

# ftrace for Android hackers.

What ftrace is, why you should be using it, and how to get the most out of it.

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# Overview

Overview of the material.

1. Introduction to ftrace
2. Filesystems and debugfs
3. ftrace functionality
4. Example

# Introduction to ftrace

What is ftrace anyway?

- ▶ Most commonly known as the function tracer.
- ▶ Idea: save timing information for the execution of kernel functions and export the information to userspace.
- ▶ Utility: This is useful to kernel developers who need to keep an eye on how much time particular functions are taking.
- ▶ Today: Expanded to include tracers for many other kinds of info.
- ▶ Output: variety of formats, including human readable output - immensely useful for embedded developers (that means us!)

# Filesystems and debugfs - introduction

- ▶ Linux - several different filesystems, intended for different purposes.
- ▶ Common features - encapsulated in the VFS (Virtual Filesystem Switch).
- ▶ This allows most filesystems to be mounted using the mount command.
- ▶ Our focus: debugfs.
- ▶ Like sysfs and procfs - intended to allow kernel developers to export information to userspace and get control instructions from userspace.
- ▶ Different from sysfs and procfs - both of these have specific purposes and their indiscriminate use for debugging is discouraged. Not so for debugfs.

# Filesystems and debugfs - using debugfs

- ▶ When you need debugfs in your build, you need to configure it into your kernel, using the configuration option `CONFIG_DEBUG_FS`.
  - ▶ NOTE: this option is automatically selected when you select any option that enables ftrace during kernel configuration.
  - ▶ NOTE: Regardless of ftrace, debugfs is usually enabled by default, because many kernel subsystems have come to depend upon it.
- ▶ When debugfs is configured, the directory `/sys/kernel/debug` is created. debugfs is usually mounted into this directory.
- ▶ This mounting can be done, either by adding a line to the `/etc/fstab` file, or by using the mount command manually.
- ▶ Once this mounting is done, we can interact with ftrace, which stores its files in the `tracing` directory at the root of debugfs.

# ftrace functionality

- ▶ ftrace offers several different tracers:
  - ▶ `function`
  - ▶ `function_graph`
  - ▶ `irqsoff`
  - ▶ `preemptoff`
  - ▶ `preemptirqsoff`
  - ▶ `wakeup`
  - ▶ `wakeup_rt`
  - ▶ `nop`
- ▶ Any one of these can be active at a time.
- ▶ To change the active tracer, write its name into the file `tracing/current_tracer`.
- ▶ The tracer `nop` simply disables all tracers when it is written to `tracing/current_tracer`.
- ▶ We shall restrict our further discussion to `function` and `function_graph`.