

D E L P H I X



Linux/UNIX Tools For Oracle DBAs (SUN5694)

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Why CLI?

There are great graphical tools like Enterprise Manager, SQL Developer, TOAD, etc out there.

Why do **command-line interfaces** (CLI's) persist?

1. Functionality not yet supported in the graphical user interface (GUI)
2. Need to reproduce for vendor support in the native OS
3. Automation and scripting
4. I still drive stick-shift in my car, too

UNIX/Linux system-level diagnostics

- CPU and Memory
- Process
- Network
- Traces
- Other useful UNIX diagnostic utilities
- Support recommended diagnostic tools
- A great source of living technical information

sar utility

- CPU utilization: *sar -u*
 - %usr, %sys, %idle
 - %nice (Linux), %wio (Solaris)
- CPU run queue report: *sar -q*
 - Runq-sz
 - plist-sz and load averages (Linux) also
- Context switching activity: *sar -w*
 - cswch/s (Linux) or pswch/s (Solaris)
- Virtual memory swapping: *sar -W* (Linux) or *sar -w* (Solaris)
 - swpin/s, swpot/s
- Virtual memory paging: *sar -B* (Linux) or *sar -p* (Solaris)
 - pgpgin/s, pgpgot/s (Linux)
 - pgin/s, ppgin/s (Solaris)

sar utility

```
$ sar -u 5 5
```

```
Linux 2.6.32-431.el6.x86_64 (xyz.acme.com) 02/25/2015 _x86_64_
```

11:51:52	PM	CPU	%user	%nice	%system	%iowait	%steal	%idle
11:51:57	PM	all	3.99	0.00	4.62	0.42	0.00	90.97
11:52:02	PM	all	31.22	0.00	52.32	6.54	0.00	9.92
11:52:07	PM	all	33.94	0.00	58.99	7.07	0.00	0.00
11:52:12	PM	all	26.63	0.00	66.26	7.11	0.00	0.00
11:52:17	PM	all	8.88	0.00	18.60	1.24	0.00	71.28
Average:		all	21.02	0.00	40.40	4.50	0.00	34.08

sar utility

```
$ sar -u 5 5
```

```
SunOS xyz.acme.com 5.11 dlpX-4.0.1.0 i86pc 03/02/2015
```

01:02:49	%usr	%sys	%wio	%idle
01:02:54	1	2	0	97
01:02:59	17	17	0	66
01:03:04	16	24	0	60
01:03:09	13	16	0	72
01:03:14	1	3	0	96
Average	9	12	0	78

sar utility

```
$ sar -p 5 5
```

```
SunOS db.xyz.com 5.8 Generic_108528-04 sun4u 04/12/15
```

13:17:52	atch/s	pgin/s	ppgin/s	pflt/s	vflt/s	slock/s
13:17:57	0.20	0.00	0.00	0.80	2.99	0.00
13:18:02	427.25	4.41	5.61	1521.24	3432.47	0.00
13:18:07	116.60	0.00	0.00	513.80	1111.40	0.00
13:18:12	0.80	0.00	0.00	0.00	0.00	0.00
13:18:17	0.80	0.00	0.00	0.00	0.00	0.00
Average	108.96	0.88	1.12	406.56	908.00	0.00

sar utility

```
$ sar -q 5 5
```

```
Linux 2.4.7-10smp (linux.bvha.net)
```

```
04/12/2015
```

01:13:55 PM	runq-sz	plist-sz	ldavg-1	ldavg-5	ldavg-15
01:14:00 PM	2	62	0.55	0.44	0.15
01:14:05 PM	5	64	1.88	0.49	0.13
01:14:10 PM	1	62	0.33	0.49	0.11
01:14:15 PM	2	62	0.43	0.48	0.11
01:14:20 PM	2	62	0.45	0.47	0.09
Average:	2	62	0.72	0.47	0.19

sadc and *sadf* utilities

- *sadc* is the back-end system activity data collector utility behind *sar*
 - Collects specified system data at configured intervals
 - Saves data to specified binary files
- *sadf* is the system activity data formatter which can be used to either report on data collected by *sadc/sar* or output it to be consumed by other programs like awk, MS-Excel, etc
 - Options for translating and displaying dates, numbers, text
 - Output to plain text or XML

mpstat utility

- Per-processor CPU statistics

```
$ mpstat 5 5
```

```
CPU minf mjf xcal intr ithr csw icsw migr srw syscl usr sys wt idl
```

```
  1  225   0  633  406  301 157    8   10   0  579  10   5  13  72
```

```
  2  230   0  449  444  319 161    8   10   0  581   9   4  10  76
```

```
CPU minf mjf xcal intr ithr csw icsw migr srw syscl usr sys wt idl
```

```
  1    1   0  582  338  236 283    4   10   0  615   5   3  67  24
```

```
  2    0   0  207  737  598 194    4   10   0  386   5   2  22  71
```

```
CPU minf mjf xcal intr ithr csw icsw migr srw syscl usr sys wt idl
```

```
  1    0   0  598  326  224 274    5   10   0  626   7   3  64  26
```

```
  2    0   0  263  882  724 191    2   10   0  337   3   2  25  70
```

