UTS Global Tape Services Suite
Technical Overview

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TSS Components 1

Tape Management Subsystem (TSS-TMS) - the core component, which provides device management through kernel drivers and the Tape Daemon (tpdaemon)

Tape Silo Feature (TSS-TSF) - provides access to tape drives housed in StorageTek® tape silos

Distributed Tape Service (TSS-DTS) - provides tape management services on the Linux/390 server to tapeless client systems

Virtual Tape Service (TSS-VTS) - provides virtual tape services (backed by a disk cache) on Linux/s390 and other platforms
TSS Components 2

**Media Manager (TSS-MGR)** - provides a centralised repository to control and administer the usage of the Linux/390 magnetic tape library.

**Backup and Restore (TSS-BAR)** - a native application to provide both filesystem and device image backups to tape

**Oracle Backup (TSS-OBR)** - provides the ability to backup and restore your Oracle database(s) using the UTS Global tape product suite.

**DB2 Backup (TSS-DBR)** - provides the ability to backup and restore your DB2 database(s) using the UTS Global tape product suite.
TSS Components – Availability Schedule

- Tape Management Subsystem (TSS-TMS) – Available Now
- Tape Silo Feature (TSS-TSF) – Available Now
- Distributed Tape Service (TSS-DTS) - Available Now
- Virtual Tape Service (TSS-VTS) - Preliminary version now. Full function in 3Q2003
- Media Manager (TSS-MMG) – Available 3Q2003
- Backup and Restore (TSS-BAR) – Available Now
- Oracle Backup – Available 3Q2003
- DB2 Backup - Available 3Q2003
TSS Components

Linux, Solaris, AIX

VTape

DTS client

Virtual Tape Devices

Vtape Archiver

DTS Pseudo Tape device

Media Manager Database

Applications
• BAR
• Oracle BAR
• DB2 BAR

Linux, Solaris, AIX

Silo

TSF

TMS

Tape devices

DTS

s390
TSS-TMS the Tape Daemon

- The core of the tape subsystem
- tpdaemon plus a sophisticated driver, lots of ioctls
- Command line interface to mount/unmount tapes
- API to mount/unmount tapes
- Add/remove tape drives dynamically
Tape Access Philosophy

- Access tapes by volume name not by device
  - /dev/tape/<volname> not /dev/rmt etc.

- Device class – group of similar devices
  - C.F. JCL unit=180  unit=3590  unit=tape

- Can co-exist with the system provided driver
  - Assign devices via config files in /etc
TSS-TMS User Commands

- **tape** – mount/unmount a tape
  - e.g. `tape -m -l IBM <volser>`
  - Mounts IBM Standard Labeled tape `<volser>`
  - Makes device node `/dev/tape/<volser>`
  - Lots more options (see below)

- **tapemt** – display status of tape mounts

- **tapevary** – tape drive: enable/disable/display status
More TSS-TMS User Commands

- label – read/write tape labels
- tm – manipulate a tape … or …. 
- mt – standard UNIX command to manipulate a tape
- tapersv – reserve a tape device (privileged)
Tape command options 1

Mount, Unmount (cancel) or Requeue request

- Mount tape readonly or writable
- Sequence number of target file
- Physical (label) name of target file
- Expiration date or Retention period

Bypass Label Processing
- Non-labeled tape
- Label type of target volume
- Standard (IBM) labeled tape
- Internal volser and external volser
- A user specified file name in /dev/tape
Tape command options 2

Mount scratch tape
Silo scratch pool to use
Target tape drive address
Key if device is reserved
type of tape drive (3590 etc.)
Density of tape IDRC|NONIDRC
Tape class that a drive belongs to
Target host and optional port
Quiet mode, no messages to terminal
Target request number

Command executed when mount completes
TSS-TMS Admin Commands

- `tapeadm` – start, stop, query for `tpdaemon`
- `tapeclass` – groups devices by attribute e.g. location
- `tapevary` – tape drive: enable/disable/display status
- `tpdconfig` – parse and print `tpdaemon` config file
/etc/tpdaemon.conf

