

# Flat Hierarchies Testing

Tests to determine whether Fedora 4 ingest performance is impacted when there is a lack of hierarchy in the repository structure. There are two sets of tests here.

The first hypothesis was that we'd see a slow down in ingest time at the ten thousand [container](#) mark. To test this, we ran tests of 30k records using [bench tool](#) and a [Bash script](#) written to alternate between the Infinispan configurations available in the [fcrepo4/fcrepo-configs](#) repository (e.g., [file](#), [leveldb-default](#), [leveldb](#), and [ram](#)). The tests were run on an [EC2 m3.medium instance](#). The initial tests, documented below, did not reveal a problem with a lack of hierarchy. However, there was an uptick at the end of the 30k 2 MB container tests that indicated more testing was warranted. When 60k container tests were run with benchtool, there were exceptions thrown and the tests ended prematurely.

The second round of tests were designed to load a larger number of containers. The initial Bash script [was modified](#) to use curl, instead of benchtool, to submit containers to Fedora 4. These tests were single threaded and attempted to load 100k, and then 500k, containers with 1 MB [binary](#) into a flat fcrepo4 structure. These tests ran without exception, but showed a definite slow down in the containers' ingest times as the number of containers ingested continued to grow. The second test (of 500k containers) was discontinued at 175k containers when the increase in ingest times was determined to be growing to the point of being prohibitively slow. The graphs for these tests are near the bottom of the page (the last two red graphs).

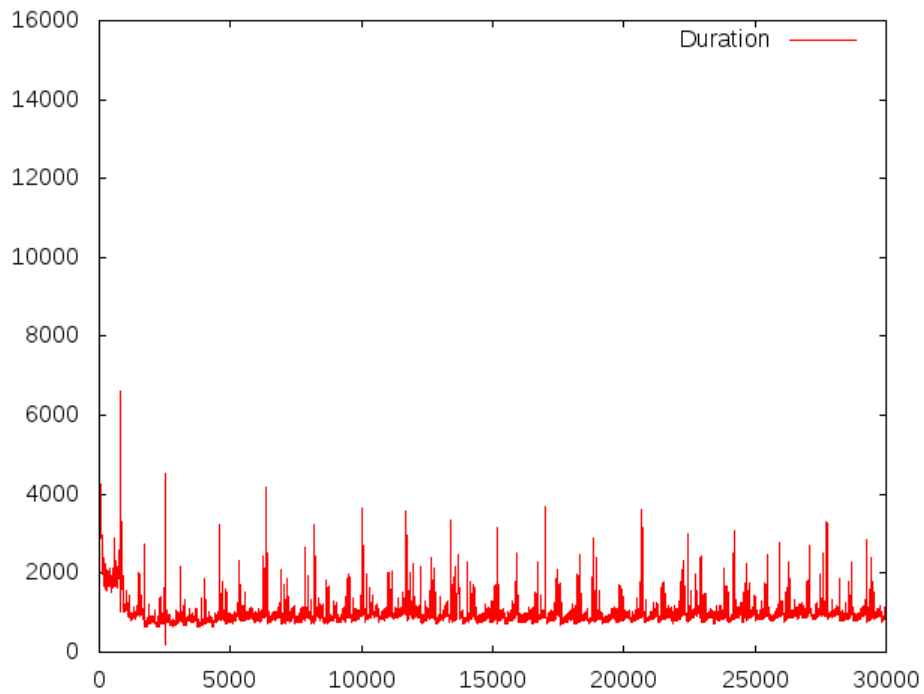
At the very bottom of this page are graphs from a test run by Ben Pennell, which shows a similar pattern in the timing of ingests of over 100k containers. He experienced the repository becoming non-responsive near the 200k container mark.

