SystemTap Tapset Reference Manual

SystemTap

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by SystemTap

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Chapter 1. Introduction

SystemTap provides free software (GPL) infrastructure to simplify the gathering of information about the running Linux system. This assists diagnosis of a performance or functional problem. SystemTap eliminates the need for the developer to go through the tedious and disruptive instrument, recompile, install, and reboot sequence that may be otherwise required to collect data.

SystemTap provides a simple command line interface and scripting language for writing instrumentation for a live running kernel. The instrumentation makes extensive use of the probe points and functions provided in the *tapset* library. This document describes the various probe points and functions.

Tapset Name Format

In this guide, tapset definitions appear in the following format:

```
name:return (parameters)
definition
```

The *return* field specifies what data type the tapset extracts and returns from the kernel during a probe (and thus, returns). Tapsets use 2 data types for *return*: `long` (tapset extracts and returns an integer) and `string` (tapset extracts and returns a string).

In some cases, tapsets do not have a *return* value. This simply means that the tapset does not extract anything from the kernel. This is common among asynchronous events such as timers, exit functions, and print functions.

Chapter 2. Context Functions

The context functions provide additional information about where an event occurred. These functions can provide information such as a backtrace to where the event occurred and the current register values for the processor.

Name

function::print_regs — Print a register dump.

Synopsis

```
print_regs()
```

Arguments

None

Name

function::execname — Returns the execname of a target process (or group of processes).

Synopsis

```
execname:string()
```

Arguments

None

Name

function::pid — Returns the ID of a target process.

Synopsis

```
pid:long()
```

Arguments

None

Name

function::tid — Returns the thread ID of a target process.

Synopsis

```
tid:long()
```

Arguments

None

Name

function::ppid — Returns the process ID of a target process's parent process.

Synopsis

```
ppid:long()
```

Arguments

None

Name

function::pgrp — Returns the process group ID of the current process.

Synopsis

```
pgrp:long()
```

Arguments

None

Name

function::sid — Returns the session ID of the current process.

Synopsis

```
sid:long()
```

Arguments

None

Description

The session ID of a process is the process group ID of the session leader. Session ID is stored in the signal_struct since Kernel 2.6.0.

Name

function::pexecname — Returns the execname of a target process's parent process.

Synopsis

```
pexecname:string()
```

Arguments

None

Name

function::gid — Returns the group ID of a target process.

Synopsis

```
gid:long()
```

Arguments

None

Name

function::egid — Returns the effective gid of a target process.

Synopsis

```
egid:long()
```

Arguments

None

Name

function::uid — Returns the user ID of a target process.

Synopsis

```
uid:long()
```

Arguments

None

Name

function::euid — Return the effective uid of a target process.

Synopsis

```
euid:long()
```

Arguments

None

Name

function::is_myproc — Determines if the current probe point has occurred in the user's own process.

Synopsis

```
is_myproc:long()
```

Arguments

None

Description

Return 1 if the current probe point has occurred in the user's own process.

Name

function::cpu — Returns the current cpu number.

Synopsis

```
cpu:long()
```

Arguments

None

Name

function::pp — Return the probe point associated with the currently running probe handler,

Synopsis

```
pp:string()
```

Arguments

None

Description

including alias and wildcard expansion effects

Context

The current probe point.

Name

function::registers_valid — Determines validity of `register` and `u_register` in current context.

Synopsis

```
registers_valid:long()
```

Arguments

None

Description

Return 1 if `register` and `u_register` can be used in the current context, or 0 otherwise. For example, `registers_valid` returns 0 when called from a begin or end probe.

Name

function::user_mode — Determines if probe point occurs in user-mode.

Synopsis

```
user_mode:long()
```

Arguments

None

Description

Return 1 if the probe point occurred in user-mode.

Name

function::is_return — Whether the current probe context is a return probe.

Synopsis

```
is_return:long()
```

Arguments

None

Description

Returns 1 if the current probe context is a return probe, returns 0 otherwise.

Name

function::target — Return the process ID of the target process.

Synopsis

```
target:long()
```

Arguments

None

Name

function::module_name — The module name of the current script.

Synopsis

```
module_name:string()
```

Arguments

None

Description

Returns the name of the stap module. Either generated randomly (stap_[0-9a-f]+_[0-9a-f]+) or set by stap -m <module_name>.

Name

function::stp_pid — The process id of the stapio process.

Synopsis

```
stp_pid:long()
```

Arguments

None

Description

Returns the process id of the stapio process that launched this script.

Name

function::stack_size — Return the size of the kernel stack.

Synopsis

```
stack_size:long()
```

Arguments

None

Name

function::stack_used — Returns the amount of kernel stack used.

Synopsis

```
stack_used:long()
```

Arguments

None

Description

Determines how many bytes are currently used in the kernel stack.

Name

function::stack_unused — Returns the amount of kernel stack currently available.

Synopsis

```
stack_unused:long()
```

Arguments

None

Description

Determines how many bytes are currently available in the kernel stack.

Name

function::uaddr — User space address of current running task. EXPERIMENTAL.

Synopsis

```
uaddr:long()
```

Arguments

None

Description

Returns the address in userspace that the current task was at when the probe occurred. When the current running task isn't a user space thread, or the address cannot be found, zero is returned. Can be used to see where the current task is combined with `usymname` or `symdata`. Often the task will be in the VDSO where it entered the kernel. FIXME - need VDSO tracking support #10080.

Name

function::cmdline_args — Fetch command line arguments from current process

Synopsis

```
cmdline_args:string(n:long,m:long,delim:string)
```

Arguments

n	First argument to get (zero is the command itself)
m	Last argument to get (or minus one for all arguments after n)
delim	String to use to delimit arguments when more than one.

Description

Returns arguments from the current process starting with argument number n, up to argument m. If there are less than n arguments, or the arguments cannot be retrieved from the current process, the empty string is returned. If m is smaller than n then all arguments starting from argument n are returned. Argument zero is traditionally the command itself.

Name

function::cmdline_arg — Fetch a command line argument.

Synopsis

```
cmdline_arg:string(n:long)
```

Arguments

n Argument to get (zero is the command itself)

Description

Returns argument the requested argument from the current process or the empty string when there are not that many arguments or there is a problem retrieving the argument. Argument zero is traditionally the command itself.

Name

function::cmdline_str — Fetch all command line arguments from current process

Synopsis

```
cmdline_str:string()
```

Arguments

None

Description

Returns all arguments from the current process delimited by spaces. Returns the empty string when the arguments cannot be retrieved.

Name

function::print_stack — Print out stack from string.

Synopsis

```
print_stack(stk:string)
```

Arguments

stk String with list of hexadecimal addresses.

Description

Perform a symbolic lookup of the addresses in the given string, which is assumed to be the result of a prior call to `backtrace`.

Print one line per address, including the address, the name of the function containing the address, and an estimate of its position within that function. Return nothing.

Name

function::probefunc — Return the probe point's function name, if known.

Synopsis

```
probefunc:string()
```

Arguments

None

Name

function::probemod — Return the probe point's module name, if known.

Synopsis

```
probemod:string()
```

Arguments

None

Name

function::modname — Return the kernel module name loaded at the address.

Synopsis

```
modname:string(addr:long)
```

Arguments

addr The address.

Description

Returns the module name associated with the given address if known. If not known it will return the string “<unknown>”. If the address was not in a kernel module, but in the kernel itself, then the string “kernel” will be returned.

Name

function::symname — Return the symbol associated with the given address.

Synopsis

```
symname:string(addr:long)
```

Arguments

addr The address to translate.

Description

Returns the (function) symbol name associated with the given address if known. If not known it will return the hex string representation of addr.

Name

function::symdata — Return the symbol and module offset for the address.

Synopsis

```
symdata:string(addr:long)
```

Arguments

addr The address to translate.

Description

Returns the (function) symbol name associated with the given address if known, plus the module name (between brackets) and the offset inside the module, plus the size of the symbol function. If any element is not known it will be omitted and if the symbol name is unknown it will return the hex string for the given address.

Name

function::usymname — Return the symbol of an address in the current task. EXPERIMENTAL!

Synopsis

```
usymname:string(addr:long)
```

Arguments

addr The address to translate.

Description

Returns the (function) symbol name associated with the given address if known. If not known it will return the hex string representation of addr.

Name

function::usymdata — Return the symbol and module offset of an address. EXPERIMENTAL!

Synopsis

```
usymdata:string(addr:long)
```

Arguments

addr The address to translate.

Description

Returns the (function) symbol name associated with the given address in the current task if known, plus the module name (between brackets) and the offset inside the module (shared library), plus the size of the symbol function. If any element is not known it will be omitted and if the symbol name is unknown it will return the hex string for the given address.

Name

function::print_ustack — Print out stack for the current task from string. EXPERIMENTAL!

Synopsis

```
print_ustack(stk:string)
```

Arguments

stk String with list of hexadecimal addresses for the current task.

Description

Perform a symbolic lookup of the addresses in the given string, which is assumed to be the result of a prior call to `ubacktrace` for the current task.

Print one line per address, including the address, the name of the function containing the address, and an estimate of its position within that function. Return nothing.

Name

function::print_backtrace — Print stack back trace

Synopsis

```
print_backtrace()
```

Arguments

None

Description

Equivalent to print_stack(`backtrace`), except that deeper stack nesting may be supported. Return nothing.

Name

function::backtrace — Hex backtrace of current stack

Synopsis

```
backtrace:string()
```

Arguments

None

Description

Return a string of hex addresses that are a backtrace of the stack. Output may be truncated as per maximum string length.

Name

function::task_backtrace — Hex backtrace of an arbitrary task

Synopsis

```
task_backtrace:string(task:long)
```

Arguments

task pointer to task_struct

Description

Return a string of hex addresses that are a backtrace of the stack of a particular task. Output may be truncated as per maximum string length.

Name

function::caller — Return name and address of calling function

Synopsis

```
caller:string()
```

Arguments

None

Description

Return the address and name of the calling function.

This is equivalent to calling

sprintf("s 0xx", symname(caller_addr, caller_addr)) Works only for return probes at this time.

Name

function::caller_addr — Return caller address

Synopsis

```
caller_addr:long()
```

Arguments

None

Description

Return the address of the calling function. Works only for return probes at this time.

Name

function::print_ubacktrace — Print stack back trace for current task. EXPERIMENTAL!

Synopsis

```
print_ubacktrace()
```

Arguments

None

Description

Equivalent to print_ustack(`ubacktrace`), except that deeper stack nesting may be supported. Return nothing.

Name

function::print_ubacktrace_brief — Print stack back trace for current task. EXPERIMENTAL!

Synopsis

```
print_ubacktrace_brief()
```

Arguments

None

Description

Equivalent to `print_ubacktrace`, but output for each symbol is shorter (just name and offset), and the function address is printed if it can't be mapped to a name.