vmstat utility

- Virtual memory statistics (SunOS)

```
$ vmstat 5 5
```

```
procs          memory                page          disk          faults         cpu
r b w swap  free  re  mf pi po fr de sr m1 in  sy  cs us sy id
2 0 0 71040 31248 51 456 17 0 0 0 0 0 750 287 318 10 4 86
1 0 0 59416 20392 59 568 44 0 0 0 0 0 941 612 528 6 5 89
1 0 0 59416 20392 0 0 0 0 0 0 0 0 947 122 472 6 2 92
0 1 1 59416 20392 0 0 0 0 0 0 0 0 998 136 548 6 3 91
0 1 0 59416 20392 1 0 0 0 0 0 0 0 837 967 449 5 2 93
```

uptime and *w* utilities

- *uptime* displays current time and up-time
 - Also displays the average number of processes in run-queue over the past 1 minute, 5 minutes, and 15 minutes (a.k.a. load average)

```
$ uptime
```

```
1:36pm, up 396 days, 21:36, 2 users, load avg: 0.31,0.28,0.28
```

- *w* displays same info plus info about logged-in UNIX users

```
$ w
```

```
1:04am, up 294 days, 23:30, 3 users, load avg: 0.58,0.42,0.31
```

USER	TTY	FROM	LOGIN@	IDLE	JCPU	PCPU	WHAT
tim	pts/0	abc.acme.com	12:16pm	1:07m	0.12s	0.12s	-bash
paul	pts/1	def.acme.com	Tue 8pm	11:12m	0.16s	0.16s	-bash
tim	pts/2	ghi.acme.com	12:17pm	1:14m	0.72s	0.67s	ssh jkl.a

ipcs utility

- Display (show) *interprocess communication* (IPC) data structures or resources
 - Shared memory
 - Use for Oracle's *System Global Area* (SGA)
 - Semaphores
 - Used by Oracle's *foreground* (i.e. user connections) and *background* (i.e. SMON, PMON, etc) *server processes*
 - Provide mutual-exclusion synchronization for concurrent multi-user processing
 - Message queues
 - **Not used by Oracle**
 - Typically used by *transaction processing monitors* (TPMs) such as Tuxedo, IBM CICS and Encina, NCR Top End, etc...
- UNIX *ipcrm* utility
 - Used to *remove* IPC structures displayed with *ipcs*

ipcs utility

- Oracle initialization parameters affecting IPC resource usage
 - Shared memory
 - SGA_TARGET, SGA_MAX_SIZE
 - MEMORY_TARGET, MEMORY_MAX_SIZE
 - DB_CACHE_SIZE, DB_*_CACHE_SIZE,
 - SHARED_POOL_SIZE, LARGE_POOL_SIZE, STREAMS_POOL_SIZE
 - LOG_BUFFER
 - Semaphores
 - PROCESSES

ipcs utility

```
$ ipcs -mb (SunOS)
```

```
IPC status from /dev/kmem as of Sat Mar 23 14:02:26 2015
```

T	ID	KEY	MODE	OWNER	GROUP	SEGSZ
Shared Memory:						
m	0	0x411c025d	--rw-rw-rw-	root	root	348
m	1	0x4e0c0002	--rw-rw-rw-	root	root	61760
m	2	0x41200e0a	--rw-rw-rw-	root	root	8192
m	3	0x301c6a7a	--rw-rw-rw-	root	root	1048576
m	101008	0x7988ff50	--rw-r-----	oracle	dba	957280256
m	19009	0x53494152	--rw-r--r--	root	sys	512
m	432011	0x12045bf8	--rw-r-----	oracle	dba	206798848
m	348012	0x0d6891d0	--rw-r-----	oracle	dba	206798848
m	9013	0x84006550	--rw-r-----	oracle	dba	99233792

ipcs utility

```
$ ipcs -sb (SunOS)
```

```
IPC status from /dev/kmem as of Sat Mar 23 14:04:25 2015
```

```
T      ID      KEY          MODE          OWNER        GROUP  NSEMS
```

```
Semaphores:
```

s	0	0x411c025d	--ra-ra-ra-	root	root	1
s	1	0x4e0c0002	--ra-ra-ra-	root	root	2
s	2	0x41200e0a	--ra-ra-ra-	root	root	2
s	16	0x6d200e5b	--ra-ra-ra-	root	root	1
s	25	0x52200e5b	--ra-ra-ra-	root	root	1
s	824026	0xafb30378	--ra-r-----	oracle	dba	104
s	105027	0x0317794c	--ra-r-----	oracle	dba	71
s	3282028	0x5701f4fc	--ra-r-----	oracle	dba	71
s	6954030	0x00000001	--ra-ra-ra-	root	root	1
s	7882031	0x5a6f7530	--ra-r-----	oracle	dba	71