*Updated (at the bottom of the page) with results from a hierarchical test (same architecture, but using a 64/64/64 structure).*

## Results from the First Round of Testing

Configuration	Results Graph	Logging Output
leveldb-default (30k 1 KB containers / 15 threads) - tested using benchtool		Running new test [config: config /infinispan /leveldb-default /infinispan.xml] [Jetty pid: 30298] 18:30:11 INFO Found Fedora 4 at http://localhost:8080 18:30:11 INFO Running 30000 INGEST action(s) against FCREPO4 with a binary size of 1.0 KB using 15 thread(s) 18:30:15 INFO The Fedora cluster has 0 node(s) before the benchmark 18:30:15 INFO preparing 30000 objects 18:32:30 INFO creating 30000 objects

		<div>took 125639 ms 18:33:27 INFO scheduling 30000 actions 19:08:14 INFO purging 30000 objects and datastreams</div> <div>19:10:38 INFO Completed 30000 INGEST action(s) executed in 31292451 ms 19:10:38 INFO The Fedora cluster has 0 node(s) after the benchmark 19:10:38 INFO Throughput was 0.01 MB/sec 19:10:38 INFO Throughput per thread was 0 MB /sec 19:10:38 INFO Condensed results: 19:10:38 INFO 30000 1024 15 INGEST 31292451 9.3622814 E-4 no-tx 19:10:38 INFO All operations completed in 2426697 ms</div>
leveldb (30k 1 KB containers / 15 threads) - tested using benchtool		<div>Running new test [config: config /infinispan /leveldb /infinispan. xml] [Jetty pid: 3870] 19:12:40 INFO Found Fedora 4 at <a href="http://localhost:8080">http://localhost:8080</a></div> <div>19:12:40</div>

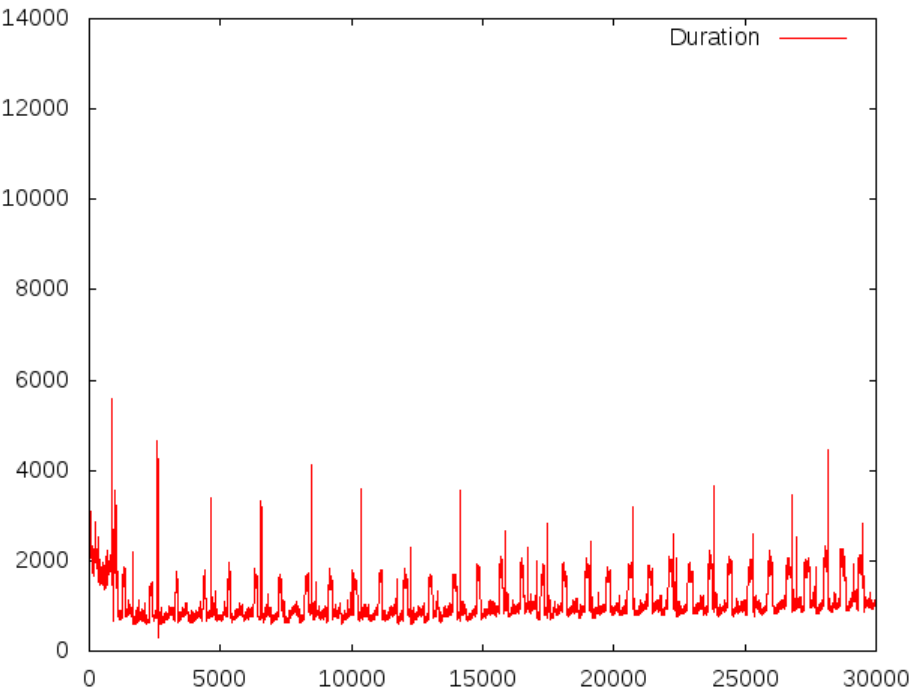


INFO  
Running  
30000  
INGEST  
action(s)  
against  
FCREPO4  
with a  
binary size  
of 1.0 KB  
using 15  
thread(s)  
19:12:44  
INFO The  
Fedora  
cluster has  
0 node(s)  
before the  
benchmark  
19:12:44  
INFO  
preparing  
30000  
objects  
19:15:01  
INFO  
creating  
30000  
objects  
took  
126888 ms  
19:16:04  
INFO  
scheduling  
30000  
actions  
19:51:06  
INFO  
purging  
30000  
objects  
and  
datastreams  
  
19:53:28  
INFO  
Completed  
30000  
INGEST  
action(s)  
executed  
in  
31517411  
ms  
19:53:29  
INFO The  
Fedora  
cluster has  
0 node(s)  
after the  
benchmark  
19:53:29  
INFO  
Throughput  
was 0.01  
MB/sec  
19:53:29  
INFO  
Throughput  
per thread  
was 0 MB  
/sec  
19:53:29  
INFO  
Condensed  
results:  
19:53:29  
INFO  
30000

