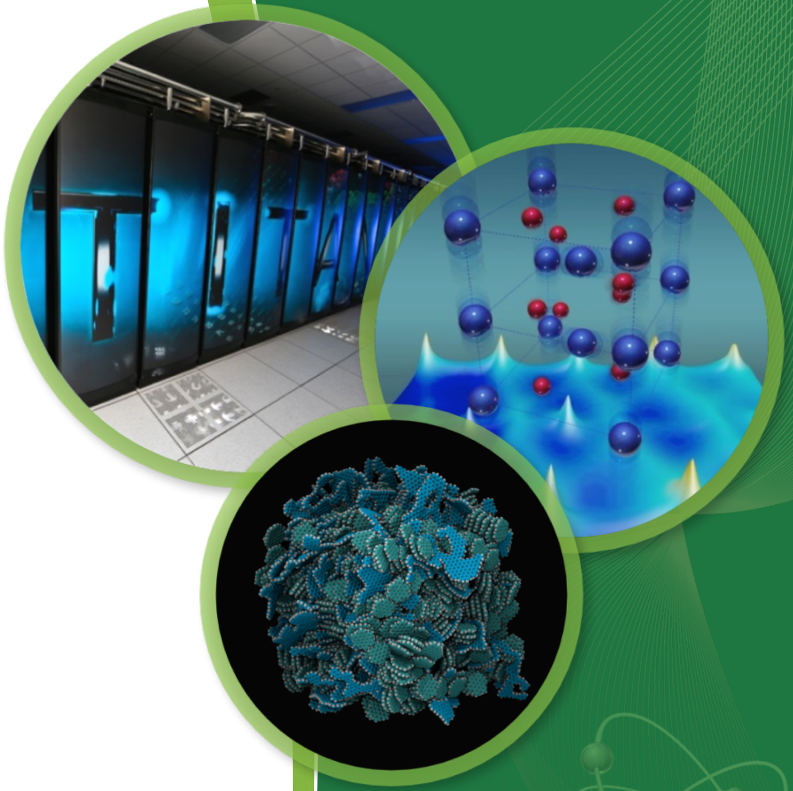
Analyzing Lustre File System Performance With Splunk



