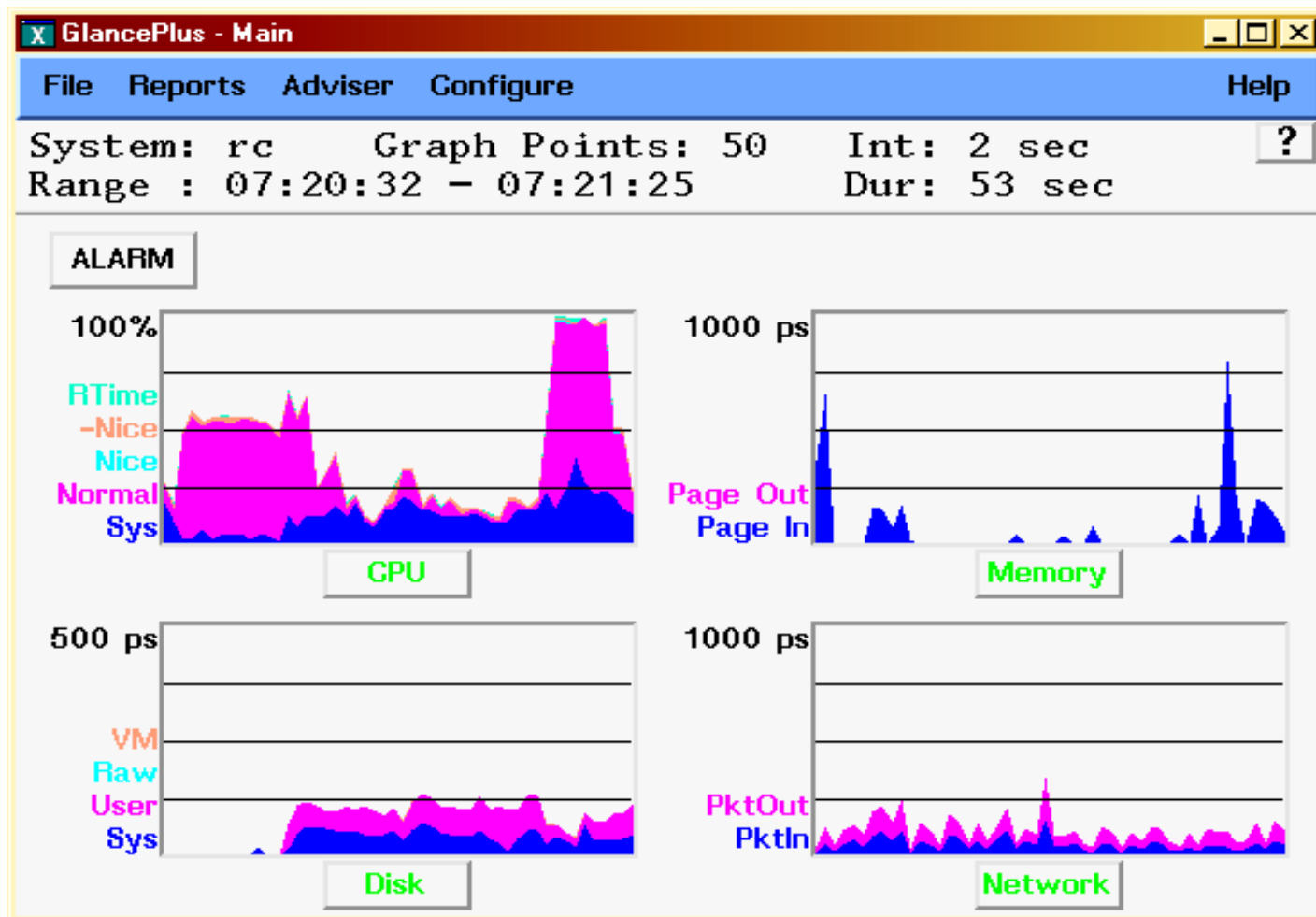
Performance tuning

Performance and Kernel Tuning

Performance tuning
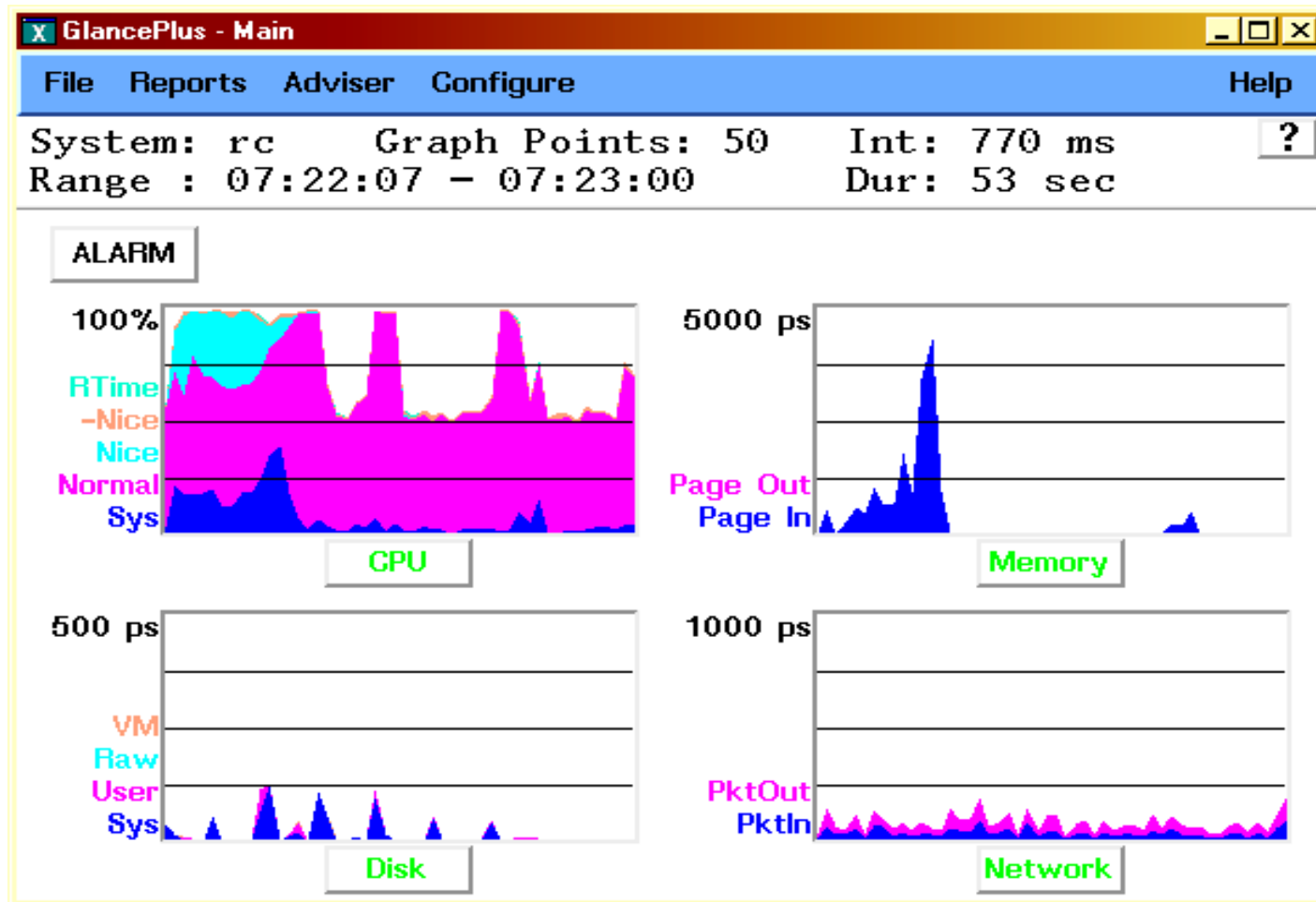
Performance and Kernel Tuning

