

Note: 凡是被__init and __devinit 修饰的function不能被ftrace function tracing

kernel 3.18.7

```
root@granite2:/sys/kernel/debug/tracing# pwd
```

```
/sys/kernel/debug/tracing
```

```
root@granite2:/sys/kernel/debug/tracing# ls -l
```

-r--r--r--	1	root	root	0 Jan 1 1970	README
-r--r--r--	1	root	root	0 Jan 1 1970	available_events
-r--r--r--	1	root	root	0 Jan 1 1970	available_filter_functions
-r--r--r--	1	root	root	0 Jan 1 1970	available_tracers
-rw-r--r--	1	root	root	0 Jan 1 1970	buffer_size_kb
-r--r--r--	1	root	root	0 Jan 1 1970	buffer_total_size_kb
-rw-r--r--	1	root	root	0 Jan 1 1970	current_tracer
-r--r--r--	1	root	root	0 Jan 1 1970	dyn_ftrace_total_info
-r--r--r--	1	root	root	0 Jan 1 1970	enabled_functions
drwxr-xr-x	47	root	root	0 Jan 1 1970	events
--w-----	1	root	root	0 Jan 1 1970	free_buffer
-rw-r--r--	1	root	root	0 Jan 1 1970	function_profile_enabled
drwxr-xr-x	2	root	root	0 Jan 1 1970	instances
-rw-r--r--	1	root	root	0 Jan 1 1970	max_graph_depth
drwxr-xr-x	2	root	root	0 Jan 1 1970	options
drwxr-xr-x	4	root	root	0 Jan 1 1970	per_cpu

-r--r--r--	1 root	root	0 Jan 1 1970 printk_formats
-r--r--r--	1 root	root	0 Jan 1 1970 saved_cmdlines
-rw-r--r--	1 root	root	0 Jan 1 1970 saved_cmdlines_size
-rw-r--r--	1 root	root	0 Jan 1 1970 set_event
-rw-r--r--	1 root	root	0 Jan 1 1970 set_fttrace_filter
-rw-r--r--	1 root	root	0 Jan 1 1970 set_fttrace_notrace
-rw-r--r--	1 root	root	0 Jan 1 1970 set_fttrace_pid
-r--r--r--	1 root	root	0 Jan 1 1970 set_graph_function
-r--r--r--	1 root	root	0 Jan 1 1970 set_graph_notrace
-rw-r--r--	1 root	root	0 Jan 1 1970 snapshot
-rw-r--r--	1 root	root	0 Jan 1 1970 stack_max_size
-r--r--r--	1 root	root	0 Jan 1 1970 stack_trace
-r--r--r--	1 root	root	0 Jan 1 1970 stack_trace_filter
-rw-r--r--	1 root	root	0 Jan 1 1970 trace
-rw-r--r--	1 root	root	0 Jan 1 1970 trace_clock
--w--w----	1 root	root	0 Jan 1 1970 trace_marker
-rw-r--r--	1 root	root	0 Jan 1 1970 trace_options
-r--r--r--	1 root	root	0 Jan 1 1970 trace_pipe
drwxr-xr-x	2 root	root	0 Jan 1 1970 trace_stat
-rw-r--r--	1 root	root	0 Jan 1 1970 tracing_cpumask
-rw-r--r--	1 root	root	0 Jan 1 1970 tracing_max_latency
-rw-r--r--	1 root	root	0 Jan 1 1970 tracing_on
-rw-r--r--	1 root	root	0 Jan 1 1970 tracing_thresh

root@granite2:/sys/kernel/debug/tracing# lsmod

Module	Size	Used by
galcore	175584	0
ipv6	307736	20
imagepower	2050	0
laservideo_a0	85661	0
upc	89404	0
stepper_api_b0	13799	0
scanblkdriver	111231	0
pegmatite_regulator	6260	4 upc,imagepower
picdriver	81599	0
dmaalloc	6079	1 laservideo_a0 trace functions in dmaalloc module
pieedriver	230242	0
dros	13596	2 laservideo_a0,scanblkdriver
cisxdriver	53160	0
icetestdriver	22313	0
hips_pll	7319	1 laservideo_a0
mv61_cdma	37948	0
sccplite	6399	0
stepper_mod_b0	18845	1 stepper_api_b0
dcmotor_reg	9960	0
ehci_hcd	67495	0
ipc_driver	8895	0
i2c_pxa	8657	0
wtm	3801	0
dro_pegmatite	1766	0

pegmatite_wdt 4868 0

```
root@granite2:/sys/kernel/debug/tracing# echo ':mod:dmaalloc' > set_ftrace_filter
```

```
root@granite2:/sys/kernel/debug/tracing# cat set_ftrace_filter
```

memFreePhysical [dmaalloc]

dma_free [dmaalloc]

dma_alloc_release [dmaalloc]

dma_alloc_adopt_irb_lines [dmaalloc]

dma_alloc [dmaalloc]

dma_alloc_platform_remove [dmaalloc]

dma_alloc_read [dmaalloc]

dma_buffer_map_single [dmaalloc]

dma_buffer_unmap_single [dmaalloc]

dma_alloc_open [dmaalloc]

memMallocPhysical [dmaalloc]

dma_alloc_write [dmaalloc]

dma_alloc_platform_probe [dmaalloc]

```
root@granite2:/sys/kernel/debug/tracing#
```

```
# enable function tracer
```

```
echo function > current_tracer
```

```
echo 1 > tracing_on
```

```
echo 1 > /proc/sys/kernel/ftrace_enabled
```

```
echo 'start' > trace_marker
```