Name

function::ubacktrace — Hex backtrace of current task stack. EXPERIMENTAL!

Synopsis

```
ubacktrace:string()
```

Arguments

None

Description

Return a string of hex addresses that are a backtrace of the stack of the current task. Output may be truncated as per maximum string length. Returns empty string when current probe point cannot determine user backtrace.

Name

function::task_current — The current task_struct of the current task.

Synopsis

```
task_current:long()
```

Arguments

None

Description

Return the task_struct representing the current process.

Name

function::task_parent — The task_struct of the parent task.

Synopsis

```
task_parent:long(task:long)
```

Arguments

task task_struct pointer.

Description

Return the parent task_struct of the given task.

Name

function::task_state — The state of the task.

Synopsis

```
task_state:long(task:long)
```

Arguments

task task_struct pointer.

Description

Return the state of the given task, one of: TASK_RUNNING (0), TASK_INTERRUPTIBLE (1), TASK_UNINTERRUPTIBLE (2), TASK_STOPPED (4), TASK_TRACED (8), EXIT_ZOMBIE (16), EXIT_DEAD (32).

Name

function::task_execname — The name of the task.

Synopsis

```
task_execname:string(task:long)
```

Arguments

task task_struct pointer.

Description

Return the name of the given task.

Name

function::task_pid — The process identifier of the task.

Synopsis

```
task_pid:long(task:long)
```

Arguments

task task_struct pointer.

Description

Return the process id of the given task.

Name

function::pid2task — The task_struct of the given process identifier.

Synopsis

```
pid2task:long(pid:long)
```

Arguments

pid Process identifier.

Description

Return the task struct of the given process id.

Name

function::pid2execname — The name of the given process identifier.

Synopsis

```
pid2execname:string(pid:long)
```

Arguments

pid Process identifier.

Description

Return the name of the given process id.

Name

function::task_tid — The thread identifier of the task.

Synopsis

```
task_tid:long(task:long)
```

Arguments

task task_struct pointer.

Description

Return the thread id of the given task.

Name

function::task_gid — The group identifier of the task.

Synopsis

```
task_gid:long(task:long)
```

Arguments

task task_struct pointer.

Description

Return the group id of the given task.

Name

function::task_egid — The effective group identifier of the task.

Synopsis

```
task_egid:long(task:long)
```

Arguments

task task_struct pointer.

Description

Return the effective group id of the given task.

Name

function::task_uid — The user identifier of the task.

Synopsis

```
task_uid:long(task:long)
```

Arguments

task task_struct pointer.

Description

Return the user id of the given task.

Name

function::task_euid — The effective user identifier of the task.

Synopsis

```
task_euid:long(task:long)
```

Arguments

task task_struct pointer.

Description

Return the effective user id of the given task.

Name

function::task_prio — The priority value of the task.

Synopsis

```
task_prio:long(task:long)
```

Arguments

task task_struct pointer.

Description

Return the priority value of the given task.

Name

function::task_nice — The nice value of the task.

Synopsis

```
task_nice:long(task:long)
```

Arguments

task task_struct pointer.

Description

Return the nice value of the given task.

Name

function::task_cpu — The scheduled cpu of the task.

Synopsis

```
task_cpu:long(task:long)
```

Arguments

task task_struct pointer.

Description

Return the scheduled cpu for the given task.

Name

function::task_open_file_handles — The number of open files of the task.

Synopsis

```
task_open_file_handles:long(task:long)
```

Arguments

task task_struct pointer.

Description

Return the number of open file handlers for the given task.

Name

function::task_max_file_handles — The max number of open files for the task.

Synopsis

```
task_max_file_handles:long(task:long)
```

Arguments

task task_struct pointer.

Description

Return the maximum number of file handlers for the given task.

Chapter 3. Timestamp Functions

Each timestamp function returns a value to indicate when a function is executed. These returned values can then be used to indicate when an event occurred, provide an ordering for events, or compute the amount of time elapsed between two time stamps.

Name

function::get_cycles — Processor cycle count.

Synopsis

```
get_cycles:long()
```

Arguments

None

Description

Return the processor cycle counter value, or 0 if unavailable.

Chapter 4. Time string utility function

Utility function to turn seconds since the epoch (as returned by the timestamp function gettimeofday_s()) into a human readable date/time string.

Name

function::ctime — Convert seconds since epoch into human readable date/time string.

Synopsis

```
ctime:string(epochsecs:long)
```

Arguments

epochsecs	Number of seconds since epoch (as returned by `gettimeofday_s`).

Description

Takes an argument of seconds since the epoch as returned by `gettimeofday_s`. Returns a string of the form

"Wed Jun 30 21:49:08 1993"

The string will always be exactly 24 characters. If the time would be unreasonable far in the past (before what can be represented with a 32 bit offset in seconds from the epoch) the returned string will be "a long, long time ago...". If the time would be unreasonable far in the future the returned string will be "far far in the future..." (both these strings are also 24 characters wide).

Note that the epoch (zero) corresponds to

"Thu Jan 1 00:00:00 1970"

The earliest full date given by ctime, corresponding to epochsecs -2147483648 is "Fri Dec 13 20:45:52 1901". The latest full date given by ctime, corresponding to epochsecs 2147483647 is "Tue Jan 19 03:14:07 2038".

The abbreviations for the days of the week are 'Sun', 'Mon', 'Tue', 'Wed', 'Thu', 'Fri', and 'Sat'. The abbreviations for the months are 'Jan', 'Feb', 'Mar', 'Apr', 'May', 'Jun', 'Jul', 'Aug', 'Sep', 'Oct', 'Nov', and 'Dec'.

Note that the real C library `ctime` function puts a newline ('\n') character at the end of the string that this function does not. Also note that since the kernel has no concept of timezones, the returned time is always in GMT.

Chapter 5. Memory Tapset

This family of probe points is used to probe memory-related events or query the memory usage of the current process. It contains the following probe points:

Name

function::vm_fault_contains — Test return value for page fault reason

Synopsis

```
vm_fault_contains:long(value:long,test:long)
```

Arguments

value	The fault_type returned by vm.page_fault.return
test	The type of fault to test for (VM_FAULT_OOM or similar)

Name

probe::vm.pagefault — Records that a page fault occurred.

Synopsis

```
vm.pagefault
```

Values

write_access Indicates whether this was a write or read access; 1 indicates a write, while 0 indicates a read.

address The address of the faulting memory access; i.e. the address that caused the page fault.

Context

The process which triggered the fault

Name

probe::vm.pagefault.return — Indicates what type of fault occurred.

Synopsis

```
vm.pagefault.return
```

Values

fault_type Returns either 0 (VM_FAULT_OOM) for out of memory faults, 2 (VM_FAULT_MINOR) for minor faults, 3 (VM_FAULT_MAJOR) for major faults, or 1 (VM_FAULT_SIGBUS) if the fault was neither OOM, minor fault, nor major fault.

Name

function::addr_to_node — Returns which node a given address belongs to within a NUMA system.

Synopsis

```
addr_to_node:long(addr:long)
```

Arguments

addr The address of the faulting memory access.

Name

probe::vm.write_shared — Attempts at writing to a shared page.

Synopsis

```
vm.write_shared
```

Values

address The address of the shared write.

Context

The context is the process attempting the write.

Description

Fires when a process attempts to write to a shared page. If a copy is necessary, this will be followed by a vm.write_shared_copy.

Name

probe::vm.write_shared_copy — Page copy for shared page write.

Synopsis

```
vm.write_shared_copy
```

Values

zero	Boolean indicating whether it is a zero page (can do a clear instead of a copy).
address	The address of the shared write.

Context

The process attempting the write.

Description

Fires when a write to a shared page requires a page copy. This is always preceded by a vm.shared_write.

Name

probe::vm.mmap — Fires when an mmap is requested.

Synopsis

```
vm.mmap
```

Values

length	The length of the memory segment
address	The requested address

Context

The process calling mmap.

Name

probe::vm.munmap — Fires when an munmap is requested.

Synopsis

```
vm.munmap
```

Values

length	The length of the memory segment
address	The requested address

Context

The process calling munmap.

Name

probe::vm.brk — Fires when a brk is requested (i.e. the heap will be resized).

Synopsis

```
vm.brk
```

Values

length	The length of the memory segment
address	The requested address

Context

The process calling brk.

Name

probe::vm.oom_kill — Fires when a thread is selected for termination by the OOM killer.

Synopsis

```
vm.oom_kill
```

Values

task The task being killed

Context

The process that tried to consume excessive memory, and thus triggered the OOM.

Name

probe::vm.kmalloc — Fires when kmalloc is requested.

Synopsis

```
vm.kmalloc
```

Values

ptr	Pointer to the kmemory allocated
caller_function	Name of the caller function.
call_site	Address of the kmemory function.
gfp_flag_name	type of kmemory to allocate (in String format)
bytes_req	Requested Bytes
bytes_alloc	Allocated Bytes
gfp_flags	type of kmemory to allocate

Name

probe::vm.kmem_cache_alloc — Fires when \

Synopsis

```
vm.kmem_cache_alloc
```

Values

ptr	Pointer to the kmemory allocated
caller_function	Name of the caller function.
call_site	Address of the function calling this kmemory function.
gfp_flag_name	Type of kmemory to allocate(in string format)
bytes_req	Requested Bytes
bytes_alloc	Allocated Bytes
gfp_flags	type of kmemory to allocate

Description

kmem_cache_alloc is requested.

Name

probe::vm.kmalloc_node — Fires when kmalloc_node is requested.

Synopsis

```
vm.kmalloc_node
```

Values

ptr	Pointer to the kmemory allocated
caller_function	Name of the caller function.
call_site	Address of the function caling this kmemory function.
gfp_flag_name	Type of kmemory to allocate(in string format)
bytes_req	Requested Bytes
bytes_alloc	Allocated Bytes
gfp_flags	type of kmemory to allocate

Name

probe::vm.kmem_cache_alloc_node — Fires when \

Synopsis

```
vm.kmem_cache_alloc_node
```

Values

ptr	Pointer to the kmemory allocated
caller_function	Name of the caller function.
call_site	Address of the function calling this kmemory function.
gfp_flag_name	Type of kmemory to allocate(in string format)
bytes_req	Requested Bytes
bytes_alloc	Allocated Bytes
gfp_flags	type of kmemory to allocate

Description

kmem_cache_alloc_node is requested.

Name

probe::vm.kfree — Fires when kfree is requested.

Synopsis

```
vm.kfree
```

Values

ptr	Pointer to the kmemory allocated which is returned by kmalloc
caller_function	Name of the caller function.
call_site	Address of the function calling this kmemory function.

