Blktrace

Contents

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Contents

1 Article purpose

This article provides the basic information needed to start using the Linux® tool: **blktrace**[1] (*block tracer*).

2 Introduction

The following table provides a brief description of the tool, as well as its availability depending on the software packages:

: this tool is either present (ready to use or to be activated), or can be integrated and activated on the software package.

: this tool is not present and cannot be integrated, or it is present but cannot be activated on the software package.

Tool			STM32MPU Embedded Software distribution			STM32MPU Embedded Software distribution for Android™		
Name	Category	Purpose	Starter Package	Developer Package	Distribution Package	Starter Package	Developer Package	Distribution Package
blktrace	Tracing tools	**blktrace**[1] generates traces of the I/O traffic on block devices (SD card, USB, eMMC...)						

The blktrace tool is composed of three main components:

- a kernel
- a utility to record the I/O trace information from the kernel on the user space
- utilities to analyze and view the trace information.

blkparse[2] is also associated to blktrace. It takes the raw output from the blktrace utility and converts it to a nicely formatted and easy-to-read form.

3 Installing the trace and debug tool on your target board

It consists of placing the **blktrace** binary in the rootfs, and modifying the Linux kernel configuration.

In order to use **blktrace**, the Linux kernel configuration must activate CONFIG_BLK_DEV_IO_TRACE using the Linux kernel menuconfig tool:

```
Symbol: BLK_DEV_IO_TRACE
Location:
  Kernel Hacking --->
    [*] Tracers --->
      [*] Support for tracing block I/O actions
```

3.1 Using the STM32MPU Embedded Software distribution

The **blktrace** binary is available by default in all STM32MPU Embedded Software Packages:

```
Board $> which blktrace
/usr/bin/blktrace
```

It is integrated in weston image distribution through openembedded-core package: *openembedded-core/meta/recipes-core/packagegroups/packagegroup-core-tools-profile.bb*.

```
RRECOMMENDS_${PN} = "\
   ${PERF} \
   trace-cmd \
   blktrace \
   ${PROFILE_TOOLS_X} \
   ${PROFILE_TOOLS_SYSTEMD} \
   "
```

3.1.1 Starter Package

Not applicable as Linux kernel configuration cannot be updated.

3.1.2 Developer Package

To enable **CONFIG_BLK_DEV_IO_TRACE** in Linux kernel configuration, please refer to the Menuconfig or how to configure kernel. This article provides instructions for modifying the configuration and recompiling the Linux kernel image in the Developer Package context.

3.1.3 Distribution Package

To enable **CONFIG_BLK_DEV_IO_TRACE** in Linux® kernel configuration, please refer to the Menuconfig or how to configure kernel. This article provides instructions for modifying the configuration and recompiling the Linux kernel image in the Distribution Package context.

3.2 Using the STM32MPU Embedded software for Android™

The **blktrace** binary is not available by default in all STM32MPU Embedded Software Packages for Android, and so must be added.

3.2.1 Starter Package

Not applicable as Linux kernel configuration cannot be updated.

3.2.2 Developer Package

Not applicable as Linux kernel configuration cannot be updated.

3.2.3 Distribution Package

To enable **CONFIG_BLK_DEV_IO_TRACE** in Linux® kernel configuration, please refer to the How to customize kernel for Android. This article provides instructions for modifying the configuration and recompiling the Linux kernel image in the Distribution Package for Android context.

blktrace source code module is available Distribution Package in *external/blktrace*.

- To compile it (ensure the build environment is correctly set):

```
PC $> cd $ANDROID_BUILD_TOP
PC $> mma blktrace
```

- Check if **blktrace** binary is available in the system image:

```
PC $> ls out/target/product/<BoardId>/system/bin/blktrace
```

- Push the binary to the remote target file system:

```
# Remount first the target file system with write access
PC $> adb root; adb remount
PC $> adb sync
```

4 Getting started

To start with **blktrace**, trace I/O traffic on a mounted block device (illustrated with the example of the block device `/dev/mmcblk0p6`, which is mounted as `/usr/local`):

```
Board $> mount | grep mmcblk
/dev/mmcblk0p5 on / type ext4 (rw,relatime,data=ordered)
/dev/mmcblk0p4 on /boot type ext4 (rw,relatime,data=ordered)
/dev/mmcblk0p6 on /usr/local type ext4 (rw,relatime,data=ordered)
```

- Launch the **blktrace** tool in background:

```
Board $> blktrace -d /dev/mmcblk0p6 &
```

- Read /usr/local content (it generates read access to the associated block device):

```
Board $> ls -la /usr/local
```

- Put blktrace activity in foreground and then stop it by pressing Ctrl+C:

```
Board $> fg
blktrace -d /dev/mmcblk0p6
Board $> <Ctrl-C>
^C=== mmcblk0p6 ===
 CPU  0:                   98 events,        5 KiB data
 CPU  1:                   79 events,        4 KiB data
 Total:                   177 events (dropped 0),        9 KiB data
```