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Introduction

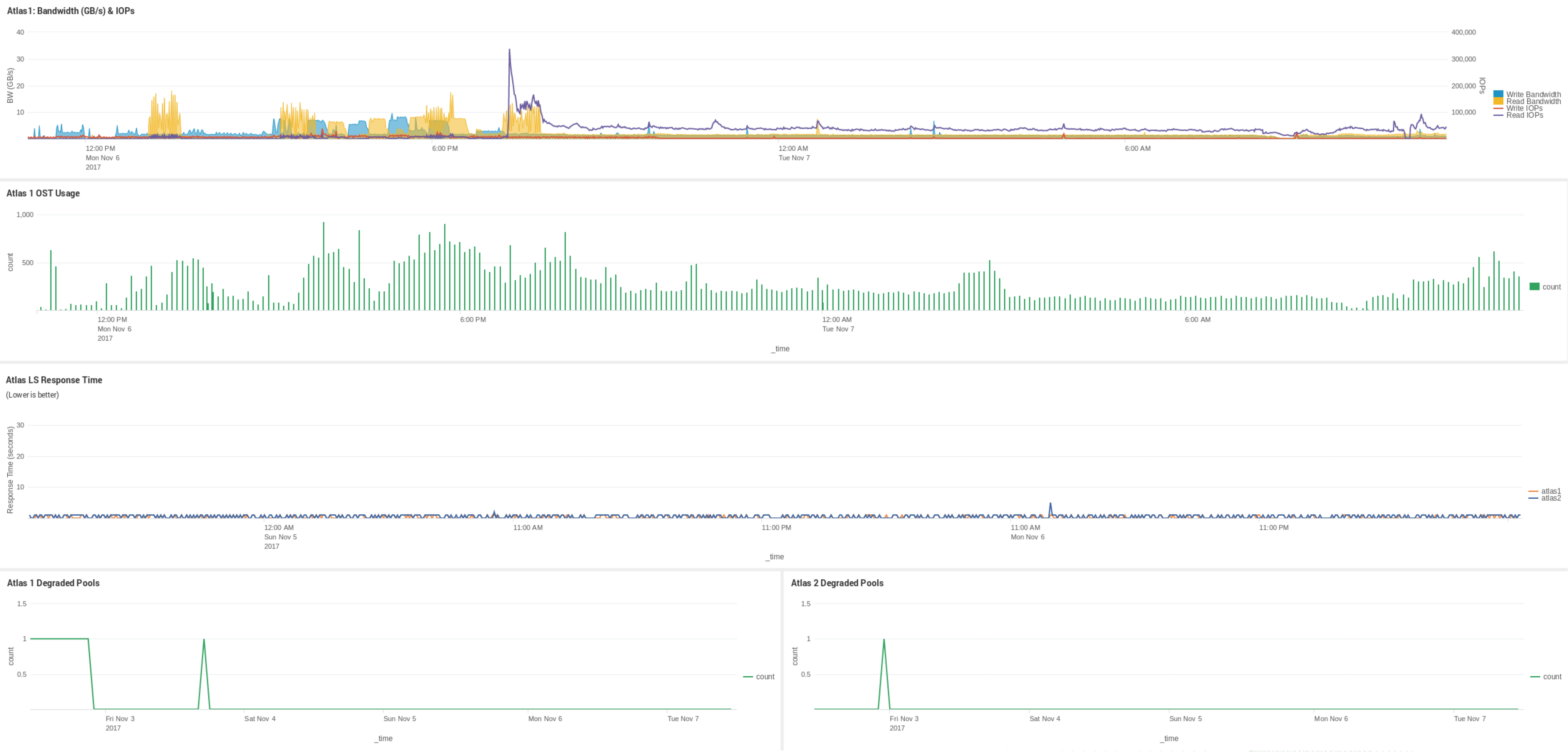
- OLCF is a Lustre shop (for now…)
  - Actually have several filesystems (2 production + various testbeds)
- Main filesystem is Atlas
  - 30PB, 20K disks, 288 OSS's, 72 DDN controllers
  - Actually split into two (Atlas1 & Atlas2) for metadata performance
  - Center-wide: filesystem is mounted on multiple compute resources
- Also have a few other filesystems (NOAA, testbeds)
- We've developed custom tools
  - We tried some other projects (like Robinhood), but they just couldn't handle the scale

Monitoring Tools – Capturing The Raw Data

- Block-level data from the DDN controllers
  - Read & write bandwidth and IOPs for each drive
  - Number of OST’s (LUN’s) in use inferred from bandwidth data
  - Gathered via a Python API
- Filesystem responsiveness tests
  - Run ‘ls’ from several different servers and record the times
  - Sounds simple (and it is), but it’s also useful
- File Size Distributions
  - Scan the filesystem from the client side and record stats
  - Tool is distributed and scalable – and thus capable of overloading the MDS

Splunk – Indexing & Searching The Data

- Splunk is an enterprise data-mining package
- Can ingest, index and store data from multiple sources
  - Very useful for tying all the different data sources together
  - Also provides mundane but necessary capabilities like user authorization
- Individual monitoring tools all feed their results into Splunk
- Allows us to do complex queries across multiple data sources
  - For filesystem monitoring, we actually don't need to
- Splunk license is based on ingest rate (GB / day)
  - This has implications for what data we collect and how frequently we sample



