Tools

	DTrace	*SystemTap*
Tool	`dtrace(1M)`	`stap(1)`

List probes	`# dtrace -l`
	`# dtrace -l -P io`
		`# stap -l 'ioblock.*'`
		`# stap -L 'ioblock.*'`

One-liner	`# dtrace -n '`
	`    syscall::read:entry {`
	`        trace(arg1); } '`
		`# stap -e '`
		`    probe syscall.read {`
		`        println(fd); } '`

Script	`# dtrace -s script.d` (optionally add `-C` for preprocessor, `-q` for quiet mode)	`# stap script.stp`
Custom probe	`# dtrace -P io -n start`	-

Integer arguments	`# dtrace -n '`
	`    syscall::read:entry`
	`      / cpu == $1 / ' 0`
		`# stap -e '`
		`    probe syscall.read {`
		`     if(cpu() != $1) next;`
		`       println(fd); } ' 0`

String arguments	`# dtrace -n '`
	`    syscall::read:entry`
	`      / execname == $1 / ' '"cat"'`
		`# stap -e '`
		`    probe syscall.read {`
		`     if(execname() == @1)`
		`        println(fd); } ' cat`

Guru/destructive mode (!)	`# dtrace -w ...`	`# stap -g ...`
Redirect to file	`# dtrace -o FILE ...` (appends)	`# stap -o FILE ...` (rewrites)

Tracing process	`# dtrace -n '`
	`    syscall::read:entry`
	`      / pid == $target / { ...`
	`        }' -c 'cat /etc/motd'`
	
	(or `-p PID`)
		`# stap -e '`
		`    probe syscall.read {`
		`     if(pid() == target()) ...`
		`         } ' -c 'cat /etc/motd'`
		
		(or `-x PID`)

Probe names

	DTrace	*SystemTap*
Begin/end	`dtrace:::BEGIN`, `dtrace:::END`	`begin`, `end`

`foo()` entry	`fbt::foo:entry`	`kernel.function("foo")`
		`module("mod").function("foo")`

`foo()` return	`fbt::foo:return`	`kernel.function("foo").return`
Wildcards	`fbt::foo*:entry`	`kernel.function("foo*")`
Static probe `mark`	`sdt:::mark`	`kernel.trace("mark")`
System call	`syscall::read:entry`	`syscall.read`
Timer once per second	`tick-1s`	`timer.s(1)`
Profiling	`profile-997hz`	`timer.profile()`, `perf.*`
`read()` from libc	`pid$target:libc:read:entry` Traces process with `pid == $target`	`process("/lib64/libc.so.6").function("read")` Traces any process that loads libc

In DTrace parts of probe name may be omitted: `fbt::foo:entry` -> `foo:entry`
Units for timer probes: `ns`, `us`, `ms`, `s`, `hz`, `jiffies` (SystemTap), `m`, `h`, `d` (all three - DTrace)

Printing

	DTrace	*SystemTap*
Value	`trace(v)`	`print(v)`
Value + newline	-	`println(v)`

Delimited values	-	`printd(",",v1,v2)`
		`printdln(",",v1,v2)`

Memory dump	`tracemem(`
	`    ptr, 16)`
		`printf("%16M", ptr)`

Formatted	`printf("%s", str)`	

Backtrace	`ustack(n)`
	`ustack()`
		`print_ubacktrace()`
		`print_ustack(`
		`    ubacktrace())`

Symbol	`usym(addr)`
	`ufunc(addr)`
	`uaddr(addr)`
		`print(usymname(addr))`
		`print(usymdata(addr))`

If *u* prefix is specified, userspace symbols and backtraces are printed, if not — kernel symbols are used

String operations

Operation	*DTrace*	**SystemTap_**

Get from kernel	`stringof(expr)`
	`(string) expr`
		`kernel_string*()`

Convert scalar		`sprint()` and `sprintf()`
Copy from user	`copyinstr()`	`user_string*()`
Compare	==, !=, >, >=, ,	

Concat	`strjoin(str1,`
	`str2)`
		`str1 . str2`

Get length	`strlen(str)`	

Check for substring	`strstr(`
	`    haystack,`
	`    needle)`
		`isinstr(`
		`    haystack,`
		`    needle)`

Context variables

Description	*DTrace*	*SystemTap*
Thread	`curthread`	`task_current()`
Thread ID	`tid`	`tid()`
PID	`pid`	`pid()`
Parent PID	`ppid`	`ppid()`

User/group ID	`uid/gid`	`uid()/gid()`
		`euid()/egid()`

Executable name	`execname`
	`curpsinfo->`
	`ps_fname`
		`execname()`

Command line	`curpsinfo->`
	`ps_psargs`
		`cmdline_*()`

CPU number	`cpu`	`cpu()`

Probe names	`probeprov`
	`probemod`
	`probefunc`
	`probename`
		`pp()`
		`pn()`
		`ppfunc()`
		`probefunc()`
		`probemod()`