1024 15  
INGEST  
31517411  
9.295457E-  
4 no-tx  
19:53:29  
INFO All  
operations  
completed  
in  
2448012  
ms

Running  
new test  
[config:  
config  
/infinispan  
/file  
/infinispan.  
xml] [Jetty  
pid: 7558]  
20:02:31  
INFO  
Found  
Fedora 4  
at <http://localhost:8080>  
  
20:02:31  
INFO  
Running  
30000  
INGEST  
action(s)  
against  
FCREPO4  
with a  
binary size  
of 1.0 KB  
using 15  
thread(s)  
20:02:34  
INFO The  
Fedora  
cluster has  
0 node(s)  
before the  
benchmark  
20:02:34  
INFO  
preparing  
30000  
objects  
20:04:47  
INFO  
creating  
30000  
objects  
took  
124113 ms  
20:08:28  
INFO  
scheduling  
30000  
actions  
20:45:14  
INFO  
purging  
30000  
objects  
and  
datastreams  
  
20:50:51  
INFO  
Completed  
30000  
INGEST  
action(s)

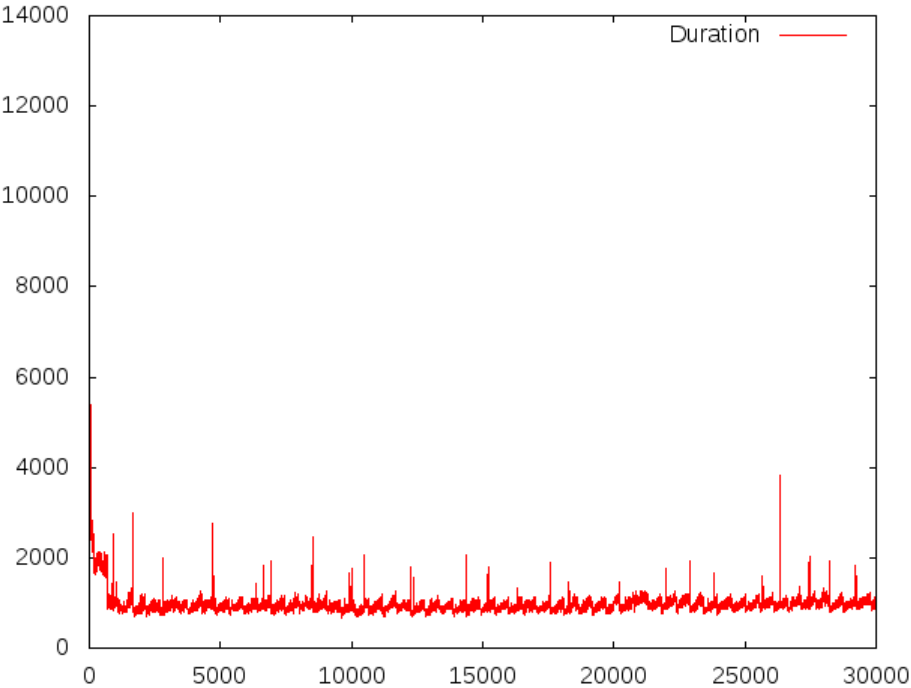
file (30k 1 KB containers /  
15 threads) - tested using  
benchtool



executed  
in  
33069648  
ms  
20:50:52  
INFO The  
Fedora  
cluster has  
0 node(s)  
after the  
benchmark  
20:50:52  
INFO  
Throughput  
was 0.01  
MB/sec  
20:50:52  
INFO  
Throughput  
per thread  
was 0 MB  
/sec  
20:50:52  
INFO  
Condensed  
results:  
20:50:52  
INFO  
30000  
1024 15  
INGEST  
33069648  
8.859143E-  
4 no-tx  
20:50:52  
INFO All  
operations  
completed  
in  
2900327  
ms