Performance tuning
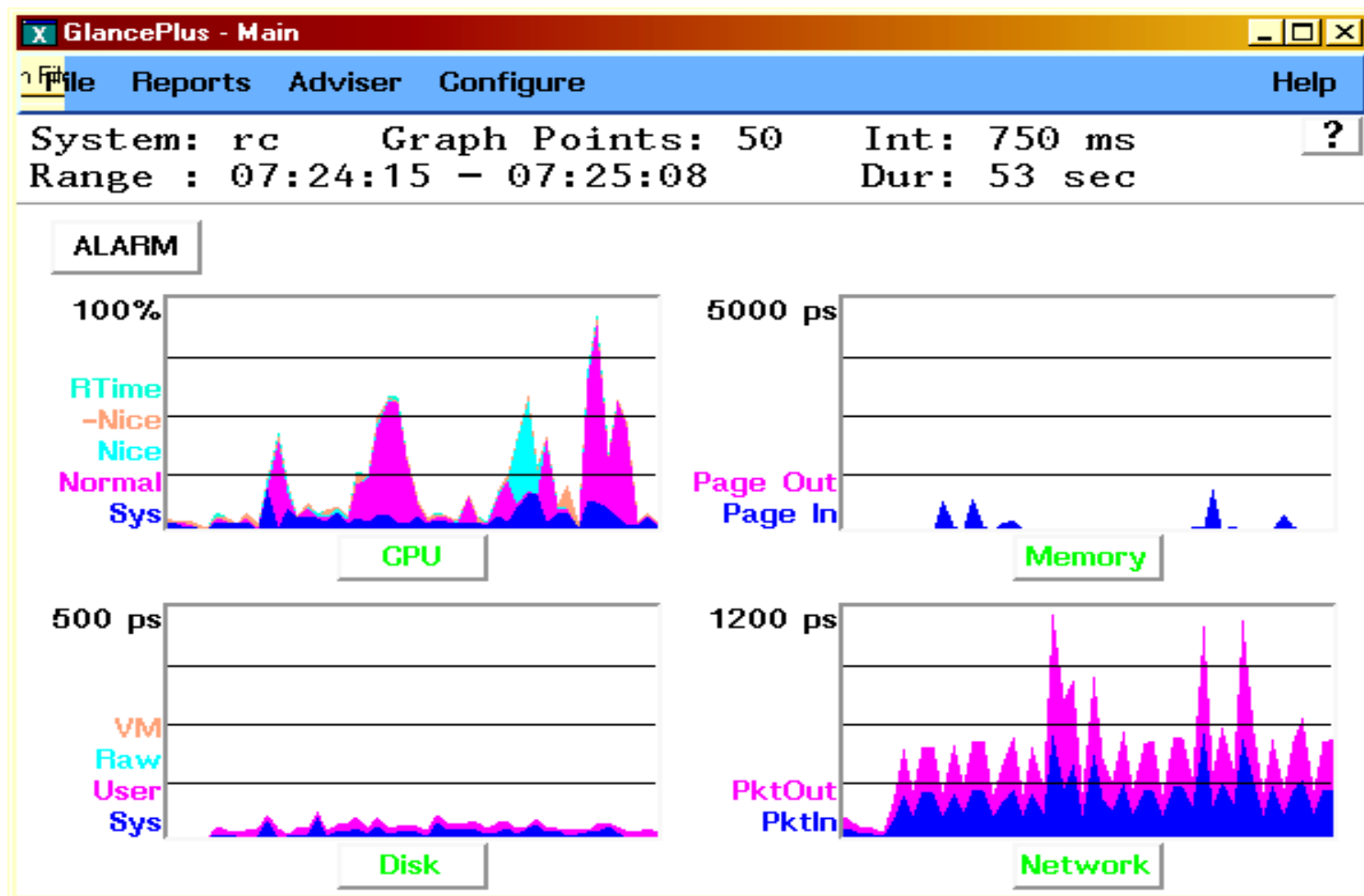
Performance and Kernel Tuning

Performance tuning
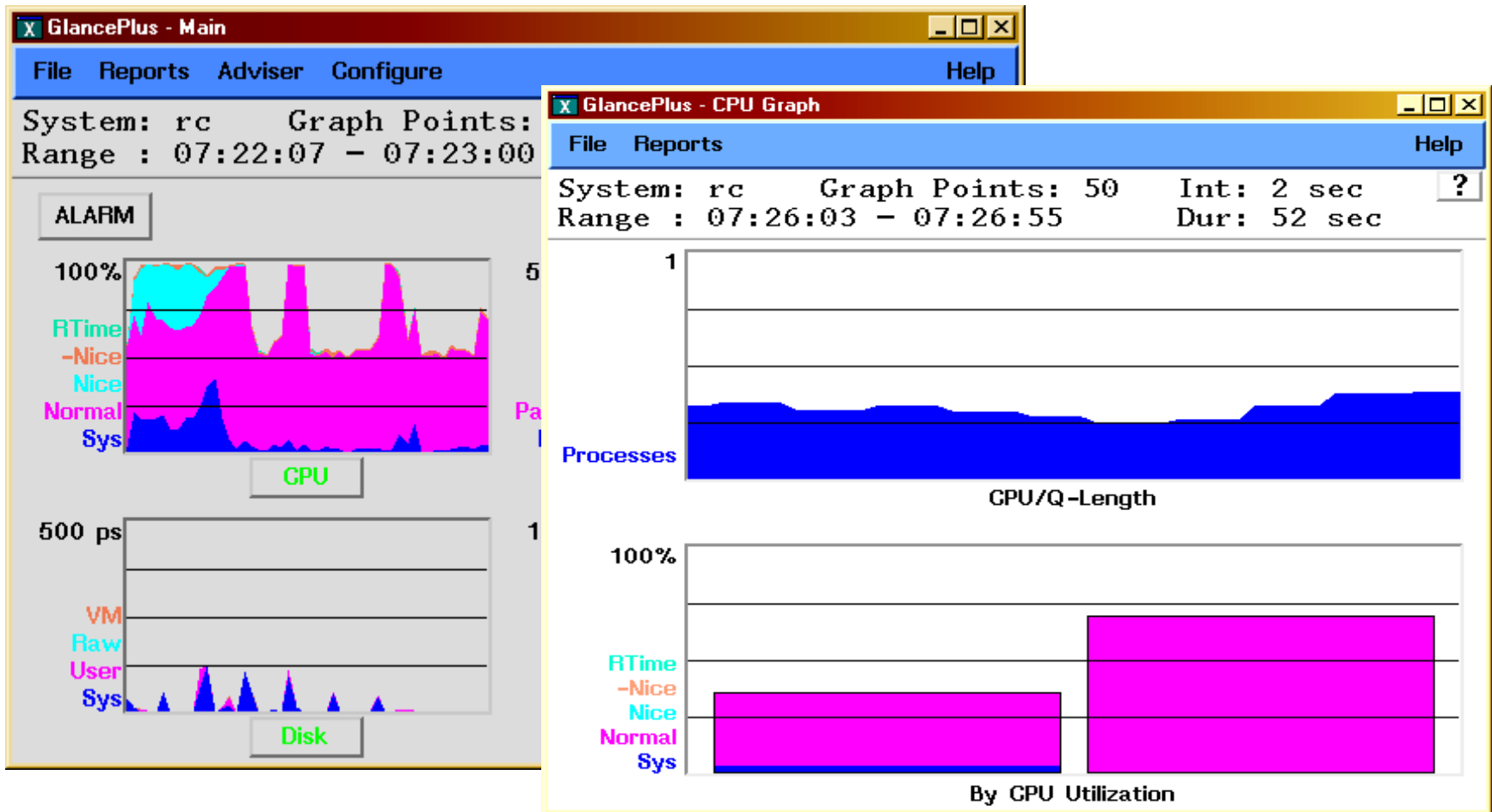
Performance and Kernel Tuning