Below information is related to the Android™ distribution

ADB must be used as the file system is readonly.

```
PC $> adb root; adb remount
PC $> adb shell
Board $> ...
```

For detailed guidelines on **blktrace** usage, refer to the man page [1] or to the help information:

```
Board $> blktrace --help
Usage: blktrace

-d <dev>              | --dev=<dev>
[ -r <debugfs path>   | --relay=<debugfs path> ]
[ -o <file>           | --output=<file>]
[ -D <dir>            | --output-dir=<dir>
[ -w           | --stopwatch=]
[ -a <action field>   | --act-mask=<action field>]
```

```
[ -A <action mask>   | --set-mask=<action mask>]
[ -b <size>          | --buffer-size]
[ -n <number>        | --num-sub-buffers=<number>]
[ -l                 | --listen]
[ -h <hostname>      | --host=<hostname>]
[ -p <port number>   | --port=<port number>]
[ -s                 | --no-sendfile]
[ -I <devs file>     | --input-devs=<devs file>]
[ -v <version>       | --version]
[ -V <version>       | --version]
        -d Use specified device. May also be given last after options
        -r Path to mounted debugfs, defaults to /sys/kernel/debug
        -o File(s) to send output to
        -D Directory to prepend to output file names
        -w Stop after defined time, in seconds
         -a Only trace specified actions. See documentation
        -A Give trace mask as a single value. See documentation
        -b Sub buffer size in KiB (default 512)
        -n Number of sub buffers (default 4)
        -l Run in network listen mode (blktrace server)
        -h Run in network client mode, connecting to the given host
        -p Network port to use (default 8462)
        -s Make the network client NOT use sendfile() to transfer data
        -I Add devices found in <devs file>
        -v Print program version info
        -V Print program version info
```

To get started with **blktrace**, you can also refer to the Yocto Project wiki page for **blktrace**[3], which provides additional details as well as an example.

