

# sar

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SAR(1)

Linux User's Manual

SAR(1)

## NAME

sar - Collect, report, or save system activity information.

## SYNOPSIS

```
sar [ -A ] [ -b ] [ -B ] [ -c ] [ -d ] [ -H ] [ -h ] [ -i interval ] [
-q ] [ -r ] [ -R ] [ -t ] [ -u ] [ -v ] [ -V ] [ -w ] [ -W ] [ -y ] [
-n { DEV | EDEV | SOCK | FULL } ] [ -x { pid | SELF | ALL } ] [ -X {
pid | SELF | ALL } ] [ -I { irq | SUM | ALL | XALL } ] [ -P { cpu | ALL
} ] [ -o [ filename ] ] [ -f [ filename ] ] [ -s [ hh:mm:ss ] ] [ -e [
hh:mm:ss ] ] [ interval [ count ] ]
```

## DESCRIPTION

The **sar** command writes to standard output the contents of selected cumulative activity counters in the operating system. The accounting system, based on the values in the *count* and *interval* parameters, writes information the specified number of times spaced at the specified intervals in seconds. If the interval parameter is set to zero, the **sar** command displays the average statistics for the time since the system was started. The default value for the *count* parameter is 1. If its value is set to zero, then reports are generated continuously. The collected data can also be saved in the file specified by the **-o filename** flag, in addition to being displayed onto the screen. If *filename* is omitted, **sar** uses the standard system activity daily data file, the */var/log/sa/sadd* file, where the *dd* parameter indicates the current day.

The **sar** command extracts and writes to standard output records previously saved in a file. This file can be either the one specified by the **-f** flag or, by default, the standard system activity daily data file.

Without the **-P** flag, the **sar** command reports system-wide (global among all processors) statistics, which are calculated as averages for values expressed as percentages, and as sums otherwise. If the **-P** flag is given, the **sar** command reports activity which relates to the specified processor or processors. If **-P ALL** is given, the **sar** command reports statistics for each individual processor and global statistics among all processors.

You can select information about specific system activities using

flags. Not specifying any flags selects only CPU activity. Specifying the **-A** flag is equivalent to specifying **-bBcdqRuvWwy -I SUM -n FULL -P ALL**.

The default version of the **sar** command (CPU utilization report) might be one of the first facilities the user runs to begin system activity investigation, because it monitors major system resources. If CPU utilization is near 100 percent (user + nice + system), the workload sampled is CPU-bound.

If multiple samples and multiple reports are desired, it is convenient to specify an output file for the **sar** command. Run the **sar** command as a background process. The syntax for this is:

```
sar -o data.file interval count >/dev/null 2>&1 &
```

All data is captured in binary form and saved to a file (data.file). The data can then be selectively displayed with the **sar** command using the **-f** option. Set the *count* parameter to select records at *count* second intervals. If this parameter is not set, all the records saved in the file will be selected. Collection of data in this manner is useful to characterize system usage over a period of time and determine peak usage hours.

**Note:** The **sar** command only reports on local activities.

## OPTIONS

**-A** This is equivalent to specifying **-bBcdqRuvWwy -I SUM -n FULL -P ALL**.

**-b** Report I/O and transfer rate statistics. This option works only with kernels older than 2.5. The following values are displayed:

### **tps**

Total number of transfers per second that were issued to the physical disk. A transfer is an I/O request to the physical disk. Multiple logical requests can be combined into a single I/O request to the disk. A transfer is of indeterminate size.

### **rtps**

Total number of read requests per second issued to the physical disk.

### **wtps**

Total number of write requests per second issued to the physical disk.

### **bread/s**

Total amount of data read from the drive in blocks per second. Blocks are equivalent to sectors with 2.4 kernels and newer and therefore have a size of 512 bytes. With older kernels, a block is of indeterminate size.

### **bwrtn/s**

Total amount of data written to the drive in blocks per second.

