



Does my DPM work?

Functional and performance tests

Georgios Bitzes

The problem

- Setting up a DPM can be a complex task – plenty of opportunities for misconfiguration
- As a site operator, it's often not obvious if the storage system works correctly after setting it up, or upgrading
 - Need to test several different protocols (http, xrootd, gsiftp, srm), several different operations (uploading, downloading, file sizes, checksums)
- All this testing has been automated

dpm-tester.py

- Developed alongside dome, initial motivation to verify that the external behavior of the new system is the same
- Tests multiple operations over all protocols, unfeasible to do the same by hand for every little change
 - Create directory
 - Upload file
 - Download file, verify contents
 - Stat file, verify filesize matches
 - Verify the checksum calculated by DPM matches our own
 - Upload files in parallel
 - caught a misconfiguration in our own testbed
 - Download and delete a file on the same location multiple times
 - Delete test files and directories
 - Multiple defensive safety checks to prevent any data loss, will refuse to operate on anything not containing “dpm-tests” string

dpm-tester.py (2)

- Helped us a lot during development. Much easier to test if a change broke something, more time efficient than manual testing
 - Helped catch regressions immediately – easy to pinpoint which commit is to blame
 - Now it can help you, too
-
- Effort to make it as simple as possible to run, hard to “use wrongly”

```
gbitzes@gbitzes-dev ~/dev/dpm-tests master ./dpm-tester.py --host domehead-trunk.cern.ch --tests davs root
PASS => davs :: Verify base exists: /dpm/cern.ch/home/dteam/ 0.31498 sec
PASS => davs :: Verify testdir does not exist: /dpm/cern.ch/home/dteam/dpm-tests 0.16467 sec
PASS => davs :: Create testdir: /dpm/cern.ch/home/dteam/dpm-tests 0.16449 sec
PASS => davs :: Upload to testdir: services 0.31652 sec
PASS => davs :: Download from testdir: services 0.66637 sec
PASS => davs :: Verify downloaded contents are identical 0.00102 sec
PASS => davs :: Verify size is 641020 0.06418 sec
PASS => davs :: Verify md5 checksum: 35435ea447c19f0ea5ef971837ab9ced 5.12925 sec
PASS => davs :: Remove: services 0.26520 sec
PASS => davs :: Upload to testdir: evil filename-!@#%^_-=:;[]{}<>' "$%&*)( 0.31456 sec
PASS => davs :: Download from testdir: evil filename-!@#%^_-=:;[]{}<>' "$%&*)( 0.21429 sec
PASS => davs :: Verify downloaded contents are identical 0.00078 sec
PASS => davs :: Verify size is 641020 0.06409 sec
PASS => davs :: Verify md5 checksum: 35435ea447c19f0ea5ef971837ab9ced 5.12977 sec
PASS => davs :: Remove: evil filename-!@#%^_-=:;[]{}<>' "$%&*)( 0.21448 sec
PASS => davs :: Hammer test - upload 10 files in parallel: /dpm/cern.ch/home/dteam/dpm-tests 1.18021 sec
PASS => davs :: Upload and delete the same file 5 times 1.49661 sec
PASS => davs :: Recursively remove contents: /dpm/cern.ch/home/dteam/dpm-tests 0.82319 sec
PASS => davs :: Remove directory: /dpm/cern.ch/home/dteam/dpm-tests 0.11431 sec
PASS => root :: Verify base exists: /dpm/cern.ch/home/dteam/ 0.16431 sec
PASS => root :: Verify testdir does not exist: /dpm/cern.ch/home/dteam/dpm-tests 0.00773 sec
PASS => root :: Create testdir: /dpm/cern.ch/home/dteam/dpm-tests 0.00757 sec
PASS => root :: Upload to testdir: services 0.46504 sec
PASS => root :: Download from testdir: services 0.03195 sec
PASS => root :: Verify downloaded contents are identical 0.00092 sec
PASS => root :: Verify size is 641020 0.01580 sec
PASS => root :: Remove: services 0.03183 sec
PASS => root :: Upload to testdir: evil filename-!@#%^_-=:;[]{}<>' "$%&*)( 0.16415 sec
PASS => root :: Download from testdir: evil filename-!@#%^_-=:;[]{}<>' "$%&*)( 0.03177 sec
PASS => root :: Verify downloaded contents are identical 0.00093 sec
PASS => root :: Verify size is 641020 0.01595 sec
PASS => root :: Remove: evil filename-!@#%^_-=:;[]{}<>' "$%&*)( 0.03189 sec
PASS => root :: Hammer test - upload 10 files in parallel: /dpm/cern.ch/home/dteam/dpm-tests 1.17908 sec
PASS => root :: Upload and delete the same file 5 times 1.63989 sec
PASS => root :: Recursively remove contents: /dpm/cern.ch/home/dteam/dpm-tests 0.41487 sec
PASS => root :: Remove directory: /dpm/cern.ch/home/dteam/dpm-tests 0.01603 sec
gbitzes@gbitzes-dev ~/dev/dpm-tests master
```

