

Search Algorithm Performance Analysis

Comprehensive Comparison of Search Algorithms Under Various Conditions

Generated on: June 28, 2025

Executive Summary

This report presents a comprehensive analysis of various search algorithms' performance under different conditions: concurrent load, parallel execution, and varying data sizes. The analysis aims to provide insights into algorithm efficiency and help in selecting the optimal solution for specific use cases.

1. Algorithm Performance Overview

The following tables shows the performance metrics of all tested algorithms, sorted by average response time. Each algorithm was tested under various conditions to ensure comprehensive evaluation.

No Buffer Mode Performance

Rank	Algorithm	Avg Response (ms)	Success Rate	Avg Memory Usage
1	Linear Search	503.31 ms	100.00 %	5.99 MB
2	Memory Mapped Search	514.55 ms	100.00 %	5.85 MB
3	Rabin-Karp Search	677.12 ms	100.00 %	5.87 MB
4	Hash Set Search	825.75 ms	100.00 %	5.86 MB
5	Shell Grep	927.84 ms	100.00 %	5.83 MB
6	Boyer-Moore Search	2646.25 ms	100.00 %	5.85 MB
7	Binary Search	3413.68 ms	100.00 %	5.85 MB
8	KMP Search	6381.63 ms	100.00 %	5.85 MB
9	Trie Search	16452.27 ms	100.00 %	5.87 MB

Buffer Mode Performance

Rank	Algorithm	Avg Response (ms)	Success Rate	Avg Memory Usage
1	FastSet	26.56 ms	100.00 %	5.94 MB
2	Trie	27.54 ms	100.00 %	5.85 MB
3	Set	28.55 ms	100.00 %	5.85 MB
4	MultiProcesses_Cache	77.31 ms	100.00 %	5.86 MB

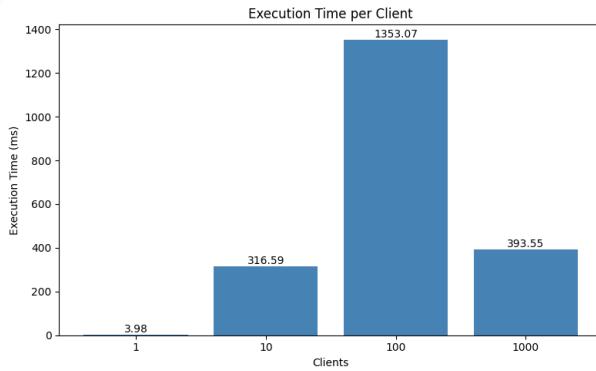
2. Concurrent Load Performance

This section analyzes how each algorithm performs under increasing concurrent client loads, from 1 to 1000 concurrent clients.

No Buffer Mode

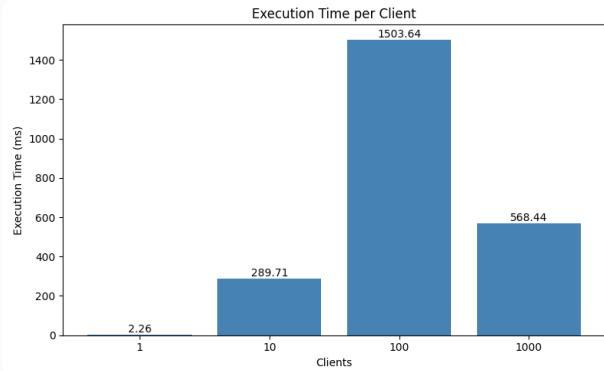
10K Data Size

Binary Search Performance



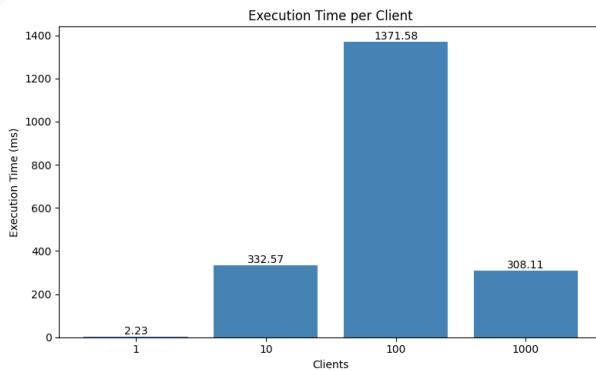
Performance analysis of Binary Search under concurrent load conditions.

