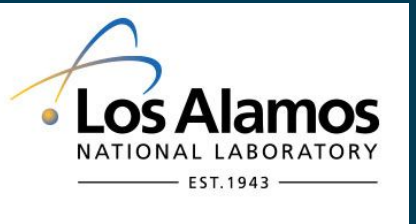
Stay GUFI with Performance Regression Testing

Skylar Hagen

Mentors: Dominic Manno and Jason Lee



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What is GUFI?

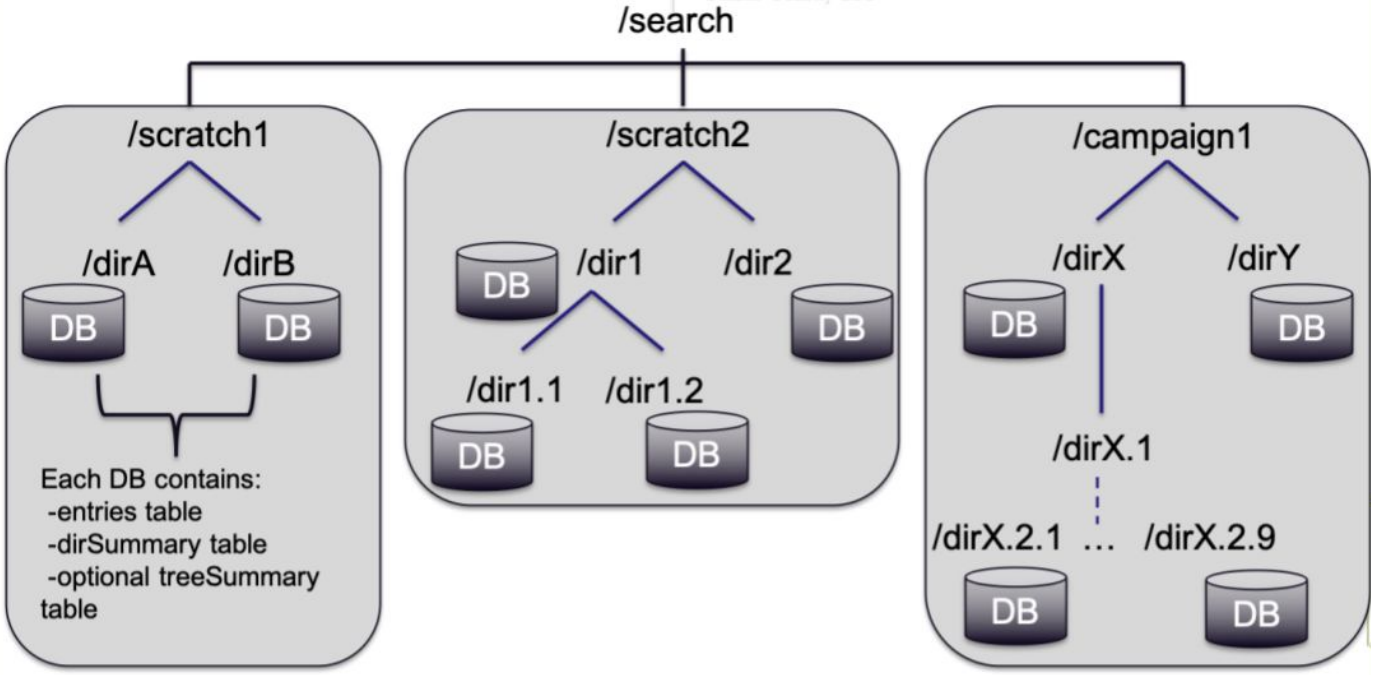
- Grand Unified File Index
- File system index tool
  - Query metadata efficiently on any HPC storage system
  - Secure
  - Outperforms other standard metadata tools
- https://github.com/mar-file-system/GUFI

https://family.disney.com/articles/goofy-weekend/

How does it work?

- Re-creates the source tree as an index
  - Index maintains same ownership and permissions
- Files are not copied over
- Directories have an embedded sqlite database that contains file and directory metadata

GUFI Design



How does it work?

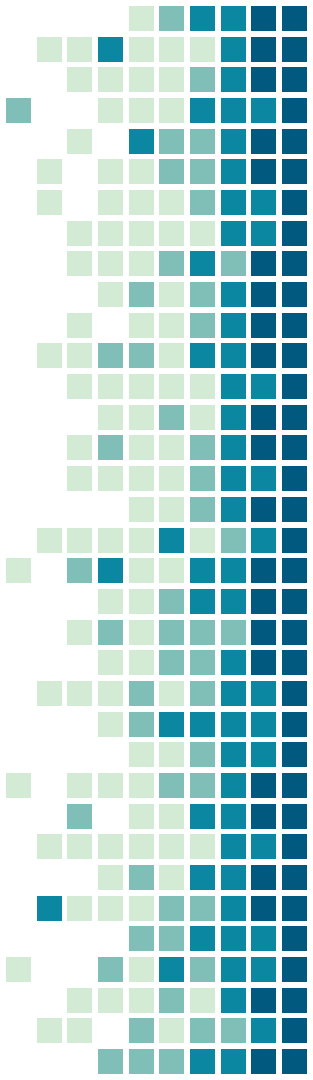
- Run queries to interact with the indexed metadata
- -S “Select * from summary” -E “Select * from entries” index.gufi