... (run application)

```
echo 'stop' > trace_marker
```

```
echo 0 > tracing_on
```

```
cat trace      show the trace log
```

应用举例：

1. `echo ':mod:dmaalloc' > set_ftrace_filter`

means all functions in kernel module dmaalloc

2. if you only want to trace the specific function (dma_alloc) in dmaalloc module,

```
root@granite2:/sys/kernel/debug/tracing# echo 'dma_alloc:mod:dmaalloc' > set_ftrace_filter
```

```
root@granite2:/sys/kernel/debug/tracing# cat set_ftrace_filter
```

```
dma_alloc [dmaalloc]
```

3. trace all functions in dmaalloc module except for dma_alloc function

```
echo ':mod:dmaalloc' > set_ftrace_filter
```

```
echo '!dma_alloc:mod:dmaalloc' >> set_ftrace_filter
```

在Ubuntu 14.04下

Note: 操作ftrace必须用root user,不能通过sudo.

为了方便，建立如下link

```
# ln -s /sys/kernel/debug/tracing /ftrace
```

```
root@walterzh-ThinkPad-T440p:/ftrace# ll set_graph_function
```

```
-r--r--r-- 1 root root 0 11月  4 2015 set_graph_function
```

该文件是readonly. ???

原因如下：

in kernel/trace/ftrace.c

```
static __init int ftrace_init_dyn_debugfs(struct dentry *d_tracer)
```

```
{
```

```
    trace_create_file("available_filter_functions", 0444,
```

```
        d_tracer, NULL, &ftrace_avail_fops);
```

```
    trace_create_file("enabled_functions", 0444,
```

```
        d_tracer, NULL, &ftrace_enabled_fops);
```

```
    ftrace_create_filter_files(&global_ops, d_tracer);
```

```
#ifdef CONFIG_FUNCTION_GRAPH_TRACER
```

```

    trace_create_file("set_graph_function", 0444, d_tracer,
                      NULL,
                      &ftrace_graph_fops);

    trace_create_file("set_graph_notrace", 0444, d_tracer,
                      NULL,
                      &ftrace_graph_notrace_fops);

#endif /* CONFIG_FUNCTION_GRAPH_TRACER */

return 0;

}

```

"set_graph_function" file的mode是0444 , 即readonly.

```

static const struct file_operations ftrace_graph_fops = {

    .open      = ftrace_graph_open,

    .read      = seq_read,

    .write     = ftrace_graph_write,

    .llseek    = tracing_llseek,

    .release   = ftrace_graph_release,

};

```

但ftrace_graph_write()并非dummy.

```

root@walterzh-ThinkPad-T440p:/ftrace# echo __do_fault > set_graph_function

```

```
root@walterzh-ThinkPad-T440p:/ftrace# cat set_graph_function
```

```
__do_fault
```

readonly, but writable.

set the functions wanted to be traced

```
root@walterzh-ThinkPad-T440p:/ftrace# echo __do_fault > set_graph_function
```

```
root@walterzh-ThinkPad-T440p:/ftrace# echo do_cow_fault >> set_graph_function
```

Note: if do_cow_fault function is not in available_filter_functions file, set_graph_function is readonly.

for example, run the same command on Ubuntu 12.04

```
root@walterzh-Precision-T1650:/ftrace# echo do_cow_fault >> set_graph_function
```

```
-su: echo: write error: Invalid argument
```

```
root@walterzh-ThinkPad-T440p:/ftrace# echo 1 > tracing_on
```

```
root@walterzh-ThinkPad-T440p:/ftrace# echo function_graph > current_tracer
```

```
root@walterzh-ThinkPad-T440p:/ftrace# echo "walter start" > trace_marker
```

```
root@walterzh-ThinkPad-T440p:/ftrace# echo 1 > /proc/sys/kernel/ftrace_enabled
```

..... (do something)

```
root@walterzh-ThinkPad-T440p:/ftrace# echo "walter stop" > trace_marker
```

```
root@walterzh-ThinkPad-T440p:/ftrace# echo 0 > /proc/sys/kernel/ftrace_enabled
```


在Gemstone2 board environment运行ftrace

```
root@granite2:~# ln -s /sys/kernel/debug/tracing /ftrace
```

```
root@granite2:~# cd /ftrace
```

```
root@granite2:/ftrace# echo driver_probe_device > set_graph_function
```

```
root@granite2:/ftrace# echo 1 > tracing_on
```

```
root@granite2:/ftrace# echo "walter start" > trace_marker
```

```
root@granite2:/ftrace# echo function_graph > current_tracer
```

```
root@granite2:/ftrace# echo 1 > /proc/sys/kernel/ftrace_enabled
```

```
root@granite2:/ftrace# lsmod
```