Linear Search Performance



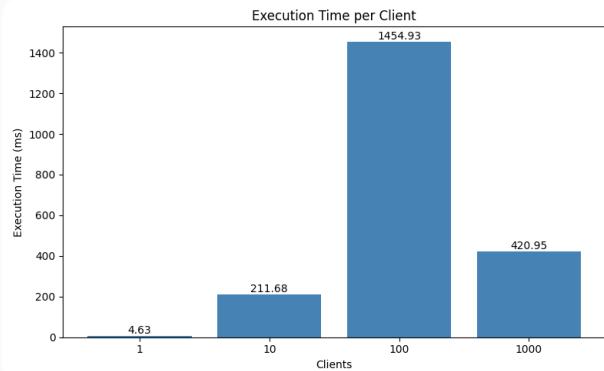
Performance analysis of Linear Search under concurrent load conditions.

Memory Mapped Search Performance



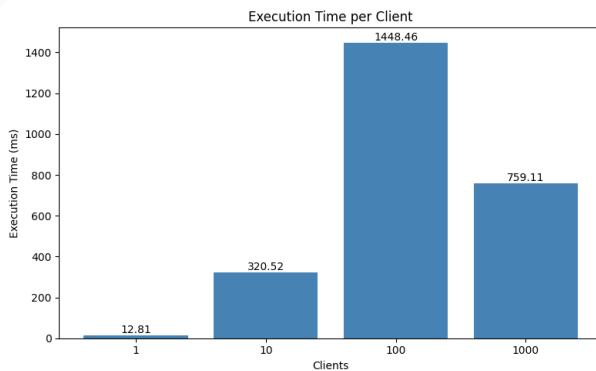
Performance analysis of Memory Mapped Search under concurrent load conditions.

Hash Set Search Performance



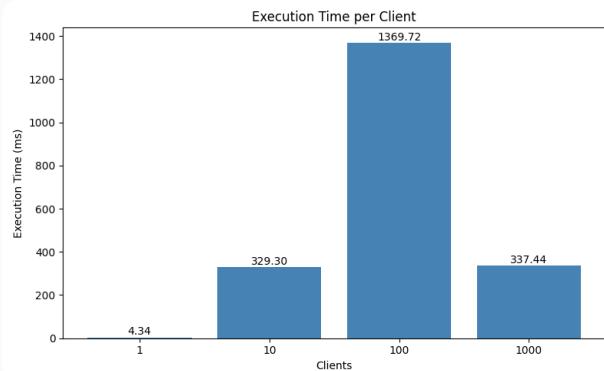
Performance analysis of Hash Set Search under concurrent load conditions.

Kmp Search Performance



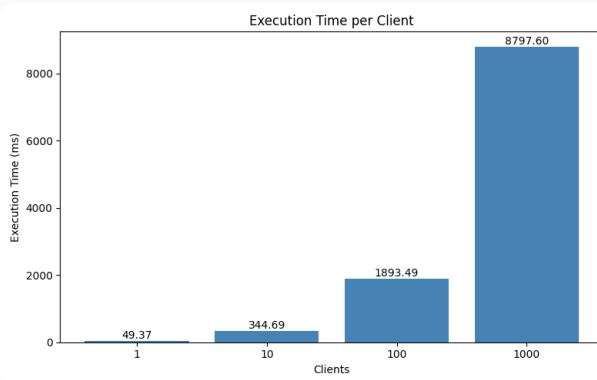
Performance analysis of Kmp Search under concurrent load conditions.

Rabin Karp Search Performance



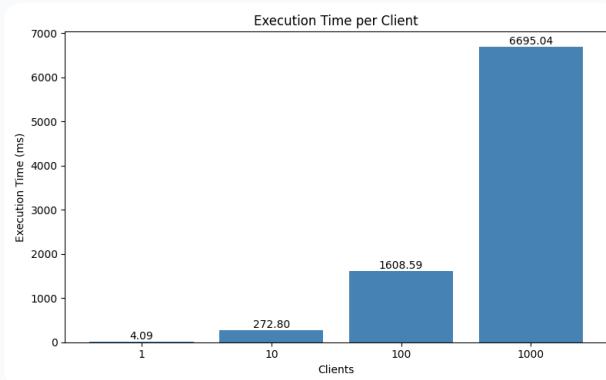
Performance analysis of Rabin Karp Search under concurrent load conditions.