Verbose output on test failure

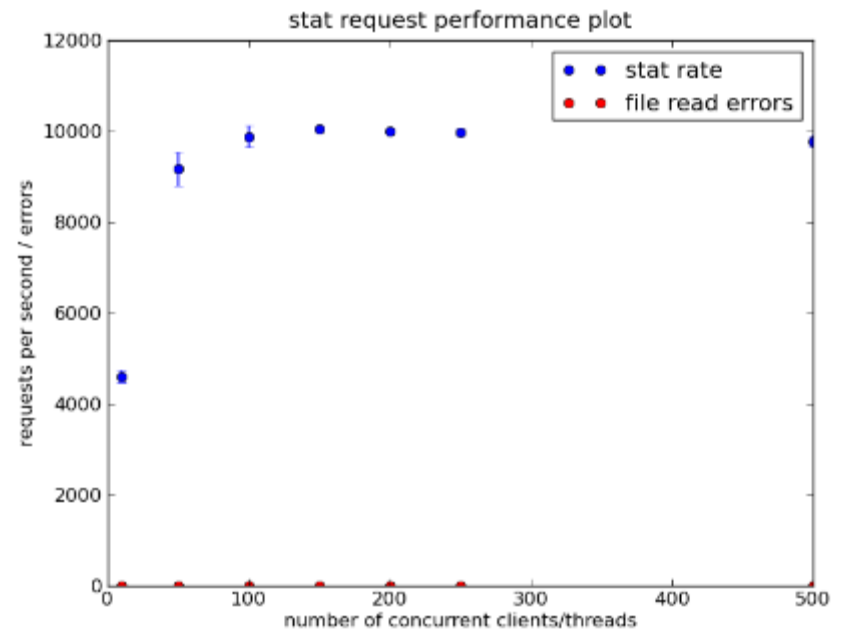
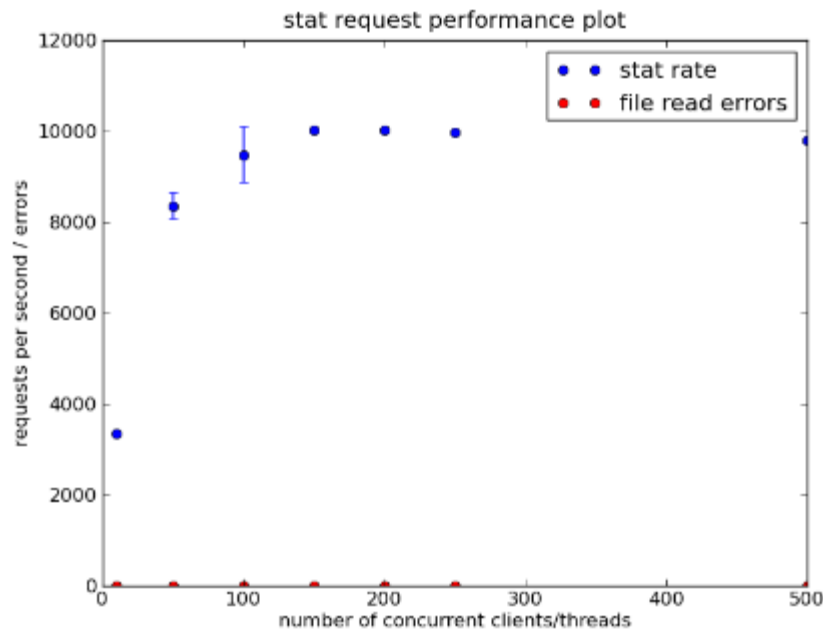
```
gbitzes@gbitzes-dev ~/dev/dpm-tests } master > ./dpm-tester.py --host domehead-trunk.cern.ch --tests gsiftp
FAIL => gsiftp :: Verify base exists: /dpm/cern.ch/home/dteam/ 0.00760 sec
FAIL => gfal :: access 0.00760 sec
['gsiftp://domehead-trunk.cern.ch:2811/dpm/cern.ch/home/dteam/', 0]
Traceback (most recent call last): File "./dpm-tester.py", line 282, in run self.output =
self.function(*self.arguments) GError: globus_xio: Unable to connect to domehead-trunk.cern.ch:2811 globus_xio:
System error in connect: Connection refused globus_xio: A system call failed: Connection refused
SKIP => gsiftp :: Verify testdir does not exist: /dpm/cern.ch/home/dteam/dpm-tests
SKIP => gsiftp :: Create testdir: /dpm/cern.ch/home/dteam/dpm-tests
SKIP => gsiftp :: Upload to testdir: services
SKIP => gsiftp :: Download from testdir: services
SKIP => gsiftp :: Verify downloaded contents are identical
SKIP => gsiftp :: Verify size is 641020
SKIP => gsiftp :: Verify md5 checksum: 35435ea447c19f0ea5ef971837ab9ced
SKIP => gsiftp :: Remove: services
SKIP => gsiftp :: Upload to testdir: evil filename-!@#%^_+=:[]{}><' " # $ & * ) (
SKIP => gsiftp :: Download from testdir: evil filename-!@#%^_+=:[]{}><' " # $ & * ) (
SKIP => gsiftp :: Verify downloaded contents are identical
SKIP => gsiftp :: Verify size is 641020
SKIP => gsiftp :: Verify md5 checksum: 35435ea447c19f0ea5ef971837ab9ced
SKIP => gsiftp :: Remove: evil filename-!@#%^_+=:[]{}><' " # $ & * ) (
SKIP => gsiftp :: Hammer test - upload 10 files in parallel: /dpm/cern.ch/home/dteam/dpm-tests
SKIP => gsiftp :: Upload and delete the same file 5 times
SKIP => gsiftp :: Recursively remove contents: /dpm/cern.ch/home/dteam/dpm-tests
SKIP => gsiftp :: Remove directory: /dpm/cern.ch/home/dteam/dpm-tests
```