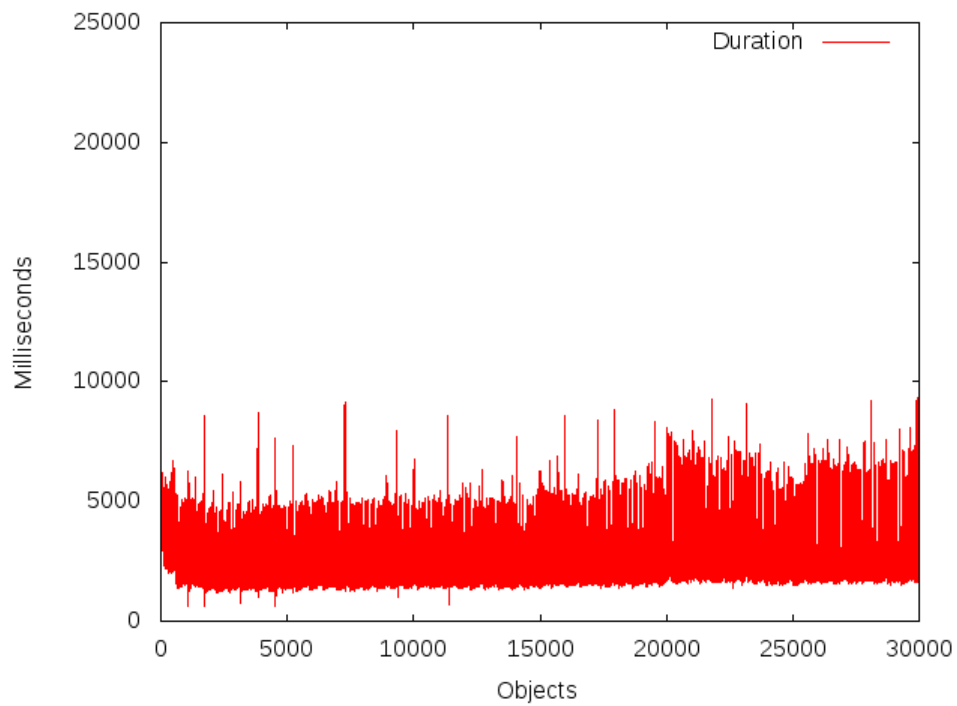
Running  
new test  
[config:  
config  
/infinispan  
/ram  
/infinispan.  
xml] [Jetty  
pid: 11324]  
20:52:45  
INFO  
Found  
Fedora 4  
at <http://localhost:8080>  
  
20:52:45  
INFO  
Running  
30000  
INGEST  
action(s)  
against  
FCREPO4  
with a  
binary size  
of 1.0 KB  
using 15  
thread(s)  
20:52:48  
INFO The  
Fedora  
cluster has  
0 node(s)  
before the  
benchmark  
20:52:48  
INFO