Trie Search Performance



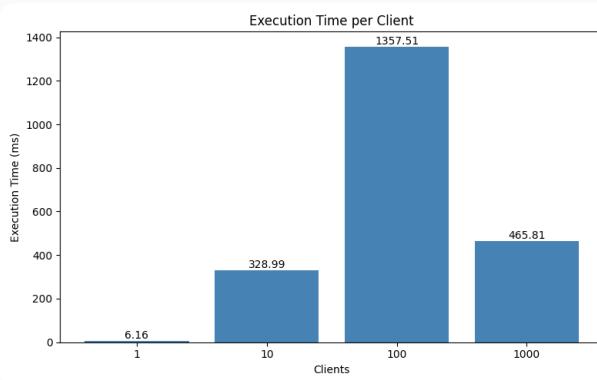
Performance analysis of Trie Search under concurrent load conditions.

Shell Grep Performance



Performance analysis of Shell Grep under concurrent load conditions.

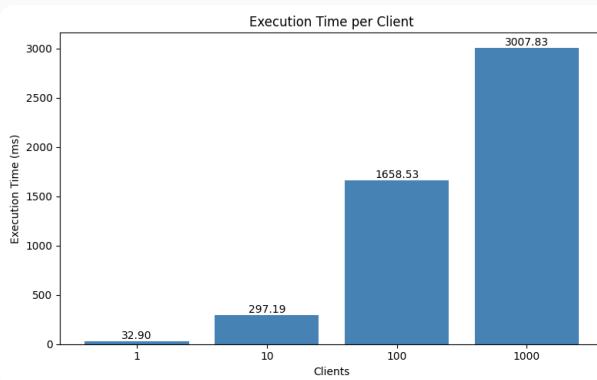
Boyer Moore Search Performance



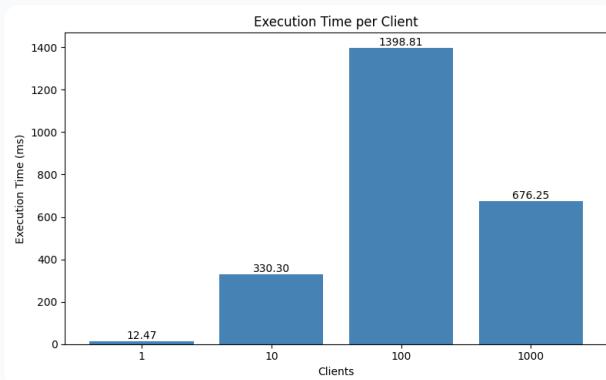
Performance analysis of Boyer Moore Search under concurrent load conditions.

100K Data Size

Binary Search Performance



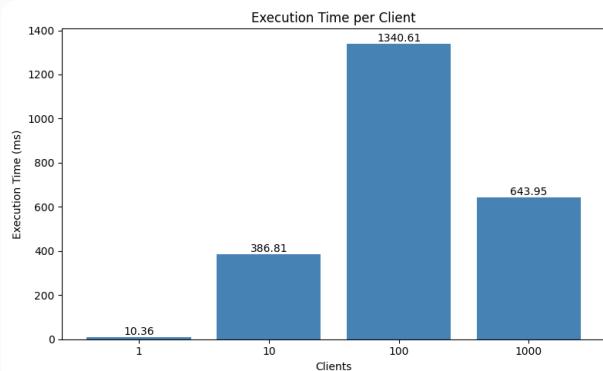
Linear Search Performance



Performance analysis of Binary Search under concurrent load conditions.

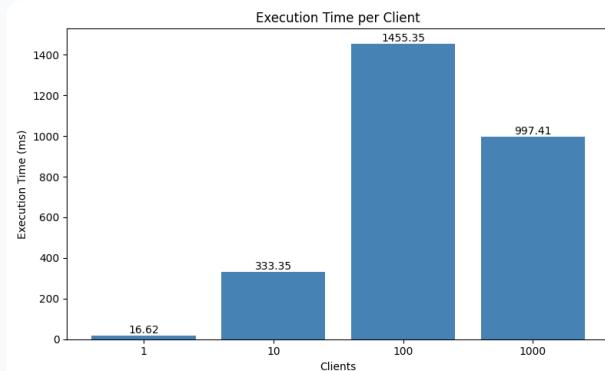
Performance analysis of Linear Search under concurrent load conditions.