5 To go further

5.1 blkparse usage

In addition to displaying information for the user on the console, **blktrace** also creates trace files (one per CPU), which can be viewed using **blkparse**. These files are stored under the current path directory.

```
Board $> blkparse mmcblk0p6
Input file mmcblk0p6.blktrace.0 added
Input file mmcblk0p6.blktrace.1 added
179,6    0        1     0.000000000    99  P   N [jbd2/mmcblk0p5-]
179,6    0        0     0.000337792     0  m   N cfq99SN insert_request
179,6    0        0     0.000344292     0  m   N cfq99SN add_to_rr
179,6    0        0     0.000366250     0  m   N cfq99SN insert_request
179,6    0        0     0.000374792     0  m   N cfq99SN insert_request
179,6    0        0     0.000382458     0  m   N cfq99SN insert_request
179,6    0        0     0.000390167     0  m   N cfq99SN insert_request
179,6    0        2     0.000396625    99  U   N [jbd2/mmcblk0p5-] 5
179,6    0        0     0.000452542     0  m   N cfq workload slice:150000000
179,6    0        0     0.000460750     0  m   N cfq99SN set_active wl_class:0 wl_type:1
179,6    0        0     0.000469083     0  m   N cfq99SN dispatch_insert
179,6    0        0     0.000478500     0  m   N cfq99SN dispatched a request
179,6    0        0     0.000484583     0  m   N cfq99SN activate rq, drv=1
179,6    0        0     0.000747292     0  m   N cfq99SN dispatch_insert
179,6    0        0     0.000755042     0  m   N cfq99SN dispatched a request
179,6    0        0     0.000759708     0  m   N cfq99SN activate rq, drv=2
179,6    0        0     0.004197583     0  m   N cfq99SN complete rqnoidle 1
179,6    0        0     0.004206958     0  m   N cfq99SN set_slice=120000000
179,6    0        0     0.004231917     0  m   N cfq99SN dispatch_insert
179,6    0        0     0.004239208     0  m   N cfq99SN dispatched a request
179,6    0        0     0.004243958     0  m   N cfq99SN activate rq, drv=2
179,6    0        0     0.006287958     0  m   N cfq99SN complete rqnoidle 1
179,6    0        0     0.006305208     0  m   N cfq99SN dispatch_insert
179,6    0        0     0.006310542     0  m   N cfq99SN dispatched a request
179,6    0        0     0.006315417     0  m   N cfq99SN activate rq, drv=2
179,6    0        0     0.008340833     0  m   N cfq99SN complete rqnoidle 1
179,6    0        0     0.008359000     0  m   N cfq99SN dispatch_insert
179,6    0        0     0.008365083     0  m   N cfq99SN dispatched a request
179,6    0        0     0.008370000     0  m   N cfq99SN activate rq, drv=2
179,6    0        0     0.011504375     0  m   N cfq99SN complete rqnoidle 1
179,6    0        0     0.014671667     0  m   N cfq99SN insert_request
179,6    0        0     0.014727458     0  m   N cfq99SN complete rqnoidle 1
179,6    0        0     0.014731250     0  m   N cfq schedule dispatch
179,6    0        0     0.014808000     0  m   N cfq99SN dispatch_insert
179,6    0        0     0.014813875     0  m   N cfq99SN dispatched a request
179,6    0        0     0.014819958     0  m   N cfq99SN activate rq, drv=1
179,6    0        0     0.017068708     0  m   N cfq99SN complete rqnoidle 1
179,6    0        0     0.017078375     0  m   N cfq schedule dispatch
179,0    0        3     5.759777419   193  A  WS 1706892 + 2 <- (179,6) 32778
179,6    0        4     5.759784878   193  Q  WS 1706892 + 2 [jbd2/mmcblk0p6-]
179,6    0        5     5.759849336   193  G  WS 1706892 + 2 [jbd2/mmcblk0p6-]
179,6    0        6     5.759854253   193  P   N [jbd2/mmcblk0p6-]
179,6    1        1     5.759855044    99  P   N [jbd2/mmcblk0p5-]
179,0    0        7     5.759887628   193  A  WS 1706894 + 2 <- (179,6) 32780
179,6    0        8     5.759893919   193  Q  WS 1706894 + 2 [jbd2/mmcblk0p6-]
179,6    0        9     5.759947753   193  G  WS 1706894 + 2 [jbd2/mmcblk0p6-]
179,6    1        0     5.759975503     0  m   N cfq99SN insert_request
179,6    1        0     5.759990336     0  m   N cfq99SN insert_request
179,6    1        2     5.759999253    99  U   N [jbd2/mmcblk0p5-] 2
179,6    0       10     5.760024669   193  I  WS 1706892 + 2 [jbd2/mmcblk0p6-]
```

```
179,6    0        0     5.760035461     0  m   N cfq193SN insert_request
179,6    0        0     5.760041711     0  m   N cfq193SN add_to_rr
179,6    0        0     5.760053169     0  m   N cfq193SN preempt
179,6    0        0     5.760059253     0  m   N cfq99SN slice expired t=1
179,6    0        0     5.760066503     0  m   N cfq99SN resid=-5635859836
179,6    0        0     5.760081503     0  m   N cfq99SN sl_used=120000000 disp=6
charge=120000000 iops=0 sect=12
179,6    0       11     5.760087294   193  I  WS 1706894 + 2 [jbd2/mmcblk0p6-]
179,6    0        0     5.760091586     0  m   N cfq193SN insert_request
179,6    0       12     5.760096294   193  U   N [jbd2/mmcblk0p6-] 2
179,6    1        0     5.760111211     0  m   N cfq workload slice:300000000
179,6    1        0     5.760118086     0  m   N cfq193SN set_active wl_class:0 wl_type:1
179,6    1        0     5.760125669     0  m   N cfq193SN dispatch_insert
179,6    1        0     5.760133128     0  m   N cfq193SN dispatched a request
179,6    1        0     5.760137711     0  m   N cfq193SN activate rq, drv=1
179,6    1        3     5.760145253    80  D  WS 1706892 + 2 [mmcqd/0]
179,6    1        0     5.760393003     0  m   N cfq193SN dispatch_insert
179,6    1        0     5.760399961     0  m   N cfq193SN dispatched a request
179,6    1        0     5.760404128     0  m   N cfq193SN activate rq, drv=2
179,6    1        4     5.760408211    80  D  WS 1706894 + 2 [mmcqd/0]
