

SystemTap Tapset Reference Manual

SystemTap

SystemTap Tapset Reference Manual

by SystemTap

Copyright © 2008-2009 Red Hat, Inc. and others

This documentation is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License version 2 as published by the Free Software Foundation.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

For more details see the file COPYING in the source distribution of Linux.

Table of Contents

1. Introduction	1
Tapset Name Format	1
2. Context Functions	2
print_regs	3
execname	4
pid	5
tid	6
ppid	7
pexecname	8
gid	9
egid	10
uid	11
euid	12
cpu	13
pp	14
registers_valid	15
user_mode	16
is_return	17
target	18
stack_size	19
stack_used	20
stack_unused	21
uaddr	22
print_stack	23
probefunc	24
probemod	25
modname	26
symname	27
symdata	28
print_backtrace	29
backtrace	30
caller	31
caller_addr	32
3. Timestamp Functions	33
get_cycles	34
4. Memory Tapset	35
vm_fault_contains	36
vm.pagefault	37
vm.pagefault.return	38
addr_to_node	39
vm.write_shared	40
vm.write_shared_copy	41
vm.mmap	42
vm.munmap	43
vm.brk	44
vm.oom_kill	45
5. IO Scheduler Tapset	46
ioscheduler.elv_next_request	47
ioscheduler.elv_next_request.return	48
ioscheduler.elv_add_request	49
ioscheduler.elv_completed_request	50
6. SCSI Tapset	51
scsi.ioentry	52
scsi.iodispatching	53
scsi.iodone	54
scsi.iocompleted	55

7. Networking Tapset	56
netdev.receive	57
netdev.transmit	58
tcp.sendmsg	59
tcp.sendmsg.return	60
tcp.recvmsg	61
tcp.recvmsg.return	62
tcp.disconnect	63
tcp.disconnect.return	64
tcp.setsockopt	65
tcp.setsockopt.return	66
tcp.receive	67
udp.sendmsg	68
udp.sendmsg.return	69
udp.recvmsg	70
udp.recvmsg.return	71
udp.disconnect	72
udp.disconnect.return	73
ip_ntop	74
8. Socket Tapset	75
socket.send	76
socket.receive	77
socket.sendmsg	78
socket.sendmsg.return	79
socket.recvmsg	80
socket.recvmsg.return	81
socket.aio_write	82
socket.aio_write.return	83
socket.aio_read	84
socket.aio_read.return	85
socket.writev	86
socket.writev.return	87
socket.readv	88
socket.readv.return	89
socket.create	90
socket.create.return	91
socket.close	92
socket.close.return	93
sock_prot_num2str	94
sock_prot_str2num	95
sock_fam_num2str	96
sock_fam_str2num	97
sock_state_num2str	98
sock_state_str2num	99
9. Kernel Process Tapset	100
kprocess.create	101
kprocess.start	102
kprocess.exec	103
kprocess.exec_complete	104
kprocess.exit	105
kprocess.release	106
10. Signal Tapset	107
signal.send	108
signal.send.return	109
signal.checkperm	110
signal.checkperm.return	111
signal.wakeup	112
signal.check_ignored	113

signal.check_ignored.return	114
signal.force_segv	115
signal.force_segv.return	116
signal.syskill	117
signal.syskill.return	118
signal.sys_tkill	119
signal.systkill.return	120
signal.sys_tgkill	121
signal.sys_tgkill.return	122
signal.send_sig_queue	123
signal.send_sig_queue.return	124
signal.pending	125
signal.pending.return	126
signal.handle	127
signal.handle.return	128
signal.do_action	129
signal.do_action.return	130
signal.procmask	131
signal.flush	132

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

`print_regs` -- Print a register dump.

Synopsis

```
print_regs()
```

Arguments

None

Name

execname -- Returns the execname of a target process (or group of processes).

Synopsis

```
execname:string()
```

Arguments

None

Name

`pid --` Returns the ID of a target process.

Synopsis

```
pid:long()
```

Arguments

None

Name

`tid` -- Returns the thread ID of a target process.

Synopsis

```
tid:long()
```

Arguments

None

Name

ppid -- Returns the process ID of a target process's parent process.