Memory Mapped Search Performance



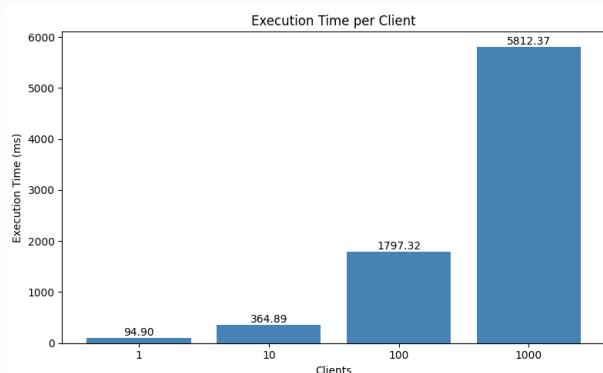
Performance analysis of Memory Mapped Search under concurrent load conditions.

Hash Set Search Performance



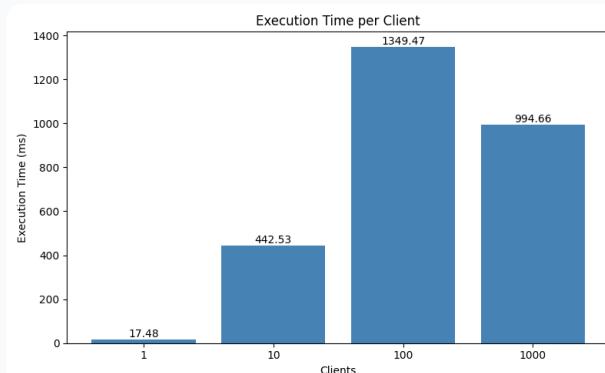
Performance analysis of Hash Set Search under concurrent load conditions.

Kmp Search Performance



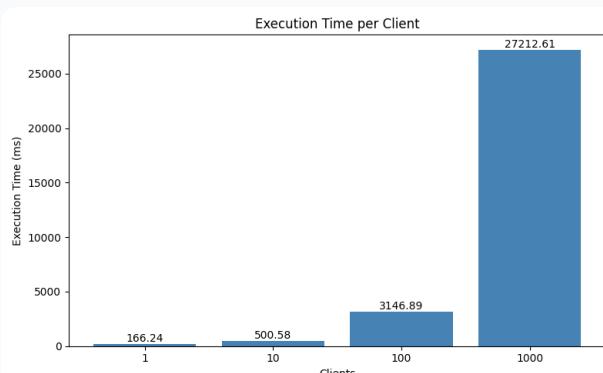
Performance analysis of Kmp Search under concurrent load conditions.

Rabin Karp Search Performance

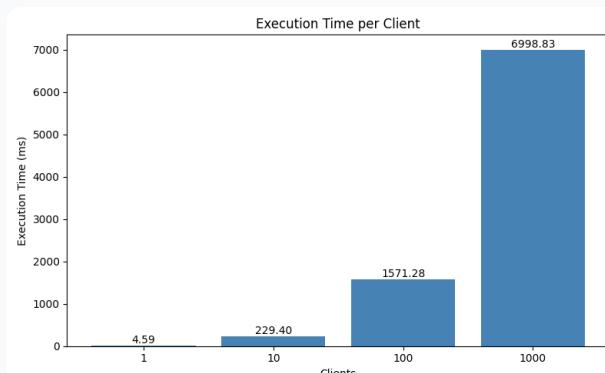


Performance analysis of Rabin Karp Search under concurrent load conditions.

Trie Search Performance



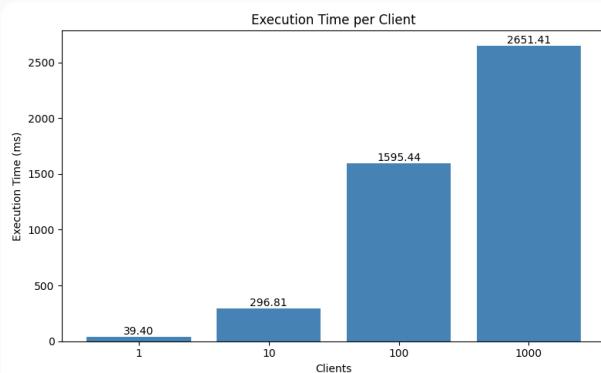
Shell Grep Performance



Performance analysis of Trie Search under concurrent load conditions.