ram (30k 1 KB containers /  
15 threads) - tested using  
benchtool



		<pre>preparing 30000 objects 20:55:00 INFO creating 30000 objects took 123502 ms 20:55:45 INFO scheduling 30000 actions 21:28:38 INFO purging 30000 objects and datastreams  21:30:23 INFO Completed 30000 INGEST action(s) executed in 29588918 ms 21:30:23 INFO The Fedora cluster has 0 node(s) after the benchmark 21:30:23 INFO Throughput was 0.01 MB/sec 21:30:23 INFO Throughput per thread was 0 MB /sec 21:30:23 INFO Condensed results: 21:30:23 INFO 30000 1024 15 INGEST 29588918 9.9013E-4 no-tx 21:30:23 INFO All operations completed in 2257950 ms</pre>
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Configuration	Results Graph	Logging Output
leveldb-default (30k 2 MB containers / 15 threads) - tested using benchtool		Running new test [config: config



```
/infinispan
/leveldb-
default
/infinispan.
xml] [Jetty
pid: 1370]
14:10:27
INFO
Found
Fedora 4
at http://localhost:8080

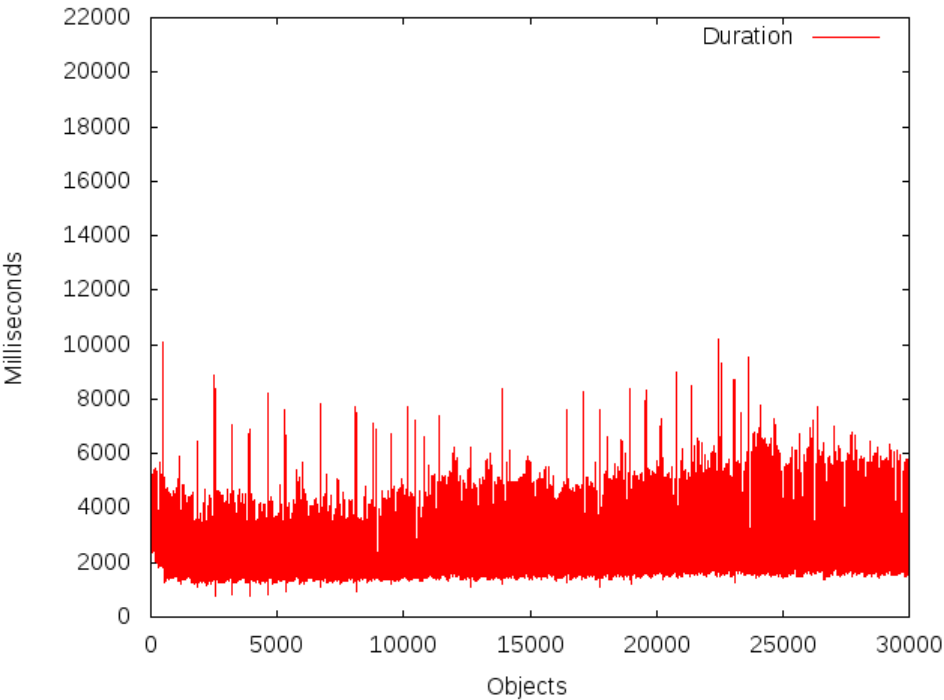
14:10:27
INFO
Running
30000
INGEST
action(s)
against
FCREPO4
with a
binary size
of 2.0 MB
using 15
thread(s)
14:10:29
INFO The
Fedora
cluster has
0 node(s)
before the
benchmark
14:10:29
INFO
preparing
30000
objects
14:12:40
INFO
creating
30000
objects
took
121853 ms
14:13:34
INFO
scheduling
30000
actions
15:48:36
INFO
purging
30000
objects
and
datastreams

15:51:10
INFO
Completed
30000
INGEST
action(s)
executed
in
85507949
ms
15:51:10
INFO The
Fedora
cluster has
0 node(s)
after the
benchmark
15:51:10
INFO
Throughput
was 10.53
```

MB/sec  
15:51:10  
INFO  
Throughput  
per thread  
was 0.7  
MB/sec  
15:51:10  
INFO  
Condensed  
results:  
15:51:10  
INFO  
30000  
2097152  
15  
INGEST  
85507949  
0.7016891  
no-tx  
15:51:10  
INFO All  
operations  
completed  
in  
6042901  
ms

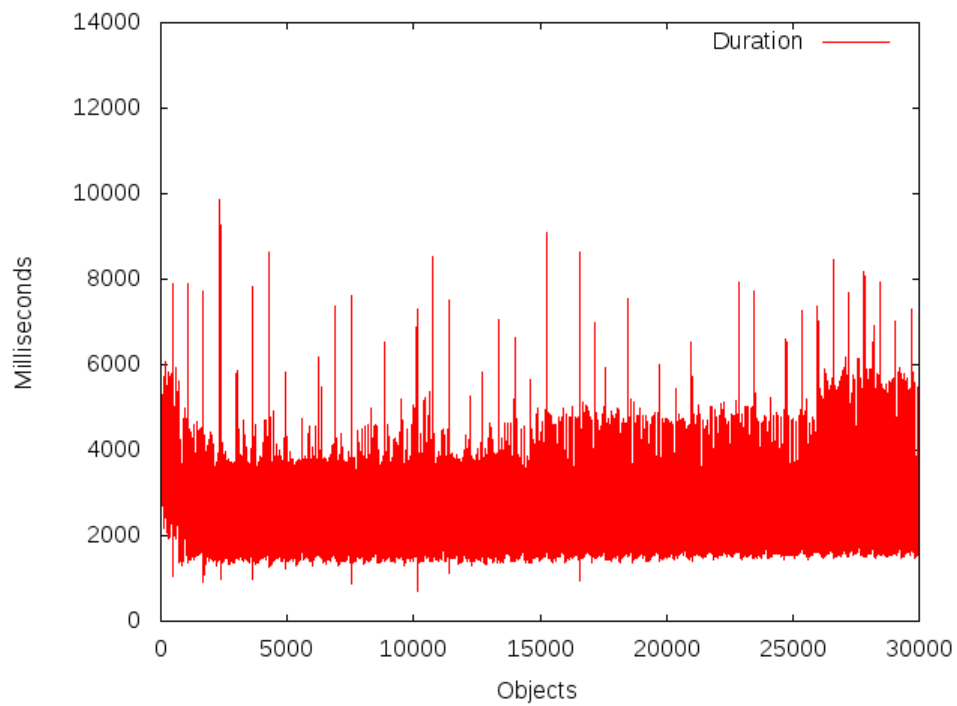
Running  
new test  
[config:  
config  
/infinispan  
/leveldb  
/infinispan.  
xml] [Jetty  
pid: 7694]  
18:06:30  
INFO  
Found  
Fedora 4  
at <http://localhost:8080>  
  