Oracle *sysresv* utility

```
$ cd $ORACLE_HOME/bin
$ echo $ORACLE_SID
ebsprd1
$ ./sysresv
IPC Resources for ORACLE_SID "ebsprd1" :
Shared Memory:

ID                KEY
788529249         0x00000000
788529250         0x00000000
788529251         0x7988ff50

Semaphores:

ID                KEY
33554441          0xbf148024
33554442          0xbf148025
33554443          0xbf148026

Oracle Instance alive for sid "ebsprd1"
```

Process diagnostics

- top
 - Display “top” resource-consuming processes and totals
- ps
 - Process status
- pmap
 - Process memory mapping display
- fuser, lsof
 - File and file-system usage displays
- jstat
 - Java virtual machine (JVM) memory usage displays

top utility

System: xyz.acme.com

Sat Mar 23 12:03:24 2015

Load averages: 2.64, 2.63, 2.47

284 processes: 248 sleeping, 36 running

CPU	LOAD	USER	NICE	SYS	IDLE	BLOCK	SWAIT	INTR	SSYS
0	2.40	84.2%	0.0%	6.9%	8.9%	0.0%	0.0%	0.0%	0.0%
1	2.63	75.2%	0.0%	6.9%	17.8%	0.0%	0.0%	0.0%	0.0%
2	3.03	81.2%	0.0%	5.0%	13.9%	0.0%	0.0%	0.0%	0.0%
3	2.51	78.2%	0.0%	5.9%	15.8%	0.0%	0.0%	0.0%	0.0%
---	----	-----	-----	-----	-----	-----	-----	-----	-----
avg	2.64	80.2%	0.0%	5.9%	13.9%	0.0%	0.0%	0.0%	0.0%

Mem: 1459956K (1286788K) real, 724328K (175844K) virtual, 56900K free

CPU	TTY	PID	USERNAME	PRI	NI	SIZE	RES	STATE	TIME	%WCPU	%CPU	COMM
0	pts/tb	22509	tgorman	240	20	1788K	880K	run	3:39	16.55	16.52	bcp
2	pts/tb	22515	tgorman	152	20	6788K	5652K	run	2:57	14.01	13.99	sql1
2	pts/th	22890	tgorman	236	20	716K	316K	run	0:52	11.44	11.42	dump
3	?	22712	oracle	154	20	9344K	1904K	sleep	1:38	11.34	11.32	orac

ps utility

- SysV version (most variants)

```
$ ps -eaf
```

- BSD version (MacOSX)

```
% ps -aux
```

- Posix XPG3/4 (X/Open Portability Guide v3/4)

```
# ps -eo opt[,opt...]
```

- Provides info about individual processes
 - Status, PID, PPID, user, command text and parameters
 - Cumulative and recent CPU usage
 - Memory (virtual, resident)

ps utility

- An easy *home-grown* “top” command

```
$ ps -eaf | sort -n +3 | tail
```

```
oracle  15848      1 228 09:51:28 ?          19:34 ora_lgwr_acme01
tim     21167 21164 232 11:15:59 pts/td    2:59 bcp dss.dbo.modi
oracle  20371      1 235 10:57:05 ?          7:05 acme01 (LOCAL =
tim     21395 21392 235 11:24:52 pts/tf    0:19 dd if=/export/sc
tim     20176 20167 239 10:51:52 pts/ta    7:16 sqlldr parfile=t
tim     21416 21407 240 11:24:58 pts/tg    0:24 sqlldr parfile=t
tim     21471 21468 240 11:25:07 pts/th    0:18 dd if=/export/sc
tim     21410 21407 252 11:24:58 pts/tg    0:27 dd if=/export/sc
```

ps utility

- Another *home-grown* “top” command
 - Also displays memory consumption in Kbytes

```
$ ps -eo user,pid,pcpu,vsz,rss,comm | sort -n +2 | tail
```

```
   root 28103  0.1    3240    2560 /usr/local/sbin/sshd
oracle 20334  0.1  495056  447056 oraclePROD
oracle 20881  0.1  711552  634144 oraclePROD
oracle 18626  3.3  463240  428032 ora_lgwr_PROD
oracle 18624 12.2  465112  429480 ora_dbw0_PROD
   root     3 14.3         0         0 fsflush
oracle 18626 15.3  463240  428032 ora_lgwr_PROD
oracle 28077 30.8  486824  450200 oraclePROD
```

ps utility

- Displaying environment variable values within a process

```
$ ps -eaf | grep tns
```

```
oracle 5614      1  0 Sep16 ?                00:00:04  
/u01/app/oracle/product/11.2.0/db_1/bin/tnslsnr LISTENER -inherit  
oracle 19415 19380  0 18:27 pts/0          00:00:00 grep tns
```

```
$ ps eww 5614
```

```
  PID TTY          STAT       TIME COMMAND  
 5614 ?                Ss1        0:04 /u01/app/oracle/product/11.2.0/db_1/bin/tnslsnr  
LISTENER -inherit HOSTNAME=prod1 SHELL=/bin/bash TERM=linux HISTSIZE=1000  
USER=oracle ORACLE_SID=prod1 ORACLE_BASE=/u01/app/oracle  
PATH=/u01/app/oracle/product/11.2.0/db_1/bin:/usr/local/bin:/bin:/usr/bin  
PWD=/home/ora11202 LANG=en_US.UTF-8 HOME=/home/oracle  
TNS_ADMIN=/dba/oracle/network LOGNAME=oracle  
ORACLE_HOME=/u01/app/oracle/product/11.2.0/db_1  
_=/u01/app/oracle/product/11.2.0/db_1/bin/lsnrctl
```

