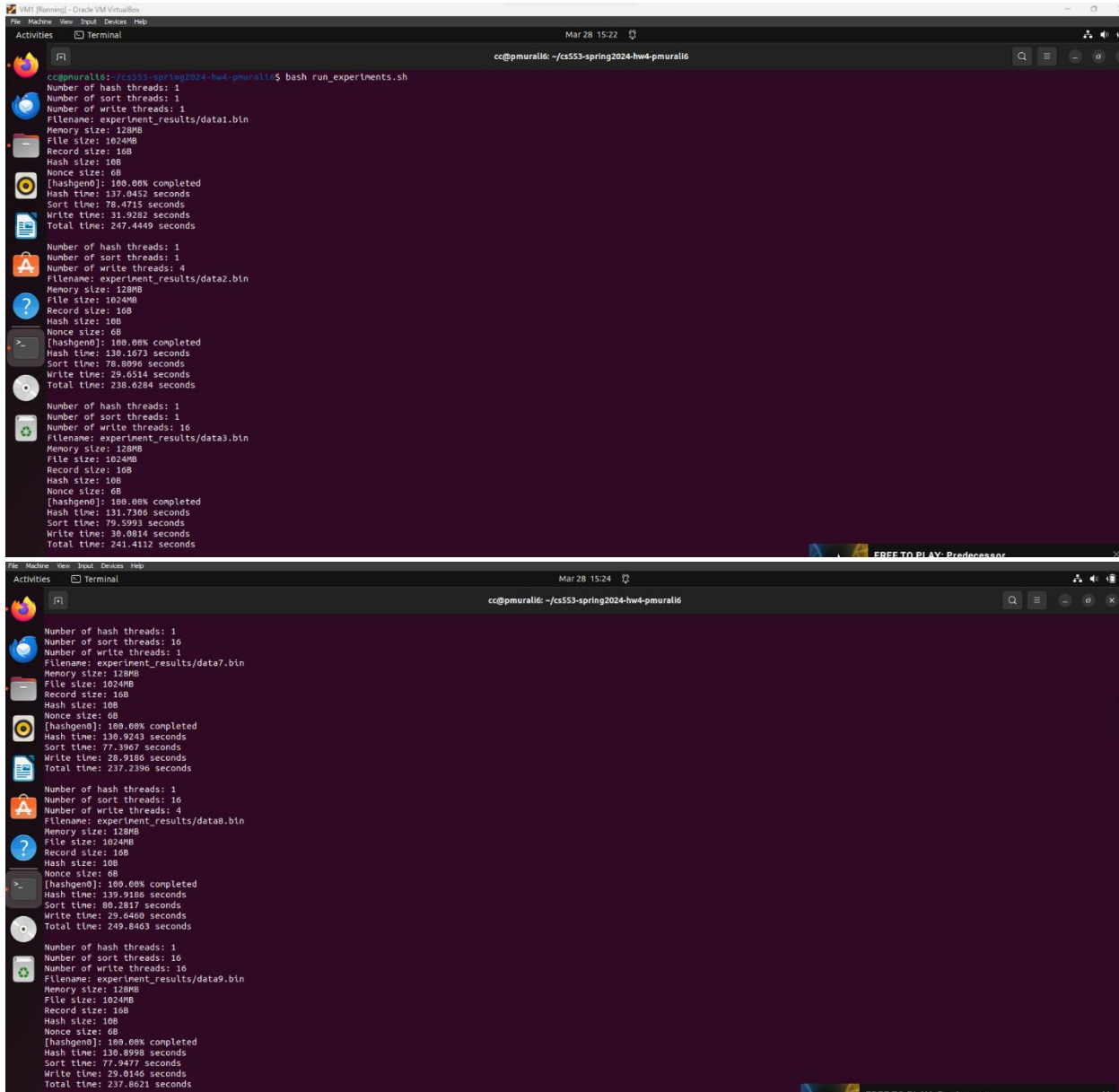


# Cloud Assignment – 4

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## Python Output screenshots



The image displays two screenshots of a terminal window running a Python script. The terminal output shows performance metrics for three different data files: data1.bin, data2.bin, and data3.bin. Each file's results are printed in a structured format, including the number of hash, sort, and write threads, file size, record size, hash size, nonce size, and completion status of the hash generation process. The total execution time for each file is also provided.