Performance tuning
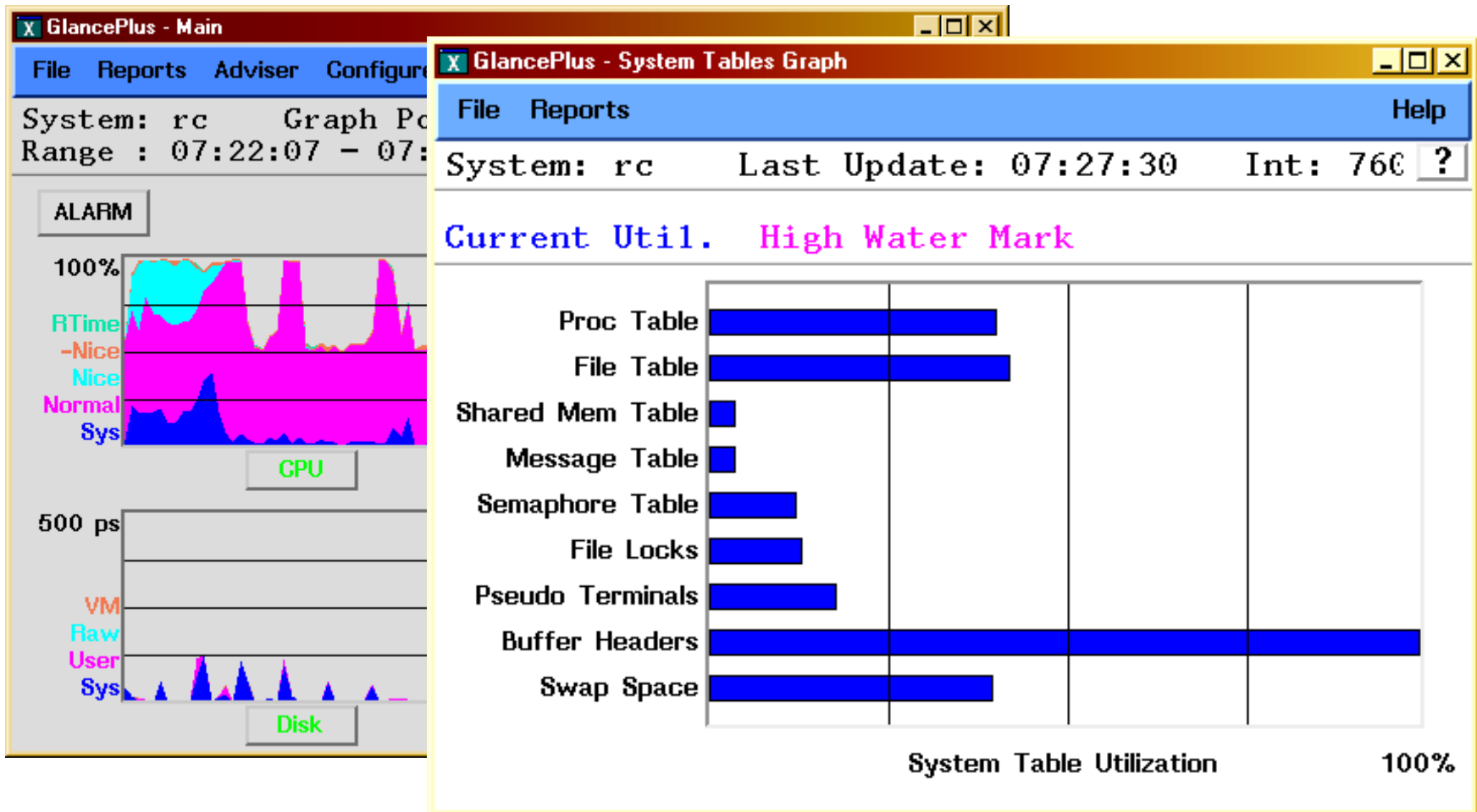
Performance and Kernel Tuning