Problem

- GUFI is efficient but a baseline for a standard set of operations has not been established
- System to track performance improvements and regressions
- The system must have a fixed set of
  - operations (queries)
  - hardware
  - load (trees + queries)

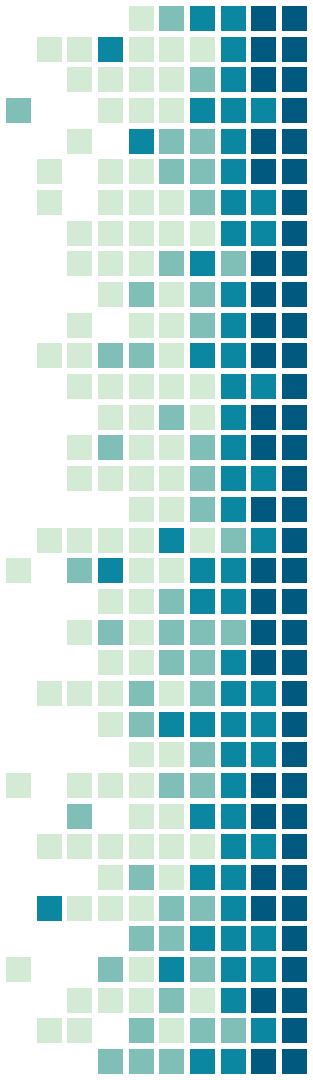
Tree Structures

- Generate trees with ideal size
  - 30 - 60 seconds to run most intensive query
- Deep Tree
  - 12 deep, 4 wide, 3 files per dir
- Wide Tree
  - 6 deep, 20 wide, 3 files per dir
- Balanced Tree
  - 6 deep, 6 wide, 500 files per dir



Performance Statistics

- These statistics are the sum of all the threads
  - Open Directories
  - Open Databases
  - Descend
  - Sqlsum
  - Sqlent
  - Close Databases
  - Close Directories
- Real Time - time main function took to run



System Design

- User calls query_test script on fixed set of hardware
  - History file
  - Average file
  - Pristine file
- Runs the query and dumps statistics into history file
- Stores averages into an average file with current commit hash
- Commit to pristine file

```
138.64
1556.00
47.95
0.00
49.57
21.90
4.47
30.00

101.14
1170.41
29.37
0.00
49.73
21.35
4.26
22.88

101.78
1180.65
28.03
0.00
47.23
21.35
4.39
23.02

99.70
1166.93
27.99
0.00
46.70
20.88
4.23
22.78
```

```
1767950
108.22999999999999
1248.9479999999999
32.458
0.0
48.67
21.386
4.33
24.32
```

System Design (Comparing)

- Compares stats between current commit and target commit (taken from the pristine file)
- Results of comparison printed to screen
  - Each stat marked with increased performance, regression, or no change
  - Allow variance (user specifies)

Average File

```
1767950
99.85
1171.35
29.47
0.0
49.02
21.22
4.24
22.89
```

Pristine File

```
a538a75
99.72
1167.83
32.45
0.0
50.76
20.8
4.24
22.88
```

```
open directories
     No change in time

open databases
     Performance regressed by:    3.5199999999999982s

descend
     Performance improved by:    2.9800000000000004s

sqlsum
     No change in time

sqlent
     Performance improved by:    1.7399999999999949s

close databases
     No change in time

close directories
     No change in time

real time
     No change in time
```

System Design (Pristine File)