18:06:30  
INFO  
Running  
30000  
INGEST  
action(s)  
against  
FCREPO4  
with a  
binary size  
of 2.0 MB  
using 15  
thread(s)  
18:06:32  
INFO The  
Fedora  
cluster has  
0 node(s)  
before the  
benchmark  
18:06:32  
INFO  
preparing  
30000  
objects  
18:08:41  
INFO  
creating  
30000  
objects  
took  
120016 ms  
18:09:34  
INFO  
scheduling  
30000

leveldb (30k 2 MB  
containers / 15 threads) -  
tested using benchtool



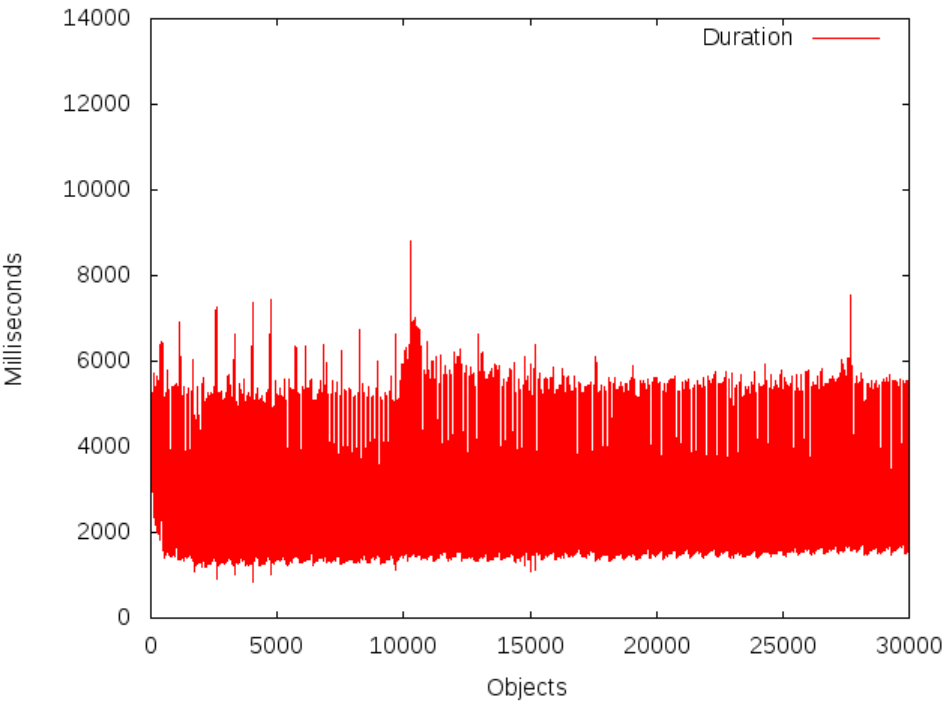


		<p>actions 19:45:21 INFO purging 30000 objects and datastreams</p> <p>19:47:52 INFO Completed 30000 INGEST action(s) executed in 86194079 ms 19:47:52 INFO The Fedora cluster has 0 node(s) after the benchmark 19:47:52 INFO Throughput was 10.44 MB/sec 19:47:52 INFO Throughput per thread was 0.7 MB/sec 19:47:52 INFO Condensed results: 19:47:52 INFO 30000 2097152 15 INGEST 86194079 0.6961035 no-tx 19:47:52 INFO All operations completed in 6081741 ms</p>
file (30k 2 MB containers / 15 threads) - tested using benchtool		<p>Running new test [config: config /infinispan /file /infinispan. xml] [Jetty pid: 14070] 21:45:20 INFO Found Fedora 4 at <a href="http://localhost:8080">http://localhost:8080</a></p> <p>21:45:20 INFO Running 30000 INGEST action(s)</p>



against  
FCREPO4  
with a  
binary size  
of 2.0 MB  
using 15  
thread(s)  
21:45:22  
INFO The  
Fedora  
cluster has  
0 node(s)  
before the  
benchmark  
21:45:22  
INFO  
preparing  
30000  
objects  
21:47:36  
INFO  
creating  
30000  
objects  
took  
124645 ms  
21:51:06  
INFO  
scheduling  
30000  
actions  
23:26:46  
INFO  
purging  
30000  
objects  
and  
datastreams  
  
