dt v24.01 Release Notes

1. Overview

This document describes the release notes for changes introduced in dt version 24.01 for initial support of NVMe disks.

Please know, this support is *only* for Linux OS at this time. Also know, the NVMe library was created from the Linux *nvme* CLI utility which has the GNU license, so if your companies legal eagles disallow GNU, you'll need to rebuild dt without this source code: **nvme_lib.[ch]**

This is the latest version information:

```
# dt version
--> Date: August 5th, 2021, Version: 24.01, Author: Robin T. Miller <--
#
```

Note: Previous versions of dt work fine with NVMe disks, as most know. The extra support added is to provide useful NVMe information and several NVMe operations, described below).

2. NVMe Updates

The current NVMe support includes the following:

1. Reporting key NVMe information, like done do for SCSI disks.
2. Providing support for write-zeroes via **unmap=unmap** option.
3. Allow direct NVMe Read and Write operations via **enable=nvme_io**

Please know, #2 and #3 above is *only* possible with direct NVMe disk testing.

For those doing file system testing, **dt** cannot unmap blocks or use pass-through read/writes.

2.1. NVMe Disk Read/Write Support

When adding the **enable=nvme_io** flag, read and writes are sent via NVMe pass-through API: (*only* supported for direct disk testing)

```
# dt of=/dev/nvme0n1 bs=64k count=3 enable=sdebug,nvme_io,raw unmap=unmap
workload=high_validation logprefix=

NVMe Information:
              NVMe Device Name: /dev/nvme0n1
                Product Number: TBA
                 Serial Number: NIM00001
             Firmware Revision: 21.10
           Namespace ID (NSID): 1
         Namespace Size (NSZE): 20480000 (10000.000 Mbytes, 9.766 Gbytes)
     Namespace Capacity (NCAP): 20480000 (10000.000 Mbytes, 9.766 Gbytes)
  Namespace Utilization (NUSE): 20480000 (10000.000 Mbytes, 9.766 Gbytes)
    Formatted LBA Size (FLBAS): 512 (logical block / sector size)
        IEEE Unique Identifier: efcb634074260d4b
    Globally Unique Identifier: efcb634074260d4b6c9ce900b3e5aa22
 Subsystem NVMe Qualified Name: nqn.2007-11.com.nimblestorage:subsystem1

Issuing NVMe Write, starting LBA 0, blocks 128, bytes 65536, offset 0...
Issuing NVMe Read, starting LBA 0, blocks 128, bytes 65536, offset 0...
Issuing NVMe Write, starting LBA 128, blocks 128, bytes 65536, offset
65536...
Issuing NVMe Read, starting LBA 128, blocks 128, bytes 65536, offset 65536...
Issuing NVMe Write, starting LBA 256, blocks 128, bytes 65536, offset
131072...
Issuing NVMe Read, starting LBA 256, blocks 128, bytes 65536, offset
131072...
Issuing NVMe Write Zeroes, starting LBA 0, blocks 32768, bytes 10485760000,
offset 0...

Operating System Information:
                     Host name: nvmehost-03 (10.234.43.66)
                     User name: root
                    Process ID: 20176
                OS information: Linux 5.4.128-1.el7.elrepo.x86_64 #1 SMP Tue
Jun 22 16:04:05 EDT 2021 x86_64

NVMe Information:
              NVMe Device Name: /dev/nvme0n1
                Product Number: TBA
                 Serial Number: NIM00001
             Firmware Revision: 21.10
           Namespace ID (NSID): 1
         Namespace Size (NSZE): 20480000 (10000.000 Mbytes, 9.766 Gbytes)
     Namespace Capacity (NCAP): 20480000 (10000.000 Mbytes, 9.766 Gbytes)
  Namespace Utilization (NUSE): 20480000 (10000.000 Mbytes, 9.766 Gbytes)
    Formatted LBA Size (FLBAS): 512 (logical block / sector size)
        IEEE Unique Identifier: efcb634074260d4b
    Globally Unique Identifier: efcb634074260d4b6c9ce900b3e5aa22
 Subsystem NVMe Qualified Name: nqn.2007-11.com.nimblestorage:subsystem1


Total Statistics:
       Output device/file name: /dev/nvme0n1 (device type=disk)
       Type of I/O's performed: sequential (forward, read-after-write)
      Job Information Reported: Job 1, Thread 1
      Data pattern prefix used: /dev/nvme0n1@nvmehost-03
      Data pattern string used: 'IOT Pattern' (blocking is 512 bytes)
```

```
      Last IOT seed value used: 0x01010101
        Block tag verify flags: 0x0fdff7ff
            Total records read: 3
              Total bytes read: 196608 (192.000 Kbytes, 0.188 Mbytes, 0.000
Gbytes)
         Total records written: 3
           Total bytes written: 196608 (192.000 Kbytes, 0.188 Mbytes, 0.000
Gbytes)
       Total records processed: 6 @ 65536 bytes/record (64.000 Kbytes)
       Total bytes transferred: 393216 (384.000 Kbytes, 0.375 Mbytes)
        Average transfer rates: 1804828 bytes/sec, 1762.527 Kbytes/sec, 1.721
Mbytes/sec
       Number I/O's per second: 27.539
        Number seconds per I/O: 0.0363 (36.31ms)
        Total passes completed: 1/1
         Total errors detected: 0/1
            Total elapsed time: 00m00.22s
             Total system time: 00m00.00s
               Total user time: 00m00.00s
                 Starting time: Fri Oct 22 09:52:18 2021
                   Ending time: Fri Oct 22 09:52:18 2021

#
```

The SCSI debug flag, **enable=sdebug**, is used to control reporting the NVMe Read/Write debug information.