179,6    1        5     5.764367836    80  C  WS 1706892 + 2 [0]
179,6    1        0     5.764403128     0  m   N cfq193SN complete rqnoidle 1
179,6    1        0     5.764412461     0  m   N cfq193SN set_slice=120000000
179,6    1        0     5.764439169     0  m   N cfq193SN slice expired t=0
179,6    1        0     5.764450253     0  m   N cfq193SN sl_used=33750 disp=2
charge=33750 iops=0 sect=4
179,6    1        0     5.764456836     0  m   N cfq193SN del_from_rr
179,6    1        0     5.764464711     0  m   N cfq99SN set_active wl_class:0 wl_type:1
179,6    1        0     5.764470211     0  m   N cfq99SN dispatch_insert
179,6    1        0     5.764475669     0  m   N cfq99SN dispatched a request
179,6    1        0     5.764479378     0  m   N cfq99SN activate rq, drv=2
179,6    1        6     5.767516794    80  C  WS 1706894 + 2 [0]
179,6    1        0     5.767546961     0  m   N cfq193SN complete rqnoidle 1
179,6    1        0     5.767564836     0  m   N cfq99SN dispatch_insert
179,6    1        0     5.767571086     0  m   N cfq99SN dispatched a request
179,6    1        0     5.767575628     0  m   N cfq99SN activate rq, drv=2
179,0    0       13     5.767654378   193  A FWFS 1706896 + 2 <- (179,6) 32782
179,6    0       14     5.767662669   193  Q  WS 1706896 + 2 [jbd2/mmcblk0p6-]
179,6    0       15     5.767726461   193  G  WS 1706896 + 2 [jbd2/mmcblk0p6-]
179,6    0       16     5.767734169   193  I  WS 1706896 + 2 [jbd2/mmcblk0p6-]
179,6    0        0     5.767744003     0  m   N cfq193SN insert_request
179,6    0        0     5.767750253     0  m   N cfq193SN add_to_rr
179,6    0        0     5.767760628     0  m   N cfq193SN preempt
179,6    0        0     5.767764336     0  m   N cfq99SN slice expired t=1
179,6    0        0     5.767770044     0  m   N cfq99SN resid=120000000
179,6    0        0     5.767781378     0  m   N cfq99SN sl_used=10000000 disp=2
charge=10000000 iops=0 sect=4
179,6    0        0     5.767784378     0  m   N cfq99SN del_from_rr
179,6    1        0     5.772038836     0  m   N cfq99SN complete rqnoidle 1
179,6    1        0     5.772064253     0  m   N cfq193SN set_active wl_class:0 wl_type:1
179,6    1        0     5.772070878     0  m   N cfq193SN dispatch_insert
179,6    1        0     5.772077044     0  m   N cfq193SN dispatched a request
179,6    1        0     5.772081878     0  m   N cfq193SN activate rq, drv=2
179,6    1        7     5.772085086    80  D  WS 1706896 + 2 [mmcqd/0]
179,6    1        0     5.774473336     0  m   N cfq99SN insert_request
179,6    1        0     5.774481419     0  m   N cfq99SN add_to_rr
179,6    1        0     5.774490461     0  m   N cfq99SN preempt
179,6    1        0     5.774496211     0  m   N cfq193SN slice expired t=1
179,6    1        0     5.774502586     0  m   N cfq193SN resid=120000000
179,6    1        0     5.774515044     0  m   N cfq193SN sl_used=10000000 disp=1
charge=10000000 iops=0 sect=2
179,6    1        0     5.774519128     0  m   N cfq193SN del_from_rr
179,6    1        0     5.774558711     0  m   N cfq99SN complete rqnoidle 1
179,6    1        0     5.774577211     0  m   N cfq99SN set_active wl_class:0 wl_type:1
179,6    1        0     5.774583919     0  m   N cfq99SN dispatch_insert
179,6    1        0     5.774590253     0  m   N cfq99SN dispatched a request
179,6    1        0     5.774595086     0  m   N cfq99SN activate rq, drv=2
```

```
179,6    1        8     5.777926544    80  C  WS 1706896 + 2 [0]
179,6    1        0     5.777956461     0  m   N cfq193SN complete rqnoidle 1
179,6    1        0     5.782932794     0  m   N cfq99SN complete rqnoidle 1
179,6    1        0     5.782943419     0  m   N cfq99SN set_slice=120000000
179,6    1        0     5.782949919     0  m   N cfq schedule dispatch
CPU0 (mmcblk0p6):
 Reads Queued:           0,        0KiB         Writes Queued:           3,        3KiB
 Read Dispatches:        0,        0KiB         Write Dispatches:        0,        0KiB
 Reads Requeued:         0                   Writes Requeued:         0
 Reads Completed:        0,        0KiB         Writes Completed:        0,        0KiB
 Read Merges:            0,        0KiB         Write Merges:            0,        0KiB
 Read depth:             0                   Write depth:             2
 IO unplugs:             2                   Timer unplugs:           0
CPU1 (mmcblk0p6):
 Reads Queued:           0,        0KiB         Writes Queued:           0,        0KiB
 Read Dispatches:        0,        0KiB         Write Dispatches:        3,        3KiB
 Reads Requeued:         0                   Writes Requeued:         0
 Reads Completed:        0,        0KiB         Writes Completed:        3,        3KiB
 Read Merges:            0,        0KiB         Write Merges:            0,        0KiB
 Read depth:             0                   Write depth:             2
 IO unplugs:             1                   Timer unplugs:           0

Total (mmcblk0p6):
 Reads Queued:           0,        0KiB         Writes Queued:           3,        3KiB
 Read Dispatches:        0,        0KiB         Write Dispatches:        3,        3KiB
 Reads Requeued:         0                   Writes Requeued:         0
 Reads Completed:        0,        0KiB         Writes Completed:        3,        3KiB
 Read Merges:            0,        0KiB         Write Merges:            0,        0KiB
 IO unplugs:             3                   Timer unplugs:           0

Throughput (R/W): 0KiB/s / 0KiB/s
Events (mmcblk0p6): 118 entries
Skips: 0 forward (0 -   0.0%)
```