CPU/memory diagnostics

- Use *top* and/or *ps* to identify process activity in UNIX/Linux
 - By current CPU activity
 - By total CPU time consumed
 - By time started
 - By process name
 - By UNIX account
 - By process hierarchy
 - *parent* processes, *child* processes, etc.

pmap utility

- Shared memory sections
 - *Text* memory sections
 - Executable file image (i.e. *oracle*)
 - Shared (dynamically-linked) libraries
 - *SHM* memory sections
 - System Global Area (SGA)
 - SGA_TARGET, SGA_MAX_SIZE
 - Session/user global area (UGA) for **shared servers**:
 - DB_FILES, OPEN_CURSORS, OPEN_LINKS, SESSION_CACHED_CURSORS

pmap/svmon utilities

- Private process memory sections
 - *Stack* memory sections
 - Process stack, assigned by the OS
 - *Heap* memory sections:
 - Session/user global area (UGA) for **dedicated servers**:
 - DB_FILES, OPEN_CURSORS, OPEN_LINKS, SESSION_CACHED_CURSORS
 - Process global area (PGA):
 - PGA_AGGREGATE_TARGET, PGA_AGGREGATE_LIMIT
 - SORT_AREA_SIZE, HASH_AREA_SIZE, BITMAP_MERGE_AREA_SIZE, CREATE_BITMAP_AREA_SIZE
 - Read buffers in SQL*Loader

pmap/svmon utilities

```
$ pmap -x 18373
```

```
18373: oraclePROD (DESCRIPTION=(LOCAL=no))
```

Addr	Kbytes	Resdent	Shared	Private	Permissions	Mapped File
00010	26488	13936	13536	400	read/exec	orac
019FC	272	272	216	56	read/write/exe	orac
01A40	480	480	-	480	read/write/exe	[heap]
80000	996816	996816	-	996816	read/write/shr	[ism shmi
FEAE6	8	8	-	8	read/write/exe	psrn
FEAF0	16	16	8	8	read/exec	libc
FEBF4	8	8	-	8	read/write/exe	libm
FEC00	4656	992	960	32	read/exe	libj
...						
FF3E0	8	8	-	8	read/write/exe	ld.s
FFBE0	64	64	-	64	read/write/exe	[stack]
-----	-----	-----	-----	-----		
Total	131688	115352	16480	998872		

fuser/lsof utilities

- Displays list of UNIX processes with file handles

```
$ fuser /d01001/oradata/PROD/indx_01.dbf
```

```
/d01001/oradata/PROD/indx_01.dbf: 450o 446o 444o
```

```
$ ps -eaf | grep 450
```

```
oracle 450 1 0 17:32:55 ? 0:01 ora_smon_PR
```

```
$ ps -eaf | grep 446
```

```
oracle 446 1 0 17:32:55 ? 0:00 ora_lgwr_PR
```

```
$ ps -eaf | grep 444
```

```
oracle 444 1 0 17:32:55 ? 0:01 ora_dbw0_PR
```

fuser/lsof utilities

- Displays list of UNIX processes using file-system

```
$ df -k
```

```
Filesystem          kbytes   used   avail  cap  Mount
/dev/dsk/c0t0s0    2052750 1586450 404718 80%  /
/proc                0         0       0     0%  /proc
/dev/dsk/c0t1s3    9708710 6904589 3387034 35%  /d010
swap                 998568   2104   996464 1%   /tmp
/dev/dsk/c0t0s3    5657589 3996745 1604269 72%  /opt
```

```
$ fuser /dev/dsk/c0t1s3
```

```
/dev/dsk/c0t1s3:  727ctm  725ctm  723ctm  722tm  720ctom
                  633tom  623tom  462o   458o   456o   454o   452o   450o   448o
                  446o   444o
```

fuser/lsof utilities

- Displays list of UNIX processes using file-system

```
$ df -k
```

```
Filesystem          kbytes   used   avail  cap  Mount
/dev/dsk/c0t0s0  2052750 1586450 404718 80%  /
/proc                0         0         0    0%  /proc
/dev/dsk/c0t1s3  9708710 6904589 3387034 35%  /d010
swap                998568   2104    996464  1%  /tmp
/dev/dsk/c0t0s3  5657589 3996745 1604269 72%  /opt
```

```
$ fuser /dev/dsk/c0t1s3
```

```
/dev/dsk/c0t1s3:  727ctm  725ctm  723ctm  722tm  720ctom
                  633tom  623tom  462o   458o   456o   454o   452o   450o   448o
                  446o   444o
```

fuser/lsof utilities

- Displays list of UNIX processes using file-system

```
# lsof /var
```

COMMAND	PID	USER	FD	TYPE	DEVICE	SIZE/OFF	NODE	NAME
syslogd	350	root	5w	VREG	222,5	0	440818	/var/adm/messag
syslogd	350	root	6w	VREG	222,5	339098	6248	/var/log/syslog
cron	353	root	cwd	VDIR	222,5	512	254550	/var -- atjobs