```
cc@pmurali6: ~/cs553-spring2024-hw4-pmurali6$ bash run_experiments.sh
Number of hash threads: 1
Number of sort threads: 1
Number of write threads: 1
Filename: experiment_results/data1.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen0]: 100.00% completed
Hash time: 137.0452 seconds
Sort time: 78.4715 seconds
Write time: 31.9282 seconds
Total time: 247.4449 seconds

Number of hash threads: 1
Number of sort threads: 1
Number of write threads: 4
Filename: experiment_results/data2.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen0]: 100.00% completed
Hash time: 130.1073 seconds
Sort time: 78.8096 seconds
Write time: 29.6514 seconds
Total time: 238.5284 seconds

Number of hash threads: 1
Number of sort threads: 1
Number of write threads: 16
Filename: experiment_results/data3.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen0]: 100.00% completed
Hash time: 131.7398 seconds
Sort time: 79.5993 seconds
Write time: 38.0814 seconds
Total time: 249.4205 seconds
```

```
cc@pmurali6: ~/cs553-spring2024-hw4-pmurali6$ bash run_experiments.sh
Number of hash threads: 1
Number of sort threads: 16
Number of write threads: 1
Filename: experiment_results/data7.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen0]: 100.00% completed
Hash time: 130.9243 seconds
Sort time: 77.3967 seconds
Write time: 28.9186 seconds
Total time: 237.2396 seconds

Number of hash threads: 1
Number of sort threads: 16
Number of write threads: 4
Filename: experiment_results/data8.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen0]: 100.00% completed
Hash time: 139.9186 seconds
Sort time: 80.2817 seconds
Write time: 29.6460 seconds
Total time: 249.8463 seconds

Number of hash threads: 1
Number of sort threads: 16
Number of write threads: 16
Filename: experiment_results/data9.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen0]: 100.00% completed
Hash time: 130.8998 seconds
Sort time: 77.9477 seconds
Write time: 29.0146 seconds
Total time: 237.8621 seconds
```

```
File Machine View Input Devices Help
Activities Terminal
cc@pmural16: ~/cs553-spring2024-hw4-pmural16
Mar 28 15:23

Number of hash threads: 1
Number of sort threads: 4
Number of write threads: 1
Filename: experiment_results/data4.bin
Memory size: 128MB
File size: 1024MB
Record size: 16B
Hash size: 10B
Nonce size: 6B
[hashgen0]: 100.00% completed
Hash time: 130.7200 seconds
Sort time: 79.5730 seconds
Write time: 29.4225 seconds
Total time: 239.7154 seconds

Number of hash threads: 1
Number of sort threads: 4
Number of write threads: 4
Filename: experiment_results/data5.bin
Memory size: 128MB
File size: 1024MB
Record size: 16B
Hash size: 10B
Nonce size: 6B
[hashgen0]: 100.00% completed
Hash time: 136.0523 seconds
Sort time: 76.9398 seconds
Write time: 29.0743 seconds
Total time: 242.0663 seconds

Number of hash threads: 1
Number of sort threads: 4
Number of write threads: 16
Filename: experiment_results/data6.bin
Memory size: 128MB
File size: 1024MB
Record size: 16B
Hash size: 10B
Nonce size: 6B
[hashgen0]: 100.00% completed
Hash time: 135.9449 seconds
Sort time: 79.6281 seconds
Write time: 29.8338 seconds
Total time: 245.4060 seconds
```

```
Number of hash threads: 16
Number of sort threads: 16
Number of write threads: 16
Filename: experiment_results/data27.bin
Memory size: 128MB
File size: 1024MB
Record size: 16B
Hash size: 10B
Nonce size: 6B
[hashgen1]: 100.00% completed
[hashgen14]: 100.00% completed
[hashgen10]: 100.00% completed
[hashgen4]: 100.00% completed
[hashgen3]: 100.00% completed
[hashgen11]: 100.00% completed
[hashgen9]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen5]: 100.00% completed
[hashgen6]: 100.00% completed
[hashgen13]: 100.00% completed
[hashgen7]: 100.00% completed
[hashgen15]: 100.00% completed
[hashgen8]: 100.00% completed
[hashgen2]: 100.00% completed
[hashgen12]: 100.00% completed
Hash time: 215.0515 seconds
Sort time: 76.8412 seconds
Write time: 27.7761 seconds
Total time: 319.6688 seconds

cc@pmural16: ~/cs553-spring2024-hw4-pmural16$
```

```