Performance tuning
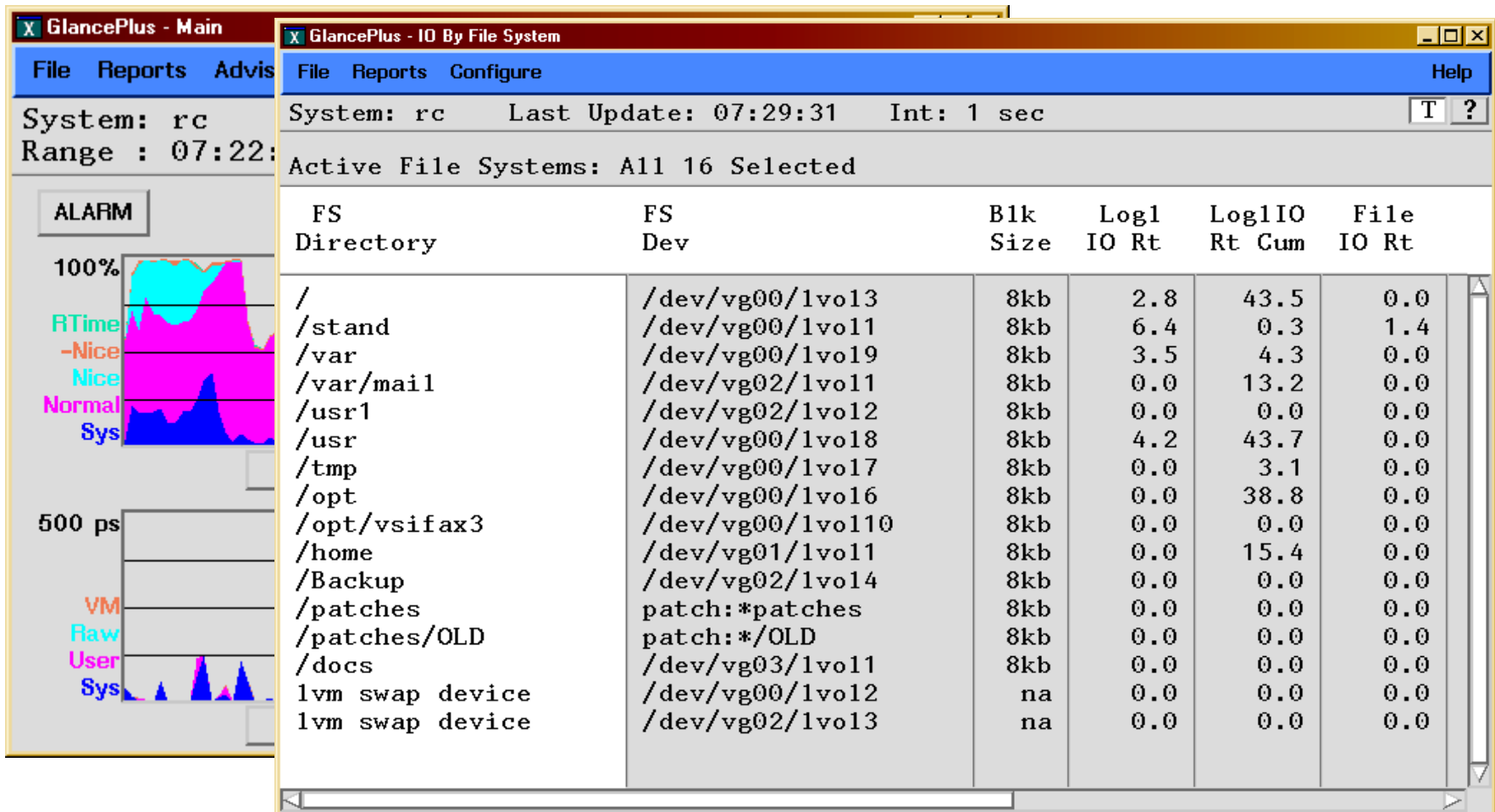
Performance and Kernel Tuning

Performance tuning

- What can you change:
  - Move busy filesystems to other disks
  - Move disks to additional channels
  - Add more processors (and/or change processor speed)
  - Add more RAM (application dependent)
  - Change large data area programs to use large memory pages (chatr) to reduce TLB misses
  - Use AutoPort Aggregation (APA) for parallel data transfers (and fallback reliability)

Memory Management

- 32/64 bit
- 32 bit Data area
- 32 bit Shared memory
- Memory windows

Memory Management

- 32/64 bit
  - HP-UX operating system
  - Hardware dependent
    - 32bit only
    - 32/64bit (either)
    - 64bit only (new machines)
  - 32bit programs run in either
  - 64bit programs only for 64bit HP-UX
  - 64bit programs remove memory map limitations, not a performance feature

Memory Management

- 32 bit Data area
  - 32bit programs have four 1000meg quadrants
  - Default data area = 960megs apx.
  - Compiler or chatr options for EXEC_MAGIC allow quadrant 1 and 2 to be combined for about 1750 megs total data area
  - Adjust maxdsiz if necessary
  - Documentation in /usr/share/doc for mem_mgt and proc_mgt (missing in 11i)

Memory Management

- 32 bit Shared memory
  - Most common limitation for 32bit database programs
    - Oracle: SGA is shared memory
  - Similar limits (960megs and 1750 megs)
  - Use SHMEM_MAGIC option for 1750 meg access
    - (all sharing processes must match)
  - **ALL** 32bit shared memory processes have one map (fragmentation, memory mapped files, shared libraries)
  - Use **ipcs –bmop** for a snapshot (does not show fragmentation)
  - Get **shminfo** from the hprc.external.hp.com ftp site: ftp://contrib:9unsupp8@hprc.external.hp.com/sysadmin

Memory Management

- Memory windows

  - Reserves a separate memory map to remove fragmentation issues

  - Memory-mapped files, shared libraries are in memory window 0 (plus 'normal' shared memory processes)

  - Need patches for 11.0 to enable

  - Set kernel param for quantity of windows

  - Start ALL sharing programs with memory window startup command.

Disk space management

- Root filesystem
  - VG00 size and management
    - HP-UX only, possibly user $HOME
    - 3-6Gb typical
    - New systems have 36/72Gb internal (too big)
    - Or use external disks
      - SCSI vs. fibre channel
      - Boot issues for external arrays
      - NAS versus SAN
    - Mirroring
    - Ignite/UX and VG00
    - Striping VG00

Disk space management

- Small versus large disks
  - JBODs
  - Arrays

- Large lvols
  - Large files versus thousands of small files
  - Flat versus hierarchical directory structure
    - Performance
    - System impact (from users)
    - Managing files and backups

Disk space management

- Filesystem types:
  - **HFS** (Fast FileSystem - BSD, circa 1984)
  - **VxFS** (Veritas FileSystem, aka Journaled FileSystem) or **JFS**
  - **CDFS** (CDROM FileSystem - ISO 9660 only)
  - **NFS** (Network FileSystem)

Disk space management

- **HFS** (Fast FileSystem - BSD, circa 1984)
  - McKusick HPF and fragmentation
  - fsck proportional to directory size
  - Inode count fixed at creation
  - resizing
    - up = umount, lvextend, extendfs
    - down = umount, backup, lvreduce, newfs, reload from backup, mount

Disk space management

- **JFS** (Veritas filesystem (not Volume Manager)
  - Aka: Journaled FileSystem or JFS
  - Inodes created as needed
  - Very busy filesystem may need defrag
  - Online (Advanced) JFS option needed for online resizing and advanced options
  - Better overall performance than HFS

Disk space management

- **CDFS** (CDROM filesystem)
    - ISO 9660 only (see below)
    - 8.3 UPPERCASE filenames plus ;1 version
    - 11.0 patch for –ocdcase to lower UPPERCASE and remove ;1 version (but no long filenanes
    - HP makes special (non-standard) CD's for Core, Application, SupportPlus, etc that have long filenames
    - PFS (Portable FileSystem) to perform RockRidge or long filename translation
    - Recent patches add –orr to natively handle long filenames
    - No direct support for Joliet, audio, multimedia, DVD
    - No direct support for CD writers

Disk space management

- **NFS** (Network FileSystem)
  - Network-based filesystem (server and clients)
  - Stateless so performance issues exist
  - Does require tuning for heavy usage
  - Version 2 = no largefiles
  - Version 3 = largefile-capable
  - nfsstat very useful
    - **biod** and **nfsd** quantity
    - Network quality
  - NFS Performance book by Dave Olker

Disk space management

- VG00 filesystem design
  - **/** (root) lvol
    - HP-UX only, rest = mountpoints
    - Static: size to about 256 megs
    - **/etc /dev /sbin** (that's all!)
  - **/stand** lvol
    - Only HFS filesystem
    - Holds bootable kernels (current and previous)
    - 60-200 megs

