

# Linux Performance Metrics

The Uptime Infrastructure Monitor Linux agent collects the following performance metrics from the systems on which it is installed:

- CPU
- Multi-CPU
- Memory
- Disk
- Network
- Process
- Workload
- User

Each set of performance metrics is averaged over an interval of one second.

## CPU

The Uptime Infrastructure Monitor agent uses the `sar -urWqR 1` command to compare the system counters during a one-second interval. The statistics returned by the agent are averaged for all CPUs on the system.

Metric	Explanation	Source
%USR	The percentage of time that the processor spends in user mode (a processing mode for applications and subsystems).	/proc/cpuinfo
%SYS	The percentage of time that the kernel spends processing system calls.	/proc/cpuinfo
%WIO	The amount of waiting time that a runnable process for a device takes to perform an I/O operation.	/proc/cpuinfo
%Total	The total amount of User %, System %, and Wait I/O %	/proc/cpuinfo
Run Queue Length	The percentage of time that one or more services or processes are waiting to be served by the CPU.	/proc/cpuinfo

## Multi-CPU

The Uptime Infrastructure Monitor agent uses the `sar` and `mpstat` utilities on a Linux system to collect the metrics in the table below from Linux systems with multiple CPUs. The agent averages the statistics from each CPU using the `sar -x SELF -I SUM -P ALL -wu 1` command, which compares the system counters during a one-second interval. The statistics that the agent returns are for the entire system, per CPU.

Me tric	Explanation
Us er %	The percentage of CPU user processes that are in use.
Sy ste m %	The percentage of CPU kernel processes that are in use.
Wa it I /O %	The percentage of time that a process which can be run must wait for a device to perform an I/O operation.
SM TX	The number of read or write locks that a thread was not able to acquire on the first attempt, as reported by the <code>mpstat</code> command.
XC AL	The number of interprocess cross-calls. In a multi-processor environment, one processor sends cross-calls to another processor to get that processor to do work. Cross-calls can also be used to ensure consistency in virtual memory. Heavy file system activity (such as NFS) can result in a high number of cross-calls.
Int err upts	The number of CPU interrupts.
Tot al %	The total amount of User %, System %, and Wait I/O%.

## Memory

The Uptime Infrastructure Monitor agent uses the `free` command to collect the Free Memory metric from a Linux system. The rest of the memory related metrics are gathered by the `sar -urWqR 1` command which compares the system counters during a one-second interval. The statistics that the agent returns are for the entire system.

Metric	Explanation	Source
Free Memory	The amount of physical memory available to the operating system, system library files, and applications.	/proc/meminfo
Cache Hit Rate	How often the system accesses the CPU cache.	/proc/meminfo
PageOut per Second	The rate at which pages were written to disk.	/proc/meminfo
PageIn per Second	The rate at which pages were read from or written to the disk.	/proc/meminfo
PageFree per Second	The number of pages that are freed from memory each second.	/proc/meminfo
PageScan per Second	The average number of pages that are scanned each second.	/proc/meminfo
Free Swap	The amount of available free swap space, as a percentage of total available free swap space.	/proc/meminfo

## Disk

The Uptime Infrastructure Monitor agent gathers file system statistics for each file system using the `df -lk` command. Disk statistics (e.g. %busy, reads per second and writes per second) are output per disk and compared between polling intervals using the `iostat -d -x 1 2` command.

Metric	Explanation	Source
Disk (Spindle) Name	The names of each disk on the system.	/proc /diskstats
Usage (% Busy)	The percentage of time during which the disk drive is handling read or write requests.	/proc /diskstats
Throughput (Blk/s)	The number of read and write operations on the disk that occur each second.	/proc /diskstats
Read/Writes/s	The average number of bytes that have been transferred to or from the disk during write or read operations.	/proc /diskstats
Average Queue Length	The number of threads that are waiting for processor time.	/proc /diskstats
Average Service Time	The average amount of time, in milliseconds, that is required for a request to be carried out.	/proc /diskstats
Average Wait Time	The average time, in milliseconds, that a transaction is waiting in a queue. The wait time is directly proportional to the length of the queue.	/proc /diskstats

## Network

The Uptime Infrastructure Monitor agent uses the `netstat -s` command to retrieve a combined total of TCP Retransmits for all network interfaces. Other network statistics (e.g. kbps, errors and collisions) are averaged, per interface, using the `sar -n DEV -n EDEV 1` command, which compares the system counters during a one-second interval.