File Machine View Input Devices Help
Activities Terminal
cc@pmural16: ~/cs553-spring2024-hw4-pmural16
Mar 28 15:30

Number of write threads: 4
Filename: experiment_results/data26.bin
Memory size: 128MB
File size: 1024MB
Record size: 16B
Hash size: 10B
Nonce size: 6B
[hashgen0]: 100.00% completed
[hashgen1]: 100.00% completed
[hashgen9]: 100.00% completed
[hashgen11]: 100.00% completed
[hashgen13]: 100.00% completed
[hashgen15]: 100.00% completed
[hashgen5]: 100.00% completed
[hashgen1]: 100.00% completed
[hashgen3]: 100.00% completed
[hashgen2]: 100.00% completed
[hashgen7]: 100.00% completed
[hashgen10]: 100.00% completed
[hashgen12]: 100.00% completed
[hashgen14]: 100.00% completed
[hashgen6]: 100.00% completed
[hashgen0]: 100.00% completed
Hash time: 216.1586 seconds
Sort time: 76.6361 seconds
Write time: 28.1087 seconds
Total time: 320.9774 seconds
```

```
File Machine View Input Devices Help
Activities Terminal
cc@pmural16: ~/cs553-spring2024-hw4-pmural16
Mar 28 15:30

Number of write threads: 1
Filename: experiment_results/data25.bin
Memory size: 128MB
File size: 1024MB
Record size: 16B
Hash size: 10B
Nonce size: 6B
[hashgen15]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen12]: 100.00% completed
[hashgen9]: 100.00% completed
[hashgen10]: 100.00% completed
[hashgen13]: 100.00% completed
[hashgen11]: 100.00% completed
[hashgen14]: 100.00% completed
[hashgen4]: 100.00% completed
[hashgen1]: 100.00% completed
[hashgen11]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen6]: 100.00% completed
[hashgen7]: 100.00% completed
[hashgen2]: 100.00% completed
[hashgen1]: 100.00% completed
Hash time: 241.3163 seconds
Sort time: 77.3846 seconds
Write time: 28.3801 seconds
Total time: 347.0810 seconds
```

```
File Machine View Input Devices Help
Activities Terminal
Mar 28 15:29
cc@pmural16: ~/cs553-spring2024-hw4-pmural16

Number of write threads: 16
Filename: experiment_results/data24.bin
Memory size: 128MB
File size: 1024MB
Record size: 16B
Hash size: 10B
Nonce size: 6B
[hashgen7]: 100.00% completed
[hashgen3]: 100.00% completed
[hashgen15]: 100.00% completed
[hashgen10]: 100.00% completed
[hashgen11]: 100.00% completed
[hashgen4]: 100.00% completed
[hashgen6]: 100.00% completed
[hashgen1]: 100.00% completed
[hashgen8]: 100.00% completed
[hashgen9]: 100.00% completed
[hashgen2]: 100.00% completed
[hashgen7]: 100.00% completed
[hashgen14]: 100.00% completed
[hashgen5]: 100.00% completed
[hashgen13]: 100.00% completed
[hashgen12]: 100.00% completed
Hash time: 216.2024 seconds
Sort time: 77.0870 seconds
Write time: 27.8812 seconds
Total time: 321.2506 seconds
```

```
File Machine View Input Devices Help
Activities Terminal
Mar 28 15:29
cc@pmural16: ~/cs553-spring2024-hw4-pmural16

Number of write threads: 4
Filename: experiment_results/data23.bin
Memory size: 128MB
File size: 1024MB
Record size: 16B
Hash size: 10B
Nonce size: 6B
[hashgen3]: 100.00% completed
[hashgen7]: 100.00% completed
[hashgen15]: 100.00% completed
[hashgen4]: 100.00% completed
[hashgen11]: 100.00% completed
[hashgen10]: 100.00% completed
[hashgen11]: 100.00% completed
[hashgen3]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen12]: 100.00% completed
[hashgen9]: 100.00% completed
[hashgen14]: 100.00% completed
[hashgen13]: 100.00% completed
[hashgen2]: 100.00% completed
[hashgen1]: 100.00% completed
[hashgen10]: 100.00% completed
[hashgen8]: 100.00% completed
Hash time: 218.0485 seconds
Sort time: 77.9089 seconds
Write time: 27.9422 seconds
Total time: 322.9995 seconds
```

```
File Machine View Input Devices Help
Activities Terminal
Mar 28 15:28
cc@pmural16: ~/cs553-spring2024-hw4-pmural16

Number of write threads: 1
Filename: experiment_results/data22.bin
Memory size: 128MB
File size: 1024MB
Record size: 16B
Hash size: 10B
Nonce size: 6B
[hashgen0]: 100.00% completed
[hashgen4]: 100.00% completed
[hashgen11]: 100.00% completed
[hashgen10]: 100.00% completed
[hashgen11]: 100.00% completed
[hashgen5]: 100.00% completed
[hashgen2]: 100.00% completed
[hashgen6]: 100.00% completed