- Configuration file for tape daemon

- Many parameters, see sample at end of presentation

- Examples:
  - tapeoperator tapeoper
  - tape 3490 "V49*" # valid 3490 volsers
  - filemode 600 # dflt permission /dev/tape/<vol>
  - tape_log_file /var/log/tpdaemon
Silo feature

- Mount/Unmount STK silo tapes
- Silo option for <tape> command
- or C language programming interface
- Silo administration commands
Silo Feature Administration

- /etc/tapesilo.conf

- Two daemons
  - ssi
  - mini_el

- Assorted admin commands
  - E.g. audit the library, define/delete tape pools,
  - Lock drives or volumes, on/offline devices
/etc/tapesilo.conf

CSI_TCP_RPCSERVICE     TRUE
CSI_UDP_RPCSERVICE     TRUE
CSI_CONNECT_AGETIME    172800
CSI_RETRY_TIMEOUT    4
CSI_RETRY_TRIES        5
CSI_HOSTNAME           tapesilo
TRACE_VALUE            00000000
LOG_SIZE               64
ACSAPI_SSI_SOCKET      50004
EVENT_FILE            /var/log/silo_event.log
TRACE_FILE            /var/log/silo_trace.log
Distributed Tape Service

- Intended for use by tape-less clients
- Network connection to Linux/s390 tape devices
- `tape -m -l IBM -H <hostname> <volser>`
- Pseudo-tape driver ……..
  - Creates `/dev/tape/<volser>` on local machine
- Platforms: Linux (s390 and i386), Solaris, AIX(3Q03)
Distributed Tape Components

- dtape_cli: The client daemon
  - `-c`: cold start, ignore established connections
  - `-t secs`: heartbeat timer, default 60 secs

- dtape_svr: The server daemon
  - lives with tpdaemon

- `/dev/ptap/` - psedotape driver
Virtual Tape Service

- Tape devices backed by disk cache
- Software solution, no extra hardware required
- Uses standard filesystem input/output functions
- `tape -m -t virtual <volser>`
- Linux/s390, Linux/i386, Solaris, AIX(3Q03)
Virtual Tape Features

- Any utility that can use real tapes can use virtual tapes.
- Automatic scratch of expired tapes.
- Unix like permissions.
- Multiple 'files' per tape.
- Use commands or API to mount, to unmount, to scratch tapes or to search the tape database.
- Data can be imported from, or exported to real tapes.
Virtual Tape Commands

- TSS-VTS can co-exist with TSS-TMS or run alone

- vtape – mount/unmount virtual tapes
  Same as `<tape -t virtual>` if TSS-TMS is installed

- vtape_cp - copy tape to tape, real or virtual,
  (takes care of mount/unmount)
Virtual Tape Commands II

- vtape_ls – list tape attributes
- vtape_rm – return a tape to the free pool
- vtape_init – initialize the cache
- vtape_db – vtape admin, add, remove, list, stats

All commands have C language equivalents
Virtual Tape Archiver

- Planned availability early 3Q 2003.
- Automated import /export between real/virtual tapes
- Options :
  - Archive now (real time)
  - Archive soon (background)
  - Archive default (based on disk cache thresholds)
Media Manager Database

- Tapes are grouped into named pools
- Tapes are in <free> or <allocated> state
- Implements ownership, access permissions, expiry
- Tracks physical location of volumes
- Audit trail of tape usage
- Fully integrated with other Tape Subsystem products
TSS Applications

- UTS Global
  - Backup and Restore
  - Oracle Backup
  - DB2 Backup

- Or ……
  - Any standard operating system utility
  - Any 3rd party application
Backup and Restore (TSS –BAR)

- Native Backup and Restore for Linux/s390
- Integrated with UTSG tape management system
- Works with Silo tapes for automated backup

- Backup Types
  - File level
  - Physical region (disk partition)
  - Disk Image
Incremental and Differential Backup

- Full Backup – Complete “Object” e.g. all of /home
- Incremental – Everything since last “Full” backup
- Differential – Everything since last backup of any kind
TSS–BAR Commands

- Command line or GUI interface

- backup <parmfile>
  - Physregion - e.g. /dev/dasda1
  - Object - e.g. /usr
  - Image – very fast but needs kernel changes

- recover <options>
  - Recover has many options (see man page)
  - Simple example: recover ~/mail ~/'test*'
    Will recover my mail directory plus any files or directories beginning with the string “test”
More TSS–BAR Commands

- bktapelib – maintain BAR tape library
  - Add, delete tape volumes
  - Mark volumes as used or unused
  - Change expiry dates etc.

