



Unix /proc file system



Back in the old days, it was very difficult to find answers to the following kinds of questions.

- How many processes are running on the system and by whom are they owned?
- What files does a process have open?
- What files are currently locked, and which processes hold the locks?
- What sockets are being used on the system?

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You could open a file called `/dev/kmem` or `/dev/mem` and get some symbols out of there, but the symbols and locations varied from vendor to vendor.

The `/proc` virtual file system is a lot easier to use.

The `/proc` file system is said to be virtual because the files and subdirectories that it contains don't reside on a disk. Instead, the kernel creates them "on the fly" as processes access them.



Files in /proc



`/proc/loadavg`

The first three fields in this file are load average figures giving the number of jobs in the run queue (state R) or waiting for disk I/O (state D) averaged over 1, 5, and 15 minutes.

`/proc/version`

This string identifies the kernel version that is currently running.

`/proc/uptime`

This file contains two numbers: the uptime of the system (seconds), and the amount of time spent in idle process (seconds).

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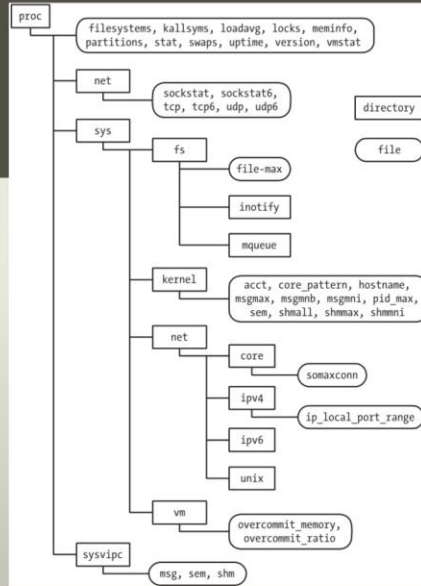
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There are so many files and directories in the `/proc` file system that I cannot cover a fraction of them. You can look at the man page for `proc` to see what they are. I'll mention just a couple here.

loadavg: They are the same as the load average numbers given by `uptime(1)` and other programs. The fourth field consists of two numbers separated by a slash (/). The first of these is the number of currently executing kernel scheduling entities (processes, threads); this will be less than or equal to the number of CPUs. The value after the slash is the number of kernel scheduling entities that currently exist on the system. The fifth field is the PID of the process that was most recently created on the system.

version:

uptime:



As you can see, there are a LOT of files and directories.

`/proc/PID`



For each process on the system, the kernel provides a corresponding directory named `/proc/PID`, where *PID* is the process-ID of the process.

Within this directory are various files and subdirectories containing information about that process.

/proc/PID



File	Description (process attribute)
cmdline	Command-line arguments delimited by \0
cwd	Symbolic link to current working directory
environ	Environment list <i>NAME=value</i> pairs, delimited by \0
exe	Symbolic link to file being executed
fd	Directory containing symbolic links to files opened by this process
maps	Memory mappings
mem	Process virtual memory (must <i>lseek()</i> to valid offset before I/O)
mounts	Mount points for this process
root	Symbolic link to root directory
status	Various information (e.g., process IDs, credentials, memory usage, signals)
task	Contains one subdirectory for each thread in process (Linux 2.6)

A few of the files inside the /proc/PID directory. We are going to look at the status file in a bit more detail.