Synopsis

```
ppid:long()
```

Arguments

None

Name

`pexecname` -- Returns the `execname` of a target process's parent process.

Synopsis

```
pexecname:string()
```

Arguments

None

Name

`gid --` Returns the group ID of a target process.

Synopsis

```
gid:long()
```

Arguments

None

Name

`egid --` Returns the effective gid of a target process.

Synopsis

```
egid:long()
```

Arguments

None

Name

`uid --` Returns the user ID of a target process.

Synopsis

```
uid:long()
```

Arguments

None

Name

`eid` -- Return the effective uid of a target process.

Synopsis

```
eid:long()
```

Arguments

None

Name

cpu -- Returns the current cpu number.

Synopsis

```
cpu:long()
```

Arguments

None

Name

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

`registers_valid` -- Determines validity of `<command>register</command>` and `<command>u_register</command>` 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, `<command>registers_valid</command>` returns 0 when called from a begin or end probe.

Name

`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

`is_return` -- Determines if probe point is a return probe.

Synopsis

```
is_return:long()
```

Arguments

None

Description

Return 1 if the probe point is a return probe. *Deprecated.*

Name

target -- Return the process ID of the target process.

Synopsis

```
target:long()
```

Arguments

None

Name

`stack_size` -- Return the size of the kernel stack.

Synopsis

```
stack_size:long()
```

Arguments

None

Name

`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

`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

`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

`print_stack` -- Print out stack from string.

Synopsis

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

Arguments

stk *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 `<command>backtrace</command>`.

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

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

Synopsis

```
probefunc:string()
```

Arguments

None

Name

probemod -- Return the probe point's module name, if known.

Synopsis

```
probemod:string()
```

Arguments

None

Name

`modname` -- Return the kernel module name loaded at the address.

Synopsis

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

Arguments

addr *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

`symname` -- Return the symbol associated with the given address.

Synopsis

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

Arguments

addr *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

`symdata` -- Return the symbol and module offset for the address.

Synopsis

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

Arguments

addr *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 ommitted and if the symbol name is unknown it will return the hex string for the given address.

Name

`print_backtrace` -- Print stack back trace

Synopsis

```
print_backtrace()
```

Arguments

None

Description

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

Name

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

caller -- Return name and address of calling function

Synopsis

```
caller:string()
```

Arguments

None

Description

Return the address and name of the calling function. <emphasis>Works only for return probes at this time.</emphasis>

Name

caller_addr -- Return caller address

Synopsis

```
caller_addr:long()
```

Arguments

None

Description

Return the address of the calling function. **<emphasis> Works only for return probes at this time.</emphasis>**

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

`get_cycles` -- Processor cycle count.

Synopsis

```
get_cycles:long()
```

Arguments

None

Description

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

Chapter 4. Memory Tapset

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

Name

`vm_fault_contains` -- Test return value for page fault reason

Synopsis

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

Arguments

value *value*

The fault_type returned by `vm.page_fault.return`

test *test*

The type of fault to test for (VM_FAULT_OOM or similar)

Name

vm.pagefault -- Records that a page fault occurred.

Synopsis

vm.pagefault

Values

<i>write_access</i>	<i>write_access</i>
	Indicates whether this was a write or read access; <code><command>1</command></code> indicates a write, while <code><command>0</command></code> indicates a read.

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

Context

The process which triggered the fault

Name

`vm.pagefault.return` -- Indicates what type of fault occurred.

Synopsis

`vm.pagefault.return`

Values

<i>fault_type</i>	<i>fault_type</i>
0	VM_FAULT_OOM
2	VM_FAULT_MINOR
3	VM_FAULT_MAJOR
1	VM_FAULT_SIGBUS

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

`addr_to_node` -- Returns which node a given address belongs to within a NUMA system.

Synopsis

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

Arguments

addr *addr*

The address of the faulting memory access.

Name

vm.write_shared -- Attempts at writing to a shared page.