Below information is related to the Android™ distribution

blkparse source code module is available in *external/blktrace*.

- To compile it (ensure the build environment is correctly set):

```
PC $> cd $ANDROID_BUILD_TOP
PC $> mma blkparse
```

- Check **blkparse** binary is available in system image:

```
PC $> ls out/target/product/<BoardId>/system/bin
/blkparse
```

- Push the binary to the remote target file system:

```
# Remount first the target file system with write access
PC $> adb root; adb remount
PC $> adb sync
```

5.2 ftrace usage

As soon as the Linux kernel configuration **CONFIG_BLK_DEV_IO_TRACE** is active, the block layer (***blk***) action can be traced by using ftrace:

- In this case, only the ***blk*** tracer may be configured for **ftrace**, as shown by the results of the following command:

```
Board $> mount -t tracefs nodev /sys/kernel/tracing
Board $> cat /sys/kernel/tracing/available_tracers
blk nop
```

- To get more **ftrace** tracers (such as. "function"), additional Linux kernel configuration options must be activated through the Distribution Package, as explained in the ftrace article.

By taking previous example on /usr/local read content (mount point to mcblk0p6):

```
Board $> echo 1 > /sys/block/mmcblk0/mmcblk0p6/trace/enable
Board $> echo blk > /sys/kernel/tracing/current_tracer
Board $> ls -la /usr/local
Board $> cat /sys/kernel/tracing/trace_pipe
```

```
 jbd2/mmcblk0p5--97    [001] ...1   100.412943: 179,0    A  WS 415902 + 2 <- (179,5)
278652
 jbd2/mmcblk0p6--196   [000] ...1   100.412943: 179,0    A  WS 1706892 + 2 <- (179,6)
32778
 jbd2/mmcblk0p5--97    [001] ...1   100.412974: 179,0    Q  WS 415902 + 2 [jbd2/mmcblk0p5-
]
 jbd2/mmcblk0p6--196   [000] ...1   100.412987: 179,0    Q  WS 1706892 + 2 [jbd2
/mmcblk0p6-]
 jbd2/mmcblk0p5--97    [001] ...1   100.413012: 179,0    G  WS 415902 + 2 [jbd2/mmcblk0p5-
]
 jbd2/mmcblk0p6--196   [000] ...1   100.413012: 179,0    G  WS 1706892 + 2 [jbd2
/mmcblk0p6-]
 jbd2/mmcblk0p6--196   [000] ...1   100.413018: 179,0    P   N [jbd2/mmcblk0p6-]
 jbd2/mmcblk0p5--97    [001] ...1   100.413019: 179,0    P   N [jbd2/mmcblk0p5-]
 jbd2/mmcblk0p5--97    [001] ...1   100.413034: 179,0    A  WS 415904 + 2 <- (179,5)
278654
 jbd2/mmcblk0p6--196   [000] ...1   100.413034: 179,0    A  WS 1706894 + 2 <- (179,6)
32780
 jbd2/mmcblk0p5--97    [001] ...1   100.413040: 179,0    Q  WS 415904 + 2 [jbd2/mmcblk0p5-
]
 jbd2/mmcblk0p6--196   [000] ...1   100.413040: 179,0    Q  WS 1706894 + 2 [jbd2
/mmcblk0p6-]
 jbd2/mmcblk0p5--97    [001] ...1   100.413054: 179,0    G  WS 415904 + 2 [jbd2/mmcblk0p5-
]
 jbd2/mmcblk0p6--196   [000] ...1   100.413056: 179,0    G  WS 1706894 + 2 [jbd2
/mmcblk0p6-]
 jbd2/mmcblk0p6--196   [000] ...2   100.413071: 179,0    I  WS 1706892 + 2 [jbd2
/mmcblk0p6-]
 jbd2/mmcblk0p6--196   [000] ...1   100.413092: 179,0    m   N cfq196SN insert_request
 jbd2/mmcblk0p6--196   [000] ...2   100.413104: 179,0    I  WS 1706894 + 2 [jbd2
/mmcblk0p6-]
 jbd2/mmcblk0p6--196   [000] ...1   100.413111: 179,0    m   N cfq196SN insert_request
 jbd2/mmcblk0p6--196   [000] ...2   100.413118: 179,0    U   N [jbd2/mmcblk0p6-] 2
 jbd2/mmcblk0p5--97    [001] ...2   100.413135: 179,0    I  WS 415902 + 2 [jbd2/mmcblk0p5-
]
 jbd2/mmcblk0p5--97    [001] ...1   100.413144: 179,0    m   N cfq97SN insert_request
 jbd2/mmcblk0p5--97    [001] ...1   100.413151: 179,0    m   N cfq97SN add_to_rr
 jbd2/mmcblk0p5--97    [001] ...1   100.413162: 179,0    m   N cfq97SN preempt
 jbd2/mmcblk0p5--97    [001] ...1   100.413168: 179,0    m   N cfq196SN slice expired t=1
```

```
 jbd2/mmcblk0p5--97    [001] ...1   100.413176: 179,0    m   N cfq196SN resid=-32494149849
 jbd2/mmcblk0p5--97    [001] ...1   100.413191: 179,0    m   N cfq196SN sl_used=120000000
disp=1 charge=120000000 iops=0 sect=2
 jbd2/mmcblk0p5--97    [001] ...2   100.413199: 179,0    I  WS 415904 + 2 [jbd2/mmcblk0p5-
]
 jbd2/mmcblk0p5--97    [001] ...1   100.413205: 179,0    m   N cfq97SN insert_request
 jbd2/mmcblk0p5--97    [001] ...2   100.413211: 179,0    U   N [jbd2/mmcblk0p5-] 2