Time

Time source	*DTrace*	*SystemTap*

System timer	`` `lbolt ``
	`` `lbolt64 ``
		`jiffies()`

CPU cycles	-	`get_cycles()`

Monotonic time	`timestamp`	`local_clock_unit()`
		
		`cpu_clock_unit(cpu)`

CPU time of thread	`vtimestamp`	-
Real time	`walltimestamp`	`gettimeofday_unit()`

Where *unit* is one of `s`, `ms`, `us`, `ns`

Aggregations

Time source	*DTrace*	*SystemTap*
Add value	`@aggr[keys] = func(value);`	`aggr[keys]`

Printing	`printa(@aggr);`
	`printa("format string", @aggr);`
		`foreach([keys] in aggr) {`
		`    print(keys, @func(aggr[keys]));`
		`}`

Clear	`clear(@aggr);` or `trunc(@aggr);`	`delete aggr;`

Normalization by 1000	`normalize(@aggr, 1000);`
	`denormalize(@aggr);`
		`@func(aggr) / 1000` in printing

Select 20 values	`trunc(@aggr, 20);`	`foreach([keys] in aggr limit 20) {`
		`    print(keys, @func(aggr[keys]));`
		`}`

Histograms (linear in [10;100] with step 5 and logarithmical)	`@lin = lquantize(value, 10, 100, 5);`
	`@log = quantize(value);`
	`...`
	`printa(@lin);   printa(@log);`
		`aggr`

Where *func* is one of `count`, `sum`, `min`, `max`, `avg`, `stddev`

Process management

SystemTap
Getting task_struct pointers:

- `task_current()` – current task_struct
- `task_parent(t)` – parent of task `t`
- `pid2task(pid)` – task_struct by pid

Working with task_struct pointers:

- `task_pid(t)` `task_tid(t)`
- `task_state(t)` – 0 (running), 1-2 (blocked)
- `task_execname(t)`

DTrace
`kthread_t* curthread` fields:

- t_tid, t_pri, t_start, t_pctcpu

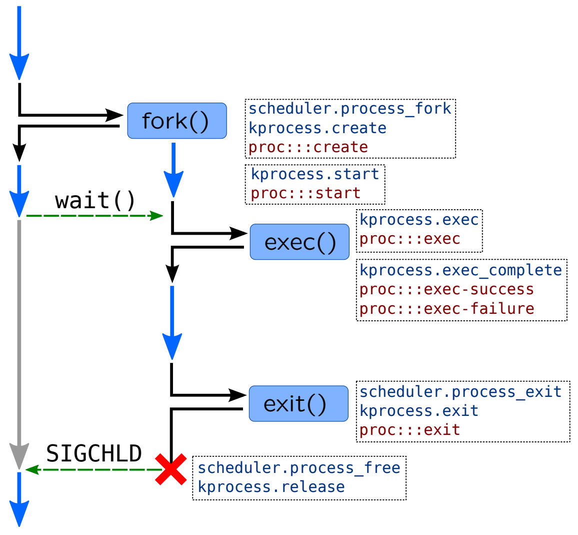
`psinfo_t* curpsinfo` fields:

- `pr_pid`, `pr_uid`, pr_gid, pr_fname, pr_psargs, pr_start

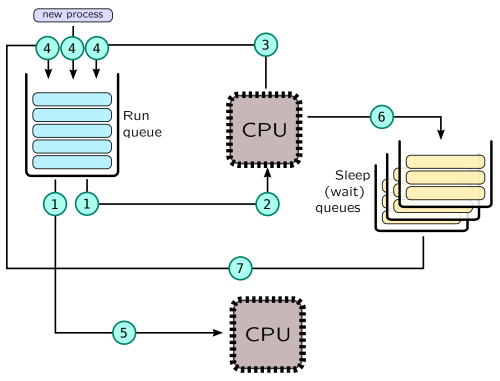
`lwpsinfo_t* curlwpsinfo` fields:

- `pr_lwpid`, `pr_state`/`pr_sname`

`psinfo_t*` and `lwpsinfo_t*` are passed to some `proc:::` probes



Scheduler



	DTrace	*SystemTap*
1	`sched:::dequeue`	`kernel.function("dequeue_task")`
2	`sched:::on-cpu`	`scheduler.cpu_on`
3	`sched:::off-cpu`	`scheduler.cpu_off`
4	`sched:::enqueue`	`kernel.function("enqueue_task")`
5	-	`scheduler.migrate`
6	`sched:::sleep`	-
7	`sched:::wakeup`	`scheduler.wakeup`

Virtual memory

Probes

SystemTap

- `vm.brk` – allocating heap
- `vm.mmap` – allocating anon memory
- `vm.munmap` – freeing anon memory