Synopsis

```
vm.write_shared
```

Values

```
address    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 <command>vm.write_shared_copy</command>.

Name

`vm.write_shared_copy` -- Page copy for shared page write.

Synopsis

`vm.write_shared_copy`

Values

zero *zero*

Boolean indicating whether it is a zero page (can do a clear instead of a copy).

address *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
<command>vm.shared_write</command>.

Name

vm.mmap -- Fires when an <command>mmap</command> is requested.

Synopsis

vm.mmap

Values

length *length*
The length of the memory segment

address *address*
The requested address

Context

The process calling <command>mmap</command>.

Name

vm.munmap -- Fires when an <command>munmap</command> is requested.

Synopsis

vm.munmap

Values

length *length*
The length of the memory segment

address *address*
The requested address

Context

The process calling <command>munmap</command>.

Name

vm.brk -- Fires when a <command>brk</command> is requested (i.e. the heap will be resized).

Synopsis

vm.brk

Values

length *length*
The length of the memory segment

address *address*
The requested address

Context

The process calling <command>brk</command>.

Name

vm.oom_kill -- Fires when a thread is selected for termination by the OOM killer.

Synopsis

```
vm.oom_kill
```

Values

```
task task
```

The task being killed

Context

The process that tried to consume excessive memory, and thus triggered the OOM. <remark>(is this correct?)</remark>

Chapter 5. IO Scheduler Tapset

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

Name

`ioscheduler.elv_next_request` -- Fires when a request is retrieved from the request queue

Synopsis

`ioscheduler.elv_next_request`

Values

elevator_name *elevator_name*
The type of I/O elevator currently enabled

Name

`ioscheduler.elv_next_request.return` -- Fires when a request retrieval issues a return signal

Synopsis

```
ioscheduler.elv_next_request.return
```

Values

<i>req_flags</i>	<i>req_flags</i>
Request flags	
<i>req</i>	<i>req</i>
Address of the request	
<i>disk_major</i>	<i>disk_major</i>
Disk major number of the request	
<i>disk_minor</i>	<i>disk_minor</i>
Disk minor number of the request	

Name

`ioscheduler.elv_add_request` -- A request was added to the request queue

Synopsis

`ioscheduler.elv_add_request`

Values

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

Name

`ioscheduler.elv_completed_request` -- Fires when a request is completed

Synopsis

`ioscheduler.elv_completed_request`

Values

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

Chapter 6. SCSI Tapset

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

Name

scsi.ioentry -- Prepares a SCSI mid-layer request

Synopsis

```
scsi.ioentry
```

Values

<i>disk_major</i>	<i>disk_major</i>	The major number of the disk (-1 if no information)
<i>device_state</i>	<i>device_state</i>	The current state of the device.
<i>disk_minor</i>	<i>disk_minor</i>	The minor number of the disk (-1 if no information)

Name

`scsi.iodispatching` -- SCSI mid-layer dispatched low-level SCSI command

Synopsis

`scsi.iodispatching`

Values

<i>lun</i>	<i>lun</i> The lun number
<i>req_bufflen</i>	<i>req_bufflen</i> The request buffer length
<i>host_no</i>	<i>host_no</i> The host number
<i>device_state</i>	<i>device_state</i> The current state of the device.
<i>dev_id</i>	<i>dev_id</i> The scsi device id
<i>channel</i>	<i>channel</i> The channel number
<i>data_direction</i>	<i>data_direction</i> The <i>data_direction</i> specifies whether this command is from/to the device. 0 (DMA_BIDIRECTIONAL), 1 (DMA_TO_DEVICE), 2 (DMA_FROM_DEVICE), 3 (DMA_NONE)
<i>request_buffer</i>	<i>request_buffer</i> The request buffer address

Name

`scsi.iodone` -- SCSI command completed by low level driver and enqueued into the done queue.

Synopsis