- bkuprpt <logfile>
  - Report on objects backed up
TSS-BAR Parameter File

- Catalog – specify backup catalog directory
  - Tape library (created by bktapelib)
  - Index – what has been backed up and where
  - Log directory (audit trail)

- Backup – List objects to backup
  - E.g. /usr, ‘/home/*/stuff’, ‘/dev/pty*’ (inode)
  - Physregion – e.g /dev/dasda1

- Other stuff – Examples: Device – 3490, 3590 etc.
  - Expiration – days, Silomount – silo or nonsilo
TSS Applications – Oracle BAR

- Backup and Restore for Oracle on Linux/s390
- Uses Oracle RMAN API
- Planned for early 3Q 2003
- Integrated with UTSG tape management system
TSS Applications – DB2 BAR

- Backup and Restore for DB2 on Linux/s390
- Planned for early 3Q 2003
- Uses DB2 XBSA interface
- Integrated with UTSG tape management system
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Sample tpdaemon.conf

# Valid volser ranges are defined using POSIX 1003.2 extended regular
# expressions which are discussed in detail in regex(7).
# The regular expressions are those used by regcomp(5) NOT
# shell regular expressions.
#

tape    any    ".*" # valid external volsers for any media type
tape 3590    ".*" # valid external volsers for 3590 media type
tape 3490E   ".*" # valid external volsers for 3490E media type
tape 3490    ".*" # valid external volsers for 3490 media type
tape 3480    ".*" # valid external volsers for 3480 media type
#
# The following are internal tape range definitions.
# The default for internal volser ranges is the
# definitions for valid external volser ranges.
#
# internal_tape    any    ".*"    # valid internal volsers for any media type
# internal_tape 3590    ".*"    # valid internal volsers for 3590 media type
# internal_tape 3490E   ".*"    # valid internal volsers for 3490E media type
# internal_tape 3490    ".*"    # valid internal volsers for 3490 media type
# internal_tape 3480    ".*"    # valid internal volsers for 3480 media type
Sample tpdaemon.conf - continued

# Definitions for system defaults
#
# devtype        any               # set device to 3480,3490,3490E/3590 or any
# tape_class     backup            # set tape class. If not specified
#                   # in this file, the tape daemon will
#                   # have no default value defined for
#                   # tape class.
# density        3480   NONIDRC    # set tape density for 3480
# density        3490   IDRC       # set tape density for 3490
# density        3490E  IDRC       # set tape density for 3490E
# density        3590   IDRC       # set tape density for 3590
# labeltype      IBM               # other options are VOL ANSI BLP and NL

# Definitions for tape operator and tape administrators
#
# tapeoperator                  tapeoper  # tape operator
# tapeadmin                     tapeoper  # tape administrator
# tapeadmingroup                adm       # authorized group
# groups_adm_and_bin_are_admin  off       # groups "bin" "adm" administrators?

# Set up defaults for tpdaemon(1m) request queue size, file retention
# period and permission mode bits for /dev/tape/<volser> files.
#
# request_queue_entries     100 # size of request queue
# retpd                 forever # default file retention period
# filemode                  600 # default permission bits for /dev/tape/<volser>
Set up default for number of dynamic drives which can be online simultaneously

dynamic_drive_entries  16  # default number of dynamic drives

tape_homedir           /var/run/tpdaemon       # home directory
# tape_lock_file        daemonlock              # name of lock file
# tape_shared_memory_keyfile   tpd_shmkey              # share memory key file
# tape_log_file         /var/log/tpdaemon       # log file name

Following flags effect tpdaemon(1m) log, and messages

# send_log_output_to_stdout    off   # send log to standard output ?
# do_not_send_messages_to_operator  off   # message sent to operator ?
# timestamp_log_entries       on    # time stamp log entries ?