jstat utility

- Displays memory usage within JVM
 - Understanding Java Garbage Collection
 - <http://www.cubrid.org/blog/dev-platform/understanding-java-garbage-collection/>
 - How to Monitor Java Garbage Collection
 - <http://www.cubrid.org/blog/dev-platform/how-to-monitor-java-garbage-collection/>

jstat utility

- In a JVM, objects are allocated and managed implicitly
 - Destroying objects that no longer in use is called “garbage collection”
 - Objects are classified as “young” (new) or “old” (persistent)
 - Some objects move from “young” to “old”, some do not
 - Young objects promote from Eden to Survivor
 - Old objects are either “Old” or “Permanent”
 - Cleaning up “young” objects is easy, cleaning up “old” objects can be difficult due to dependencies and inheritance chains
 - Cleaning up “old” objects can be known as “Stop The World” (STW) events, which mean halting all activity within the JVM until the operation is completed

jstat utility

- Displays memory usage within JVM

```
$ jstat -gc 13513 1000
```

S0C	S1C	S0U	S1U	EC	EU	OC	OU	PC	PU	YGC	YGCT	FGC	FGCT	GCT
16128.0	1664.0	0.0	9881.6	667136.0	470346.6	1398784.0	1106875.4	65536.0	65007.6	183777	6048.454	109	64.755	6113.209
16128.0	1664.0	0.0	9881.6	667136.0	501826.7	1398784.0	1106875.4	65536.0	65007.6	183777	6048.454	109	64.755	6113.209
16128.0	1664.0	0.0	9881.6	667136.0	510070.9	1398784.0	1106875.4	65536.0	65007.6	183777	6048.454	109	64.755	6113.209



```
$ jstat -gc 13513 1000
```

...	YGC	YGCT	FGC	FGCT	GCT
...	183777	6048.454	109	64.755	6113.209
...	183777	6048.454	109	64.755	6113.209
...	183777	6048.454	109	64.755	6113.209

Network diagnostics

- ifconfig
 - Configure/display network interfaces
- netstat
 - Display cumulative network statistics
- ping
 - Send ICMP echo packets to network hosts
- traceroute
 - Trace the route of ICMP echo packets to network hosts
- tcpdump/snoop, wireshark

ifconfig utility

- Configures network interfaces
 - Configure new network interface: *ifconfig ... create inet ... up*
 - Display network interface status: *ifconfig -a*

```
$ ifconfig -a
```

```
lo0: flags=0849<UP,LOOPBACK,RUNNING,MULTICAST,IPv4> mtu 8232  
    inet 127.0.0.1 netmask ff000000
```

```
hme0: flags=0843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500  
    inet 10.8.2.10 netmask ffffffff0 broadcast 10.8.2.63
```

```
hme1: flags=0843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500  
    inet 10.8.2.12 netmask ffffffff0 broadcast 10.8.2.63
```

```
hme2: flags=0843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500  
    inet 192.168.2.18 netmask ffffffff0 broadcast 192.168.2.55
```

netstat utility

- Displays network connections, routing tables, interface statistics
 - Network connections (a.k.a. sockets): *netstat*
 - Cumulative networking statistics: *netstat -s*
 - Routing tables: *netstat -r*
 - STREAMS statistics (Solaris and AIX): *netstat -m*
- Verbose mode: add “-v” switch

netstat utility

```
$ netstat
```

```
Local Addr  Remote Addr  Swind  Snd-Q  Rwind  Rcv-Q  State
-----  -
xyz.32797   abc.1521     73620   0 73620   0 ESTABLISHED
xyz.1521    abc.32797   73620   0 73620   0 ESTABLISHED
xyz.1521    def.56788   24820   0 64240   0 ESTABLISHED
xyz.1521    def.60942   24320   0 64240   0 ESTABLISHED
xyz.22      ghi.2038     32120   0 24616   0 TIME_WAIT
xyz.1521    def.45444   73620   0 73620   0 TIME_WAIT
xyz.45451   ghi.1984     31856   0 66608   0 TIME_WAIT
xyz.1521    abc.45452   73620   0 73620   0 TIME_WAIT
```

```
...
```

```
Active UNIX domain sockets
```

```
Addr      Type      Vnode      Conn Remote Addr
303b9a88  stream-ord 303bf888  0000 /var/tmp/.oracle/sEXTPROC
303b9c30  stream-ord 303bef50  0000 /var/tmp/.oracle/s#1031.1
```

netstat utility

- Display network routing tables on the local host:

```
$ netstat -r
```

```
Routing Table: IPv4
```

