Overview of Data Test Program (dt)

Robin T. Miller

This Software is Provided
By
Robin's Nest Software Inc.
2 Paradise Lane
Hudson, NH. 03038
(603) 883-2355

WARNING!!!

This software MUST BE CONSIDERED DESTRUCTIVE to any data stored on the device under test. NO safety precautions are taken to ensure existing data integrity during testing!!!

Please Note

DT is Open Source. You are free to copy and distribute it!
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Introduction

- The purpose of this training, is to provide an overview of DT's features, options, and limitations.
- On contract to Tony Raymond, the Qualification Software Engineering (QSE) group in Shrewsbury.
- Our main area of expertise is doing device qualification on Tru64 Unix, Linux (Alpha/Intel), and Windows.

Topics of Discussion

- Devices and O/S's supported.
- Short history of DT evolution.
- Generic DT features & options.
- Device specific test options.
- Tru64 Unix specific features.
- Test suites using DT program.
- Future DT enhancements?
- Where's this DT located?

Short History of DT

- Developed at Compugraphic initially for testing tape devices.
- Initially developed on SUN/OS.
- Written to replace Unix DD utility.
- Later disk, serial lines, and other device type support was added.
- Goal was to be generic yet flexible enough to customize your tests.

Numeric Input Formats

- w = words (4 bytes)
- b = blocks (512 bytes)
- m = megabytes
- g = gigabytes
- t = terabytes
- inf or INF = Infinite
- q = quadwords (8 bytes)
- k = kilobytes (1024 bytes)
- p = page size (varies)
- Simple arithmetic allowed.
- Bitwise operations allowed.
- ‘expr’ for complex math.

The default base for numeric input is decimal, but you can override this default by specifying 0x or 0X for hexadecimal conversions, or a leading ‘0’ for octal conversions. Please Note: Evaluation is from right to left without precedence, and parenthesis are not permitted.

Time Input Format

- d = days (86400 seconds)
- m = minutes (60 seconds)

h = hours (3600 seconds)

s = seconds (the default)

Arithmetic characters are permitted, and implicit addition is performed on strings of the form ‘1d5h10m30s’.

Generic DT Features

- Assortment of data patterns (pattern= or pf= options).
- Control of I/O request sizes (min=, max=, incr=, bs= opts).
- Checks for buffer overwrites (pad bytes w/inverted pattern).
- Allows misaligned data buffers (align= option).
- Allows block number encoding (enable=lbdata or pattern=iot).
- Reports performance statistics (total stats after test complete).
- Variable I/O request sizes (new). (incr=variable option).
- Various flags to control program behavior (debug, verify, etc).
- Intuitive numeric and runtime string parsing.
- Flags to control test operation (flags=excl,sync etc).

Generic DT Options

- Limit I/O by data limit (limit= option, Infinite on disk devices).
- Limit I/O by record limit (count= or records= options).
- Limit I/O by volume limit (volumes= and vrecords= options).
- Limit I/O by runtime limit (runtime=timeString option).
- Limit random I/O limit (rlimit= option).
- Control of error limits (errors= option, default is 1).
- Control of pass limit (passes= option, default is 1).
- Control of multiple processes (procs= option).
- Control of process behavior (oncerror=**abort** or continue).
- Control of device types, size, etc. (dtype= and dsize= options).
- POSIX Asynchronous I/O (enable=aio or aios= options).

Disk Specific Features

- Random & Sequential I/O (iotype=**sequential** or random).
- Supports raw & block devices (gleamed from stat() or IOCTL).
- Allows multiple file system files (unique files with child PID).
- Supports copy/verify of disks (iomode=copy, **test**, or verify).
- Supports multi-volume media (enable=multi or volumes= opts).
- Supports reverse direction (new) (iodir=**forward** or reverse).
- Supports multiple disk slices (new) (slices= options).
- Control file system file disposition (dispose=**delete** or keep).

Tape Specific Features

- Supports multiple tapes files (files= option, Write File Mark).
- Forward Space File operation used between tape files.
- Supports read-after-write (enable=raw, Backspace Record).
- Supports tape repositioning (enable=resets & EEI on Tru64).
- Supports multi-volume tapes (enable=multi or volumes= opts).
- Verifies media changed is ready via Rewind operation.
- Sorry, no loader or library media changer support (yet).
- More tape testing support planned in a future release.