Name

probe::vm.kmem_cache_free — Fires when \

Synopsis

```
vm.kmem_cache_free
```

Values

ptr	Pointer to the kmemory allocated which is returned by kmem_cache
caller_function	Name of the caller function.
call_site	Address of the function calling this kmemory function.

Description

kmem_cache_free is requested.

Name

function::proc_mem_size — Total program virtual memory size in pages

Synopsis

```
proc_mem_size:long()
```

Arguments

None

Description

Returns the total virtual memory size in pages of the current process, or zero when there is no current process or the number of pages couldn't be retrieved.

Name

function::proc_mem_size_pid — Total program virtual memory size in pages

Synopsis

```
proc_mem_size_pid:long(pid:long)
```

Arguments

pid The pid of process to examine

Description

Returns the total virtual memory size in pages of the given process, or zero when that process doesn't exist or the number of pages couldn't be retrieved.

Name

function::proc_mem_rss — Program resident set size in pages

Synopsis

```
proc_mem_rss:long()
```

Arguments

None

Description

Returns the resident set size in pages of the current process, or zero when there is no current process or the number of pages couldn't be retrieved.

Name

function::proc_mem_rss_pid — Program resident set size in pages

Synopsis

```
proc_mem_rss_pid:long(pid:long)
```

Arguments

pid The pid of process to examine

Description

Returns the resident set size in pages of the given process, or zero when the process doesn't exist or the number of pages couldn't be retrieved.

Name

function::proc_mem_shr — Program shared pages (from shared mappings)

Synopsis

```
proc_mem_shr:long()
```

Arguments

None

Description

Returns the shared pages (from shared mappings) of the current process, or zero when there is no current process or the number of pages couldn't be retrieved.

Name

function::proc_mem_shr_pid — Program shared pages (from shared mappings)

Synopsis

```
proc_mem_shr_pid:long(pid:long)
```

Arguments

pid The pid of process to examine

Description

Returns the shared pages (from shared mappings) of the given process, or zero when the process doesn't exist or the number of pages couldn't be retrieved.

Name

function::proc_mem_txt — Program text (code) size in pages

Synopsis

```
proc_mem_txt:long()
```

Arguments

None

Description

Returns the current process text (code) size in pages, or zero when there is no current process or the number of pages couldn't be retrieved.

Name

function::proc_mem_txt_pid — Program text (code) size in pages

Synopsis

```
proc_mem_txt_pid:long(pid:long)
```

Arguments

pid The pid of process to examine

Description

Returns the given process text (code) size in pages, or zero when the process doesn't exist or the number of pages couldn't be retrieved.

Name

function::proc_mem_data — Program data size (data + stack) in pages

Synopsis

```
proc_mem_data:long()
```

Arguments

None

Description

Returns the current process data size (data + stack) in pages, or zero when there is no current process or the number of pages couldn't be retrieved.

Name

function::proc_mem_data_pid — Program data size (data + stack) in pages

Synopsis

```
proc_mem_data_pid:long(pid:long)
```

Arguments

pid The pid of process to examine

Description

Returns the given process data size (data + stack) in pages, or zero when the process doesn't exist or the number of pages couldn't be retrieved.

Name

function::mem_page_size — Number of bytes in a page for this architecture

Synopsis

```
mem_page_size:long()
```

Arguments

None

Name

function::bytes_to_string — Human readable string for given bytes

Synopsis

```
bytes_to_string:string(bytes:long)
```

Arguments

bytes Number of bytes to translate.

Description

Returns a string representing the number of bytes (up to 1024 bytes), the number of kilobytes (when less than 1024K) postfixed by 'K', the number of megabytes (when less than 1024M) postfixed by 'M' or the number of gigabytes postfixed by 'G'. If representing K, M or G, and the number is amount is less than 100, it includes a '.' plus the remainer. The returned string will be 5 characters wide (padding with whitespace at the front) unless negative or representing more than 9999G bytes.

Name

function::pages_to_string — Turns pages into a human readable string

Synopsis

```
pages_to_string:string(pages:long)
```

Arguments

pages Number of pages to translate.

Description

Multiplies pages by `page_size` to get the number of bytes and returns the result of `bytes_to_string`.

Name

function::proc_mem_string — Human readable string of current proc memory usage

Synopsis

```
proc_mem_string:string()
```

Arguments

None

Description

Returns a human readable string showing the size, rss, shr, txt and data of the memory used by the current process. For example “size: 301m, rss: 11m, shr: 8m, txt: 52k, data: 2248k”.

Name

function::proc_mem_string_pid — Human readable string of process memory usage

Synopsis

```
proc_mem_string_pid:string(pid:long)
```

Arguments

pid The pid of process to examine

Description

Returns a human readable string showing the size, rss, shr, txt and data of the memory used by the given process. For example “size: 301m, rss: 11m, shr: 8m, txt: 52k, data: 2248k”.

Chapter 6. Task Time Tapset

This tapset defines utility functions to query time related properties of the current tasks, translate those in miliseconds and human readable strings.

Name

function::task_utime — User time of the current task

Synopsis

```
task_utime:long()
```

Arguments

None

Description

Returns the user time of the current task in cputime. Does not include any time used by other tasks in this process, nor does it include any time of the children of this task.

Name

function::task_utime_tid — User time of the given task

Synopsis

```
task_utime_tid:long(tid:long)
```

Arguments

tid Thread id of the given task

Description

Returns the user time of the given task in cputime, or zero if the task doesn't exist. Does not include any time used by other tasks in this process, nor does it include any time of the children of this task.

Name

function::task_stime — System time of the current task

Synopsis

```
task_stime:long()
```

Arguments

None

Description

Returns the system time of the current task in cputime. Does not include any time used by other tasks in this process, nor does it include any time of the children of this task.

Name

function::task_stime_tid — System time of the given task

Synopsis

```
task_stime_tid:long(tid:long)
```

Arguments

tid Thread id of the given task

Description

Returns the system time of the given task in cputime, or zero if the task doesn't exist. Does not include any time used by other tasks in this process, nor does it include any time of the children of this task.

Name

function::cputime_to_msecs — Translates the given cputime into milliseconds

Synopsis

```
cputime_to_msecs:long(cputime:long)
```

Arguments

cputime	Time to convert to milliseconds.

Name

function::msecs_to_string — Human readable string for given milliseconds

Synopsis

```
msecs_to_string:string(msecs:long)
```

Arguments

msecs Number of milliseconds to translate.

Description

Returns a string representing the number of milliseconds as a human readable string consisting of "XmY.ZZZs", where X is the number of minutes, Y is the number of seconds and ZZZ is the number of milliseconds.

Name

function::cputime_to_string — Human readable string for given cputime

Synopsis

```
cputime_to_string:string(cputime:long)
```

Arguments

cputime Time to translate.

Description

Equivalent to calling: msec_to_string (cputime_to_msecs (cputime).

Name

function::task_time_string — Human readable string of task time usage

Synopsis

```
task_time_string:string()
```

Arguments

None

Description

Returns a human readable string showing the user and system time the current task has used up to now. For example “usr: 0m12.908s, sys: 1m6.851s”.

Name

function::task_time_string_tid — Human readable string of task time usage

Synopsis

```
task_time_string_tid:string(tid:long)
```

Arguments

tid Thread id of the given task

Description

Returns a human readable string showing the user and system time the given task has used up to now. For example “usr: 0m12.908s, sys: 1m6.851s”.

Chapter 7. IO Scheduler and block IO Tapset

This family of probe points is used to probe block IO layer and IO scheduler activities. It contains the following probe points:

Name

probe::ioscheduler.elv_next_request — Fires when a request is retrieved from the request queue

Synopsis

```
ioscheduler.elv_next_request
```

Values

elevator_name	The type of I/O elevator currently enabled

Name

probe::ioscheduler.elv_next_request.return — Fires when a request retrieval issues a return signal

Synopsis

```
ioscheduler.elv_next_request.return
```

Values

req_flags	Request flags
req	Address of the request
disk_major	Disk major number of the request
disk_minor	Disk minor number of the request

Name

probe::ioscheduler.elv_add_request.kp — kprobe based probe to indicate that a request was added to the request queue

Synopsis

```
ioscheduler.elv_add_request.kp
```

Values

req_flags	Request flags
req	Address of the request
disk_major	Disk major number of the request
q	pointer to request queue
elevator_name	The type of I/O elevator currently enabled
disk_minor	Disk minor number of the request

Name

probe::ioscheduler.elv_completed_request — Fires when a request is completed

Synopsis

```
ioscheduler.elv_completed_request
```

Values

req_flags	Request flags
req	Address of the request
disk_major	Disk major number of the request
elevator_name	The type of I/O elevator currently enabled
disk_minor	Disk minor number of the request

Name

probe::ioscheduler.elv_add_request.tp — tracepoint based probe to indicate a request is added to the request queue.

Synopsis

```
ioscheduler.elv_add_request.tp
```

Values

disk_major	Disk major no of request.
rq	Address of request.
q	Pointer to request queue.
elevator_name	The type of I/O elevator currently enabled.
disk_minor	Disk minor number of request.
rq_flags	Request flags.

Name

probe::ioscheduler.elv_add_request — probe to indicate request is added to the request queue.

Synopsis

```
ioscheduler.elv_add_request
```

Values

disk_major	Disk major no of request.
rq	Address of request.
q	Pointer to request queue.
elevator_name	The type of I/O elevator currently enabled.
disk_minor	Disk minor number of request.
rq_flags	Request flags.

Name

probe::ioscheduler_trace.elv_completed_request — Fires when a request is

Synopsis

```
ioscheduler_trace.elv_completed_request
```

Values

disk_major	Disk major no of request.
rq	Address of request.
elevator_name	The type of I/O elevator currently enabled.
disk_minor	Disk minor number of request.
rq_flags	Request flags.

Description

completed.

Name

probe::ioscheduler_trace.elv_issue_request — Fires when a request is

Synopsis

```
ioscheduler_trace.elv_issue_request
```

Values

disk_major	Disk major no of request.
rq	Address of request.
elevator_name	The type of I/O elevator currently enabled.
disk_minor	Disk minor number of request.
rq_flags	Request flags.

Description

scheduled.

Name

probe::ioscheduler_trace.elv_requeue_request — Fires when a request is

Synopsis

```
ioscheduler_trace.elv_requeue_request
```

Values

disk_major	Disk major no of request.
rq	Address of request.
elevator_name	The type of I/O elevator currently enabled.
disk_minor	Disk minor number of request.
rq_flags	Request flags.

Description

put back on the queue, when the hadware cannot accept more requests.

Name

probe::ioscheduler_trace.elv_abort_request — Fires when a request is aborted.