          mmcqd/0-80    [000] ...1   100.413224: 179,0    m   N cfq workload slice:
200000000
          mmcqd/0-80    [000] ...1   100.413232: 179,0    m   N cfq97SN set_active
wl_class:0 wl_type:1
          mmcqd/0-80    [000] ...1   100.413241: 179,0    m   N cfq97SN dispatch_insert
          mmcqd/0-80    [000] ...1   100.413250: 179,0    m   N cfq97SN dispatched a
request
          mmcqd/0-80    [000] ...1   100.413256: 179,0    m   N cfq97SN activate rq, drv=1
          mmcqd/0-80    [000] ...2   100.413261: 179,0    D  WS 415902 + 2 [mmcqd/0]
          mmcqd/0-80    [000] ...1   100.413515: 179,0    m   N cfq97SN dispatch_insert
          mmcqd/0-80    [000] ...1   100.413524: 179,0    m   N cfq97SN dispatched a
request
          mmcqd/0-80    [000] ...1   100.413530: 179,0    m   N cfq97SN activate rq, drv=2
          mmcqd/0-80    [000] ...2   100.413534: 179,0    D  WS 415904 + 2 [mmcqd/0]
          mmcqd/0-80    [000] ...1   100.417441: 179,0    C  WS 415902 + 2 [0]
          mmcqd/0-80    [000] ...1   100.417482: 179,0    m   N cfq97SN complete rqnoidle 1
          mmcqd/0-80    [000] ...1   100.417494: 179,0    m   N cfq97SN set_slice=120000000
          mmcqd/0-80    [000] ...1   100.417526: 179,0    m   N cfq97SN slice expired t=0
          mmcqd/0-80    [000] ...1   100.417539: 179,0    m   N cfq97SN sl_used=40584
disp=2 charge=40584 iops=0 sect=4
          mmcqd/0-80    [000] ...1   100.417545: 179,0    m   N cfq97SN del_from_rr
          mmcqd/0-80    [000] ...1   100.417555: 179,0    m   N cfq196SN set_active
wl_class:0 wl_type:1
          mmcqd/0-80    [000] ...1   100.417561: 179,0    m   N cfq196SN dispatch_insert
          mmcqd/0-80    [000] ...1   100.417569: 179,0    m   N cfq196SN dispatched a
request
          mmcqd/0-80    [000] ...1   100.417575: 179,0    m   N cfq196SN activate rq, drv=2
          mmcqd/0-80    [000] ...2   100.417579: 179,0    D  WS 1706892 + 2 [mmcqd/0]
          mmcqd/0-80    [000] ...1   100.419353: 179,0    C  WS 415904 + 2 [0]
          mmcqd/0-80    [000] ...1   100.419380: 179,0    m   N cfq97SN complete rqnoidle 1
          mmcqd/0-80    [000] ...1   100.419393: 179,0    m   N cfq196SN dispatch_insert
          mmcqd/0-80    [000] ...1   100.419400: 179,0    m   N cfq196SN dispatched a
request
          mmcqd/0-80    [000] ...1   100.419405: 179,0    m   N cfq196SN activate rq, drv=2
          mmcqd/0-80    [000] ...2   100.419409: 179,0    D  WS 1706894 + 2 [mmcqd/0]
 jbd2/mmcblk0p5--97    [001] ...1   100.419431: 179,0    A FWFS 415906 + 2 <- (179,5)
278656
 jbd2/mmcblk0p5--97    [001] ...1   100.419440: 179,0    Q  WS 415906 + 2 [jbd2/mmcblk0p5-
]
 jbd2/mmcblk0p5--97    [001] ...1   100.419465: 179,0    G  WS 415906 + 2 [jbd2/mmcblk0p5-
]
 jbd2/mmcblk0p5--97    [001] ...2   100.419475: 179,0    I  WS 415906 + 2 [jbd2/mmcblk0p5-
]
 jbd2/mmcblk0p5--97    [001] ...1   100.419484: 179,0    m   N cfq97SN insert_request
 jbd2/mmcblk0p5--97    [001] ...1   100.419491: 179,0    m   N cfq97SN add_to_rr
 jbd2/mmcblk0p5--97    [001] ...1   100.419502: 179,0    m   N cfq97SN preempt
 jbd2/mmcblk0p5--97    [001] ...1   100.419507: 179,0    m   N cfq196SN slice expired t=1
 jbd2/mmcblk0p5--97    [001] ...1   100.419514: 179,0    m   N cfq196SN resid=120000000
 jbd2/mmcblk0p5--97    [001] ...1   100.419526: 179,0    m   N cfq196SN sl_used=10000000
disp=2 charge=10000000 iops=0 sect=4
 jbd2/mmcblk0p5--97    [001] ...1   100.419530: 179,0    m   N cfq196SN del_from_rr
          mmcqd/0-80    [000] ...1   100.424339: 179,0    C  WS 1706892 + 2 [0]
          mmcqd/0-80    [000] ...1   100.424367: 179,0    m   N cfq196SN complete rqnoidle
1
          mmcqd/0-80    [000] ...1   100.424388: 179,0    m   N cfq97SN set_active
wl_class:0 wl_type:1
          mmcqd/0-80    [000] ...1   100.424396: 179,0    m   N cfq97SN dispatch_insert
          mmcqd/0-80    [000] ...1   100.424404: 179,0    m   N cfq97SN dispatched a
request
          mmcqd/0-80    [000] ...1   100.424409: 179,0    m   N cfq97SN activate rq, drv=2
```