DTrace

- `as_map:entry` – allocating proc mem
- `as_unmap:entry` – freeing proc mem

Page faults

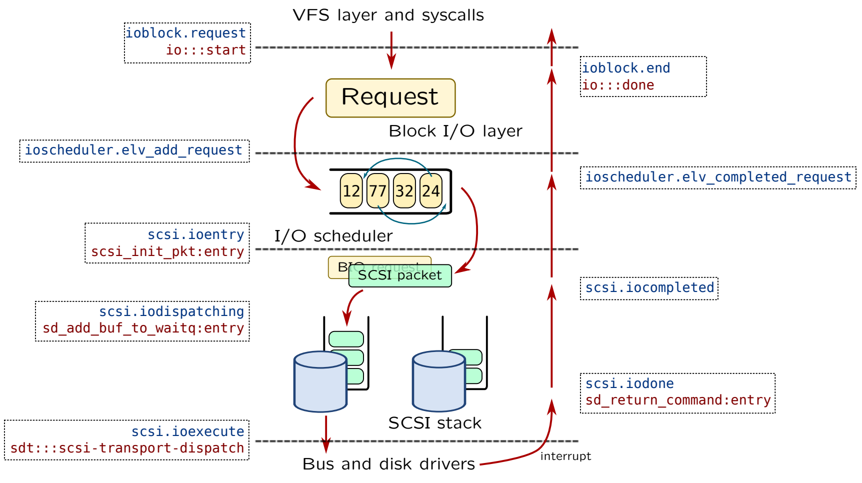
Type	*DTrace*	*SystemTap*
Any	`vminfo::as_fault`	`vm.pagefault` `vm.pagefault.return` `perf.sw.page_faults`
Minor		`perf.sw.page_faults_min`
Major	`vminfo:::maj_fault`	`perf.sw.page_faults_maj`
CoW	`vminfo:::cow_fault`	
Protection	`vminfo:::prot_fault`	

Block Input-Output

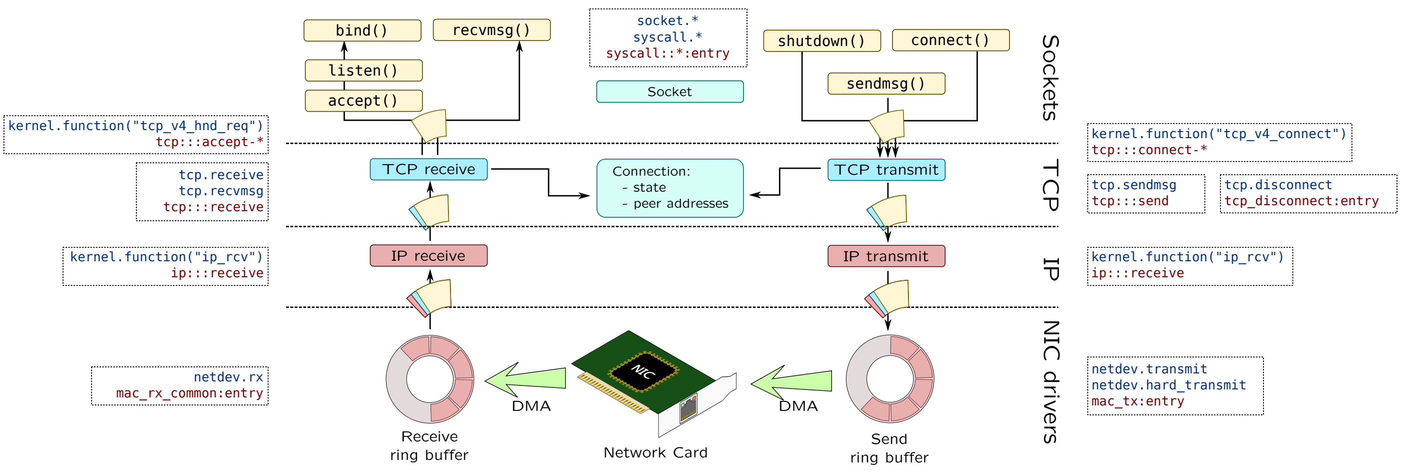
Block request structure fields:

Field	`bufinfo_t` `struct buf`	`struct bio`
Flags	`b_flags`	`bi_flags`
R/W	`b_flags`	`bi_rw`
Size	`b_bcount`	`bi_size`
Block	`b_blkno` `b_lblkno`	`bi_sector`
Callback	`b_iodone`	`bi_end_io`
Device	`b_edev` `b_dip`	`bi_bdev`

* flags `B_WRITE`, `B_READ`



Network stack



Non-native languages

Function call	*DTrace*	*SystemTap*
Java*	`method-entry` • arg0 — internal JVM thread's identifier • arg1:arg2 — class name • arg3:arg4 — method name • arg5:arg6 — method signature	`hotspot.method_entry` • thread_id — internal JVM thread's identifier • class — class name • method — method name • sig — method signature
Perl	`perl$target:::sub-entry` • `arg0` –- subroutine name • `arg1` –- source file name • `arg2` –- line number	`process("...").mark("sub__entry")` • `$arg1` –- subroutine name • `$arg2` –- source file name • `$arg3` –- line number
Python	`python$target:::function-entry` • `arg0` –- source file name • `arg1` –- function name	`python.function.entry` • `$arg1` –- source file name • `$arg2` –- function name
PHP	`function-entry` • `arg0` — function name • `arg1` — file name • `arg2` — line number • `arg3` — class name • `arg4` — scope operator `::`	`process("...").mark("function__entry")` • `$arg1` — function name • `$arg2` — file name • `$arg3` — line number • `$arg4` — class name • `$arg5` — scope operator `::`

*requires `-XX:+DTraceMethodProbes`