- B** Report paging statistics. The following values are displayed:
- pgpgin/s**  
Total number of kilobytes the system paged in from disk per second.
- pgpgout/s**  
Total number of kilobytes the system paged out to disk per second.
- fault/s**  
Number of page faults (major + minor) made by the system per second (post 2.5 kernels only). This is not a count of page faults that generate I/O, because some page faults can be resolved without I/O.
- majflt/s**  
Number of major faults the system has made per second, those which have required loading a memory page from disk (post 2.5 kernels only).
- c** Report process creation activity.
- proc/s**  
Total number of processes created per second.
- d** Report activity for each block device (kernels 2.4 and newer only). When data is displayed, the device specification *dev m-n* is generally used ( **DEV** column). **m** is the major number of the device. With recent kernels (post 2.5), **n** is the minor number of the device, but is only a sequence number with pre 2.5 kernels.
- tps**  
Indicate the number of transfers per second that were issued to the device. Multiple logical requests can be combined into a single I/O request to the device. A transfer is of indeterminate size.
- rd\_sec/s**  
Number of sectors read from the device. The size of a sector is 512 bytes.
- wr\_sec/s**  
Number of sectors written to the device. The size of a sector is 512 bytes.
- e hh:mm:ss**  
Set the ending time of the report. The default ending time is 18:00:00. Hours must be given in 24-hour format. This option can be used only when data are read from or written to a file (options **-f** or **-o** ). Note that if you also use **-h** option, ending time will have to be given in UTC (Coordinated Universal Time).
- f filename**  
Extract records from *filename* (created by the **-o filename** flag). The default value of the **filename** parameter is the current daily data file, the */var/log/sa/sadd* file. The **-f** option is exclusive of the **-o** option.
- h** When reading data from a file, print its contents in a format that can easily be handled by pattern processing commands like *awk*. The output consists of fields separated by a tab. Each record contains the hostname of the host where *sar* was run, the

interval value (or -1 if not applicable), the timestamp (UTC value - Coordinated Universal Time) in seconds from the epoch, the device name (or - if not applicable), the field name and its value.

**-H** When reading data from a file, print its contents in a format that can easily be ingested by a relational database system. The output consists of fields separated by a semicolon. Each record contains the hostname of the host where sar was run, the interval value (or -1 if not applicable), the sar timestamp in a form easily acceptable by most databases, and additional semicolon separated data fields as specified by other sar command line options. Note that the timestamp is displayed in UTC (Coordinated Universal Time) unless option -t is used. In this latter case, the timestamp is displayed in local time.

**-i interval**  
Select data records at seconds as close as possible to the number specified by the *interval* parameter.

**-I irq | SUM | ALL | XALL**  
Report statistics for a given interrupt. **irq** is the interrupt number. The **SUM** keyword indicates that the total number of interrupts received per second is to be displayed. The **ALL** keyword indicates that statistics from the first 16 interrupts are to be reported, whereas the **XALL** keyword indicates that statistics from all interrupts, including potential APIC interrupt sources, are to be reported.

**-n DEV | EDEV | SOCK | FULL**  
Report network statistics.

With the **DEV** keyword, statistics from the network devices are reported. The following values are displayed:

**IFACE**  
Name of the network interface for which statistics are reported.

**rxpck/s**  
Total number of packets received per second.

**txpck/s**  
Total number of packets transmitted per second.

**rxbyt/s**  
Total number of bytes received per second.

**txbyt/s**  
Total number of bytes transmitted per second.

**rxcmp/s**  
Number of compressed packets received per second (for cslip etc.).

**txcmp/s**  
Number of compressed packets transmitted per second.

**rxmcast/s**  
Number of multicast packets received per second.

With the **EDEV** keyword, statistics on failures (errors) from the network devices are reported. The following values are displayed:

**IFACE**  
Name of the network interface for which statistics are reported.

**rxerr/s**  
Total number of bad packets received per second.

**txerr/s**  
Total number of errors that happened per second while transmitting packets.

**coll/s**  
Number of collisions that happened per second while transmitting packets.

**rxdrop/s**  
Number of received packets dropped per second because of a lack of space in linux buffers.

**txdrop/s**  
Number of transmitted packets dropped per second because of a lack of space in linux buffers.

**txcarr/s**  
Number of carrier-errors that happened per second while transmitting packets.

**rxfram/s**  
Number of frame alignment errors that happened per second on received packets.

**rxfifo/s**  
Number of FIFO overrun errors that happened per second on received packets.

**txfifo/s**  
Number of FIFO overrun errors that happened per second on transmitted packets.

With the **SOCK** keyword, statistics on sockets in use are reported. The following values are displayed:

**totsck**  
Total number of used sockets.

**tcpsck**  
Number of TCP sockets currently in use.

**udpsck**  
Number of UDP sockets currently in use.

**rawsck**  
Number of RAW sockets currently in use.

**ip-frag**  
Number of IP fragments currently in use.

The **FULL** keyword is equivalent to specifying all the keywords above and therefore all the network activities are reported.