[hashgen7]: 100.00% completed
[hashgen13]: 100.00% completed
[hashgen14]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen3]: 100.00% completed
[hashgen12]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen15]: 100.00% completed
Hash time: 215.6232 seconds
Sort time: 76.6335 seconds
Write time: 27.9960 seconds
Total time: 320.2528 seconds
```

```
File Machine View Input Devices Help
Activities Terminal
Mar 28 15:28
cc@pmural16: ~/cs553-spring2024-hw4-pmural16

Number of write threads: 16
Filename: experiment_results/data21.bin
Memory size: 128MB
File size: 1024MB
Record size: 16B
Hash size: 10B
Nonce size: 6B
[hashgen7]: 100.00% completed
[hashgen3]: 100.00% completed
[hashgen15]: 100.00% completed
[hashgen10]: 100.00% completed
[hashgen11]: 100.00% completed
[hashgen4]: 100.00% completed
[hashgen6]: 100.00% completed
[hashgen11]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen12]: 100.00% completed
[hashgen9]: 100.00% completed
[hashgen14]: 100.00% completed
[hashgen5]: 100.00% completed
[hashgen13]: 100.00% completed
Hash time: 215.8525 seconds
Sort time: 76.8701 seconds
Write time: 27.6669 seconds
Total time: 320.3294 seconds
```

```
File Machine View Input Devices Help
Activities Terminal
Mar 28 15:28
cc@pmurali6: ~/cs553-spring2024-hw4-pmurali6

Number of write threads: 4
Filename: experiment_results/data20.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen2]: 100.00% completed
[hashgen1]: 100.00% completed
[hashgen5]: 100.00% completed
[hashgen9]: 100.00% completed
[hashgen4]: 100.00% completed
[hashgen12]: 100.00% completed
[hashgen13]: 100.00% completed
[hashgen8]: 100.00% completed
[hashgen7]: 100.00% completed
[hashgen6]: 100.00% completed
[hashgen3]: 100.00% completed
[hashgen10]: 100.00% completed
[hashgen]: 100.00% completed
[hashgen11]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen15]: 100.00% completed
Hash time: 215.6848 seconds
Sort time: 76.5618 seconds
Write time: 27.7484 seconds
Total time: 319.9150 seconds
```

```
File Machine View Input Devices Help
Activities Terminal
Mar 28 15:27
cc@pmurali6: ~/cs553-spring2024-hw4-pmurali6

Number of hash threads: 4
Number of sort threads: 16
Number of write threads: 16
Filename: experiment_results/data18.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen1]: 100.00% completed
[hashgen]: 100.00% completed
[hashgen11]: 100.00% completed
[hashgen2]: 100.00% completed
Hash time: 230.7824 seconds
Sort time: 77.1978 seconds
Write time: 27.6603 seconds
Total time: 335.6405 seconds

Number of hash threads: 16
Number of sort threads: 1
Number of write threads: 1
Filename: experiment_results/data19.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen2]: 100.00% completed
[hashgen3]: 100.00% completed
[hashgen13]: 100.00% completed
[hashgen4]: 100.00% completed
[hashgen15]: 100.00% completed
[hashgen1]: 100.00% completed
[hashgen8]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen4]: 100.00% completed
[hashgen11]: 100.00% completed
[hashgen10]: 100.00% completed
[hashgen5]: 100.00% completed
[hashgen6]: 100.00% completed
[hashgen7]: 100.00% completed
[hashgen12]: 100.00% completed
Hash time: 241.8881 seconds
Sort time: 77.7194 seconds
Write time: 28.4127 seconds
Total time: 347.2122 seconds
***
```

```
File Machine View Input Devices Help
Activities Terminal
Mar 28 15:27
cc@pmurali6: ~/cs553-spring2024-hw4-pmurali6

Number of sort threads: 16
Number of write threads: 1
Filename: experiment_results/data16.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen1]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen3]: 100.00% completed
[hashgen2]: 100.00% completed
Hash time: 254.3145 seconds
Sort time: 76.4533 seconds
Write time: 27.8768 seconds
Total time: 358.6438 seconds

Number of hash threads: 4
Number of sort threads: 16
Number of write threads: 4
Filename: experiment_results/data17.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen1]: 100.00% completed
[hashgen3]: 100.00% completed
[hashgen2]: 100.00% completed