Atlas1: Bandwidth (GB/s) & IOPs

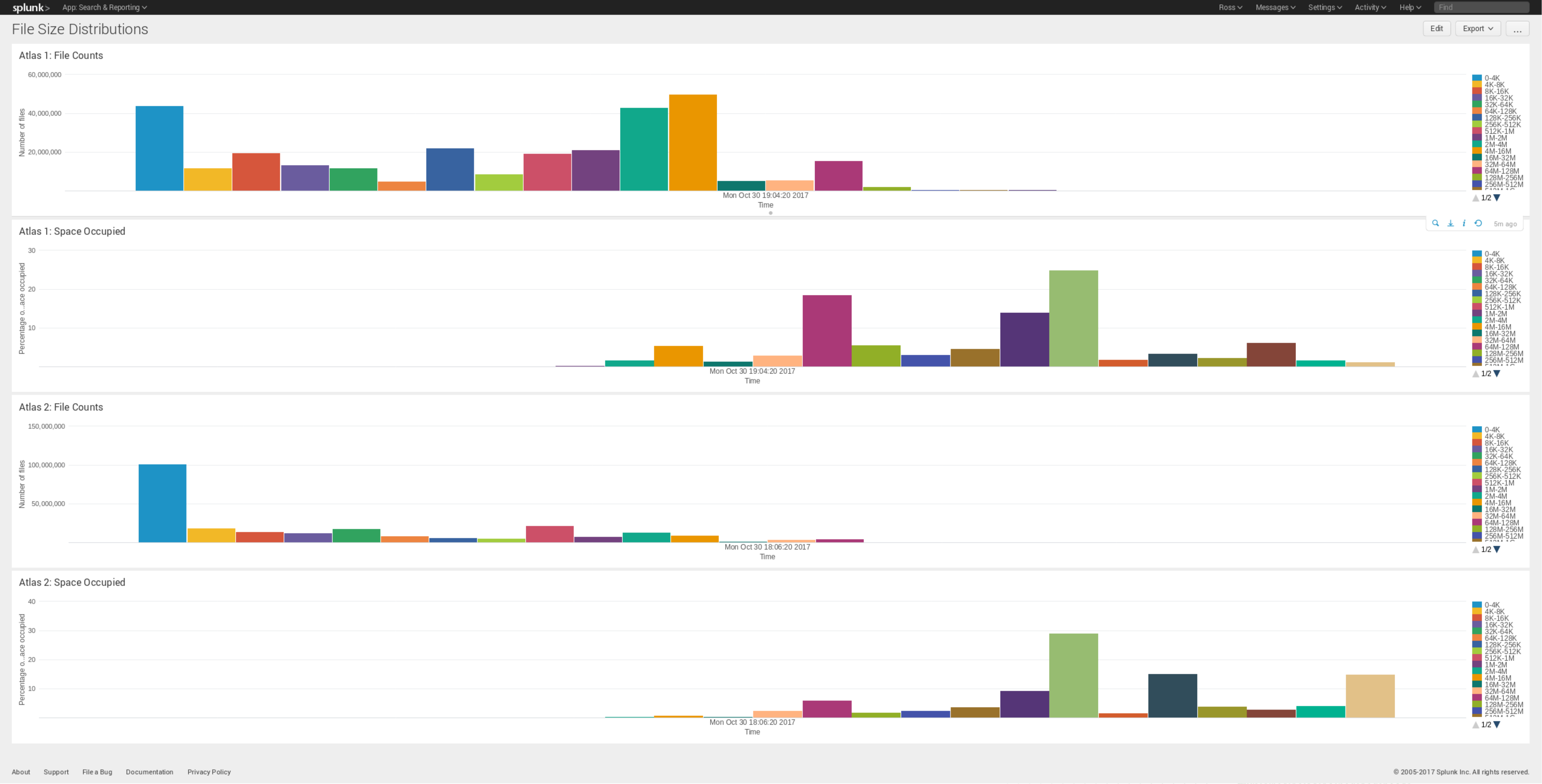
Atlas 1 OST Usage

Atlas LS Response Time

(Lower is better)

Atlas 1 Degraded Pools

Atlas 2 Degraded Pools


splunk>
App: Search & Reporting
Ross
Messages
Settings
Activity
Help
Find
File Size Distributions
Edit
Export
...
Atlas 1: File Counts
60,000,000
40,000,000
20,000,000
Number of files
Mon Oct 30 19:04:20 2017
Time
0-4K
4K-8K
8K-16K
16K-32K
32K-64K
64K-128K
128K-256K
256K-512K
512K-1M
1M-2M
2M-4M
4M-16M
16M-32M
32M-64M
64M-128M
128M-256M
256M-512M
1/2
Atlas 1: Space Occupied
5m ago
30
20
10
Percentage o...ace occupied
Mon Oct 30 19:04:20 2017
Time
Atlas 2: File Counts
150,000,000
100,000,000
50,000,000
Number of files
Mon Oct 30 18:06:20 2017
Time
Atlas 2: Space Occupied
40
30
20
10
Percentage o...ace occupied
Mon Oct 30 18:06:20 2017
Time
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Questions?

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