Module	Size	Used by
wtm	3801	0
galcore	175584	0
ipv6	307736	20
imagepower	2050	0
upc	89404	0
stepper_api_b0	13799	0
laservideo_a0	85661	0
pegmatite_regulator	6260	4 upc,imagepower
picdriver	81599	0
scanblkdriver	111231	0
icetestdriver	22313	0
pieedriver	230242	0
cisxdriver	53160	0
dmaalloc	6079	1 laservideo_a0

```

dros          13596 2 laservideo_a0,scanblkdriver
hips_pll      7319 1 laservideo_a0
mv61_cdma     37948 0
sccplite      6399 0
stepper_mod_b0 18845 1 stepper_api_b0
dcmotor_reg   9960 0
ehci_hcd      67495 0
ipc_driver    8895 0
i2c_pxa       8657 0
dro_pegmatite 1766 0
pegmatite_wdt 4868 0

```

```
root@granite2:/ftrace# rmmod wtm
```

comments: The following command will trigger driver_probe_device() function

```

root@granite2:/ftrace# insmod /lib/modules/3.18.7-yocto-standard/kernel/drivers/wtm/wtm.ko
root@granite2:/ftrace# echo "walter stop" > trace_marker
root@granite2:/ftrace# echo 0 > /proc/sys/kernel/ftrace_enabled
root@granite2:/ftrace# cat trace
# tracer: function_graph
#
# CPU DURATION          FUNCTION CALLS
# |  |  |              | | | |
0)      | /* walter start */
-----
0) sh-1738  => insmod-1756
-----

0)      | driver_probe_device() {
0)      | pm_runtime_barrier() {
0)      | _raw_spin_lock_irq() {
0) 0.840 us | preempt_count_add();

```

```

0) 0.840 us | do_raw_spin_lock();
0) + 34.720 us | }
0) 0.840 us | __pm_runtime_barrier();
0) | _raw_spin_unlock_irq() {
0) 0.680 us | do_raw_spin_unlock();
0) 0.720 us | preempt_count_sub();
0) + 32.720 us | }
0) ! 115.960 us | }
0) | pinctrl_bind_pins() {
0) | devm_kmalloc() {
0) | __kmalloc_track_caller() {
0) 0.680 us | kmalloc_slab();
0) + 17.000 us | }
0) | devres_add() {
0) | _raw_spin_lock_irqsave() {
0) 0.760 us | preempt_count_add();
0) 0.640 us | do_raw_spin_lock();
0) + 32.440 us | }
0) 0.560 us | add_dr();
0) | _raw_spin_unlock_irqrestore() {
0) 0.640 us | do_raw_spin_unlock();
0) 0.720 us | preempt_count_sub();
0) + 32.480 us | }
0) ! 111.880 us | }
0) ! 160.520 us | }
0) | devm_pinctrl_get() {
0) | devres_alloc() {
0) | __kmalloc_track_caller() {
0) 0.600 us | kmalloc_slab();
0) + 16.960 us | }
0) + 33.080 us | }
0) | pinctrl_get() {
0) 0.880 us | mutex_lock();
0) 0.640 us | mutex_unlock();
0) 1.120 us | kmem_cache_alloc_trace();
0) | pinctrl_dt_to_map() {
0) | __kmalloc_track_caller() {
0) 0.640 us | kmalloc_slab();
0) + 16.800 us | }
0) | of_find_property() {

```

```

0)          |      _raw_spin_lock_irqsave() {
0) 0.800 us  |      preempt_count_add();
0) 0.680 us  |      do_raw_spin_lock();
0) + 32.560 us |      }
0) 2.400 us  |      __of_find_property();
0)          |      _raw_spin_unlock_irqrestore() {
0) 0.640 us  |      do_raw_spin_unlock();
0) 0.760 us  |      preempt_count_sub();
0) + 32.560 us |      }
0) ! 113.800 us |      }
0) 1.160 us  |      kfree();
0) ! 184.880 us |      }
0) 0.680 us  |      mutex_lock();
0) 0.600 us  |      mutex_unlock();
0) 0.680 us  |      mutex_lock();
0) 0.640 us  |      mutex_unlock();
0) ! 323.000 us |      }
0)          |      devres_add() {
0)          |      _raw_spin_lock_irqsave() {
0) 0.760 us  |      preempt_count_add();
0) 0.640 us  |      do_raw_spin_lock();
0) + 32.480 us |      }
0) 0.560 us  |      add_dr();
0)          |      _raw_spin_unlock_irqrestore() {
0) 0.640 us  |      do_raw_spin_unlock();
0) 0.720 us  |      preempt_count_sub();
0) + 32.440 us |      }
0) ! 111.600 us |      }
0) ! 514.200 us |      }

```

..... (very long log list)

```

-----
0) insmod-1756 => sh-1738
-----

```

```

0)          | /* walter stop */

```