Automatic (optional) cleanup of test files on failure

```
gbitzes@gbitzes-dev ~/dev/dpm-tests master ./dpm-tester.py --host domehead-trunk.cern.ch --tests davs
PASS => davs :: Verify base exists: /dpm/cern.ch/home/dteam/ 0.11422 sec
PASS => davs :: Verify testdir does not exist: /dpm/cern.ch/home/dteam/dpm-tests 0.16576 sec
PASS => davs :: Create testdir: /dpm/cern.ch/home/dteam/dpm-tests 0.11441 sec
PASS => davs :: Upload to testdir: services 0.31647 sec
PASS => davs :: Download from testdir: services 0.21454 sec
PASS => davs :: Verify downloaded contents are identical 0.00085 sec
PASS => davs :: Verify size is 641020 0.06435 sec
FAIL => davs :: Verify md5 checksum: 35435ea447c19f0ea5ef971837ab9ceq 5.03076 sec
    Verify the md5 checksum of 'davs://domehead-trunk.cern.ch:443/dpm/cern.ch/home/dteam/dpm-tests/services' is
    '35435ea447c19f0ea5ef971837ab9ceq'
PASS => gfal :: checksum 5.03011 sec
    ['davs://domehead-trunk.cern.ch:443/dpm/cern.ch/home/dteam/dpm-tests/services', 'md5']
    Checksum mismatch! Expected '35435ea447c19f0ea5ef971837ab9ceq', received '35435ea447c19f0ea5ef971837ab9ced'
PASS => davs :: Remove: services 0.21586 sec
SKIP => davs :: Upload to testdir: evil filename-!@#%^_-=:;[]{}<>' "$$&*)(
SKIP => davs :: Download from testdir: evil filename-!@#%^_-=:;[]{}<>' "$$&*)(
SKIP => davs :: Verify downloaded contents are identical
SKIP => davs :: Verify size is 641020
SKIP => davs :: Verify md5 checksum: 35435ea447c19f0ea5ef971837ab9ceq
SKIP => davs :: Remove: evil filename-!@#%^_-=:;[]{}<>' "$$&*)(
SKIP => davs :: Hammer test - upload 10 files in parallel: /dpm/cern.ch/home/dteam/dpm-tests
SKIP => davs :: Upload and delete the same file 5 times
PASS => davs :: Recursively remove contents: /dpm/cern.ch/home/dteam/dpm-tests 0.06620 sec
PASS => davs :: Remove directory: /dpm/cern.ch/home/dteam/dpm-tests 0.11467 sec
```