Disk space management

- VG00 filesystem design - other HP-UX mountpoints
  - **/usr** = HP-UX and local executables, libraries
    - **/bin and /lib**
    - **/usr/local** versus **/usr/contrib**
    - Perhaps 400-1000 megs
  - **/opt** = application installation directories
    - /opt/app-name
        bin doc lib lbin etc man…
    - Perhaps 500-1500 megs
  - **/tmp** = system temporary directory (note: system)
    - Not for users, scripts, etc
    - Perhaps 200-400 megs

Disk space management

- VG00 filesystem design - other HP-UX mountpoints
  - **/var** = variable directory
    - Most critical directory in HP-UX
    - When full, daemons and processes abort
    - Used by many unrelated subsystems
    - Ideally, separate mountpoint lvols will be created for the most intrusive directories:
      - **/var/mail**
      - **/var/spool**
      - **/var/tmp**
      - **/var/adm**
      - **/var/adm/crash**
      - **/var/adm/sw**

Disk space management

- VG00 filesystem design - other HP-UX mountpoints
  - **/home** = user home directories
    - Highly variable
    - When full, cause little impact to production processes
    - May require active space management or quotas
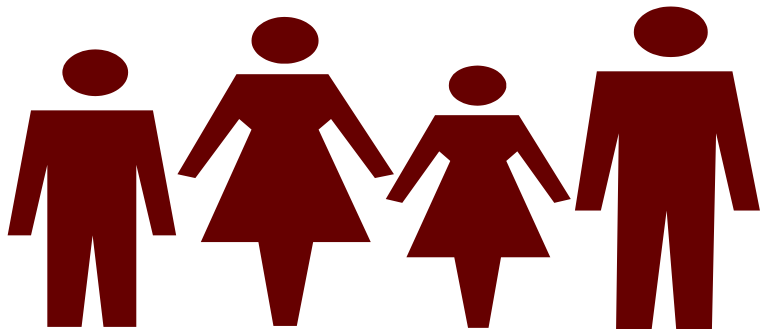
Disk space management

- XVG
  - Contributed Xwindow program
  - Visualize disk layout
  - Highlight swap, free space, filesystem types
  - Highlight non-contigous areas
  - Download from:

ftp://contrib:9unsupp8@hprc.external.hp.com/sysadmin

Xvg Display Program

Xvg Display Program

Xvg Display Program

Xvg Display Program

HP World 2003 Solutions and Technology

Xvg Display Program

Xvg Display Program

Xvg Display Program

Xvg Display Program

Xvg Display Program

Xvg Display Program

Xvg Display Program

Xvg - continued

Xvg - continued

Xvg - continued

Xvg - continued

Logfiles:
Where did the space go?

- Don't look for big files!

- Look for big directories (10,000 small files)

- Use du as in:

```
du -kx /
9          /lost+found
1682       /etc/lvmconf
464        /etc/hpC2400
2          /etc/switch
8          /etc/eisa
18         /etc/skel/.elm
1          /etc/skel/Mail      (oops...)
```

Where did the space go?

- Use du as in (sorted):

```
du -kx / | sort -rn | more
36048    /
15215    /sbin
14196    /etc
8032     /etc/lp
7927     /etc/lp/interface
6864     /etc/lp/interface/model.orig
6509     /root
3868     /sbin/fs
```

Database directories
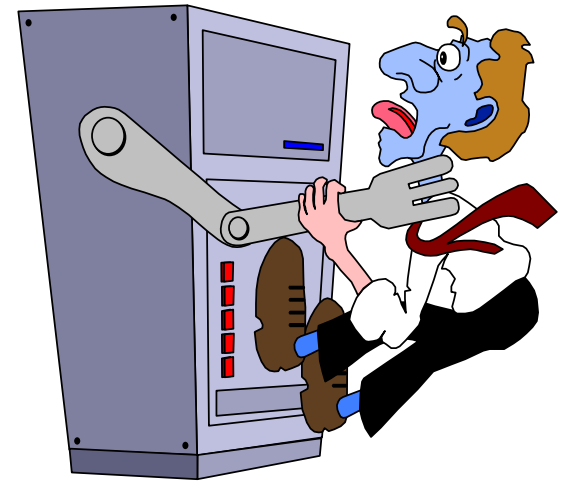
- Databases
  - files vs raw access
  - raw: document! (`/etc/fstab`)

Database directories

- Databases
  - files vs raw access
  - raw: document! (`/etc/fstab`)
  - fixed file count and size
    - minfree (10% and 0%)
    - inodes (HFS only)
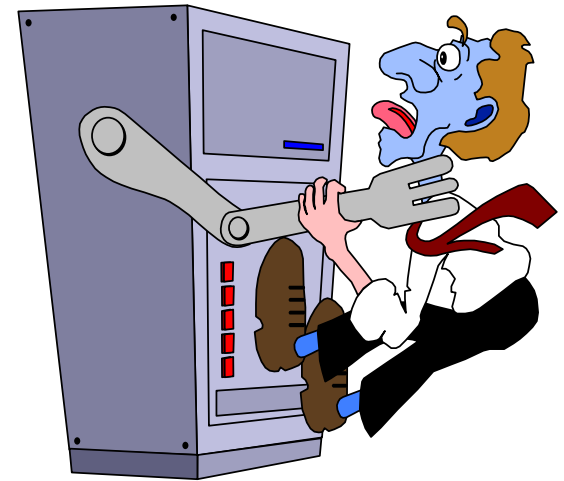
Database directories

- Databases
  - files vs raw access
  - raw: document! (`/etc/fstab`)
  - fixed file count and size
    - minfree (10% and 0%)
    - inodes (HFS only)
  - Mount options (advanced VxFS)
    - Table space (/u01 /u02 …)
      minfree=direct,convosync=direct,nodatainlog
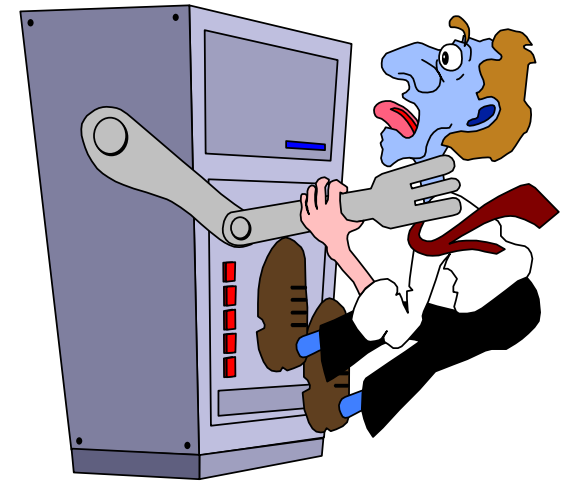
Database directories