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          mmcqd/0-80    [000] ...2   100.424413: 179,0    D  WS 415906 + 2 [mmcqd/0]
          mmcqd/0-80    [000] ...1   100.427349: 179,0    C  WS 1706894 + 2 [0]
          mmcqd/0-80    [000] ...1   100.427382: 179,0    m   N cfq196SN complete rqnoidle
1
 jbd2/mmcblk0p6--196    [000] ...1   100.427441: 179,0    A FWFS 1706896 + 2 <- (179,6)
32782
 jbd2/mmcblk0p6--196    [000] ...1   100.427458: 179,0    Q  WS 1706896 + 2 [jbd2
/mmcblk0p6-]
 jbd2/mmcblk0p6--196    [000] ...1   100.427482: 179,0    G  WS 1706896 + 2 [jbd2
/mmcblk0p6-]
 jbd2/mmcblk0p6--196    [000] ...2   100.427492: 179,0    I  WS 1706896 + 2 [jbd2
/mmcblk0p6-]
 jbd2/mmcblk0p6--196    [000] ...1   100.427499: 179,0    m   N cfq196SN insert_request
 jbd2/mmcblk0p6--196    [000] ...1   100.427505: 179,0    m   N cfq196SN add_to_rr
 jbd2/mmcblk0p6--196    [000] ...1   100.427516: 179,0    m   N cfq196SN preempt
 jbd2/mmcblk0p6--196    [000] ...1   100.427521: 179,0    m   N cfq97SN slice expired t=1
 jbd2/mmcblk0p6--196    [000] ...1   100.427528: 179,0    m   N cfq97SN resid=120000000
 jbd2/mmcblk0p6--196    [000] ...1   100.427545: 179,0    m   N cfq97SN sl_used=10000000
disp=1 charge=10000000 iops=0 sect=2
 jbd2/mmcblk0p6--196    [000] ...1   100.427550: 179,0    m   N cfq97SN del_from_rr
          mmcqd/0-80    [000] ...1   100.427598: 179,0    m   N cfq196SN set_active
wl_class:0 wl_type:1
          mmcqd/0-80    [000] ...1   100.427605: 179,0    m   N cfq196SN dispatch_insert
          mmcqd/0-80    [000] ...1   100.427612: 179,0    m   N cfq196SN dispatched a
request
          mmcqd/0-80    [000] ...1   100.427618: 179,0    m   N cfq196SN activate rq, drv=2
          mmcqd/0-80    [000] ...2   100.427622: 179,0    D  WS 1706896 + 2 [mmcqd/0]
          mmcqd/0-80    [000] ...1   100.431133: 179,0    C  WS 415906 + 2 [0]
          mmcqd/0-80    [000] ...1   100.431164: 179,0    m   N cfq97SN complete rqnoidle 1
          mmcqd/0-80    [000] ...1   100.434921: 179,0    C  WS 1706896 + 2 [0]
          mmcqd/0-80    [000] ...1   100.434951: 179,0    m   N cfq196SN complete rqnoidle
1
          mmcqd/0-80    [000] ...1   100.434962: 179,0    m   N cfq196SN
set_slice=120000000
          mmcqd/0-80    [000] ...1   100.434969: 179,0    m   N cfq schedule dispatch
     kworker/u4:1-65    [001] ...1   101.612916: 179,0    A  WM 137922 + 2 <- (179,5) 672
     kworker/u4:1-65    [001] ...1   101.612949: 179,0    Q  WM 137922 + 2 [kworker/u4:1]
     kworker/u4:1-65    [001] ...1   101.613001: 179,0    G  WM 137922 + 2 [kworker/u4:1]
     kworker/u4:1-65    [001] ...1   101.613012: 179,0    P   N [kworker/u4:1]
     kworker/u4:1-65    [001] ...1   101.613071: 179,0    A  WM 1674662 + 2 <- (179,6) 548
     kworker/u4:1-65    [001] ...1   101.613077: 179,0    Q  WM 1674662 + 2 [kworker/u4:1]
     kworker/u4:1-65    [001] ...1   101.613093: 179,0    G  WM 1674662 + 2 [kworker/u4:1]
     kworker/u4:1-65    [001] ...2   101.613119: 179,0    I  WM 137922 + 2 [kworker/u4:1]
     kworker/u4:1-65    [001] ...1   101.613131: 179,0    m   N cfq200A  insert_request
     kworker/u4:1-65    [001] ...1   101.613139: 179,0    m   N cfq200A  add_to_rr
     kworker/u4:1-65    [001] ...1   101.613152: 179,0    m   N cfq200A  preempt
     kworker/u4:1-65    [001] ...1   101.613157: 179,0    m   N cfq196SN slice expired t=1
     kworker/u4:1-65    [001] ...1   101.613164: 179,0    m   N cfq196SN resid=-1058203000
     kworker/u4:1-65    [001] ...1   101.613179: 179,0    m   N cfq196SN sl_used=120000000
disp=1 charge=120000000 iops=0 sect=2
     kworker/u4:1-65    [001] ...1   101.613185: 179,0    m   N cfq196SN del_from_rr
     kworker/u4:1-65    [001] ...2   101.613198: 179,0    I  WM 1674662 + 2 [kworker/u4:1]
     kworker/u4:1-65    [001] ...1   101.613206: 179,0    m   N cfq200A  insert_request
     kworker/u4:1-65    [001] ...2   101.613214: 179,0    U   N [kworker/u4:1] 2
          mmcqd/0-80    [000] ...1   101.613238: 179,0    m   N cfq workload slice:40000000
          mmcqd/0-80    [000] ...1   101.613248: 179,0    m   N cfq200A  set_active
wl_class:0 wl_type:0
          mmcqd/0-80    [000] ...1   101.613258: 179,0    m   N cfq200A  dispatch_insert
          mmcqd/0-80    [000] ...1   101.613267: 179,0    m   N cfq200A  dispatched a
request
          mmcqd/0-80    [000] ...1   101.613274: 179,0    m   N cfq200A  activate rq, drv=1
          mmcqd/0-80    [000] ...2   101.613280: 179,0    D  WM 1674662 + 2 [mmcqd/0]
          mmcqd/0-80    [000] ...1   101.613511: 179,0    m   N cfq200A  dispatch_insert
          mmcqd/0-80    [000] ...1   101.613520: 179,0    m   N cfq200A  dispatched a
request
          mmcqd/0-80    [000] ...1   101.613525: 179,0    m   N cfq200A  activate rq, drv=2
          mmcqd/0-80    [000] ...2   101.613529: 179,0    D  WM 137922 + 2 [mmcqd/0]
```