```
scsi.iodone
```

Values

<i>lun</i>	<i>lun</i> The lun number
<i>host_no</i>	<i>host_no</i> The host number
<i>device_state</i>	<i>device_state</i> The current state of the device
<i>dev_id</i>	<i>dev_id</i> The scsi device id
<i>channel</i>	<i>channel</i> The channel number
<i>data_direction</i>	<i>data_direction</i> The <code>data_direction</code> specifies whether this command is from/to the device.

Name

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

Synopsis

`scsi.iocompleted`

Values

<i>lun</i>	<i>lun</i> The lun number
<i>host_no</i>	<i>host_no</i> The host number
<i>device_state</i>	<i>device_state</i> The current state of the device
<i>dev_id</i>	<i>dev_id</i> The scsi device id
<i>channel</i>	<i>channel</i> The channel number
<i>data_direction</i>	<i>data_direction</i> The <code>data_direction</code> specifies whether this command is from/to the device
<i>goodbytes</i>	<i>goodbytes</i> The bytes completed.

Chapter 7. Networking Tapset

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

Name

`netdev.receive` -- Data recieved from network device.

Synopsis

`netdev.receive`

Values

protocol *protocol*
Protocol of recieved packet.

dev_name *dev_name*
The name of the device. e.g: eth0, ath1.

length *length*
The length of the receiving buffer.

Name

`netdev.transmit` -- Network device transmitting buffer

Synopsis

`netdev.transmit`

Values

protocol *protocol*
The protocol of this packet.

dev_name *dev_name*
The name of the device. e.g: eth0, ath1.

length *length*
The length of the transmit buffer.

true_size *true_size*
The size of the the data to be transmitted.

Name

tcp.sendmsg -- Sending a tcp message

Synopsis

`tcp.sendmsg`

Values

name *name*
Name of this probe

size *size*
Number of bytes to send

sock *sock*
Network socket

Context

The process which sends a tcp message

Name

`tcp.sendmsg.return` -- Sending TCP message is done

Synopsis

`tcp.sendmsg.return`

Values

name *name*
Name of this probe

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

Context

The process which sends a tcp message

Name

tcp.recvmsg -- Receiving TCP message

Synopsis

tcp.recvmsg

Values

saddr saddr

A string representing the source IP address

daddr daddr

A string representing the destination IP address

name name

Name of this probe

sport sport

TCP source port

dport dport

TCP destination port

size size

Number of bytes to be received

sock sock

Network socket

Context

The process which receives a tcp message

Name

tcp.recvmsg.return -- Receiving TCP message complete

Synopsis

```
tcp.recvmsg.return
```

Values

saddr *saddr*

A string representing the source IP address

daddr *daddr*

A string representing the destination IP address

name *name*

Name of this probe

sport *sport*

TCP source port

dport *dport*

TCP destination port

size *size*

Number of bytes received or error code if an error occurred.

Context

The process which receives a tcp message

Name

tcp.disconnect -- TCP socket disconnection

Synopsis

tcp.disconnect

Values

saddr saddr

A string representing the source IP address

daddr daddr

A string representing the destination IP address

flags flags

TCP flags (e.g. FIN, etc)

name name

Name of this probe

sport sport

TCP source port

dport dport

TCP destination port

sock sock

Network socket

Context

The process which disconnects tcp

Name

tcp.disconnect.return -- TCP socket disconnection complete

Synopsis

```
tcp.disconnect.return
```

Values

ret *ret*
Error code (0: no error)

name *name*
Name of this probe

Context

The process which disconnects tcp

Name

tcp.setsockopt -- Call to setsockopt

Synopsis

tcp.setsockopt

Values

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

Context

The process which calls setsockopt

Name

`tcp.setsockopt.return` -- Return from `setsockopt`

Synopsis

`tcp.setsockopt.return`

Values

ret *ret*
Error code (0: no error)

name *name*
Name of this probe

Context

The process which calls `setsockopt`

Name

`tcp.receive` -- Called when a TCP packet is received

Synopsis

`tcp.receive`

Values

urg *urg*
TCP URG flag

psh *psh*
TCP PSH flag

rst *rst*
TCP RST flag

dport *dport*
TCP destination port

saddr *saddr*
A string representing the source IP address

daddr *daddr*
A string representing the destination IP address

ack *ack*
TCP ACK flag

syn *syn*
TCP SYN flag

fin *fin*
TCP FIN flag

sport *sport*
TCP source port

Name

udp.sendmsg -- Fires whenever a process sends a UDP message

Synopsis