- Databases
  - files vs raw access
  - raw: document! (`/etc/fstab`)
  - fixed file count and size
    - minfree (10% and 0%)
    - inodes (HFS only)
  - Mount options (advanced VxFS)
    - Table space (/u01 /u02 …)
      minfree=direct,convosync=direct,nodatainlog
    - Redo logs, archived redo logs, indexes
    - executables
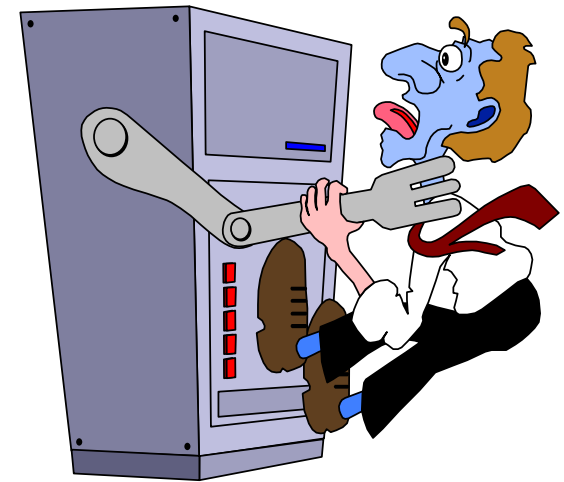
Growing directories

- New application installs
  - Ask vendor for inventory and size
  - Require all apps to install in /opt
  - Or create a symlink (ln -s)
- logfiles
  - Always grow
  - Require regular trim
- core (**ulimit –Sc 0**) and other files
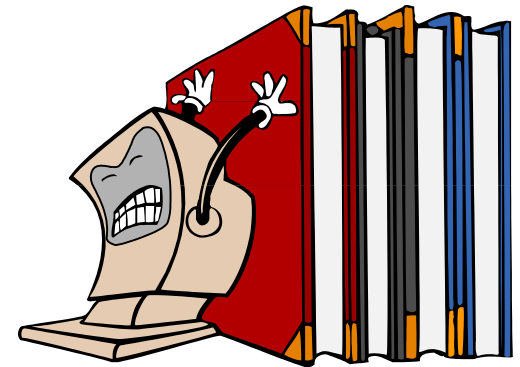
Log Files

/var/adm:

- acct/
- automount.log
- btmp
- crash/
- cron/
- diag/
- dmesg.log
- eisa/
- inetd.sec
- lp/
- netstat_data
- nettl.LOG00
- ps_data
- ptydaemonlog

/var/adm:

- rbootd.log
- rpc.lockd.log
- rpc.statd.log
- sbtab
- shutdownlog@ -> /etc/shutdownlog
- streams/
- sulog
- sw/
- syslog/
- vtdaemonlog
- wtmp
- wtmpold
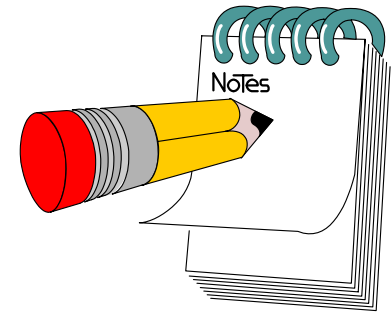
Core Files

- Identify with file command:

```
# sleep 999 &
# ps
 11244 ttyp3  0:00 sleep
# kill -SIGQUIT 11244
# ll core
-rw-------1 root sys 243140 Nov 27 16:16 core
# file core
core: core file from 'sleep'-received SIGQUIT
```
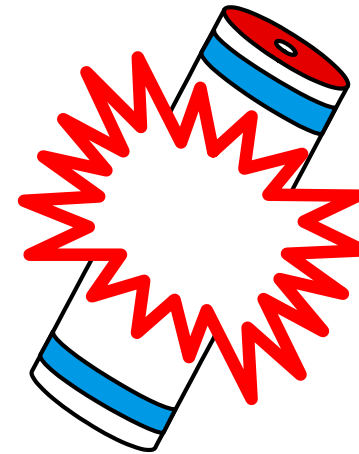
- Find and remove:
  - **find / -fsonly vxfs -type f -name core -exec rm {} \;**

- add **-mtime** for development (save for a while)

  -mtime +3 (older than 3 days)

  -mtime -3 (newer than 3 days)
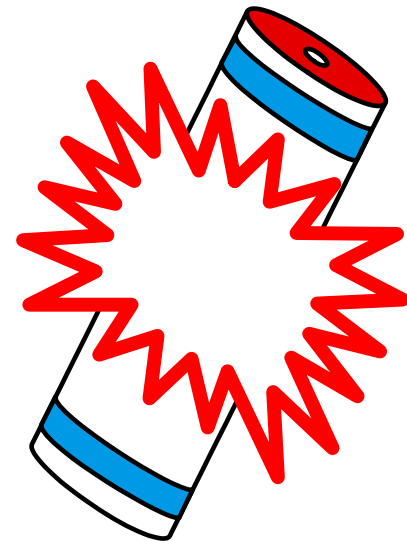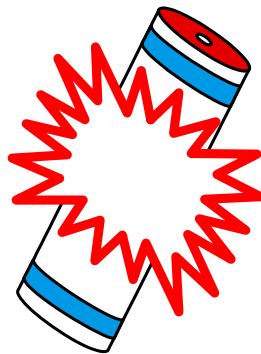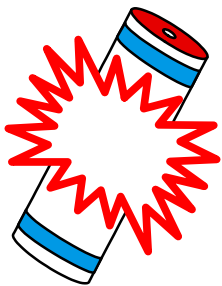
Cron Monitoring

- diskspace.sh:
  - monitors all mountpoints
  - selectable limits
  - automated notification
  - run from cron
  - Download from ftp site
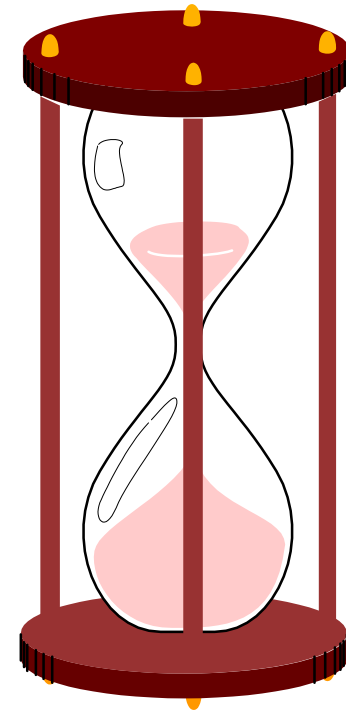
Logfiles

- Characteristics and locations
- syslog, the big one
- User Activity logs (*tmp)
- Miscellaneous logs
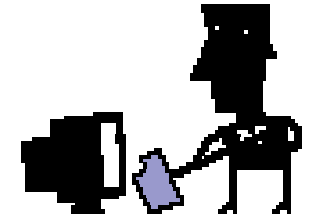
Logfiles - what to do?

- Can't live with 'em, can't live without 'em
- Why?
- Where?
- How?
- Huh?

Filesystem Full!

- White paper (9.x and 10.x/11.x)

  ftp://contrib:9unsupp8@hprc.external.hp.com

- find versus du
  - find = files only
  - du = directory sums:

  du -x /home | sort -rn > /usr/tmp/du.home

Where?