23:31:50  
INFO  
Completed  
30000  
INGEST  
action(s)  
executed  
in  
86083830  
ms  
23:31:51  
INFO The  
Fedora  
cluster has  
0 node(s)  
after the  
benchmark  
23:31:51  
INFO  
Throughput  
was 10.45  
MB/sec  
23:31:51  
INFO  
Throughput  
per thread  
was 0.7  
MB/sec  
23:31:51  
INFO  
Condensed  
results:  
23:31:51  
INFO  
30000  
2097152  
15  
INGEST  
86083830  
0.696995

ram (30k 2 MB containers / 15 threads) - tested using benchtool



no-tx  
23:31:51  
INFO All  
operations  
completed  
in  
6390673  
ms

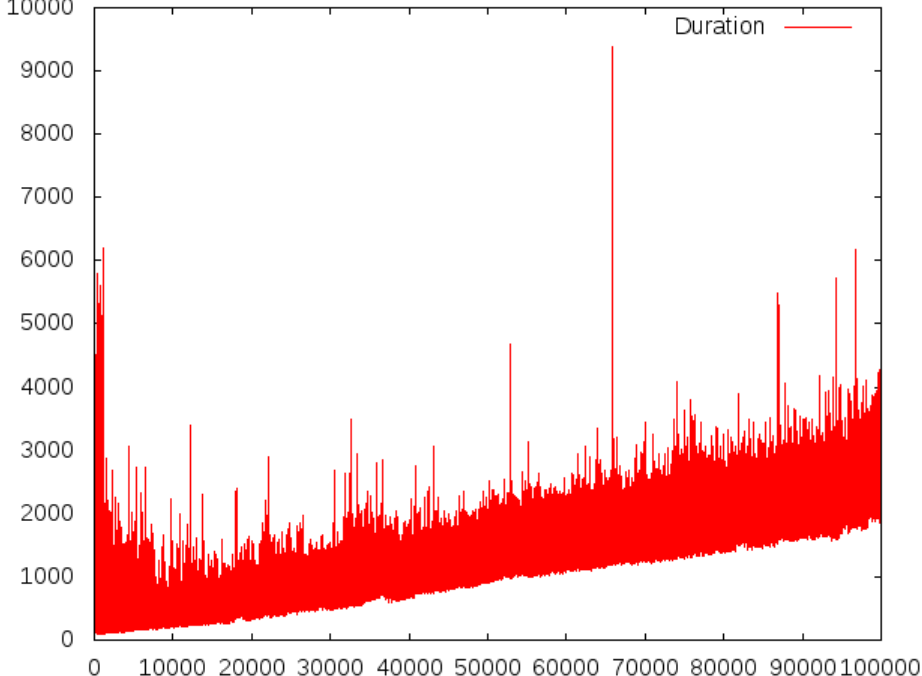
Running  
new test  
[config:  
config  
/infinispan  
/ram  
/infinispan.  
xml] [Jetty  
pid: 1573]  
17:46:22  
INFO  
Found  
Fedora 4  
at <http://localhost:8080>