```
          mmcqd/0-80    [000] ...1   101.618520: 179,0    C  WM 1674662 + 2 [0]
          mmcqd/0-80    [000] ...1   101.618576: 179,0    m   N cfq200A  complete rqnoidle
0
          mmcqd/0-80    [000] ...1   101.618586: 179,0    m   N cfq200A  set_slice=40000000
          mmcqd/0-80    [000] ...1   101.623185: 179,0    C  WM 137922 + 2 [0]
          mmcqd/0-80    [000] ...1   101.623215: 179,0    m   N cfq200A  complete rqnoidle
0
          mmcqd/0-80    [000] ...1   101.623221: 179,0    m   N cfq schedule dispatch
```

Below information is related to the Android™ distribution

ADB must be used as the file system is readonly.

```
PC $> adb root; adb remount
PC $> adb shell
Board $> ...
```

6 References

- 1.01.11.2 https://linux.die.net/man/8/blktrace
- https://linux.die.net/man/1/blkparse
- https://wiki.yoctoproject.org/wiki/Tracing_and_Profiling#blktrace

- Useful external links

Document link	Document Type	Description
blktrace tool source code including userspace tool	Sources	blktrace sources git
blktrace Presentation	Presentation	Presentation by Alan D. Brunelle

Linux® is a registered trademark of Linus Torvalds.

SD memory card (https://www.sdcard.org)

former spelling for e•MMC ('e' in italic)

input/output

eval,disco (Generic term used, to complete configuration modules paths depending on used board)

Central processing unit

Android debug bridge (Android specific)

Debug File System (See https://en.wikipedia.org/wiki/Debugfs for more details)