**-o filename**  
Save the readings in the file in binary form. Each reading is in a separate record. The default value of the **filename** parameter

is the current daily data file, the `/var/log/sa/sadd` file. The `-o` option is exclusive of the `-f` option.

`-P cpu | ALL`

Report per-processor statistics for the specified processor or processors. Specifying the **ALL** keyword reports statistics for each individual processor, and globally for all processors. Of the flags which specify the statistics to be reported, only the `-u` and `-I SUM` flags are meaningful with the `-P` flag. Note that processor 0 is the first processor.

`-q` Report queue length and load averages. The following values are displayed:

**runq-sz**

Run queue length (number of processes waiting for run time).

**plist-sz**

Number of processes in the process list.

**ldavg-1**

System load average for the last minute.

**ldavg-5**

System load average for the past 5 minutes.

**ldavg-15**

System load average for the past 15 minutes.

`-r` Report memory and swap space utilization statistics. The following values are displayed:

**kbmemfree**

Amount of free memory available in kilobytes.

**kbmemused**

Amount of used memory in kilobytes. This does not take into account memory used by the kernel itself.

**%memused**

Percentage of used memory.

**kbbuffers**

Amount of memory used as buffers by the kernel in kilobytes.

**kbcached**

Amount of memory used to cache data by the kernel in kilobytes.

**kbswpfree**

Amount of free swap space in kilobytes.

**kbswpused**

Amount of used swap space in kilobytes.

**%swpused**

Percentage of used swap space.

**kbswpcad**

Amount of cached swap memory in kilobytes. This is memory that once was swapped out, is swapped back in but still also is in the swap area (if memory is needed it

doesn't need to be swapped out again because it is already in the swap area. This saves I/O).

**-R** Report memory statistics. The following values are displayed:

**frmpg/s**

Number of memory pages freed by the system per second. A negative value represents a number of pages allocated by the system. Note that a page has a size of 4 kB or 8 kB according to the machine architecture.

**bufpg/s**

Number of additional memory pages used as buffers by the system per second. A negative value means fewer pages used as buffers by the system.

**campg/s**

Number of additional memory pages cached by the system per second. A negative value means fewer pages in the cache.

**-s hh:mm:ss**

Set the starting time of the data, causing the **sar** command to extract records time-tagged at, or following, the time specified. The default starting time is 08:00. Hours must be given in 24-hour format. This option can be used only when data are read from a file (option **-f**). Note that if you also use **-h** option, starting time will have to be given in UTC (Coordinated Universal Time).

**-t**

When reading data from a daily data file, indicate that **sar** should display the timestamps in the original locale time of the data file creator. Without this option, the **sar** command displays the timestamps in the user locale time. When this option is used together with option **-H**, the timestamp is displayed in local time instead of UTC (Coordinated Universal Time). This option is ignored when option **-h** is used.

**-u** Report CPU utilization. The following values are displayed:

**%user**

Percentage of CPU utilization that occurred while executing at the user level (application).

**%nice**

Percentage of CPU utilization that occurred while executing at the user level with nice priority.

**%system**

Percentage of CPU utilization that occurred while executing at the system level (kernel).

**%iowait**

Percentage of time that the CPU or CPUs were idle during which the system had an outstanding disk I/O request.

**%idle**

Percentage of time that the CPU or CPUs were idle and the system did not have an outstanding disk I/O request.

**-v** Report status of inode, file and other kernel tables. The following values are displayed:

**dentunusd**

Number of unused cache entries in the directory cache.

**file-sz**

Number of used file handles.

**inode-sz**

Number of used inode handlers.