Performance analysis of Shell Grep under concurrent load conditions.

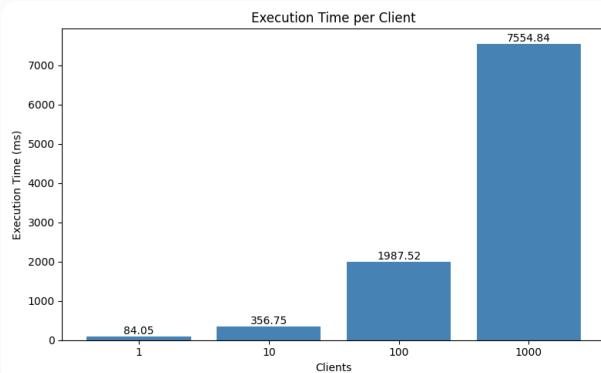
Boyer Moore Search Performance



Performance analysis of Boyer Moore Search under concurrent load conditions.

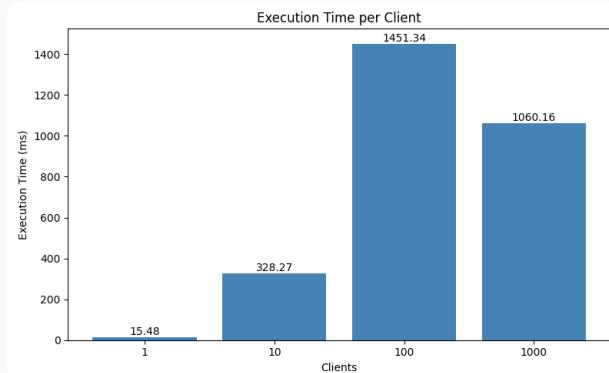
200K Data Size

Binary Search Performance



Performance analysis of Binary Search under concurrent load conditions.

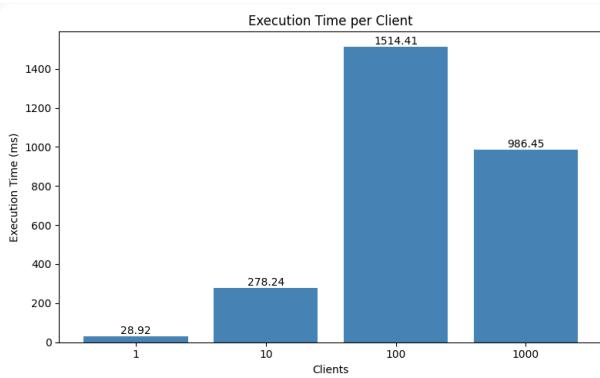
Linear Search Performance



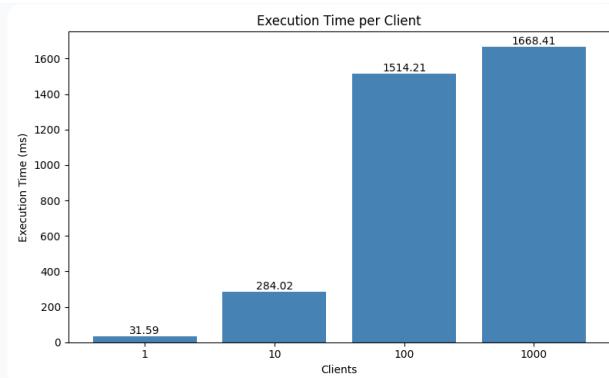
Performance analysis of Linear Search under concurrent load conditions.

Memory Mapped Search Performance

Hash Set Search Performance

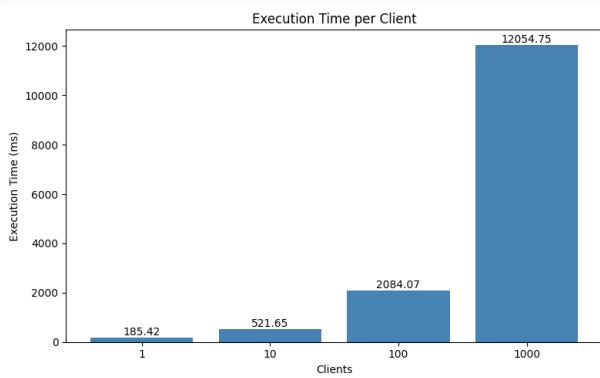


Performance analysis of Memory Mapped Search under concurrent load conditions.