[hashgen0]: 100.00% completed
Hash time: 229.4293 seconds
Sort time: 77.5745 seconds
Write time: 28.8017 seconds
Total time: 335.8055 seconds
```

```
File Machine View Input Devices Help
Activities Terminal
cc@pmurali6: ~/cs553-spring2024-hw4-pmurali6

Filename: experiment_results/data12.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen0]: 100.00% completed
[hashgen1]: 100.00% completed
[hashgen2]: 100.00% completed
[hashgen3]: 100.00% completed
[hashgen4]: 100.00% completed
Hash time: 230.6234 seconds
Sort time: 76.8669 seconds
Write time: 26.1479 seconds
Total time: 335.6322 seconds

Number of hash threads: 4
Number of sort threads: 4
Number of write threads: 1
Filename: experiment_results/data13.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen2]: 100.00% completed
[hashgen3]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen1]: 100.00% completed
[hashgen4]: 100.00% completed
Hash time: 231.6734 seconds
Sort time: 76.7998 seconds
Write time: 27.7380 seconds
Total time: 336.2104 seconds
```

```
File Machine View Input Devices Help
Activities Terminal
cc@pmurali6: ~/cs553-spring2024-hw4-pmurali6

Number of write threads: 4
Filename: experiment_results/data14.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen2]: 100.00% completed
[hashgen1]: 100.00% completed
[hashgen3]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen4]: 100.00% completed
Hash time: 231.3673 seconds
Sort time: 77.1117 seconds
Write time: 27.7850 seconds
Total time: 336.4641 seconds

Number of hash threads: 4
Number of sort threads: 4
Number of write threads: 16
Filename: experiment_results/data15.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen1]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen2]: 100.00% completed
[hashgen3]: 100.00% completed
[hashgen4]: 100.00% completed
Hash time: 255.6099 seconds
Sort time: 77.2722 seconds
Write time: 27.9341 seconds
Total time: 360.8162 seconds
```

```
File Machine View Input Devices Help
Activities Terminal
cc@pmurali6: ~/cs553-spring2024-hw4-pmurali6

Number of hash threads: 4
Number of sort threads: 1
Number of write threads: 1
Filename: experiment_results/data10.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen1]: 100.00% completed
[hashgen0]: 100.00% completed
[hashgen2]: 100.00% completed
[hashgen3]: 100.00% completed
Hash time: 231.4099 seconds
Sort time: 77.1598 seconds
Write time: 27.5582 seconds
Total time: 335.8198 seconds

Number of hash threads: 4
Number of sort threads: 1
Number of write threads: 4
Filename: experiment_results/data11.bin
Memory size: 128MB
File size: 1024MB
Record size: 108
Hash size: 108
Nonce size: 68
[hashgen2]: 100.00% completed
[hashgen3]: 100.00% completed
[hashgen1]: 100.00% completed
[hashgen0]: 100.00% completed
Hash time: 253.8172 seconds
Sort time: 78.3967 seconds
Write time: 28.1225 seconds
Total time: 360.3365 seconds
```

## All the files are verified

```
cc@pmurali6:~/cs553-spring2024-hw4-pmurali6$ ./hashverify -d false -f experiment_results/data1.bin -v true
Read 1073741824 bytes and found all records are sorted.
cc@pmurali6:~/cs553-spring2024-hw4-pmurali6$ ./hashverify -d true -f experiment_results/data1.bin -v true -d true
DEBUG=true
FILENAME=experiment_results/data1.bin
VERIFY_RECORDS=true
DEBUG=true
RECORD_SIZE=16
HASH_SIZE=10
NONCE_SIZE=6
[0.311][VERIFY]: 100.00% completed, ETA 0.0 seconds, 1024 flushes, 3291.1 MB/sec
Read 1073741824 bytes and found all records are sorted.
cc@pmurali6:~/cs553-spring2024-hw4-pmurali6$ ./hashverify -d false -f experiment_results/data27.bin -v true
Read 1073741824 bytes and found all records are sorted.
cc@pmurali6:~/cs553-spring2024-hw4-pmurali6$ ./hashverify -d true -f experiment_results/data27.bin -v true -d true
DEBUG=true
FILENAME=experiment_results/data27.bin
VERIFY_RECORDS=true
DEBUG=true
RECORD_SIZE=16
HASH_SIZE=10
NONCE_SIZE=6
[0.321][VERIFY]: 100.00% completed, ETA 0.0 seconds, 1024 flushes, 3187.0 MB/sec
Read 1073741824 bytes and found all records are sorted.
cc@pmurali6:~/cs553-spring2024-hw4-pmurali6$
```