



# Mass Storage Systems Testing Laboratory (MSTL) at NASA GSFC

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**THIC Meeting**

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# Topics



- ◆ Problem
- ◆ Objectives
- ◆ Approach
- ◆ Test Suite
- ◆ Test Operation
- ◆ Status

# What is the Problem?



- ◆ Mass storage systems are characterized differently by vendors, customers, government agencies
  - What is a mass storage system?
- ◆ How do I know that the system (combination of hardware and software) will meet my needs?
- ◆ How will it perform in my environment?

# Objective

- ◆ To develop a Mass Storage Testing Laboratory (MSTL) that will allow testing of mass storage systems
- ◆ Promote the development of standardized mass storage benchmarks that will lead to consistent evaluation criteria for mass storage systems.
- ◆ Provide the ability to assess the reliability, performance and scalability of mass storage system.
- ◆ Provide a common basis for evaluation of mass storage systems not only for EOS (Earth Observing Systems), but for many other programs at NASA and other agencies.

# Approach to Developing the MSTL

- ◆ Survey mass storage system benchmarks available from government agencies (NASA, NSA, ...), industry/vendors, and academia
- ◆ Establish a peer group from other agencies to review work to be done on the benchmark.
- ◆ Develop benchmarks based on survey and review.
- ◆ Produce benchmark documentation which will describe all tests
- ◆ Negotiate with computer and storage vendors to obtain loaner hardware equipment to test.

# Approach (continued)

- ◆ Negotiate with file storage management system (FSMS) software vendors to obtain their software on a loaner basis for this effort.
- ◆ Run the tests and document results.
- ◆ Provide results to vendors and peer review to evaluate the testing approach.
- ◆ Commercialize test suite
  - agreement between NASA and vendor(s) for sustaining and further development of the benchmark suite



# MSTL Test Suite

- ◆ The benchmark is being created in two parts:  
Checklist and Benchmark Software
- ◆ Checklist will determine the features of the system being tested
- ◆ Benchmark will test the performance of the system

# Checklist

- ◆ The Checklist characterizes the system being tested. Some examples of the checks we include are:
  - basic functions
    - ◆ client/server, API, open systems, NFS, FTP
  - scalability
    - ◆ what are the limits ( i.e. support thousands of clients, millions of files)
    - ◆ very large files
    - ◆ vaulting
    - ◆ expandability from small hardware system to large
  - file copy, directory and catalog functions
    - ◆ configurable parameters
    - ◆ utilities to manage the system