Synopsis

```
ioscheduler_trace.elv_abort_request
```

Values

disk_major	Disk major no of request.
rq	Address of request.
elevator_name	The type of I/O elevator currently enabled.
disk_minor	Disk minor number of request.
rq_flags	Request flags.

Name

probe::ioscheduler_trace.plug — Fires when a request queue is plugged;

Synopsis

```
ioscheduler_trace.plug
```

Values

rq_queue request queue

Description

ie, requests in the queue cannot be serviced by block driver.

Name

probe::ioscheduler_trace.unplug_io — Fires when a request queue is unplugged;

Synopsis

```
ioscheduler_trace.unplug_io
```

Values

rq_queue request queue

Description

Either, when number of pending requests in the queue exceeds threshold or, upon expiration of timer that was activated when queue was plugged.

Name

probe::ioscheduler_trace.unplug_timer — Fires when unplug timer associated

Synopsis

```
ioscheduler_trace.unplug_timer
```

Values

rq_queue request queue

Description

with a request queue expires.

Name

probe::ioblock.request — Fires whenever making a generic block I/O request.

Synopsis

```
ioblock.request
```

Values

None

Description

devname - block device name *ino* - i-node number of the mapped file *sector* - beginning sector for the entire bio *flags* - see below BIO_UPTODATE 0 ok after I/O completion BIO_RW_BLOCK 1 RW_AHEAD set, and read/write would block BIO_EOF 2 out-out-bounds error BIO_SEG_VALID 3 nr_hw_seg valid BIO_CLONED 4 doesn't own data BIO_BOUNCED 5 bio is a bounce bio BIO_USER_MAPPED 6 contains user pages BIO_EOPNOTSUPP 7 not supported

rw - binary trace for read/write request *vcnt* - bio vector count which represents number of array element (page, offset, length) which make up this I/O request *idx* - offset into the bio vector array *phys_segments* - number of segments in this bio after physical address coalescing is performed *hw_segments* - number of segments after physical and DMA remapping hardware coalescing is performed *size* - total size in bytes *bdev* - target block device *bdev_contains* - points to the device object which contains the partition (when bio structure represents a partition) *p_start_sect* - points to the start sector of the partition structure of the device

Context

The process makes block I/O request

Name

probe::ioblock.end — Fires whenever a block I/O transfer is complete.

Synopsis

```
ioblock.end
```

Values

None

Description

devname - block device name *ino* - i-node number of the mapped file *bytes_done* - number of bytes transferred *sector* - beginning sector for the entire bio *flags* - see below BIO_UPTODATE 0 ok after I/O completion BIO_RW_BLOCK 1 RW_AHEAD set, and read/write would block BIO_EOF 2 out-out-bounds error BIO_SEG_VALID 3 nr_hw_seg valid BIO_CLONED 4 doesn't own data BIO_BOUNCED 5 bio is a bounce bio BIO_USER_MAPPED 6 contains user pages BIO_EOPNOTSUPP 7 not supported *error* - 0 on success *rw* - binary trace for read/write request *vcnt* - bio vector count which represents number of array element (page, offset, length) which makes up this I/O request *idx* - offset into the bio vector array *phys_segments* - number of segments in this bio after physical address coalescing is performed. *hw_segments* - number of segments after physical and DMA remapping hardware coalescing is performed *size* - total size in bytes

Context

The process signals the transfer is done.

Name

probe::ioblock_trace.bounce — Fires whenever a buffer bounce is needed for at least one page of a block IO request.

Synopsis

```
ioblock_trace.bounce
```

Values

None

Description

devname device for which a buffer bounce was needed. *ino* - i-node number of the mapped file *bytes_done* - number of bytes transferred *sector* - beginning sector for the entire bio *flags* - see below BIO_UPTODATE 0 ok after I/O completion BIO_RW_BLOCK 1 RW_AHEAD set, and read/write would block BIO_EOF 2 out-out-bounds error BIO_SEG_VALID 3 nr_hw_seg valid BIO_CLONED 4 doesn't own data BIO_BOUNCED 5 bio is a bounce bio BIO_USER_MAPPED 6 contains user pages BIO_EOPNOTSUPP 7 not supported *rw* - binary trace for read/write request *vcnt* - bio vector count which represents number of array element (page, offset, length) which makes up this I/O request *idx* - offset into the bio vector array *phys_segments* - number of segments in this bio after physical address coalescing is performed. *size* - total size in bytes

Context

The process creating a block IO request.

Name

probe::ioblock_trace.request — Fires just as a generic block I/O request is created for a bio.

Synopsis

```
ioblock_trace.request
```

Values

None

Description

devname - block device name *ino* - i-node number of the mapped file *bytes_done* - number of bytes transferred *sector* - beginning sector for the entire bio *flags* - see below BIO_UPTODATE 0 ok after I/O completion BIO_RW_BLOCK 1 RW_AHEAD set, and read/write would block BIO_EOF 2 out-out-bounds error BIO_SEG_VALID 3 nr_hw_seg valid BIO_CLONED 4 doesn't own data BIO_BOUNCED 5 bio is a bounce bio BIO_USER_MAPPED 6 contains user pages BIO_EOPNOTSUPP 7 not supported

rw - binary trace for read/write request *vcnt* - bio vector count which represents number of array element (page, offset, length) which make up this I/O request *idx* - offset into the bio vector array *phys_segments* - number of segments in this bio after physical address coalescing is performed. *size* - total size in bytes *bdev* - target block device *bdev_contains* - points to the device object which contains the partition (when bio structure represents a partition) *p_start_sect* - points to the start sector of the partition structure of the device

Context

The process makes block I/O request

Name

probe::ioblock_trace.end — Fires whenever a block I/O transfer is complete.

Synopsis

```
ioblock_trace.end
```

Values

None

Description

q - request queue on which this bio was queued. *devname* - block device name *ino* - i-node number of the mapped file *bytes_done* - number of bytes transferred *sector* - beginning sector for the entire bio *flags* - see below BIO_UPTODATE 0 ok after I/O completion BIO_RW_BLOCK 1 RW_AHEAD set, and read/write would block BIO_EOF 2 out-out-bounds error BIO_SEG_VALID 3 nr_hw_seg valid BIO_CLONED 4 doesn't own data BIO_BOUNCED 5 bio is a bounce bio BIO_USER_MAPPED 6 contains user pages BIO_EOPNOTSUPP 7 not supported

rw - binary trace for read/write request *vcnt* - bio vector count which represents number of array element (page, offset, length) which makes up this I/O request *idx* - offset into the bio vector array *phys_segments* - number of segments in this bio after physical address coalescing is performed. *size* - total size in bytes

Context

The process signals the transfer is done.

Chapter 8. SCSI Tapset

This family of probe points is used to probe SCSI activities. It contains the following probe points:

Name

probe::scsi.ioentry — Prepares a SCSI mid-layer request

Synopsis

```
scsi.ioentry
```

Values

disk_major	The major number of the disk (-1 if no information)
device_state_str	The current state of the device, as a string
device_state	The current state of the device
req_addr	The current struct request pointer, as a number
disk_minor	The minor number of the disk (-1 if no information)

Name

probe::scsi.iodispatching — SCSI mid-layer dispatched low-level SCSI command

Synopsis

```
scsi.iodispatching
```

Values

device_state_str	The current state of the device, as a string
dev_id	The scsi device id
channel	The channel number
data_direction	The data_direction specifies whether this command is from/to the device 0 (DMA_BIDIRECTIONAL), 1 (DMA_TO_DEVICE), 2 (DMA_FROM_DEVICE), 3 (DMA_NONE)
lun	The lun number
request_bufflen	The request buffer length
host_no	The host number
device_state	The current state of the device
data_direction_str	Data direction, as a string
request_buffer	The request buffer address

Name

probe::scsi.iodone — SCSI command completed by low level driver and enqueued into the done queue.

Synopsis

```
scsi.iodone
```

Values

device_state_str	The current state of the device, as a string
dev_id	The scsi device id
channel	The channel number
data_direction	The data_direction specifies whether this command is from/to the device.
lun	The lun number
host_no	The host number
data_direction_str	Data direction, as a string
device_state	The current state of the device

Name

probe::scsi.iocompleted — SCSI mid-layer running the completion processing for block device I/O requests

Synopsis

```
scsi.iocompleted
```

Values

device_state_str	The current state of the device, as a string
dev_id	The scsi device id
channel	The channel number
data_direction	The data_direction specifies whether this command is from/to the device
lun	The lun number
host_no	The host number
data_direction_str	Data direction, as a string
device_state	The current state of the device
goodbytes	The bytes completed

Name

probe::scsi.ioexecute — Create mid-layer SCSI request and wait for the result

Synopsis

```
scsi.ioexecute
```

Values

retries	Number of times to retry request
device_state_str	The current state of the device, as a string
dev_id	The scsi device id
channel	The channel number
data_direction	The data_direction specifies whether this command is from/to the device.
lun	The lun number
timeout	Request timeout in seconds
request_bufflen	The data buffer buffer length
host_no	The host number
data_direction_str	Data direction, as a string
device_state	The current state of the device
request_buffer	The data buffer address

Name

probe::scsi.set_state — Order SCSI device state change

Synopsis

```
scsi.set_state
```

Values

state_str	The new state of the device, as a string
dev_id	The scsi device id
channel	The channel number
state	The new state of the device
old_state_str	The current state of the device, as a string
lun	The lun number
old_state	The current state of the device
host_no	The host number

Chapter 9. TTY Tapset

This family of probe points is used to probe TTY (Teletype) activities. It contains the following probe points:

Name

probe::tty.open — Called when a tty is opened

Synopsis

```
tty.open
```

Values

inode_state	the inode state
file_name	the file name
file_mode	the file mode
file_flags	the file flags
inode_number	the inode number
inode_flags	the inode flags

Name

probe::tty.release — Called when the tty is closed

Synopsis

```
tty.release
```

Values

inode_state	the inode state
file_name	the file name
file_mode	the file mode
file_flags	the file flags
inode_number	the inode number
inode_flags	the inode flags

Name

probe::tty.resize — Called when a terminal resize happens

Synopsis

```
tty.resize
```

Values

new_ypixel	the new ypixel value
old_col	the old col value
old_xpixel	the old xpixel
old_ypixel	the old ypixel
name	the tty name
old_row	the old row value
new_row	the new row value
new_xpixel	the new xpixel value
new_col	the new col value

Name

probe::tty.ioctl — called when a ioctl is request to the tty

Synopsis

```
tty.ioctl
```

Values

cmd	the ioctl command
arg	the ioctl argument
name	the file name

Name

probe::tty.init — Called when a tty is being initalized

Synopsis

```
tty.init
```

Values

driver_name	the driver name
name	the driver .dev_name name
module	the module name

Name

probe::tty.register — Called when a tty device is registred

Synopsis

```
tty.register
```

Values

driver_name	the driver name
name	the driver .dev_name name
index	the tty index requested
module	the module name

Name

probe::tty.unregister — Called when a tty device is being unregistered

Synopsis

```
tty.unregister
```

Values

driver_name	the driver name
name	the driver .dev_name name
index	the tty index requested
module	the module name

Name

probe::tty.poll — Called when a tty device is being polled

Synopsis

```
tty.poll
```

Values

file_name	the tty file name
wait_key	the wait queue key

Name

probe::tty.receive — called when a tty receives a message

Synopsis

```
tty.receive
```

Values

driver_name	the driver name
count	The amount of characters received
name	the name of the module file
fp	The flag buffer
cp	the buffer that was received
index	The tty Index
id	the tty id

Name

probe::tty.write — write to the tty line

Synopsis

```
tty.write
```

Values

driver_name	the driver name
buffer	the buffer that will be written
file_name	the file name lreated to the tty
nr	The amount of characters

Name

probe::tty.read — called when a tty line will be read

Synopsis

```
tty.read
```

Values

driver_name	the driver name
buffer	the buffer that will receive the characters
file_name	the file name lreated to the tty
nr	The amount of characters to be read

Chapter 10. Networking Tapset

This family of probe points is used to probe the activities of the network device and protocol layers.