```
udp.sendmsg
```

Values

name *name*

The name of this probe

size *size*

Number of bytes sent by the process

sock *sock*

Network socket used by the process

Context

The process which sent a UDP message

Name

`udp.sendmsg.return` -- Fires whenever an attempt to send a UDP message is completed

Synopsis

`udp.sendmsg.return`

Values

name *name*

The name of this probe

size *size*

Number of bytes sent by the process

Context

The process which sent a UDP message

Name

udp.recvmsg -- Fires whenever a UDP message is received

Synopsis

```
udp.recvmsg
```

Values

name *name*

The name of this probe

size *size*

Number of bytes received by the process

sock *sock*

Network socket used by the process

Context

The process which received a UDP message

Name

`udp.recvmsg.return` -- Fires whenever an attempt to receive a UDP message received is completed

Synopsis

`udp.recvmsg.return`

Values

name *name*

The name of this probe

size *size*

Number of bytes received by the process

Context

The process which received a UDP message

Name

udp.disconnect -- Fires when a process requests for a UDP disconnection

Synopsis

udp.disconnect

Values

flags flags
Flags (e.g. FIN, etc)

name name
The name of this probe

sock sock
Network socket used by the process

Context

The process which requests a UDP disconnection

Name

`udp.disconnect.return` -- UDP has been disconnected successfully

Synopsis

`udp.disconnect.return`

Values

ret *ret*
Error code (0: no error)

name *name*
The name of this probe

Context

The process which requested a UDP disconnection

Name

`ip_ntop` -- returns a string representation from an integer IP number

Synopsis

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

Arguments

addr *addr*
the ip represented as an integer

Chapter 8. Socket Tapset

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

Name

socket.send -- Message sent on a socket.

Synopsis

```
socket.send
```

Values

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

Context

The message sender

Name

socket.receive -- Message received on a socket.

Synopsis

```
socket.receive
```

Values

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

Context

The message receiver

Name

socket.sendmsg -- Message is currently being sent on a socket.

Synopsis

```
socket.sendmsg
```

Values

<i>protocol</i>	<i>protocol</i>
Protocol value	

<i>flags</i>	<i>flags</i>
Socket flags value	

<i>name</i>	<i>name</i>
Name of this probe	

<i>state</i>	<i>state</i>
Socket state value	

<i>size</i>	<i>size</i>
Message size in bytes	

<i>type</i>	<i>type</i>
Socket type value	

<i>family</i>	<i>family</i>
Protocol family value	

Context

The message sender

Description

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

Name

`socket.sendmsg.return` -- Return from `<command>socket.sendmsg</command>`.

Synopsis

```
socket.sendmsg.return
```

Values

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

socket.recvmsg -- Message being received on socket

Synopsis

```
socket.recvmsg
```

Values

protocol *protocol*
Protocol value

flags *flags*
Socket flags value

name *name*
Name of this probe

state *state*
Socket state value

size *size*
Message size in bytes

type *type*
Socket type value

family *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

socket.recvmsg.return -- Return from Message being received on socket

Synopsis

```
socket.recvmsg.return
```

Values

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

socket.aio_write -- Message send via sock_aio_write

Synopsis

```
socket.aio_write
```

Values

protocol *protocol*
Protocol value

flags *flags*
Socket flags value

name *name*
Name of this probe

state *state*
Socket state value

size *size*
Message size in bytes

type *type*
Socket type value

family *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

socket.aio_write.return -- Conclusion of message send via `sock_aio_write`

Synopsis

```
socket.aio_write.return
```

Values

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

socket.aio_read -- Receiving message via sock_aio_read

Synopsis

```
socket.aio_read
```

Values

protocol *protocol*
Protocol value

flags *flags*
Socket flags value

name *name*
Name of this probe

state *state*
Socket state value

size *size*
Message size in bytes

type *type*
Socket type value

family *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

socket.aio_read.return -- Conclusion of message received via `sock_aio_read`

Synopsis

```
socket.aio_read.return
```

Values

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

socket.writev -- Message sent via socket_writev

Synopsis

```
socket.writev
```

Values

protocol *protocol*
Protocol value

flags *flags*
Socket flags value

name *name*
Name of this probe

state *state*
Socket state value

size *size*
Message size in bytes

type *type*
Socket type value

family *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

`socket.writev.return` -- Conclusion of message sent via `socket.writev`

Synopsis

`socket.writev.return`

Values

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

socket.readv -- Receiving a message via `sock_readv`

Synopsis