Destination	Gateway	Flags	Ref	Uses	Interface
-----	-----	-----	---	-----	-----
abc.acme.com	jkl.acme.com	U	1	22541	hme0
def.acme.com	dmz.acme.com	U	1	347	hme1
ghi.acme.com	xyz.acme.com	U	2	45	hme2
224.0.0.0	dbif	U	1	0	hme0
localhost	localhost	UH	2	33384	lo0

ping utility

- Simple diagnostic test for network connectivity
 - Be aware that many network administrators block ICMP traffic for security reasons

```
$ ping -c 4 www.yahoo.com
```

```
PING www.yahoo.akadns.net (66.218.71.84) from 216.183.97.53 : 56(84) bytes of data.
```

```
64 bytes from w5.scd.yahoo.com (66.218.71.84): icmp_seq=0 ttl=56 time=30.864 msec
```

```
64 bytes from w5.scd.yahoo.com (66.218.71.84): icmp_seq=1 ttl=56 time=24.241 msec
```

```
64 bytes from w5.scd.yahoo.com (66.218.71.84): icmp_seq=2 ttl=56 time=24.238 msec
```

```
64 bytes from w5.scd.yahoo.com (66.218.71.84): icmp_seq=3 ttl=56 time=24.232 msec
```


traceroute utility

- Display the route taken by ICMP packets to an IP host

```
$ traceroute www.yahoo.com
```

```
Warning: www.yahoo.com has multiple addrs; using 66.218.70.49
```

```
traceroute to 66.218.70.49, 30 hops max, 38 byte packets
```

```
1  216.183.97.51 (216.183.97.51) 1.83 ms 0.29 ms 0.28 ms
2  xr05-1.xxx.net (217.189.96.5) 0.42 ms 0.32 ms 0.30 ms
3  POS2-3.ZZZ.NET (158.230.175.85) 1.06 ms 1.01 ms 0.97 ms
4  at-5-0.ZZZ.NET (152.63.91.126) 1.57 ms 1.61 ms 1.27 ms
5  so-7-0.ZZZ.NET (153.63.8.70) 11.13 ms 11.31 ms 11.04 ms
...
12 ge9-0.Level3.net (64.159.2.9) 27.72 ms 27.72 ms 27.74 ms
13 xz3-3.Level3.net (64.152.69.30) 33.16 ms 33.12 ms 33.05 ms
14 w18-ww.yahoo.com (66.218.70.49) 32.99 ms 33.05 ms 32.98 ms
```

telnet utility

- Originally used as a remote shell utility, now useful for checking TCP connectivity...

```
$ telnet prod.example.com 22
```

```
Trying 10.43.17.57...
```

```
Connected to prod.example.com (10.43.17.57).
```

```
Escape character is '^]'.  
SSH-2.0-OpenSSH_7.1
```

```
^]
```

```
telnet> quit
```

```
Connection closed.
```

← banner from telnet

← banner from telnet

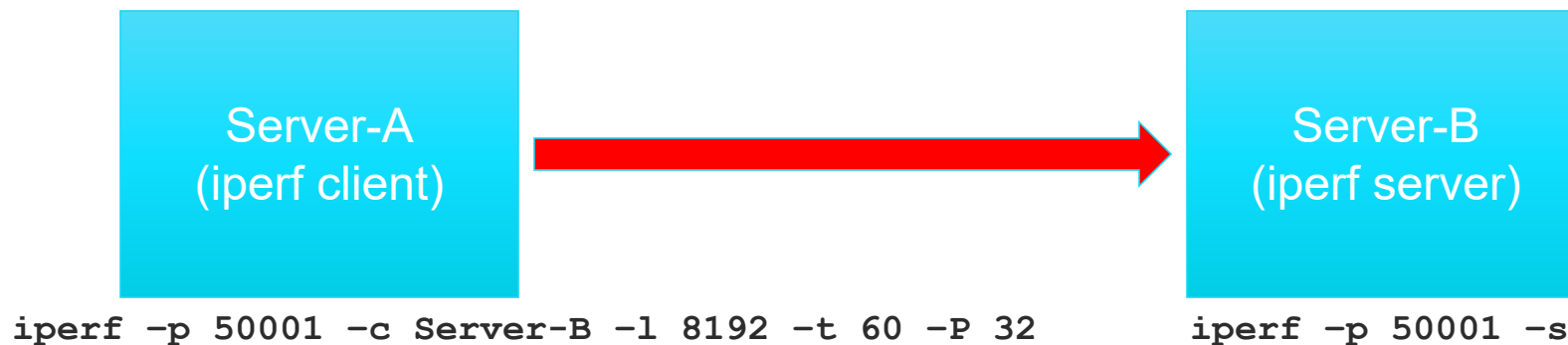
← banner from telnet

← response from port listener

← user-entered escape

iPerf3 utility

- iPerf3 is a tool for active measurements of the maximum achievable bandwidth on IP networks
 - supports tuning of various parameters related to timing, buffers and protocols (TCP, UDP, SCTP with IPv4 and IPv6)
 - Home page <https://iperf.fr/>
- “iperf” executable must be installed on servers on both ends of network being measured