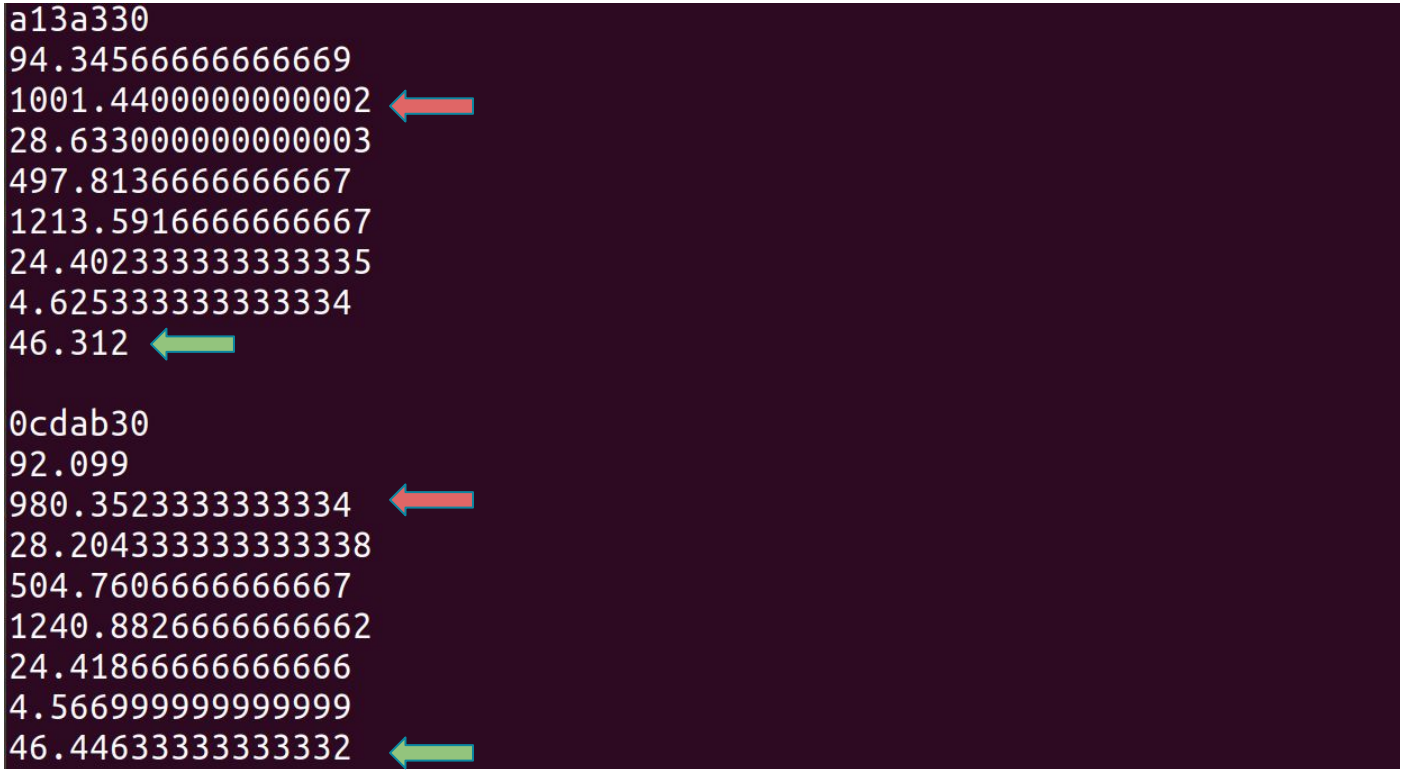
- Commit good results to the pristine file
  - One entry from every commit hash
- Official history file

```
a13a330
94.34566666666669
1001.4400000000002
28.633000000000003
497.8136666666667
1213.5916666666667
24.402333333333335
4.625333333333334
46.312

0cdab30
92.099
980.3523333333334
28.204333333333338
504.7606666666667
1240.8826666666662
24.41866666666666
4.566999999999999
46.44633333333332

b4d2883
92.04733333333334
981.2320000000001
28.24633333333334
503.73033333333336
1235.449
24.477333333333334
4.624999999999999
46.37466666666667

a538a75
91.63433333333334
973.0056666666667
28.183333333333337
509.2043333333333
1255.5533333333335
24.444333333333336
4.577666666666667
46.62966666666667
```

Most Recent

Conclusion

- Tracks and compares statistics between commits
- Detects a performance regression / improvement for each stat based on variance
- Stats vary in timings
  - Real time: 1s window
  - Open databases: 20s window
  - With more runs, we will pin down an acceptable variance value for each statistic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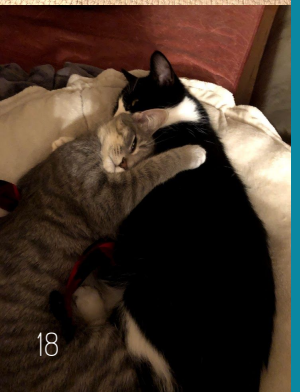
46.312
0cdab30
92.099
980.3523333333334
28.204333333333338
504.7606666666667
1240.8826666666662
24.41866666666666
4.566999999999999
46.44633333333332

Future

- Automate the testing process
  - CMake
  - Run on Travis-CI, Jenkins, Gitlab, etc.
- Move stat numbers to a database
- Additional tree structures
  - Different shapes beyond the ones listed
  - Compare results to our trees now
- Explore queries
- Explore variance



Contact / Information

Skylar Hagen
Email: Skylar.Hagen@trojans.dsu.edu
CompSci undergrad: Dec 2020
Master's: Jan 2021