```
socket.readv
```

Values

protocol *protocol*
Protocol value

flags *flags*
Socket flags value

name *name*
Name of this probe

state *state*
Socket state value

size *size*
Message size in bytes

type *type*
Socket type value

family *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

socket.readv.return -- Conclusion of receiving a message via `sock_readv`

Synopsis

```
socket.readv.return
```

Values

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

socket.create -- Creation of a socket

Synopsis

```
socket.create
```

Values

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

Context

The requester (see requester variable)

Description

Fires at the beginning of creating a socket.

Name

`socket.create.return` -- Return from Creation of a socket

Synopsis

`socket.create.return`

Values

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

Context

The requester (user process or kernel)

Description

Fires at the conclusion of creating a socket.

Name

socket.close -- Close a socket

Synopsis

```
socket.close
```

Values

<i>protocol</i>	<i>protocol</i>
Protocol value	

<i>flags</i>	<i>flags</i>
Socket flags value	

<i>name</i>	<i>name</i>
Name of this probe	

<i>state</i>	<i>state</i>
Socket state value	

<i>type</i>	<i>type</i>
Socket type value	

<i>family</i>	<i>family</i>
Protocol family value	

Context

The requester (user process or kernel)

Description

Fires at the beginning of closing a socket.

Name

socket.close.return -- Return from closing a socket

Synopsis

```
socket.close.return
```

Values

name *name*
Name of this probe

Context

The requester (user process or kernel)

Description

Fires at the conclusion of closing a socket.

Name

`sock_prot_num2str` -- Given a protocol number, return a string representation.

Synopsis

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

Arguments

proto *proto*
The protocol number.

Name

`sock_prot_str2num` -- Given a protocol name (string), return the corresponding protocol number.

Synopsis

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

Arguments

proto *proto*
The protocol name.

Name

`sock_fam_num2str` -- Given a protocol family number, return a string representation.

Synopsis

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

Arguments

family *family*
The family number.

Name

`sock_fam_str2num` -- Given a protocol family name (string), return the corresponding

Synopsis

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

Arguments

family *family*
The family name.

Description

protocol family number.

Name

`sock_state_num2str` -- Given a socket state number, return a string representation.

Synopsis

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

Arguments

state *state*
The state number.

Name

`sock_state_str2num` -- Given a socket state string, return the corresponding state number.

Synopsis

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

Arguments

state *state*
The state name.

Chapter 9. Kernel Process Tapset

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

Name

kprocess.create -- Fires whenever a new process is successfully created

Synopsis

```
kprocess.create
```

Values

```
new_pid    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 <command>fork</command> (or one of its syscall variants), or a new kernel thread.

Name

kprocess.start -- Starting new process

Synopsis

```
kprocess.start
```

Values

None

Context

Newly created process.

Description

Fires immediately before a new process begins execution.

Name

kprocess.exec -- Attempt to exec to a new program

Synopsis

kprocess.exec

Values

filename *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

kprocess.exec_complete -- Return from exec to a new program

Synopsis

```
kprocess.exec_complete
```

Values

success *success*

A boolean indicating whether the exec was successful

errno *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

kprocess.exit -- Exit from process

Synopsis

```
kprocess.exit
```

Values

code *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

kprocess.release -- Process released

Synopsis

kprocess.release

Values

pid *pid*
PID of the process being released

task *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 10. Signal Tapset

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

Name

signal.send -- Signal being sent to a process

Synopsis

```
signal.send
```

Values

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

Context

The signal's sender.

Name

signal.send.return -- Signal being sent to a process completed

Synopsis

signal.send.return

Values

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

Context

The signal's sender. <remark>(correct?)</remark>

Description

Possible <command>__group_send_sig_info</command> and <command>specific_send_sig_info</command> return values are as follows;

<command>0</command> -- The signal is successfully 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 <command>sigqueue</command> of the receiving process.

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

Possible <command>send_group_sigqueue</command> and <command>send_sigqueue</command> return values are as follows;

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

<command>1</command> -- The signal was ignored by the receiving process.