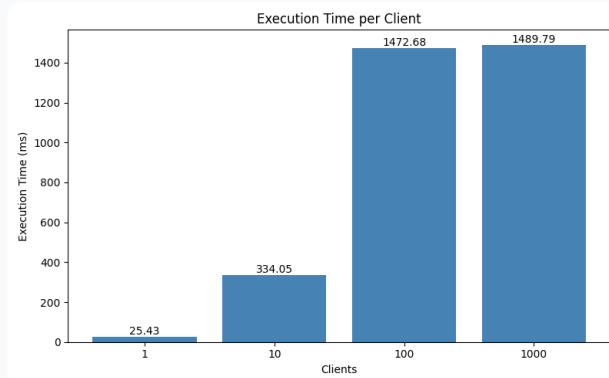
Performance analysis of Hash Set Search under concurrent load conditions.

Kmp Search Performance



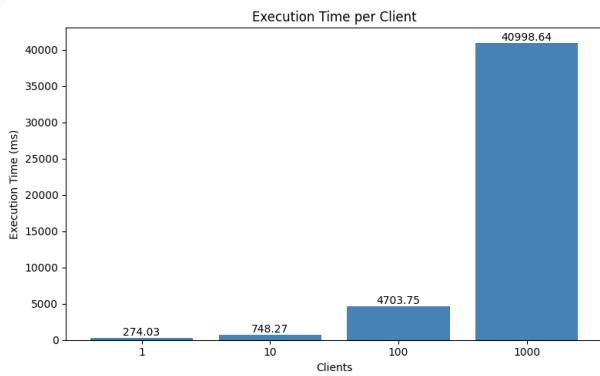
Performance analysis of Kmp Search under concurrent load conditions.

Rabin Karp Search Performance



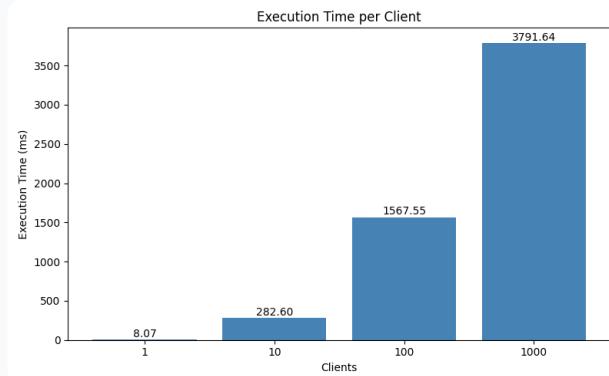
Performance analysis of Rabin Karp Search under concurrent load conditions.

Trie Search Performance



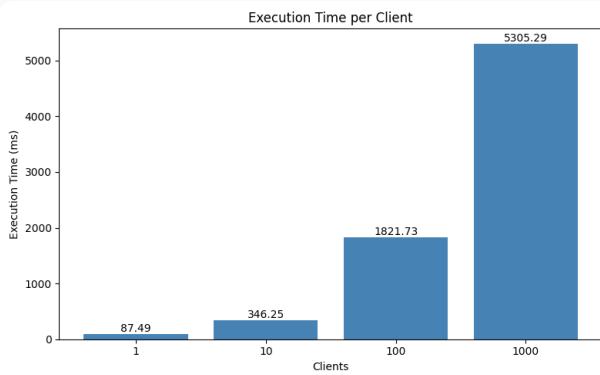
Performance analysis of Trie Search under concurrent load conditions.

Shell Grep Performance



Performance analysis of Shell Grep under concurrent load conditions.

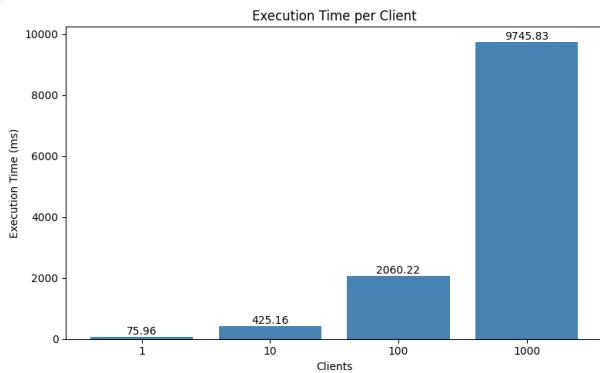
Boyer Moore Search Performance



Performance analysis of Boyer Moore Search under concurrent load conditions.