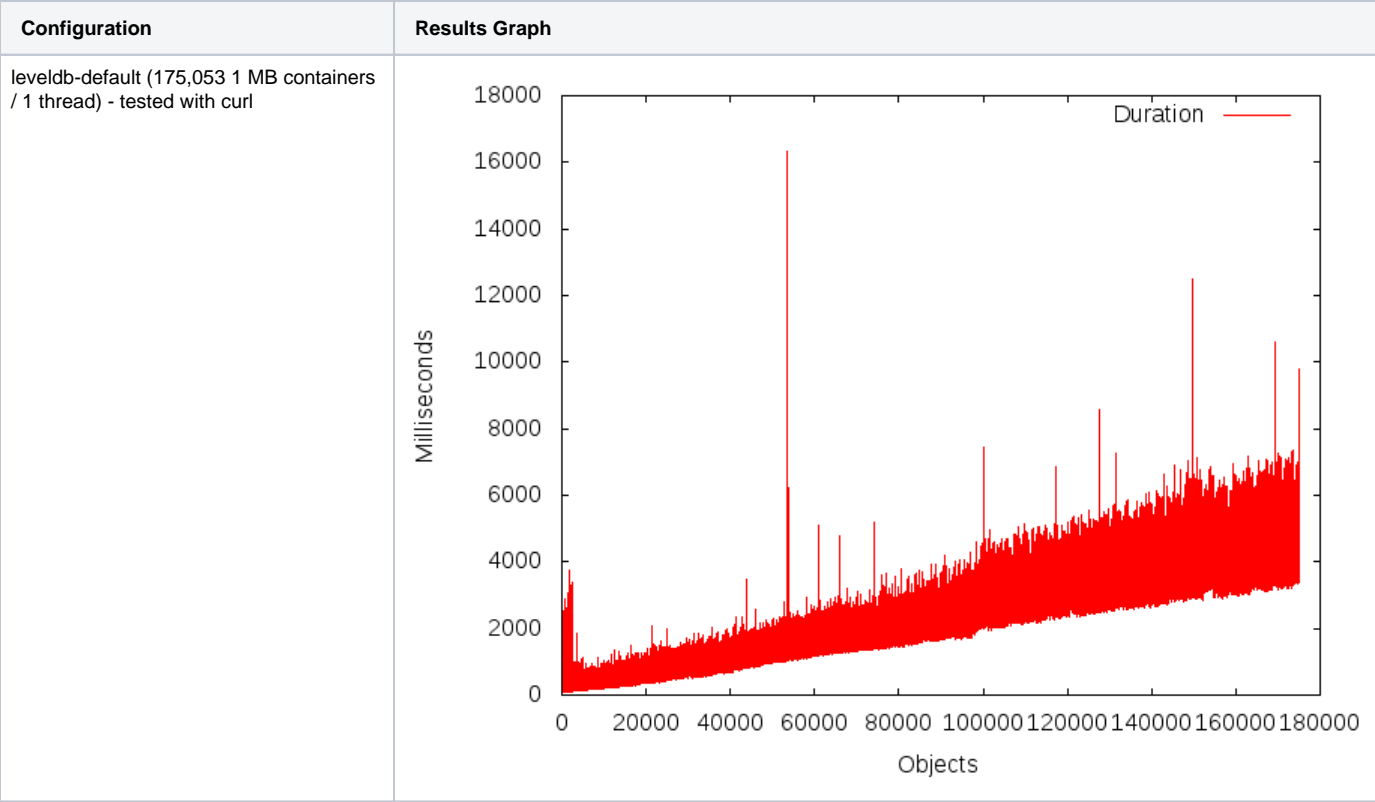
17:46:22  
INFO  
Running  
30000  
INGEST  
action(s)  
against  
FCREPO4  
with a  
binary size  
of 2.0 MB  
using 15  
thread(s)  
17:46:24  
INFO The  
Fedora  
cluster has  
0 node(s)  
before the  
benchmark  
17:46:24  
INFO  
preparing  
30000  
objects  
17:48:35  
INFO  
creating  
30000  
objects  
took  
122076 ms  
17:49:25  
INFO  
scheduling  
30000  
actions  
19:18:49  
INFO  
purging  
30000  
objects  
and  
datastreams

19:21:02  
INFO  
Completed  
30000  
INGEST  
action(s)  
executed  
in  
80453741  
ms

		19:21:02 INFO The Fedora cluster has 0 node(s) after the benchmark 19:21:02 INFO Throughput was 11.19 MB/sec 19:21:02 INFO Throughput per thread was 0.75 MB/sec 19:21:02 INFO Condensed results: 19:21:02 INFO 30000 2097152 15 INGEST 80453741 0.7457701 6 no-tx 19:21:02 INFO All operations completed in 5680046 ms
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Results from the Second Round of Testing

Configuration	Results Graph
leveldb-default (100k 1 MB containers / 1 thread) - tested using curl	



Results from Ben Pennell's Testing