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

Name

signal.checkperm -- Check being performed on a sent signal

Synopsis

signal.checkperm

Values

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

Name

signal.checkperm.return -- Check performed on a sent signal completed

Synopsis

```
signal.checkperm.return
```

Values

```
retstr      retstr  
Return value as a string
```

```
name        name  
Name of the probe point; default value is <command>signal.checkperm</command>
```

Name

signal.wakeup -- Sleeping process being wakened for signal

Synopsis

```
signal.wakeup
```

Values

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

Name

signal.check_ignored -- Checking to see signal is ignored

Synopsis

```
signal.check_ignored
```

Values

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

Name

signal.check_ignored.return -- Check to see signal is ignored completed

Synopsis

```
signal.check_ignored.return
```

Values

```
retstr      retstr  
Return value as a string
```

```
name        name  
Name of the probe point; default value is <command>signal.checkperm</command>
```

Name

signal.force_segv -- Forcing send of <command>SIGSEGV</command>

Synopsis

signal.force_segv

Values

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

Name

signal.force_segv.return -- Forcing send of <command>SIGSEGV</command> complete

Synopsis

```
signal.force_segv.return
```

Values

retstr *retstr*
Return value as a string

name *name*
Name of the probe point; default value is <command>force_sigsegv</command>

Name

signal.syskill -- Sending kill signal to a process

Synopsis

```
signal.syskill
```

Values

sig sig

The specific signal sent to the process

pid pid

The PID of the process receiving the signal

Name

signal.syskill.return -- Sending kill signal completed

Synopsis

```
signal.syskill.return
```

Values

None

Name

signal.sys_tkill -- Sending a kill signal to a thread

Synopsis

```
signal.sys_tkill
```

Values

<i>sig_name</i>	<i>sig_name</i>	The specific signal sent to the process
<i>sig</i>	<i>sig</i>	The specific signal sent to the process
<i>pid</i>	<i>pid</i>	The PID of the process receiving the kill signal

Description

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

Name

signal.systkill.return -- Sending kill signal to a thread completed

Synopsis

```
signal.systkill.return
```

Values

None

Name

signal.sys_tgkill -- Sending kill signal to a thread group

Synopsis

```
signal.sys_tgkill
```

Values

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

Description

The `<command>tgkill</command>` call is similar to `<command>tkill</command>`, 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

signal.sys_tgkill.return -- Sending kill signal to a thread group completed

Synopsis

```
signal.sys_tgkill.return
```

Values

None

Name

signal.send_sig_queue -- Queuing a signal to a process

Synopsis

```
signal.send_sig_queue
```

Values

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

Name

signal.send_sig_queue.return -- Queuing a signal to a process completed

Synopsis

```
signal.send_sig_queue.return
```

Values

```
retstr    retstr  
Return value as a string
```

Name

signal.pending -- Examining pending signal

Synopsis

signal.pending

Values

sigset_size *sigset_size*
The size of the user-space signal set

sigset_add *sigset_add*
The address of the user-space signal set (<command>sigset_t</command>)

Description

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

Name

signal.pending.return -- Examination of pending signal completed

Synopsis

```
signal.pending.return
```

Values

```
retstr    retstr  
Return value as a string
```

Name

signal.handle -- Signal handler being invoked

Synopsis

signal.handle

Values

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

Name

signal.handle.return -- Signal handler invocation completed

Synopsis

```
signal.handle.return
```

Values

```
retstr    retstr  
Return value as a string
```

Name

signal.do_action -- Examining or changing a signal action

Synopsis

signal.do_action

Values

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

Name

signal.do_action.return -- Examining or changing a signal action completed

Synopsis

```
signal.do_action.return
```

Values

```
retstr    retstr  
Return value as a string
```

Name

signal.procmask -- Examining or changing blocked signals

Synopsis

```
signal.procmask
```

Values

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

Name

signal.flush -- Flusing all pending signals for a task

Synopsis

```
signal.flush
```

Values

<i>task</i>	<i>task</i>
	The task handler of the process performing the flush
<i>pid_name</i>	<i>pid_name</i>
	The name of the process associated with the task performing the flush
<i>sig_pid</i>	<i>sig_pid</i>
	The PID of the process associated with the task performing the flush