**super-sz**

Number of super block handlers allocated by the kernel.

**%super-sz**

Percentage of allocated super block handlers with regard to the maximum number of super block handlers that Linux can allocate.

**dquot-sz**

Number of allocated disk quota entries.

**%dquot-sz**

Percentage of allocated disk quota entries with regard to the maximum number of cached disk quota entries that can be allocated.

**rtsig-sz**

Number of queued RT signals.

**%rtsig-sz**

Percentage of queued RT signals with regard to the maximum number of RT signals that can be queued.

-V Print version number and usage then exit.

-w Report system switching activity.

**cswch/s**

Total number of context switches per second.

-W Report swapping statistics. The following values are displayed:

**pswpin/s**

Total number of swap pages the system brought in per second.

**pswpout/s**

Total number of swap pages the system brought out per second.

-x pid | SELF | ALL

Report statistics for a given process. **pid** is the process identification number. The **SELF** keyword indicates that statistics are to be reported for the **sar** process itself, whereas the **ALL** keyword indicates that statistics are to be reported for all the system processes. All these statistics cannot be saved to a file. So this option will be ignored whenever -o option is used. At the present time, no more than 256 processes can be monitored simultaneously.

The following values are displayed:

**minflt/s**

Total number of minor faults the process has made per second, those which have not required loading a memory page from disk.



**majflt/s**

Total number of major faults the process has made per second, those which have required loading a memory page from disk.

**%user**

Percentage of CPU used by the process while executing at the user level (application).

**%system**

Percentage of CPU used by the process while executing at the system level (kernel).

**nswap/s**

Number of pages from the process address space the system has swapped out per second.

**CPU**

Processor number to which the process is attached.

**-X pid | SELF | ALL**

Report statistics for the child processes of the process whose PID is **pid**. The **SELF** keyword indicates that statistics are to be reported for the child processes of the **sar** process itself, whereas the **ALL** keyword indicates that statistics are to be reported for all the child processes of all the system processes. All these statistics cannot be saved to a file. So this option will be ignored whenever **-o** option is used. At the present time, no more than 256 processes can be monitored simultaneously. The following values are displayed:

**cminflt/s**

Total number of minor faults the child processes have made per second, those which have not required loading a memory page from disk.

**cmajflt/s**

Total number of major faults the child processes have made per second, those which have required loading a memory page from disk.

**%cuser**

Percentage of CPU used by the child processes while executing at the user level (application).

**%csystem**

Percentage of CPU used by the child processes while executing at the system level (kernel).

**cnswap/s**

Number of pages from the child process address spaces the system has swapped out per second.

**-y** Report TTY device activity. The following values are displayed:

**rcvin/s**

Number of receive interrupts per second for current serial line. Serial line number is given in the TTY column.

**xmtin/s**

Number of transmit interrupts per second for current serial line.

Note that with recent 2.6 kernels, these statistics can be retrieved only by root.

## ENVIRONMENT

The **sar** command takes into account the following environment variable:

### S\_TIME\_FORMAT

If this variable exists and its value is **ISO** then the current locale will be ignored when printing the date in the report header. The **sar** command will use the ISO 8601 format (YYYY-MM-DD) instead.

## EXAMPLES

**sar -u 2 5**

Report CPU utilization for each 2 seconds. 5 lines are displayed.

**sar -I 14 -o int14.file 2 10**

Report statistics on IRQ 14 for each 2 seconds. 10 lines are displayed. Data are stored in a file called *int14.file*.

**sar -r -n DEV -f /var/log/sa/sa16**

Display memory, swap space and network statistics saved in daily data file 'sa16'.

**sar -A**

Display all the statistics saved in current daily data file.

## BUGS

*/proc* filesystem must be mounted for the **sar** command to work.

All the statistics are not necessarily available, depending on the kernel version used.

## FILES

*/var/log/sa/sadd*

Indicate the daily data file, where the **dd** parameter is a number representing the day of the month.

*/proc* contains various files with system statistics.

## AUTHOR

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## SEE ALSO

`sadc(8)`, `sa1(8)`, `sa2(8)`, `isag(1)`, `mpstat(1)`, `iostat(1)`, `vmstat(8)`

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Linux

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