Metric	Explanation	Source
In Kbps	The rate, in kilobytes per seconds, at which data is received over a specific network adapter.	/proc /net
Out Kbps	The rate, in kilobytes per seconds, at which data is sent over a specific network adapter.	/proc /net
In Errors	The number of inbound packets that contained errors, which preventing those packets from being delivered to a higher-layer protocol.	/proc /net
Out Errors	The number of outbound packets that could not be transmitted because of errors.	/proc /net
Collisions	The number of signals from two separate nodes on the network that have collided.	/proc /net

TCP Retransmits	The number of packets that have been re-sent over a network interface. The agent returns a combined total for all interfaces.	/proc /net
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## Process

The Uptime Infrastructure Monitor agent uses the `ps -eo` command to collect the process information listed in the table below from a Linux system. By default, the agent gathers the top 20 processes and sorts them by the highest CPU usage.

Metric	Explanation	Source
PID	The unique identifier of a specific process.	/proc/stat
PPID	The identifier of the process that the process that is currently running.	/proc/stat
UID	A value that identifies the current user.	/proc/stat
GID	A value that identifies a group of users.	/proc/stat
Memory Consumed	The amount of memory that is being used by a process.	/proc/stat
RSS	The amount of physical memory that is being used by a process.	/proc/stat
CPU % Utilization by Process	The percentage of CPU time that is being used by individual processes.	/proc/stat
Memory % Utilization by Process	The amount of physical memory that is being used by individual processes.	/proc/stat
Process Start Time	The time at which the process started.	/proc/stat
Process Run Time	The time at which the process started.	/proc/stat
Number of Processes Running	The total number of processes that are currently running on the system.	/proc/stat
Number of Blocked Processes	The total number of processes that are blocking resources.	/proc/stat
Number of Waiting Processes	The total number of processes that are waiting to be executed by the CPU.	/proc/stat
Execs per Second	The total number of system calls that are executed each second.	/proc/stat
Process Creation Rate	The total number of processes that are being spawned over a specified time period.	/proc/stat

## Workload

The Uptime Infrastructure Monitor agent uses the `ps` utility to collect workload information from a Linux system. Workload statistics (based on the same 20 processes that were gathered from the [Process method](#)) are sorted within Uptime Infrastructure Monitor's core. The workload processes that the agent gathers include the user/group/process name and their individual statistics, which can be sorted based on the user's desired graph presentation (e.g. user, group or process name).

Metric	Explanation	Source
Workload by Process	The demand that network and local services are putting on a system, based on the processes that are running.	/proc /load
Workload by User	The demand that network and local services are putting on the system, based on the IDs of the users who are logged into a system.	/proc /load
Workload by Group	The demand that network and local services are putting on the system, based on the IDs of the user groups that are logged into a system.	/proc /load
Workload Top 10 by Process	The 10 processes that are consuming the most CPU resources.	/proc /load
Workload Top 10 by User	The 10 processes the are consuming the most CPU resources, based on user ID.	/proc /load
Workload Top 10 by Group	The 10 processes the are consuming the most CPU resources, based on group ID.	/proc /load

## User

The Uptime Infrastructure Monitor agent uses the following commands to collect user statistics from a system:

- `ps -eo`
- `last | head 10` (login history for the last 10 users on the system)
- `who` (lists who is currently logged into the system)

Metric	Explanation
Login History	The number of times or frequency at which a user has logged into a system during any 30 minute time interval.
Sessions	The number of sessions or number of distinct users who are logged into a system during any 30 minute time interval.