Name

probe::netdev.receive — Data received from network device.

Synopsis

```
netdev.receive
```

Values

protocol	Protocol of received packet.
dev_name	The name of the device. e.g: eth0, ath1.
length	The length of the receiving buffer.

Name

probe::netdev.transmit — Network device transmitting buffer

Synopsis

```
netdev.transmit
```

Values

protocol	The protocol of this packet(defined in include/linux/if_ether.h).
dev_name	The name of the device. e.g: eth0, ath1.
length	The length of the transmit buffer.
truesize	The size of the data to be transmitted.

Name

probe::netdev.change_mtu — Called when the netdev MTU is changed

Synopsis

```
netdev.change_mtu
```

Values

dev_name	The device that will have the MTU changed
new_mtu	The new MTU
old_mtu	The current MTU

Name

probe::netdev.open — Called when the device is opened

Synopsis

```
netdev.open
```

Values

dev_name	The device that is going to be opened

Name

probe::netdev.close — Called when the device is closed

Synopsis

```
netdev.close
```

Values

dev_name	The device that is going to be closed

Name

probe::netdev.hard_transmit — Called when the devices is going to TX (hard)

Synopsis

```
netdev.hard_transmit
```

Values

protocol	The protocol used in the transmission
dev_name	The device scheduled to transmit
length	The length of the transmit buffer.
truesize	The size of the data to be transmitted.

Name

probe::netdev.rx — Called when the device is going to receive a packet

Synopsis

```
netdev.rx
```

Values

protocol	The packet protocol
dev_name	The device received the packet

Name

probe::netdev.change_rx_flag — Called when the device RX flag will be changed

Synopsis

```
netdev.change_rx_flag
```

Values

dev_name	The device that will be changed
flags	The new flags

Name

probe::netdev.set_promiscuity — Called when the device enters/leaves promiscuity

Synopsis

```
netdev.set_promiscuity
```

Values

dev_name	The device that is entering/leaving promiscuity mode
enable	If the device is entering promiscuity mode
inc	Count the number of promiscuity openers
disable	If the device is leaving promiscuity mode

Name

probe::netdev.ioctl — Called when the device suffers an IOCTL

Synopsis

```
netdev.ioctl
```

Values

cmd The IOCTL request

arg The IOCTL argument (usually the netdev interface)

Name

probe::netdev.register — Called when the device is registered

Synopsis

```
netdev.register
```

Values

dev_name	The device that is going to be registered

Name

probe::netdev.unregister — Called when the device is being unregistered

Synopsis

```
netdev.unregister
```

Values

dev_name	The device that is going to be unregistered

Name

probe::netdev.get_stats — Called when someone asks the device statistics

Synopsis

```
netdev.get_stats
```

Values

dev_name	The device that is going to provide the statistics

Name

probe::netdev.change_mac — Called when the netdev_name has the MAC changed

Synopsis

```
netdev.change_mac
```

Values

dev_name	The device that will have the MTU changed
new_mac	The new MAC address
mac_len	The MAC length
old_mac	The current MAC address

Name

probe::tcp.sendmsg — Sending a tcp message

Synopsis

```
tcp.sendmsg
```

Values

name	Name of this probe
size	Number of bytes to send
sock	Network socket

Context

The process which sends a tcp message

Name

probe::tcp.sendmsg.return — Sending TCP message is done

Synopsis

```
tcp.sendmsg.return
```

Values

name Name of this probe

size Number of bytes sent or error code if an error occurred.

Context

The process which sends a tcp message

Name

probe::tcp.recvmsg — Receiving TCP message

Synopsis

```
tcp.recvmsg
```

Values

saddr	A string representing the source IP address
daddr	A string representing the destination IP address
name	Name of this probe
sport	TCP source port
dport	TCP destination port
size	Number of bytes to be received
sock	Network socket

Context

The process which receives a tcp message

Name

probe::tcp.recvmsg.return — Receiving TCP message complete

Synopsis

```
tcp.recvmsg.return
```

Values

saddr	A string representing the source IP address
daddr	A string representing the destination IP address
name	Name of this probe
sport	TCP source port
dport	TCP destination port
size	Number of bytes received or error code if an error occurred.

Context

The process which receives a tcp message

Name

probe::tcp.disconnect — TCP socket disconnection

Synopsis

```
tcp.disconnect
```

Values

saddr	A string representing the source IP address
daddr	A string representing the destination IP address
flags	TCP flags (e.g. FIN, etc)
name	Name of this probe
sport	TCP source port
dport	TCP destination port
sock	Network socket

Context

The process which disconnects tcp

Name

probe::tcp.disconnect.return — TCP socket disconnection complete

Synopsis

```
tcp.disconnect.return
```

Values

ret	Error code (0: no error)
name	Name of this probe

Context

The process which disconnects tcp

Name

probe::tcp.setsockopt — Call to `setsockopt`

Synopsis

```
tcp.setsockopt
```

Values

optstr	Resolves optname to a human-readable format
level	The level at which the socket options will be manipulated
optlen	Used to access values for `setsockopt`
name	Name of this probe
optname	TCP socket options (e.g. TCP_NODELAY, TCP_MAXSEG, etc)
sock	Network socket

Context

The process which calls setsockopt

Name

probe::tcp.setsockopt.return — Return from `setsockopt`

Synopsis

```
tcp.setsockopt.return
```

Values

ret	Error code (0: no error)
name	Name of this probe

Context

The process which calls setsockopt

Name

probe::tcp.receive — Called when a TCP packet is received

Synopsis

```
tcp.receive
```

Values

urg	TCP URG flag
psh	TCP PSH flag
rst	TCP RST flag
dport	TCP destination port
saddr	A string representing the source IP address
daddr	A string representing the destination IP address
ack	TCP ACK flag
syn	TCP SYN flag
fin	TCP FIN flag
sport	TCP source port

Name

probe::udp.sendmsg — Fires whenever a process sends a UDP message

Synopsis

```
udp.sendmsg
```

Values

name	The name of this probe
size	Number of bytes sent by the process
sock	Network socket used by the process

Context

The process which sent a UDP message

Name

probe::udp.sendmsg.return — Fires whenever an attempt to send a UDP message is completed

Synopsis

```
udp.sendmsg.return
```

Values

name The name of this probe

size Number of bytes sent by the process

Context

The process which sent a UDP message

Name

probe::udp.recvmsg — Fires whenever a UDP message is received

Synopsis

```
udp.recvmsg
```

Values

name	The name of this probe
size	Number of bytes received by the process
sock	Network socket used by the process

Context

The process which received a UDP message

Name

probe::udp.recvmsg.return — Fires whenever an attempt to receive a UDP message received is completed

Synopsis

```
udp.recvmsg.return
```

Values

name The name of this probe

size Number of bytes received by the process

Context

The process which received a UDP message

Name

probe::udp.disconnect — Fires when a process requests for a UDP disconnection

Synopsis

```
udp.disconnect
```

Values

flags	Flags (e.g. FIN, etc)
name	The name of this probe
sock	Network socket used by the process

Context

The process which requests a UDP disconnection

Name

probe::udp.disconnect.return — UDP has been disconnected successfully

Synopsis

```
udp.disconnect.return
```

Values

ret	Error code (0: no error)
name	The name of this probe

Context

The process which requested a UDP disconnection

Name

function::ip_ntop — returns a string representation from an integer IP number

Synopsis

```
ip_ntop:string(addr:long)
```

Arguments

addr the ip represented as an integer

Chapter 11. Socket Tapset

This family of probe points is used to probe socket activities. It contains the following probe points:

Name

probe::socket.send — Message sent on a socket.

Synopsis

```
socket.send
```

Values

success	Was send successful? (1 = yes, 0 = no)
protocol	Protocol value
flags	Socket flags value
name	Name of this probe
state	Socket state value
size	Size of message sent (in bytes) or error code if success = 0
type	Socket type value
family	Protocol family value

Context

The message sender

Name

probe::socket.receive — Message received on a socket.

Synopsis

```
socket.receive
```

Values

success	Was send successful? (1 = yes, 0 = no)
protocol	Protocol value
flags	Socket flags value
name	Name of this probe
state	Socket state value
size	Size of message received (in bytes) or error code if success = 0
type	Socket type value
family	Protocol family value

Context

The message receiver

Name

probe::socket.sendmsg — Message is currently being sent on a socket.

Synopsis

```
socket.sendmsg
```

Values

protocol	Protocol value
flags	Socket flags value
name	Name of this probe
state	Socket state value
size	Message size in bytes
type	Socket type value
family	Protocol family value

Context

The message sender

Description

Fires at the beginning of sending a message on a socket via the `sock_sendmsg` function

Name

probe::socket.sendmsg.return — Return from socket.sendmsg.

Synopsis

```
socket.sendmsg.return
```

Values

success	Was send successful? (1 = yes, 0 = no)
protocol	Protocol value
flags	Socket flags value
name	Name of this probe
state	Socket state value
size	Size of message sent (in bytes) or error code if success = 0
type	Socket type value
family	Protocol family value

Context

The message sender.

Description

Fires at the conclusion of sending a message on a socket via the `sock_sendmsg` function

Name

probe::socket.recvmsg — Message being received on socket

Synopsis

```
socket.recvmsg
```

Values

protocol	Protocol value
flags	Socket flags value
name	Name of this probe
state	Socket state value
size	Message size in bytes
type	Socket type value
family	Protocol family value

Context

The message receiver.