Serial Line Features

- Supports setting of flow control (flow=none,cts_rts, xon_xoff).
- Supports setting of parity (parity=even,odd, or none).
- Supports setting of speed (speed= option, none gives list).
- Handles line desciplines on Tru64 Unix.
- Single line loopback tests (enable=loopback)
- Dual line loopback tests (if=/dev/tty00 of=/dev/tty01)
- Dual line between different hosts and different OS's too!
- Limited Tru64 modem support (enable=modem, on Tru64).
- Parallel loopback support too (if=/dev/pig or /dev/pog, Agfa).

Tru64 Unix Specifics

- Distributed Lock Manager (DLM) (munsa=cr, cw, pr, pw, or ex)
- Tape Extended Error Information (EEI) (enable=**eei**, is default). On tape errors, full tape stats and EEI data is displayed.
- Tape bus/device reset support (enable=resets, repositions tape).
- Device info via DEC IOCTL() (DEVIOCGET or DEVGETINFO).
- Optionally logs errors to system binary error logger *if* root! (enable=diag) Diagnostic message events are 350 (ELMSGT_DIAG)
- Tru64 Unix disk label caveats (first 8K of disk protected, must either skip label or use ‘disklabel –z’ to zero the disk label).
- Use “sysconfig -q rt” to query the Async I/O (AIO) limits.

Other DT Support?

- Supports memory mapped files.
- Supports FIFO's and pipes.
- Supports any device capable of standard open/read/write/close().
- No support for CPU's, memory, floating point, video/monitors, network cards, or audio devices.
- Easy to add new device support.

Special DT Notes

- All DT output written to stderr.
- Redirect output to log via log= opt.
- Log files opened in append mode.
- No mounted file system checks!
- End of file/media exit status (254)
- General failure exit status (255).
- Success exit status is zero (0).
- Signals cause non-zero exit too.

Example DT Tests

- dt of=/dev/rrz1c bs=256k aios=4 slices=12 enable=lbdata,raw
- dt of=/dev/rrz1c bs=64k align=rotate step=16k pf=/vmunix
- dt of=/dev/rrz1c min=1b max=1m incr=var enable=raw iodir=reverse pattern=iot
- dt of=/dev/rrz1c bs=256k disable=compare,verify limit=1g aios=32 (**write performance**).
- dt if=/dev/rrz1c bs=256k disable=compare limit=1g aios=32 (**read performance only**)**.**
- dt if=/dev/PhysicalDrive6 bs=64k of=/dev/PhysicalDrive5 iomode=copy (**image copy**).
- dt of=/dev/st0 bs=32k files=25 limit=50m pattern=iot
- dt of=/dev/rmt0h min=1 max=64k incr=var enable=lbdata,raw records=100 files=10
- dt of=/dev/tape/tape0c bs=1m limit=1g enable=resets,debug,eei log=tape0c.log
- dt of=/dev/rmt0h bs=256k aios=8 pf=pattern_all volumes=2 vrecords=1k enable=lbdata
- dt of=/usr/tmp/dt-data bs=64k procs=10 limit=1m passes=12 disable=pstats
- dt of=/dev/rfd0c min=b max=64k incr=7b iotype=random enable=raw runtime=30m
- dt if=/dev/tty00 of=/dev/tty01 bs=64 limit=100k flow=xon_xoff parity=none speed=38400
- dt of=NamedPipe bs=8k limit=1g enable=loopback (**create via "mkfifo NamedPipe"**).
- dt of=- bs=8k limit=1g disable=stats | dt if=- bs=8k limit=1g

Test Suites Using DT

- Well, there are various labs using DT, including UEG, but I'll discuss my group's QSuite here.
- QSuite uses the Tool Command Language (Tcl/Tk, pronounced *tickle/tee kay*).
- Scripts for disks, tapes, C/DVD's, and Tape & Automation devices.
- Kit @ URL: http://leto.shr.dec.com

Future of DT?

- Well, although DT is feature rich, it's looong overdue for a rewrite.
- Goal is to create a modular design with support for multiple concurrent devices, POSIX threads, and an interactive mode.
- Customizable, dynamic statistics, on-the-fly device interaction.
- Please send me your wish list!!!

Where's DT Located?

- Within Compaq:
  http://www.zk3.dec.com/~rmiller/dt.html
  http://leto.shr.dec.com/~rmiller/dt.html
- External to Compaq:
  http://www.bit-net.com/~rmiller/dt.html
- Contact author via e-mail to:
  Robin.Miller@Compaq.com
- Questions & comments welcome!