# Checklist (continued)

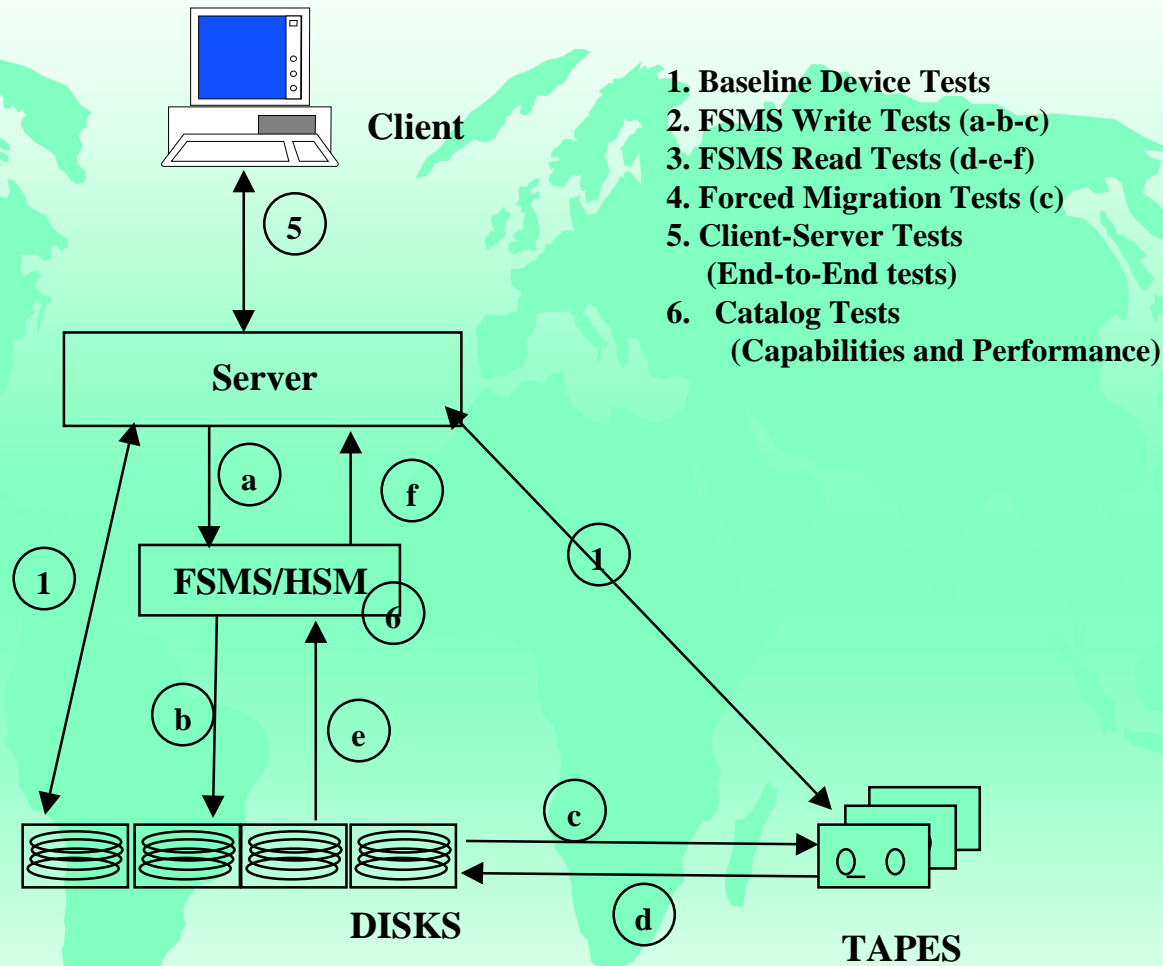


- disaster recovery
  - ◆ utilities to recover from disasters
- data integrity
  - ◆ make duplicates of files on same or different media
  - ◆ automatic monitoring of error thresholds
- security
  - ◆ site-configurable user level access
  - ◆ access controls on data
  - ◆ resource consumption limits
  - ◆ error and activity logs
- system administration
  - ◆ GUI interface for monitoring
  - ◆ dynamic display of activities across the storage system

# MSTL Test Suite

- ◆ The proposed benchmarks software suite will consist of six test categories including:
  - baseline device read/write tests
  - file storage management system write tests
  - file storage management system read tests
  - forced migration tests
  - client-server tests
  - file storage management system catalog tests
- ◆ Software is being written in standardized C with Unix scripts. Our intention is that the software should be portable across platforms.

## MSTL Benchmark Test Groups



MSTL\_fig2.PPT

Ravi - SES- 12/5/96

# T1 Tests

- ◆ Baseline device tests - measure the performance of the storage devices that are attached to the storage server
- ◆ Read and write files to disk and tape
  - Block size for the files is variable
- ◆ Results for a baseline for estimating the overhead for similar operations done by an FSMS
- ◆ Eight tests:
  - disk write, disk read, tape write, tape read, disk-to-disk copy, tape-to-disk copy, concurrent tap write and read

# T2 Tests

- ◆ FSMS write tests - measure the performance of the FSMS while writing to storage system
- ◆ write files of various sizes to tape storage and disk cache
- ◆ span tape volumes
- ◆ write to multiple tape drives
- ◆ write “special” files
- ◆ Results are used to measure FSMS performance
  - compare to T1 tests

# T3 Tests

- ◆ FSMS read tests - measure the performance of the FSMS while reading from the storage system
- ◆ read files of various sizes from tape storage and disk cache
- ◆ span tape volumes
- ◆ read from multiple tape drives
- ◆ read “special” files
- ◆ Results are used to measure FSMS performance
  - compare to T1 tests

# T4 Tests



- ◆ Forced migration tests - measure the effective rates for migrating files in and out of the disk cache
- ◆ migration with verification
- ◆ migration with duplications
- ◆ standardized batch of files
- ◆ look at ‘family’ groups and migration of single families and multiple families

# T5 Tests



- ◆ Client/server end-to-end tests
  - measure the “user perceived” performance on a storage server
- ◆ Time required to store and retrieve files from server to client
- ◆ non-loaded network
- ◆ mix of file sizes
- ◆ uses FTP

# T6 Tests



- ◆ Catalog tests
  - measure the performance of the catalog used by the FSMS
- ◆ load catalog with enough records to simulate a mass storage system of a certain size
- ◆ query catalog for a particular file and time results

# Running the Tests



- ◆ Test suites will be made available to vendor prior to run at MSTL.
- ◆ Tests are run at the MSTL. Once benchmarks are complete, a comprehensive report will be prepared and sent to the vendor for comment
- ◆ Vendor's comments are to be included in the report.
- ◆ Once report is completed, it will be made available on WWW and in print form.

# MSTL Status

- ◆ Formed panel of experts to review MSTL concept and benchmark. 30 member review team (December 1996)
- ◆ Collated replies, reviewed existing benchmarks
- ◆ Began coding and testing benchmark suite
  - refining the code
  - portability testing
- ◆ Begin testing mass storage systems
- ◆ Developing the commercialization concept
- ◆ <http://silorita.gsfc.nasa.gov>



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