Description

Fires at the beginning of receiving a message on a socket via the `sock_recvmsg` function

Name

probe::socket.recvmsg.return — Return from Message being received on socket

Synopsis

```
socket.recvmsg.return
```

Values

success	Was receive successful? (1 = yes, 0 = no)
protocol	Protocol value
flags	Socket flags value
name	Name of this probe
state	Socket state value
size	Size of message received (in bytes) or error code if success = 0
type	Socket type value
family	Protocol family value

Context

The message receiver.

Description

Fires at the conclusion of receiving a message on a socket via the `sock_recvmsg` function.

Name

probe::socket.aio_write — Message send via `sock_aio_write`

Synopsis

```
socket.aio_write
```

Values

protocol	Protocol value
flags	Socket flags value
name	Name of this probe
state	Socket state value
size	Message size in bytes
type	Socket type value
family	Protocol family value

Context

The message sender

Description

Fires at the beginning of sending a message on a socket via the `sock_aio_write` function

Name

probe::socket.aio_write.return — Conclusion of message send via `sock_aio_write`

Synopsis

```
socket.aio_write.return
```

Values

success	Was receive successful? (1 = yes, 0 = no)
protocol	Protocol value
flags	Socket flags value
name	Name of this probe
state	Socket state value
size	Size of message received (in bytes) or error code if success = 0
type	Socket type value
family	Protocol family value

Context

The message receiver.

Description

Fires at the conclusion of sending a message on a socket via the `sock_aio_write` function

Name

probe::socket.aio_read — Receiving message via `sock_aio_read`

Synopsis

```
socket.aio_read
```

Values

protocol	Protocol value
flags	Socket flags value
name	Name of this probe
state	Socket state value
size	Message size in bytes
type	Socket type value
family	Protocol family value

Context

The message sender

Description

Fires at the beginning of receiving a message on a socket via the `sock_aio_read` function

Name

probe::socket.aio_read.return — Conclusion of message received via `sock_aio_read`

Synopsis

```
socket.aio_read.return
```

Values

success	Was receive successful? (1 = yes, 0 = no)
protocol	Protocol value
flags	Socket flags value
name	Name of this probe
state	Socket state value
size	Size of message received (in bytes) or error code if success = 0
type	Socket type value
family	Protocol family value

Context

The message receiver.

Description

Fires at the conclusion of receiving a message on a socket via the `sock_aio_read` function

Name

probe::socket.writev — Message sent via `socket_writev`

Synopsis

```
socket.writev
```

Values

protocol	Protocol value
flags	Socket flags value
name	Name of this probe
state	Socket state value
size	Message size in bytes
type	Socket type value
family	Protocol family value

Context

The message sender

Description

Fires at the beginning of sending a message on a socket via the `sock_writev` function

Name

probe::socket.writev.return — Conclusion of message sent via `socket_writev`

Synopsis

```
socket.writev.return
```

Values

success	Was send successful? (1 = yes, 0 = no)
protocol	Protocol value
flags	Socket flags value
name	Name of this probe
state	Socket state value
size	Size of message sent (in bytes) or error code if success = 0
type	Socket type value
family	Protocol family value

Context

The message receiver.

Description

Fires at the conclusion of sending a message on a socket via the `sock_writev` function

Name

probe::socket.readv — Receiving a message via `sock_readv`

Synopsis

```
socket.readv
```

Values

protocol	Protocol value
flags	Socket flags value
name	Name of this probe
state	Socket state value
size	Message size in bytes
type	Socket type value
family	Protocol family value

Context

The message sender

Description

Fires at the beginning of receiving a message on a socket via the `sock_readv` function

Name

probe::socket.readv.return — Conclusion of receiving a message via `sock_readv`

Synopsis

```
socket.readv.return
```

Values

success	Was receive successful? (1 = yes, 0 = no)
protocol	Protocol value
flags	Socket flags value
name	Name of this probe
state	Socket state value
size	Size of message received (in bytes) or error code if success = 0
type	Socket type value
family	Protocol family value

Context

The message receiver.

Description

Fires at the conclusion of receiving a message on a socket via the `sock_readv` function

Name

probe::socket.create — Creation of a socket

Synopsis

```
socket.create
```

Values

protocol	Protocol value
name	Name of this probe
requester	Requested by user process or the kernel (1 = kernel, 0 = user)
type	Socket type value
family	Protocol family value

Context

The requester (see requester variable)

Description

Fires at the beginning of creating a socket.

Name

probe::socket.create.return — Return from Creation of a socket

Synopsis

```
socket.create.return
```

Values

success	Was socket creation successful? (1 = yes, 0 = no)
protocol	Protocol value
err	Error code if success == 0
name	Name of this probe
requester	Requested by user process or the kernel (1 = kernel, 0 = user)
type	Socket type value
family	Protocol family value

Context

The requester (user process or kernel)

Description

Fires at the conclusion of creating a socket.

Name

probe::socket.close — Close a socket

Synopsis

```
socket.close
```

Values

protocol	Protocol value
flags	Socket flags value
name	Name of this probe
state	Socket state value
type	Socket type value
family	Protocol family value

Context

The requester (user process or kernel)

Description

Fires at the beginning of closing a socket.

Name

probe::socket.close.return — Return from closing a socket

Synopsis

```
socket.close.return
```

Values

name Name of this probe

Context

The requester (user process or kernel)

Description

Fires at the conclusion of closing a socket.

Name

function::sock_prot_num2str — Given a protocol number, return a string representation.

Synopsis

```
sock_prot_num2str:string(proto:long)
```

Arguments

proto The protocol number.

Name

function::sock_prot_str2num — Given a protocol name (string), return the corresponding protocol number.

Synopsis

```
sock_prot_str2num:long(proto:string)
```

Arguments

proto The protocol name.

Name

function::sock_fam_num2str — Given a protocol family number, return a string representation.

Synopsis

```
sock_fam_num2str:string(family:long)
```

Arguments

family	The family number.

Name

function::sock_fam_str2num — Given a protocol family name (string), return the corresponding

Synopsis

```
sock_fam_str2num:long(family:string)
```

Arguments

family The family name.

Description

protocol family number.

Name

function::sock_state_num2str — Given a socket state number, return a string representation.

Synopsis

```
sock_state_num2str:string(state:long)
```

Arguments

state	The state number.

Name

function::sock_state_str2num — Given a socket state string, return the corresponding state number.

Synopsis

```
sock_state_str2num:long(state:string)
```

Arguments

state The state name.

Chapter 12. Kernel Process Tapset

This family of probe points is used to probe process-related activities. It contains the following probe points:

Name

probe::kprocess.create — Fires whenever a new process is successfully created

Synopsis

```
kprocess.create
```

Values

new_pid The PID of the newly created process

Context

Parent of the created process.

Description

Fires whenever a new process is successfully created, either as a result of fork (or one of its syscall variants), or a new kernel thread.

Name

probe::kprocess.start — Starting new process

Synopsis

```
kprocess.start
```

Values

None

Context

Newly created process.

Description

Fires immediately before a new process begins execution.

Name

probe::kprocess.exec — Attempt to exec to a new program

Synopsis

```
kprocess.exec
```

Values

filename The path to the new executable

Context

The caller of exec.

Description

Fires whenever a process attempts to exec to a new program.

Name

probe::kprocess.exec_complete — Return from exec to a new program

Synopsis

```
kprocess.exec_complete
```

Values

success	A boolean indicating whether the exec was successful
errno	The error number resulting from the exec

Context

On success, the context of the new executable. On failure, remains in the context of the caller.

Description

Fires at the completion of an exec call.

Name

probe::kprocess.exit — Exit from process

Synopsis

```
kprocess.exit
```

Values

code The exit code of the process

Context

The process which is terminating.

Description

Fires when a process terminates. This will always be followed by a kprocess.release, though the latter may be delayed if the process waits in a zombie state.

Name

probe::kprocess.release — Process released

Synopsis

```
kprocess.release
```

Values

pid PID of the process being released

task A task handle to the process being released

Context

The context of the parent, if it wanted notification of this process' termination, else the context of the process itself.

Description

Fires when a process is released from the kernel. This always follows a kprocess.exit, though it may be delayed somewhat if the process waits in a zombie state.

Chapter 13. Signal Tapset

This family of probe points is used to probe signal activities. It contains the following probe points:

Name

probe::signal.send — Signal being sent to a process

Synopsis

```
signal.send
```

Values

send2queue	Indicates whether the signal is sent to an existing sigqueue
name	The name of the function used to send out the signal
task	A task handle to the signal recipient
sinfo	The address of siginfo struct
si_code	Indicates the signal type
sig_name	A string representation of the signal
sig	The number of the signal
shared	Indicates whether the signal is shared by the thread group
sig_pid	The PID of the process receiving the signal
pid_name	The name of the signal recipient

Context

The signal's sender.

Name

probe::signal.send.return — Signal being sent to a process completed

Synopsis

```
signal.send.return
```

Values

retstr	The return value to either __group_send_sig_info, specific_send_sig_info, or send_sigqueue
send2queue	Indicates whether the sent signal was sent to an existing sigqueue
name	The name of the function used to send out the signal
shared	Indicates whether the sent signal is shared by the thread group.

Context

The signal's sender. (correct?)

Description

Possible __group_send_sig_info and specific_send_sig_info return values are as follows;

0 -- The signal is sucessfully sent to a process,

which means that

(1) the signal was ignored by the receiving process, (2) this is a non-RT signal and the system already has one queued, and (3) the signal was successfully added to the sigqueue of the receiving process.

-EAGAIN -- The sigqueue of the receiving process is overflowing, the signal was RT, and the signal was sent by a user using something other than `kill`.

Possible send_group_sigqueue and send_sigqueue return values are as follows;

0 -- The signal was either sucessfully added into the sigqueue of the receiving process, or a SI_TIMER entry is already queued (in which case, the overrun count will be simply incremented).

1 -- The signal was ignored by the receiving process.

-1 -- (send_sigqueue only) The task was marked exiting, allowing * posix_timer_event to redirect it to the group leader.