tcpdump/snoop utilities

- Dump/sniff traffic on a network

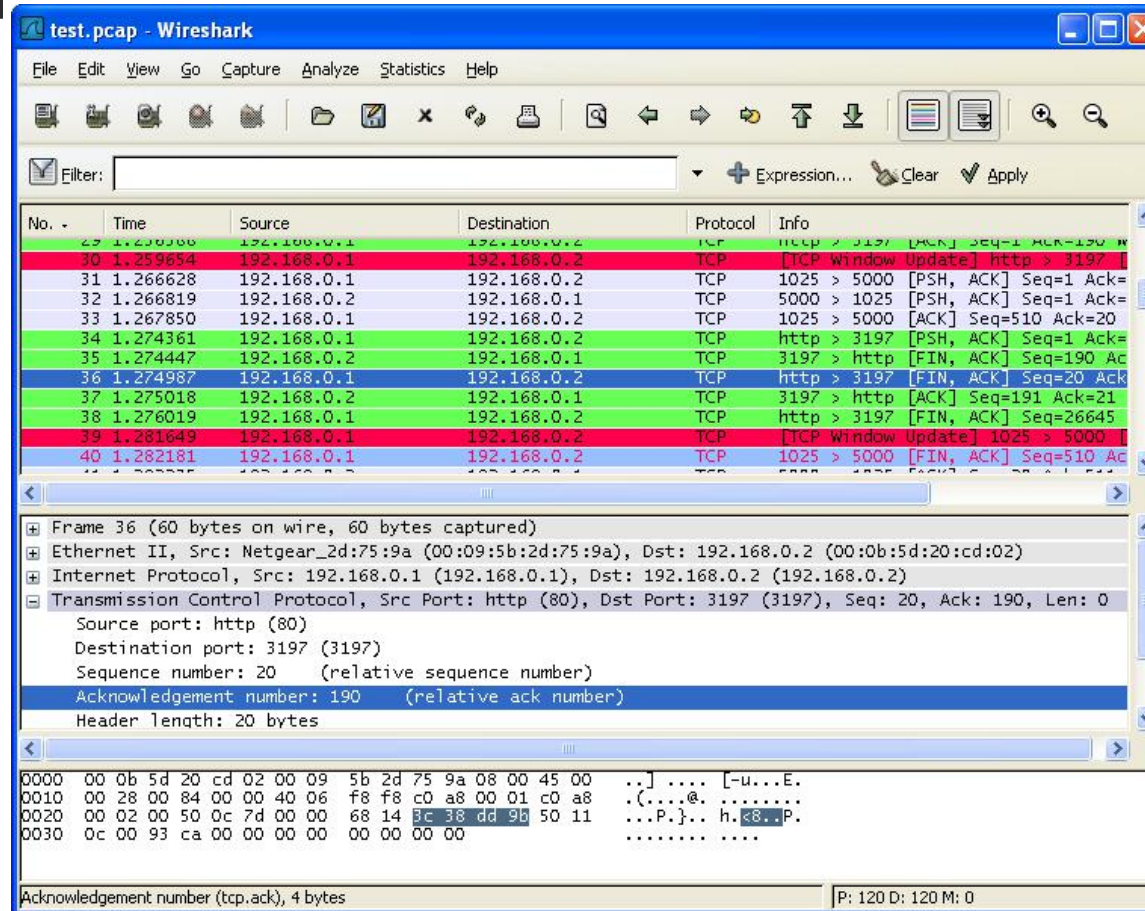
```
$ tcpdump
```

```
tcpdump: listening on hme0
```

```
17:01:12.147248 mail.acme.com.22 > 0-2pool182-  
90.nas33.thornton1.co.us.da.qwest.net.49161: P 428278756:428278820(64) ack  
1413349383 win 24624 <nop,nop,timestamp 157942572 1881953418> (DF) [tos 0x10]  
17:01:12.344385 0-2pool182-90.nas33.thornton1.co.us.da.qwest.net.49161 >  
mail.acme.com.22: . ack 64 win 32832 <nop,nop,timestamp 1881953418 157942561>  
(DF) [tos 0x10]  
17:01:13.143542 mail.acme.com.22 > 0-2pool182-  
90.nas33.thornton1.co.us.da.qwest.net.49161: P 64:480(416) ack 1 win 24624  
<nop,nop,timestamp 157942672 1881953418> (DF) [tos 0x10]
```

wireshark utility

- Wireshark (<http://wireshark.org>) is a network protocol analyzer



Trace utilities

- Different utilities on different platforms
 - *truss*
 - Solaris, AIX
 - *tusc*
 - HP-UX
 - *strace*
 - Linux
- Attach to *or* run a process and then trace:
 - UNIX *system calls* executed
 - Signals received
 - Machine faults incurred
 - (optional) entry/exit trace of *user level* function calls

truss utility

- Output from *truss* on Solaris10
 - Oracle PMON process

```
semop(196608, 0xFFBEE7F4, 1)                (sleeping...)
    Received signal #14, SIGALRM, in semop()    [caught]
semop(196608, 0xFFBEE7F4, 1)                Err#91 ERESTART
sigprocmask(SIG_BLOCK, 0xFFBEE320, 0x00000000) = 0
sigprocmask(SIG_UNBLOCK, 0xFFBEE320, 0x00000000) = 0
getcontext(0xFFBEE0E0)
setcontext(0xFFBEE0E0)
sigprocmask(SIG_BLOCK, 0xFFBEE5FC, 0x00000000) = 0
setitimer(ITIMER_REAL, 0xFFBEE584, 0x00000000) = 0
sigprocmask(SIG_UNBLOCK, 0xFFBEE5FC, 0x00000000) = 0
getcontext(0xFFBEE4E8)
sigprocmask(SIG_BLOCK, 0xFFBEE5FC, 0x00000000) = 0
```