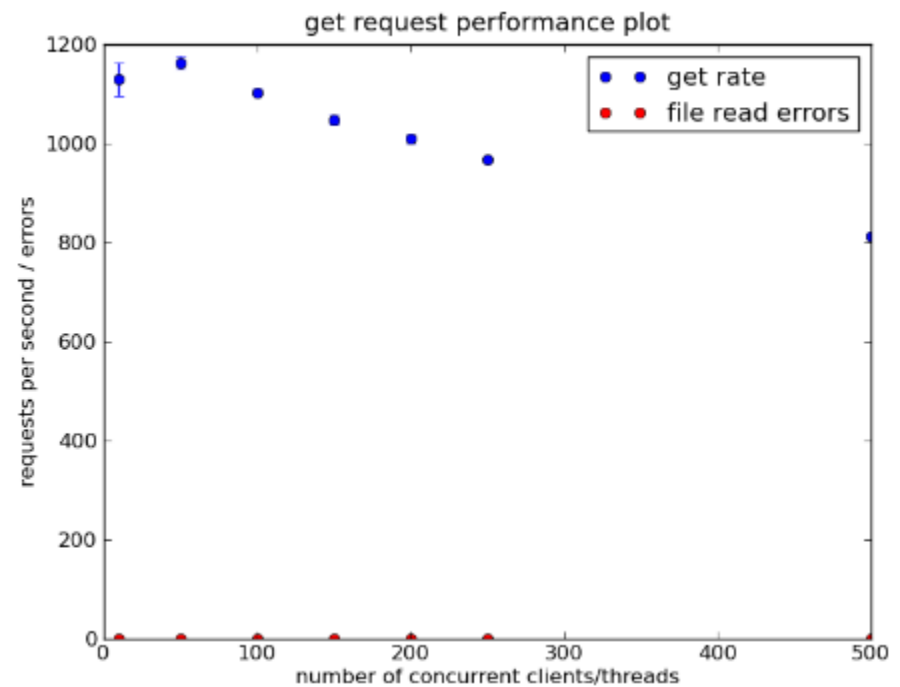
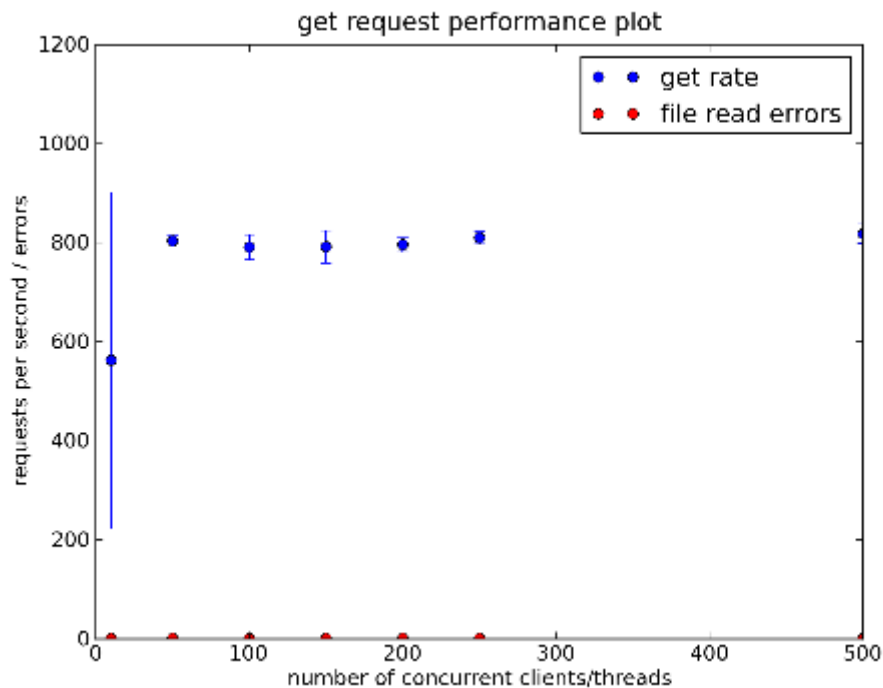

Performance measurements

- Our performance tests show that DOME / domeadapter performance is on par with dpmd / adapter.
- Statting with DAV (left dpmd, right dome)



Performance measurements (2)

- XROOT GET. (left dpmd, right dome)



Demo, Questions

Georgios.bitzes@cern.ch