Name

probe::signal.checkperm — Check being performed on a sent signal

Synopsis

```
signal.checkperm
```

Values

name	Name of the probe point; default value is signal.checkperm
task	A task handle to the signal recipient
sinfo	The address of the siginfo structure
si_code	Indicates the signal type
sig_name	A string representation of the signal
sig	The number of the signal
pid_name	Name of the process receiving the signal
sig_pid	The PID of the process receiving the signal

Name

probe::signal.checkperm.return — Check performed on a sent signal completed

Synopsis

```
signal.checkperm.return
```

Values

retstr	Return value as a string
name	Name of the probe point; default value is signal.checkperm

Name

probe::signal.wakeup — Sleeping process being wakened for signal

Synopsis

```
signal.wakeup
```

Values

resume	Indicates whether to wake up a task in a STOPPED or TRACED state
state_mask	A string representation indicating the mask of task states to wake. Possible values are TASK_INTERRUPTIBLE, TASK_STOPPED, TASK_TRACED, and TASK_INTERRUPTIBLE.
pid_name	Name of the process to wake
sig_pid	The PID of the process to wake

Name

probe::signal.check_ignored — Checking to see signal is ignored

Synopsis

```
signal.check_ignored
```

Values

sig_name	A string representation of the signal
sig	The number of the signal
pid_name	Name of the process receiving the signal
sig_pid	The PID of the process receiving the signal

Name

probe::signal.check_ignored.return — Check to see signal is ignored completed

Synopsis

```
signal.check_ignored.return
```

Values

retstr	Return value as a string
name	Name of the probe point; default value is signal.checkperm

Name

probe::signal.force_segv — Forcing send of SIGSEGV

Synopsis

```
signal.force_segv
```

Values

sig_name	A string representation of the signal
sig	The number of the signal
pid_name	Name of the process receiving the signal
sig_pid	The PID of the process receiving the signal

Name

probe::signal.force_segv.return — Forcing send of SIGSEGV complete

Synopsis

```
signal.force_segv.return
```

Values

retstr	Return value as a string
name	Name of the probe point; default value is force_sigsegv

Name

probe::signal.syskill — Sending kill signal to a process

Synopsis

```
signal.syskill
```

Values

sig The specific signal sent to the process

pid The PID of the process receiving the signal

Name

probe::signal.syskill.return — Sending kill signal completed

Synopsis

```
signal.syskill.return
```

Values

None

Name

probe::signal.sys_tkill — Sending a kill signal to a thread

Synopsis

```
signal.sys_tkill
```

Values

sig_name	The specific signal sent to the process
sig	The specific signal sent to the process
pid	The PID of the process receiving the kill signal

Description

The tkill call is analogous to kill(2), except that it also allows a process within a specific thread group to be targeted. Such processes are targeted through their unique thread IDs (TID).

Name

probe::signal.systkill.return — Sending kill signal to a thread completed

Synopsis

```
signal.systkill.return
```

Values

None

Name

probe::signal.sys_tgkill — Sending kill signal to a thread group

Synopsis

```
signal.sys_tgkill
```

Values

sig_name	A string representation of the signal
sig	The specific kill signal sent to the process
pid	The PID of the thread receiving the kill signal
tgid	The thread group ID of the thread receiving the kill signal

Description

The tgkill call is similar to tkill, except that it also allows the caller to specify the thread group ID of the thread to be signalled. This protects against TID reuse.

Name

probe::signal.sys_tgkill.return — Sending kill signal to a thread group completed

Synopsis

```
signal.sys_tgkill.return
```

Values

None

Name

probe::signal.send_sig_queue — Queuing a signal to a process

Synopsis

```
signal.send_sig_queue
```

Values

sigqueue_addr	The address of the signal queue
sig_name	A string representation of the signal
sig	The queued signal
pid_name	Name of the process to which the signal is queued
sig_pid	The PID of the process to which the signal is queued

Name

probe::signal.send_sig_queue.return — Queuing a signal to a process completed

Synopsis

```
signal.send_sig_queue.return
```

Values

retstr Return value as a string

Name

probe::signal.pending — Examining pending signal

Synopsis

```
signal.pending
```

Values

sigset_size	The size of the user-space signal set
sigset_add	The address of the user-space signal set (sigset_t)

Description

This probe is used to examine a set of signals pending for delivery to a specific thread. This normally occurs when the do_sigpending kernel function is executed.

Name

probe::signal.pending.return — Examination of pending signal completed

Synopsis

```
signal.pending.return
```

Values

retstr Return value as a string

Name

probe::signal.handle — Signal handler being invoked

Synopsis

```
signal.handle
```

Values

regs	The address of the kernel-mode stack area
sig_code	The si_code value of the siginfo signal
sig_mode	Indicates whether the signal was a user-mode or kernel-mode signal
sinfo	The address of the siginfo table
oldset_addr	The address of the bitmask array of blocked signals
sig	The signal number that invoked the signal handler
ka_addr	The address of the k_sigaction table associated with the signal

Name

probe::signal.handle.return — Signal handler invocation completed

Synopsis

```
signal.handle.return
```

Values

retstr Return value as a string

Name

probe::signal.do_action — Examining or changing a signal action

Synopsis

```
signal.do_action
```

Values

sa_mask	The new mask of the signal
oldsigact_addr	The address of the old sigaction struct associated with the signal
sig	The signal to be examined/changed
sa_handler	The new handler of the signal
sigact_addr	The address of the new sigaction struct associated with the signal

Name

probe::signal.do_action.return — Examining or changing a signal action completed

Synopsis

```
signal.do_action.return
```

Values

retstr Return value as a string

Name

probe::signal.procmask — Examining or changing blocked signals

Synopsis

```
signal.procmask
```

Values

how	Indicates how to change the blocked signals; possible values are SIG_BLOCK=0 (for blocking signals), SIG_UNBLOCK=1 (for unblocking signals), and SIG_SETMASK=2 for setting the signal mask.
oldsigset_addr	The old address of the signal set (sigset_t)
sigset	The actual value to be set for sigset_t (correct?)
sigset_addr	The address of the signal set (sigset_t) to be implemented

Name

probe::signal.flush — Flushing all pending signals for a task

Synopsis

```
signal.flush
```

Values

task	The task handler of the process performing the flush
pid_name	The name of the process associated with the task performing the flush
sig_pid	The PID of the process associated with the task performing the flush

Chapter 14. Directory-entry (dentry) Tapset

This family of functions is used to map kernel VFS directory entry pointers to file or full path names.

Name

function::d_name — get the dirent name

Synopsis

```
d_name:string(dentry:long)
```

Arguments

dentry Pointer to dentry.

Description

Returns the dirent name (path basename).

Name

function::reverse_path_walk — get the full dirent path

Synopsis

```
reverse_path_walk:string(dentry:long)
```

Arguments

dentry Pointer to dentry.

Description

Returns the path name (partial path to mount point).

Name

function::d_path — get the full nameidata path

Synopsis

```
d_path:string(nd:long)
```

Arguments

nd Pointer to nameidata.

Description

Returns the full dirent name (full path to the root), like the kernel d_path function.

Chapter 15. Logging Tapset

This family of functions is used to send simple message strings to various destinations.

Name

function::log — Send a line to the common trace buffer.

Synopsis

```
log(msg:string)
```

Arguments

msg The formatted message string.

Description

An implicit end-of-line is added. Same as `println` with a single string argument.

Name

function::warn — Send a line to the warning stream.

Synopsis

```
warn(msg:string)
```

Arguments

msg The formatted message string.

Description

An implicit end-of-line is added. staprun prepends the string “WARNING:”.

Name

function::exit — Start shutting down probing script.

Synopsis

```
exit()
```

Arguments

None

Description

This only enqueues a request to start shutting down the script. New probes will not fire (except “end” probes), but all currently running ones may complete their work.

Name

function::error — Send an error message.

Synopsis

```
error(msg:string)
```

Arguments

msg The formatted message string.

Description

An implicit end-of-line is added. staprun prepends the string "ERROR:". Sending an error message aborts the currently running probe. Depending on the MAXERRORS parameter, it may trigger an `exit`.

Name

function::ftrace — Send a message to the ftrace ring-buffer.

Synopsis

```
ftrace(msg:string)
```

Arguments

msg The formatted message string.

Description

If the ftrace ring-buffer is configured & available, see /debugfs/tracing/trace for the message. Otherwise, the message may be quietly dropped. An implicit end-of-line is added.

Chapter 16. Random functions Tapset

These functions deal with random number generation.

Name

function::randint — Return a random number between [0,n)

Synopsis

```
randint:long(n:long)
```

Arguments

n Number past upper limit of range, not larger than 2**20.

Chapter 17. String and data retrieving functions Tapset

Functions to retrieve strings and other primitive types from the kernel or a user space programs based on addresses. All strings are of a maximum length given by MAXSTRINGLEN.

Name

function::kernel_string — Retrieves string from kernel memory.

Synopsis

```
kernel_string:string(addr:long)
```

Arguments

addr The kernel address to retrieve the string from.

Description

Returns the null terminated C string from a given kernel memory address. Reports an error on string copy fault.

Name

function::kernel_string_n — Retrieves string of given length from kernel memory.

Synopsis

```
kernel_string_n:string(addr:long,n:long)
```

Arguments

addr	The kernel address to retrieve the string from.
n	The maximum length of the string (if not null terminated).

Description

Returns the C string of a maximum given length from a given kernel memory address. Reports an error on string copy fault.

Name

function::kernel_long — Retrieves a long value stored in kernel memory.

Synopsis

```
kernel_long:long(addr:long)
```

Arguments

addr The kernel address to retrieve the long from.

Description

Returns the long value from a given kernel memory address. Reports an error when reading from the given address fails.

Name

function::kernel_int — Retrieves an int value stored in kernel memory.

Synopsis

```
kernel_int:long(addr:long)
```

Arguments

addr The kernel address to retrieve the int from.

Description

Returns the int value from a given kernel memory address. Reports an error when reading from the given address fails.

Name

function::kernel_short — Retrieves a short value stored in kernel memory.

Synopsis

```
kernel_short:long(addr:long)
```

Arguments

addr The kernel address to retrieve the short from.

Description

Returns the short value from a given kernel memory address. Reports an error when reading from the given address fails.

Name

function::kernel_char — Retrieves a char value stored in kernel memory.

Synopsis

```
kernel_char:long(addr:long)
```

Arguments

addr The kernel address to retrieve the char from.

Description

Returns the char value from a given kernel memory address. Reports an error when reading from the given address fails.

Name

function::user_string — Retrieves string from user space.

Synopsis

```
user_string:string(addr:long)
```

Arguments

addr The user space address to retrieve the string from.

Description

Returns the null terminated C string from a given user space memory address. Reports "<unknown>" on the rare cases when userspace data is not accessible.

Name

function::user_string2 — Retrieves string from user space with alternative error string..

Synopsis

```
user_string2:string(addr:long,err_msg:string)
```

Arguments

addr	The user space address to retrieve the string from.
err_msg	The error message to return when data isn't available.

Description

Returns the null terminated C string from a given user space memory address. Reports the given error message on the rare cases when userspace data is not accessible.

Name

function::user_string_warn — Retrieves string from user space.

Synopsis

```
user_string_warn:string(addr:long)
```

Arguments

addr The user space address to retrieve the string from.

Description

Returns the null terminated C string from a given user space memory address. Reports "<unknown>" on the rare cases when userspace data is not accessible and warns (but does not abort) about the failure.

Name

function::user_string_quoted — Retrieves and quotes string from user space.