2.2. NVMe File System Example

```
# dt of=/mnt/localhost/nvme1n1-NIM00002/dt.data bs=64k count=3 enable=raw
workload=high_validation logprefix=
NVMe Information:
             NVMe Device Name: /dev/nvme1n1
               Product Number: TBA
                Serial Number: NIM00002
            Firmware Revision: 21.10
          Namespace ID (NSID): 2
        Namespace Size (NSZE): 2048000 (1000.000 Mbytes, 0.977 Gbytes)
    Namespace Capacity (NCAP): 2048000 (1000.000 Mbytes, 0.977 Gbytes)
  Namespace Utilization (NUSE): 2048000 (1000.000 Mbytes, 0.977 Gbytes)
    Formatted LBA Size (FLBAS): 512 (logical block / sector size)
        IEEE Unique Identifier: 0cc9be2a12e34579
    Globally Unique Identifier: 0cc9be2a12e345796c9ce900b3e5aa22
 Subsystem NVMe Qualified Name: nqn.2007-11.com.nimblestorage:subsystem2


Operating System Information:
                     Host name: nvmehost-03 (10.234.43.66)
                     User name: root
                    Process ID: 20337
                OS information: Linux 5.4.128-1.el7.elrepo.x86_64 #1 SMP Tue
Jun 22 16:04:05 EDT 2021 x86_64

File System Information:
           Mounted from device: /dev/nvme1n1
```

```
          Mounted on directory: /mnt/localhost/nvme1n1-NIM00002
               Filesystem type: ext4
            Filesystem options: rw,relatime
          Filesystem block size: 4096
          Filesystem free space: 1012547584 (965.641 Mbytes, 0.943 Gbytes,
0.001 Tbytes)
         Filesystem total space: 1015308288 (968.273 Mbytes, 0.946 Gbytes,
0.001 Tbytes)

NVMe Information:
              NVMe Device Name: /dev/nvme1n1
                Product Number:
                 Serial Number: NIM00002
              Firmware Revision: 21.10
            Namespace ID (NSID): 2
          Namespace Size (NSZE): 2048000 (1000.000 Mbytes, 0.977 Gbytes)
     Namespace Capacity (NCAP): 2048000 (1000.000 Mbytes, 0.977 Gbytes)
  Namespace Utilization (NUSE): 2048000 (1000.000 Mbytes, 0.977 Gbytes)
    Formatted LBA Size (FLBAS): 512 (logical block / sector size)
        IEEE Unique Identifier: 0cc9be2a12e34579
    Globally Unique Identifier: 0cc9be2a12e345796c9ce900b3e5aa22
 Subsystem NVMe Qualified Name: nqn.2007-11.com.nimblestorage:subsystem2


Total Statistics:
       Output device/file name: /mnt/localhost/nvme1n1-NIM00002/dt.data
(device type=regular)
       Type of I/O's performed: sequential (forward, read-after-write)
      Job Information Reported: Job 1, Thread 1
      Data pattern prefix used: /mnt/localhost/nvme1n1-
NIM00002/dt.data@nvmehost-03
      Data pattern string used: 'IOT Pattern' (blocking is 512 bytes)
      Last IOT seed value used: 0x01010101
        Block tag verify flags: 0x0fdff7ff
            Total records read: 3
              Total bytes read: 196608 (192.000 Kbytes, 0.188 Mbytes, 0.000
Gbytes)
         Total records written: 3
           Total bytes written: 196608 (192.000 Kbytes, 0.188 Mbytes, 0.000
Gbytes)
       Total records processed: 6 @ 65536 bytes/record (64.000 Kbytes)
       Total bytes transferred: 393216 (384.000 Kbytes, 0.375 Mbytes)
        Average transfer rates: 14606835 bytes/sec, 14264.487 Kbytes/sec,
13.930 Mbytes/sec
       Number I/O's per second: 222.883
        Number seconds per I/O: 0.0045 (4.49ms)
        Total passes completed: 1/1
         Total files processed: 0
         Total errors detected: 0/1
            Total elapsed time: 00m00.03s
             Total system time: 00m00.00s
               Total user time: 00m00.00s
                 Starting time: Fri Oct 22 09:55:23 2021
                   Ending time: Fri Oct 22 09:55:23 2021

#
```