- **/var/adm**
  - Most system logfiles
  - diag logs
- **/var/adm/lp**
  - **log, lpd.log, lpana.log**
- (and others in **/var/adm**)
- applications!
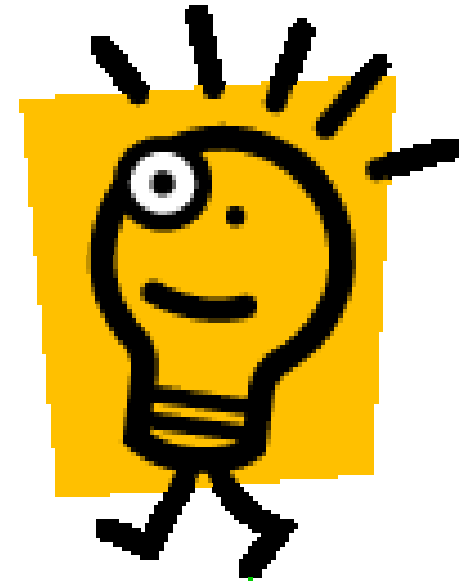
Syslog - everything's here

- **/var/adm/syslog/syslog.log**
  - Bootup info
  - daemons, kernel, errors, info
  - applications
  - user-defined messages
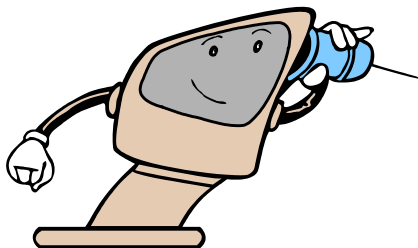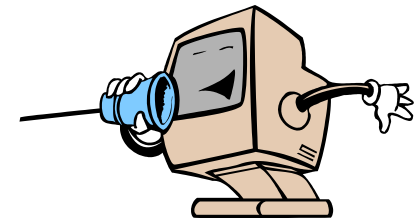
Logfiles and crash dumps

- Example entries:

```
Jan 19 02:00:01 bambam named[3790]: reloading nameserver
  \                 \         \                  \___ message
   \                 \               \_process[PID]
    \                        \_machine
     \_Date/time
```

syslog boot messages

- `syslogd: restart`

- `vmunix: 8/16 bus_adapter`

- `vmunix: Logical volume 64, 0x3 configured as ROOT`

- `vmunix: Memory Information:`

- `vmunix:      physical page size = 4096 bytes, logical page size = 4096`

- `vmunix:      Physical: 131072 Kbytes, lockable: 90036 Kbytes, available`

More syslog oneliners

- `nettl[593]: nettl starting up.`
- `inetd[749]: Reading configuration`
- `inetd[749]: ftp/tcp: Added service, server /usr/lbin/ftpd`
- `inetd[19760]: auth/tcp: Connection from i3125ljm`
- `xntpd[864]: offset -0.001348 freq -26.23103 comp 6`
- `ftpd[8204]: User hassell: Login incorrect`
- `syslogd: going down on signal 1`

Still more syslog

- `snmpd[5706]: EXCEPTIONS: bad version: 1`

- `last message repeated 3 times`

- `do_timeouts() - cannot unmount XXX:/`

- `do_timeouts() check symlink on XXX`

- `fs is busy - keep the link`   (automount -v message)

- `bootpd[266]: found 15.17.186.105 e3109569`

- `bootpd[266]: request from hardware address 52415320D044`
  (bootp patch or /etc/syslog.conf)

syslog.conf

- facility:
  - **kern, mail, lpr, daemon, auth, local0...local7, mark**

- level:
  - **debug, info, notice, warning, err, alert, emerg, crit, none**

- destination/action:
  - pathname/file: **/var/adm/mylogfile**
  - device: **/dev/console**
  - usernames (logged in)
  - * (every user)
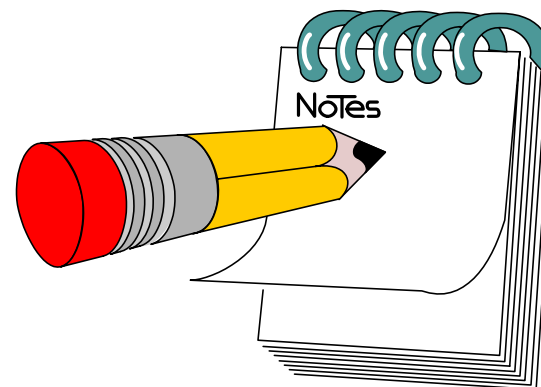
syslog examples

- `kern,mark.debug        /dev/console`
- `mail.debug             /var/adm/syslog/mail.log`
- `*.info;mail.none       /var/adm/syslog/syslog.log`
- `*.alert                /dev/console`
- `*.alert                root,eric, hassell`
- `*.emerg                *`
- `*.emerg                @ admin.hp.com`

logger

- ## shell script log entries:

  ```
  logger  [-t tag] [-p pri] [-f file] msg
  -  logger -t MyScript -p lpr.warn Testing
  -  logger -t blh-cron -p kern.alert "step 3 ok"
  -  logger -p local3.info "News throttled"
  ```

- ## Test syslog.conf entries

- ## Debug scripts with no tty output

Facility Logging

- Idea: separate syslog files
  - **syslog.kern**
  - **syslog.mail**
  - **syslog.lpr**
  - **syslog.daemon**
  - **syslog.auth**
  - etc...
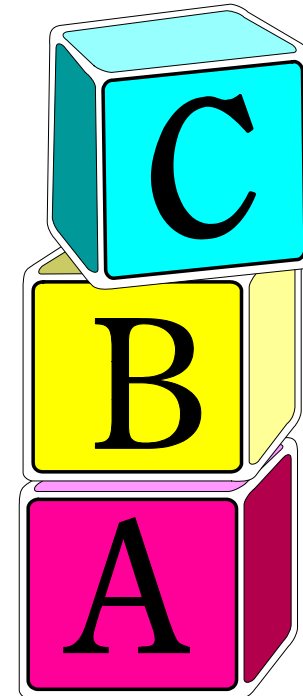
User Activity Logs

- **utmp** (zeroed at reboot)

- **wtmp** (cumulative!)

- **btmp** (create!)

- **last, who, write, login**

- **fwtmp** to decode (**/usr/sbin/acct/fwtmp**)

The *tmp files

- *tmp files are all in binary format
- **/etc/utmp**
  - active login/logout
  - rebuilt at bootup
  - needs valid logouts
  - user programs or actions can corrupt

    (**must login at lowest level shell**...)