Synopsis

```
user_string_quoted:string(addr:long)
```

Arguments

addr The user space address to retrieve the string from.

Description

Returns the null terminated C string from a given user space memory address where any ASCII characters that are not printable are replaced by the corresponding escape sequence in the returned string. Reports “NULL” for address zero. Returns “<unknown>” on the rare cases when userspace data is not accessible at the given address.

Name

function::user_string_n — Retrieves string of given length from user space.

Synopsis

```
user_string_n:string(addr:long,n:long)
```

Arguments

addr	The user space address to retrieve the string from.
n	The maximum length of the string (if not null terminated).

Description

Returns the C string of a maximum given length from a given user space address. Returns "<unknown>" on the rare cases when userspace data is not accessible at the given address.

Name

function::user_string_n2 — Retrieves string of given length from user space.

Synopsis

```
user_string_n2:string(addr:long,n:long,err_msg:string)
```

Arguments

addr	The user space address to retrieve the string from.
n	The maximum length of the string (if not null terminated).
err_msg	The error message to return when data isn't available.

Description

Returns the C string of a maximum given length from a given user space address. Returns the given error message string on the rare cases when userspace data is not accessible at the given address.

Name

function::user_string_n_warn — Retrieves string from user space.

Synopsis

```
user_string_n_warn:string(addr:long,n:long)
```

Arguments

addr	The user space address to retrieve the string from.
n	The maximum length of the string (if not null terminated).

Description

Returns up to n characters of a C string from a given user space memory address. Reports "<unknown>" on the rare cases when userspace data is not accessible and warns (but does not abort) about the failure.

Name

function::user_string_n_quoted — Retrieves and quotes string from user space.

Synopsis

```
user_string_n_quoted:string(addr:long,n:long)
```

Arguments

addr	The user space address to retrieve the string from.
n	The maximum length of the string (if not null terminated).

Description

Returns up to n characters of a C string from the given user space memory address where any ASCII characters that are not printable are replaced by the corresponding escape sequence in the returned string. Reports “NULL” for address zero. Returns “<unknown>” on the rare cases when userspace data is not accessible at the given address.

Name

function::user_short — Retrieves a short value stored in user space.

Synopsis

```
user_short:long(addr:long)
```

Arguments

addr The user space address to retrieve the short from.

Description

Returns the short value from a given user space address. Returns zero when user space data is not accessible.

Name

function::user_short_warn — Retrieves a short value stored in user space.

Synopsis

```
user_short_warn:long(addr:long)
```

Arguments

addr The user space address to retrieve the short from.

Description

Returns the short value from a given user space address. Returns zero when user space and warns (but does not abort) about the failure.

Name

function::user_int — Retrieves an int value stored in user space.

Synopsis

```
user_int:long(addr:long)
```

Arguments

addr The user space address to retrieve the int from.

Description

Returns the int value from a given user space address. Returns zero when user space data is not accessible.

Name

function::user_int_warn — Retrieves an int value stored in user space.

Synopsis

```
user_int_warn:long(addr:long)
```

Arguments

addr The user space address to retrieve the int from.

Description

Returns the int value from a given user space address. Returns zero when user space and warns (but does not abort) about the failure.

Name

function::user_long — Retrieves a long value stored in user space.

Synopsis

```
user_long:long(addr:long)
```

Arguments

addr The user space address to retrieve the long from.

Description

Returns the long value from a given user space address. Returns zero when user space data is not accessible. Note that the size of the long depends on the architecture of the current user space task (for those architectures that support both 64/32 bit compat tasks).

Name

function::user_long_warn — Retrieves a long value stored in user space.

Synopsis

```
user_long_warn:long(addr:long)
```

Arguments

addr The user space address to retrieve the long from.

Description

Returns the long value from a given user space address. Returns zero when user space and warns (but does not abort) about the failure. Note that the size of the long depends on the architecture of the current user space task (for those architectures that support both 64/32 bit compat tasks).

Name

function::user_char — Retrieves a char value stored in user space.

Synopsis

```
user_char:long(addr:long)
```

Arguments

addr The user space address to retrieve the char from.

Description

Returns the char value from a given user space address. Returns zero when user space data is not accessible.

Name

function::user_char_warn — Retrieves a char value stored in user space.

Synopsis

```
user_char_warn:long(addr:long)
```

Arguments

addr The user space address to retrieve the char from.

Description

Returns the char value from a given user space address. Returns zero when user space and warns (but does not abort) about the failure.

Chapter 18. A collection of standard string functions

Functions to get the length, a substring, getting at individual characters, string seaching, escaping, tokenizing, and converting strings to longs.

Name

function::strlen — Returns the length of a string.

Synopsis

```
strlen:long(s:string)
```

Arguments

s the string

Description

Returns the lenght of the string, which can be zero up to MAXSTRINGLEN.

Name

function::substr — Returns a substring.

Synopsis

```
substr:string(str:string,start:long,length:long)
```

Arguments

str	The string to take a substring from
start	Starting position. 0 = start of the string.
length	Length of string to return.

Description

Returns the substring of the up to the given length starting at the given start position.

Name

function::stringat — Returns the char at a given position in the string.

Synopsis

```
stringat:long(str:string,pos:long)
```

Arguments

str The string to fetch the character from.

pos The position to get the character from. 0 = start of the string.

Description

Returns the character at a given position in the string or zero if the string doesn't have as many characters.

Name

function::isinstr — Returns whether a string is a substring of another string.

Synopsis

```
isinstr:long(s1:string,s2:string)
```

Arguments

s1 String to search in.

s2 Substring to find.

Description

Returns 1 if s2 is in s1, otherwise 0.

Name

function::text_str — Escape any non-printable chars in a string.

Synopsis

```
text_str:string(input:string)
```

Arguments

input	The string to escape.

Description

Description Takes a string, and any ASCII characters that are not printable are replaced by the corresponding escape sequence in the returned string.

Name

function::text_strn — Escape any non-printable chars in a string.

Synopsis

```
text_strn:string(input:string,len:long,quoted:long)
```

Arguments

input The string to escape.

len Maximum length of string to return. 0 means MAXSTRINGLEN.

quoted Put double quotes around the string. If input string is truncated it will have "..." after the second quote.

Description

Description Takes a string, and any ASCII characters that are not printable are replaced by the corresponding escape sequence in the returned string.

Name

function::tokenize — Return the next non-empty token in a string.

Synopsis

```
tokenize:string(input:string,delim:string)
```

Arguments

input String to tokenize. If NULL, returns the next non-empty token in the string passed in the previous call to `tokenize`.

delim Token delimiter. Set of characters that delimit the tokens.

Description

Given a string and a token delimiter, return the next non-empty token in the string or blank when no more non-empty tokens are left.

Name

function::str_replace — str_replace Replaces all instances of a substring with another.

Synopsis

```
str_replace:string(prnt_str:string,srch_str:string,rplc_str:string)
```

Arguments

prnt_str	The string to search and replace in.
srch_str	The substring which is used to search in prnt_str string.
rplc_str	The substring which is used to replace srch_str.

Description

Returns the given string with substrings replaced.

Name

function::strtol — strtol - Convert a string to a long.

Synopsis

```
strtol:long(str:string,base:long)
```

Arguments

str	String to convert.
base	The base to use

Chapter 19. Utility functions for using ansi control chars in logs

Utility functions for logging using ansi control characters. This lets you manipulate the cursor position and character color output and attributes of log messages.

Name

function::ansi_clear_screen — Move cursor to top left and clear screen.

Synopsis

```
ansi_clear_screen()
```

Arguments

None

Description

Sends ansi code for moving cursor to top left and then the ansi code for clearing the screen from the cursor position to the end.

Name

function::ansi_set_color — Set the ansi Select Graphic Rendition mode.

Synopsis

```
ansi_set_color(fg:long)
```

Arguments

fg Foreground color to set.

Description

Sends ansi code for Select Graphic Rendition mode for the given forground color. Black (30), Blue (34), Green (32), Cyan (36), Red (31), Purple (35), Brown (33), Light Gray (37).

Name

function::ansi_set_color2 — Set the ansi Select Graphic Rendition mode.

Synopsis

```
ansi_set_color2(fg:long,bg:long)
```

Arguments

fg Foreground color to set.

bg Background color to set.

Description

Sends ansi code for Select Graphic Rendition mode for the given forground color, Black (30), Blue (34), Green (32), Cyan (36), Red (31), Purple (35), Brown (33), Light Gray (37) and the given background color, Black (40), Red (41), Green (42), Yellow (43), Blue (44), Magenta (45), Cyan (46), White (47).

Name

function::ansi_set_color3 — Set the ansi Select Graphic Rendition mode.

Synopsis

```
ansi_set_color3(fg:long,bg:long,attr:long)
```

Arguments

fg	Foreground color to set.
bg	Background color to set.
attr	Color attribute to set.

Description

Sends ansi code for Select Graphic Rendition mode for the given forground color, Black (30), Blue (34), Green (32), Cyan (36), Red (31), Purple (35), Brown (33), Light Gray (37), the given background color, Black (40), Red (41), Green (42), Yellow (43), Blue (44), Magenta (45), Cyan (46), White (47) and the color attribute All attributes off (0), Intensity Bold (1), Underline Single (4), Blink Slow (5), Blink Rapid (6), Image Negative (7).

Name

function::ansi_reset_color — Resets Select Graphic Rendition mode.

Synopsis

```
ansi_reset_color()
```

Arguments

None

Description

Sends ansi code to reset foreground, background and color attribute to default values.

Name

function::ansi_new_line — Move cursor to new line.

Synopsis

```
ansi_new_line()
```

Arguments

None

Description

Sends ansi code new line.

Name

function::ansi_cursor_move — Move cursor to new coordinates.

Synopsis

```
ansi_cursor_move(x:long,y:long)
```

Arguments

- *x* Row to move the cursor to.
- *y* Colomn to move the cursor to.

Description

Sends ansi code for positioning the cursor at row x and column y. Coordinates start at one, (1,1) is the top-left corner.

Name

function::ansi_cursor_hide — Hides the cursor.

Synopsis

```
ansi_cursor_hide()
```

Arguments

None

Description

Sends ansi code for hiding the cursor.

Name

function::ansi_cursor_save — Saves the cursor position.

Synopsis

```
ansi_cursor_save()
```

Arguments

None

Description

Sends ansi code for saving the current cursor position.

Name

function::ansi_cursor_restore — Restores a previously saved cursor position.

Synopsis

```
ansi_cursor_restore()
```

Arguments

None

Description

Sends ansi code for restoring the current cursor position previously saved with `ansi_cursor_save`.

Name

function::ansi_cursor_show — Shows the cursor.

Synopsis

```
ansi_cursor_show()
```

Arguments

None

Description

Sends ansi code for showing the cursor.