DTrace utility

- Performance analysis and troubleshooting tool (<http://dtrace.org>)
- Not just user-level software (i.e. applications, databases and webservers)
 - also OS kernel and device drivers
 - provides a language, (i.e. “D”) for writing DTrace scripts and one-liners
- Terrific case-study of I/O performance analysis using DTrace
 - https://blogs.oracle.com/BestPerf/entry/i_o_analysis_using_dtrace

```
# dtrace -n 'proc:::exec-success{printf("%d %s",timestamp,curpsinfo->pr_psargs);}'
```

```
dtrace: description 'proc:::exec-success ' matched 1 probe
```

CPU	ID	FUNCTION:NAME
1	797	exec_common:exec-success 21935388676181394 man ls
0	797	exec_common:exec-success 21935388840101743 sh -c cd /usr/share/man; tbl /usr/sha
1	797	exec_common:exec-success 21935388858652639 col -x
0	797	exec_common:exec-success 21935388863714971 neqn /usr/share/lib/pub/eqnchar -
0	797	exec_common:exec-success 21935388867119787 tbl /usr/share/man/man1/ls.1
1	797	exec_common:exec-success 21935388881310626 nroff -u0 -Tlp -man -

Other useful utilities

- strings
 - Display text strings within a binary file
- file
 - Display the type of file
- dd
 - Copy (and optionally convert) data
- od
 - Octal dump (also dumps hex, decimal, and char)

strings utility

```
$ strings oracle | more
```

```
ksmpgf_
```

```
word
```

```
ksmmpd_
```

```
skgm_cx
```

```
ksmskgmctx_
```

```
skgmrhandle *
```

```
ksmrealm_
```

```
kgtmp *
```

```
ksmgpp_
```

```
ksmpy
```

```
ksmpgh_
```

```
struct ksmug *
```

file utility

```
$ file $ORACLE_HOME/bin/oracle
```

```
oracle: ELF 32-bit MSB executable SPARC Version 1, dynamically linked, not stripped
```

```
$ file oramem.sh
```

```
oramem.sh:      executable /bin/ksh script
```

dd utility

- The *dd* utility is useful for moving data:
 - Between files
 - From an *offset* within a file to an *offset* within a file
 - From files to devices and vice-versa
 - Devices could be tape, disk, network, etc...
 - Converting data
 - ASCII => EBCDIC and vice-versa
 - Big-endian => little-endian (a.k.a. *swab* operation) and vice-versa

od utility

```
$ dd if=system01.dbf bs=8k skip=100 count=1 2> /dev/null | \
```

```
> od -x
```

```
0000000 0602 0000 0040 0064 1c7d 0e89 0000 0106
0000020 bdbc 0000 0200 0000 0000 0027 1c7d 0e85
0000040 0000 fd78 0002 0200 0000 0000 0000 0000
0000060 0000 0000 0000 0000 0000 0000 0000 0000
0000100 0000 0000 0003 0055 0000 63b2 0100 11c1
0000120 1499 0100 2001 0000 1c7d 0e89 0000 8002
0000140 0000 0000 000c 003c 1e9d 1e7d 0000 0000
0000160 0000 0000 0000 0000 0600 0000 1f60 0000
0000200 1f53 1f45 1f37 1f29 1f1b 1f0d 1eff 1ef1
0000220 1ec7 1ee3 1ed5 1e9d 0000 0000 0000 0000
0000240 0000 0000 0000 0000 0000 0000 0000 0000
```

Support-recommended diagnostic tools

- Documented recommendations

http://docs.oracle.com/cd/E37670_01/E37355/html/ol_diag.html

- sosreport

http://docs.oracle.com/cd/E37670_01/E37355/html/ol_sosreport_diag.html

Collects configuration and diagnostic information for Linux systems

- kdump

http://docs.oracle.com/cd/E37670_01/E37355/html/ol_kdump_diag.html

Linux kernel crash-dump diagnostic tool

- OSWatcher Black Box (OSW or OSWbb)

http://docs.oracle.com/cd/E37670_01/E37355/html/ol_oswatcher_diag.html

Collects and archives OS and network metrics that you can use to diagnose performance issues

- Records output from iostat, mpstat, netstat, vmstat, ps, and top
 - Captures /proc/meminfo and /proc/slabinfo

ORACLE-L list

- Global email forum
 - Over 20 years old now and still going strong
 - Anyone can subscribe and listen
 - Must ask moderator for the right to post
- Subscribe via <http://www.freelists.org/list/oracle-l>
- Archives at <http://www.freelists.org/archive/oracle-l/>
 - All conversations back to Jan 2004 is archived and available for searching

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Linux/UNIX Tools For Oracle DBAs - SUN5694

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