All the flags for the tape daemon
Default for all of these flags is "off"
# enforce_requester_only_open        off   # requester ONLY can open tape ?
# block_user_after_io_error          on    # cancel request if I/O error ?
# allow_case_sensitive_labels        off   # ok to use lower case labels ?

# Tapes label types non-administrators can mount. Non-administrative users
# can always mount the tapes with the default label type.

# allow_nonadmin_blp               on    # can non-admin mount BLP ?
# allow_nonadmin_IBM_label_spec    on    # can non-admin mount IBM tape ?
# allow_nonadmin_ANSI_label_spec   on    # can non-admin mount ANSI tape ?
# allow_nonadmin_VOL_label_spec    on    # can non-admin mount VOL tape ?
# allow_nonadmin_NL_label_spec     on    # can non-admin mount NL tape ?

# Time interval and number of reminder messages to the operator

# oper_msg_limit       0   # Default: do not reissue messages to operator
# oper_msg_interval    10   # 10 minutes: interval between messages

# Ask the tape operator to confirm non-scratch non-labeled (NL) tape mounts
# and non-scratch tapes mounted with by-pass label processing enabled

# verify_non_scratch_NL_label_spec on    # confirm non-scratch NL mounts ?
# verify_non_scratch_BLP_label_spec on    # confirm non-scratch BLP mounts ?
Sample tpdaemon.conf - continued

# Set flag to determine if non-administrators can skip volser format check.
# Administrators can always skip volser format check.
#
# nonadmin_skip_label_format_check     off   # can non-admin skip volser check ?
#
# Set flag to determine if a ring-check is made when a tape is mounted
#
# enforce_ring_check     on   # should ring-check be made for mounts ?
#
# Specify which users are authorized to reserve tape devices. If the
# username does not appear here, even administrative users cannot reserve
# devices. Note that values below are not defaults, just examples.
#
# enable_device_reservation ADDR  580  larry  # user "larry" can reserve dev 580
# enable_device_reservation TYPE  3480  curly  # user "curly" can reserve a 3480
# enable_device_reservation CLASS ipt  moe    # user "moe" can reserve a dev in
#     tapeclass "ipt"
#
# Define action to take if an unexpired tape volume is mounted writable
#
Sample tpdaemon.conf - continued

# Define action to take if an unexpired tape volume is mounted writable
#
# if_mounted_unexpired_volume_for_write nonsilo ask   # ask tape operator whether to mnt unexpired volume on non-silo drive
# if_mounted_unexpired_volume_for_write silo cancel   # cancel request if unexpired volume mounted on silo drive

# Specify the default mode for mounts. The default is extended
# mode. This can be overridden by invidual mount requests (tape [-U|-X]).
#
# compat_21_mode off # by default do not mount tapes in compatibility mode
# check_scratch_expiration off # by default all tapes mounted as scratch are expired
# allow_premount_scratch off # by default any premounted tape will be rejected as a scratch tape.

# Silo related parameters.
#
# The location of the STK SSI start script is configurable to cater for
# differences between Linux distributions.
# stk_ssi_path /etc/rc.d/init.d/ssi # STK SSI start script

# Define drives that are in the silo
#
# silo_devices 0 0 9 0 580-583 # values are examples only, not defaults
Sample tpdaemon.conf - continued

# silo_lock_protocol   lockvry # can be lockvry, lockdrv, lockvol, lockall
# lockall2 or nolock
#
# Define silo scratch pool id
#
# silo_scratch_pool    0 # scratch pool id of 0 is default
#
# Define whether daemon should come up in "silo" mode or "non-silo" mode.
# In silo mode, first try to assign silo drives. In non-silo mode, first
# try to assign non-silo drives.
#
# assign_silo_drives_first    off # by default, non-silo drives assigned first
# ignore_case_for_silo_volsers off # by default, do not ignore case for silo volsers
# ignore_hdrs_for_compat_mode_mount off # by default, do not ignore hdrs for compatibility mode mounts
#
# Specify flag which determines whether non-admin users are allowed access
# to silo drives. Admin users are always allowed access to silo drives
#
# allow_nonadmin_silo_access   off # by default, no silo access to non-admin uid