Null block device driver

Overview

The null block device (`/dev/nullb*`) is used for benchmarking the various block-layer implementations. It emulates a block device of X gigabytes in size. It does not execute any read/write operation, just mark them as complete in the request queue. The following instances are possible:

Multi-queue block-layer

- Request-based.
- Configurable submission queues per device.

No block-layer (Known as bio-based)

- Bio-based. IO requests are submitted directly to the device driver.
- Directly accepts bio data structure and returns them.

All of them have a completion queue for each core in the system.

Module parameters

queue_mode=[0-2]: Default: 2-Multi-queue

Selects which block-layer the module should instantiate with.

0	Bio-based
1	Single-queue (deprecated)
2	Multi-queue

home_node=[0--nr_nodes]: Default: NUMA_NO_NODE

Selects what CPU node the data structures are allocated from.

gb=[Size in GB]: Default: 250GB

The size of the device reported to the system.

bs=[Block size (in bytes)]: Default: 512 bytes

The block size reported to the system.

nr_devices=[Number of devices]: Default: 1

Number of block devices instantiated. They are instantiated as /dev/nullb0, etc.

irqmode=[0-2]: Default: 1-Soft-irq

The completion mode used for completing IOs to the block-layer.

0	None.
1	Soft-irq. Uses IPI to complete IOs across CPU nodes. Simulates the overhead when IOs are issued from another CPU node than the home the device is connected to.
2	Timer: Waits a specific period (completion_nsec) for each IO before completion.

completion_nsec=[ns]: Default: 10,000ns

Combined with irqmode=2 (timer). The time each completion event must wait.

submit_queues=[1..nr_cpus]: Default: 1

The number of submission queues attached to the device driver. If unset, it defaults to 1. For multi-queue, it is ignored when use_per_node_hctx module parameter is 1.

hw_queue_depth=[0..qdepth]: Default: 64

The hardware queue depth of the device.

Multi-queue specific parameters

use_per_node_hctx=[0/1]: Default: 0

Number of hardware context queues.

0	The number of submit queues are set to the value of the submit_queues parameter.
1	The multi-queue block layer is instantiated with a hardware dispatch queue for each CPU node in the system.

no_sched=[0/1]: Default: 0

Enable/disable the io scheduler.

0	nullb* use default blk-mq io scheduler
1	nullb* doesn't use io scheduler

blocking=[0/1]: Default: 0

Blocking behavior of the request queue.

0	Register as a non-blocking blk-mq driver device.
1	Register as a blocking blk-mq driver device, null_blk will set the BLK_MQ_F_BLOCKING flag, indicating that it sometimes/always needs to block in its ->queue_rq() function.

shared_tags=[0/1]: Default: 0

Sharing tags between devices.

0	Tag set is not shared.
1	Tag set shared between devices for blk-mq. Only makes sense with nr_devices > 1, otherwise there's no tag set to share.

zoned=[0/1]: Default: 0

Device is a random-access or a zoned block device.

0	Block device is exposed as a random-access block device.
1	Block device is exposed as a host-managed zoned block device. Requires CONFIG_BLK_DEV_ZONED.

zone_size=[MB]: Default: 256

Per zone size when exposed as a zoned block device. Must be a power of two.

zone_nr_conv=[nr_conv]: Default: 0

The number of conventional zones to create when block device is zoned. If zone_nr_conv >= nr_zones, it will be reduced to nr_zones - 1.