More *tmp files

- **/var/adm/wtmp**
  - comprehensive and cumulative:
    - logins/logouts
    - init changes
    - boot time
    - accounting
  - Always needs trimming!
  - View: **last -R -<qty> login-name**

Still more *tmp files

- **`/var/adm/btmp`**:
  - Bad logins by UID and tty port
  - Never allow group/user readable
  - **`lastb`** (section 1, not 1m, hence warning)
  - watch for sudden jumps in size and repeated failures for root or other users

fwtmp

- **Program is hiding:**
  - `/usr/sbin/acct/fwtmp`

- **decodes `utmp, wtmp, btmp` into ASCII**

- **no errors!**

- **Converts either direction**

lp logfiles

- **`/var/adm/lp`**:

  - – **`log`** (**`lpsched -v`** for verbose entries)

  - – **`lpd.log`** (**`rlpdaemon -l`** to enable logging)

  - – **`lpana.log`** (**`lpsched -a`** to add **`lpana`** logging)
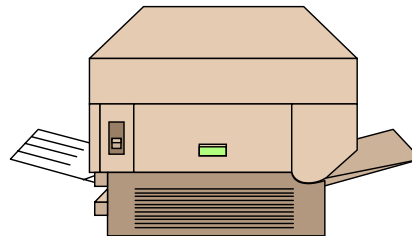
cron

- `/var/adm/cron/log`

- Format:

  > `CMD: command to run`

 > `owner PID c/a start time`

  < `owner PID c/a start time`

- Sample:

  > `CMD: /usr/sbin/dmesg - >> /var/adm/dmesg.log`

  > `root 10034 c Sun Mar  4 01:11:00 EST 2001`

  < `root 10034 c Sun Mar  4 01:11:00 EST 2001`

  > `CMD: $HOME/cronfiles/bin/badboy`

  > `root 10206 c Sun Mar  4 01:15:00 EST 2001`

  < `root 10206 c Sun Mar  4 01:15:01 EST 2001`

sulog

- **/var/adm/sulog**

  – logs every su change (good or bad)

  – **/etc/securetty** to force su - root

    • Use: **console** (not **/dev/console**)

    • man **login**
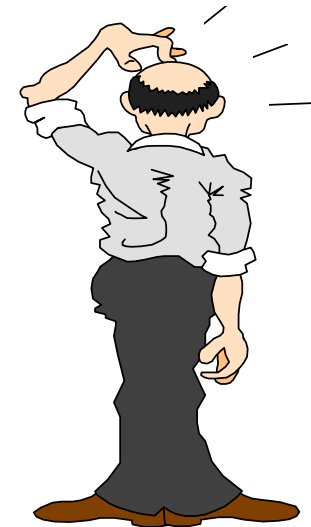
/etc/shutdownlog

- Make sure it exists

- logs every normal shutdown

- logs abnormal restarts and can decode a panic (crash)
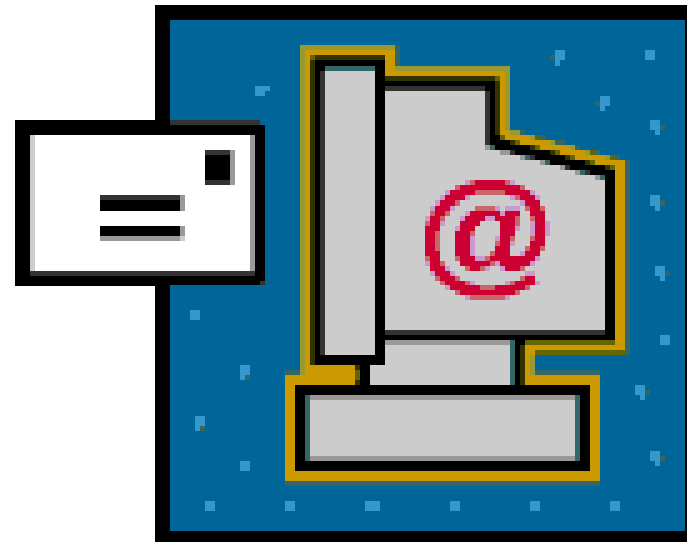 if `/var/adm/crash` is OK
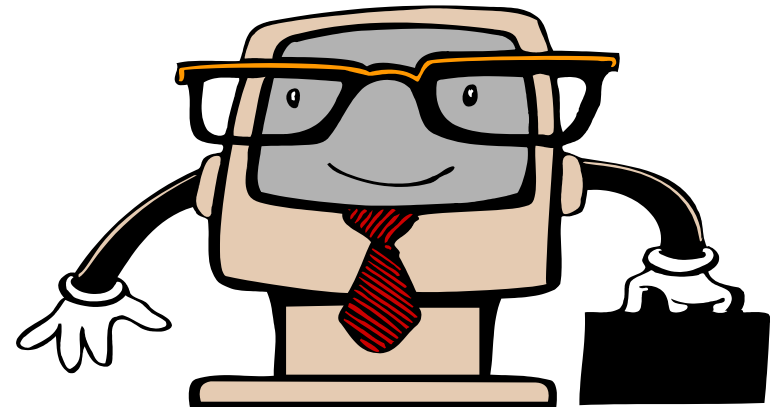
mail logs

- `/var/adm/syslog/mail.log`

  – email transactions

  – Sample:

```
Jan 19 22:58:28 hpuerca sendmail[2524]:
    AA025201: msgid=<19980..
```

more mail logs

- `from=<baae26@mpset.com.mx`

- `to=<rex7@bambam.atl.hp.com>, delay=00:00:05, stat=Sent, mailer=local`

- `to=jo_amstrong@hp.com, delay=10:00:04, stat=Deferred: <this_is_not@my.email.address.com>... unresolvable host name my.email.address.com,check your configuration., mailer=tcp, MX host=palsmtpx.hp.com., address=[15.81.184.10]`

Install/SD logs

- Software Distributor
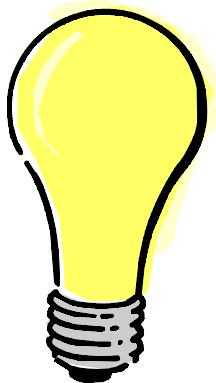 - `/var/adm/sw`
    `swagent.log  swconfig.log swinstall.log`
    `swpackage.log swremove.log swagentd.log`
    `swcopy.log swmodify.log swreg.log`
    `swverify.log`

- `cleanup` program

- `Swmodify:`

  `swmodify -x patch_commit=true <patch_name>`

logtrim

- Trim common logfiles
  - archive older information
    - log -> log.1
    - log.1 -> log.2 etc
  - compress the archives
  - ensure no data loss
  - correct permissions/ownerships
  - available from:

`ftp://contrib:9unsupp8@hprc.external.hp.com`

Useful tools (ftp site)

- **autosum**
- **bdfmegs**
- **cstm-cpu**
- **cstm-mem**
- **cstm-periph**
- **cstm-all**
- **errno**
- **jetinfo**
- **laninfo**
- **ljdisplay**
- **lls**
- **llt**

- **lpinfo**
- **loadmedia**
- **mx**
- **psbyname**
- **psgrep, pslgrep**
- **psram**
- **pwgrep**
- **remshall**
- **restart**
- **syslogdecode**
- **viman**

Additional resources

- Web help:

  At: `docs.hp.com`
        `/hpux/onlinedocs/939/KCParms/`
        `KCparams.OverviewAll.html`

- `/usr/share/doc` (11.0, not 11i)

- `itrc.hp.com`   `docs.hp.com`

- `software.hp.com`   `licensing.hp.com`

- `eproducts.hp.com`   `partsurfer.hp.com`

- `education.hp.com`

- Interex-Netherlands: sysadmin mail list

  `echo subscribe hpux-admin |`

  `mailx -sSubscribe  majordomo@dutchworks.nl`

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