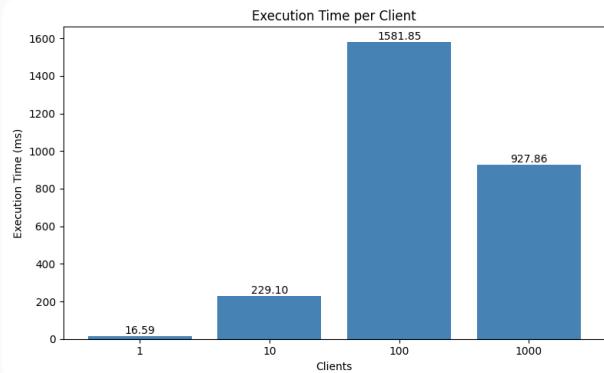
250K Data Size

Binary Search Performance



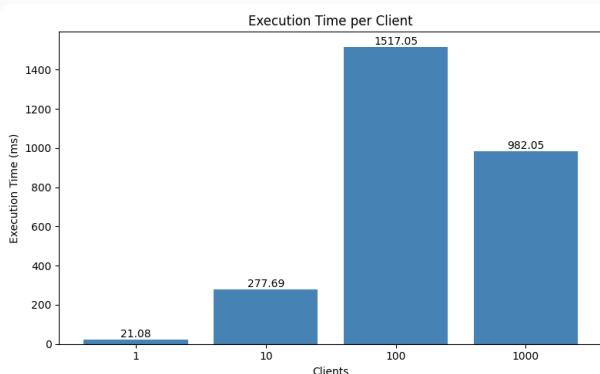
Performance analysis of Binary Search under concurrent load conditions.

Linear Search Performance



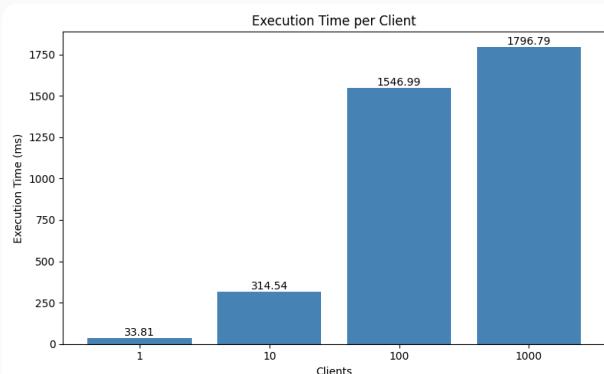
Performance analysis of Linear Search under concurrent load conditions.

Memory Mapped Search Performance



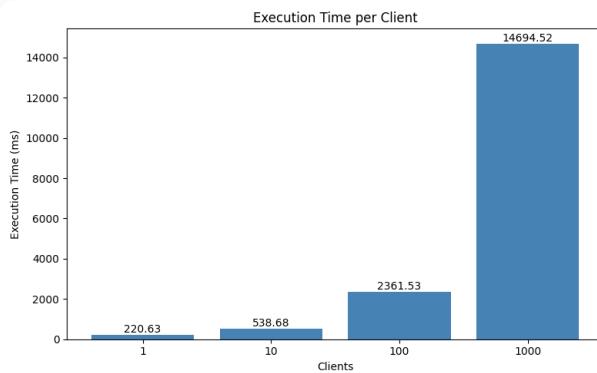
Performance analysis of Memory Mapped Search under concurrent load conditions.

Hash Set Search Performance



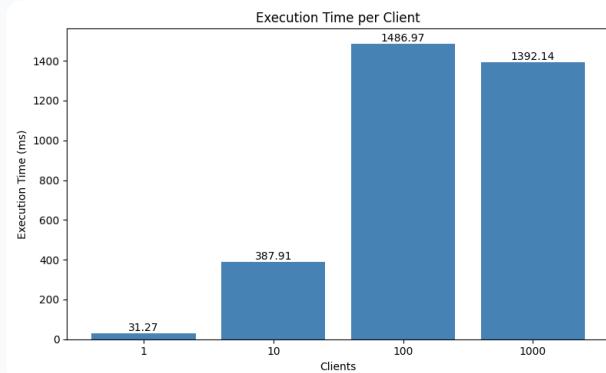
Performance analysis of Hash Set Search under concurrent load conditions.

Kmp Search Performance



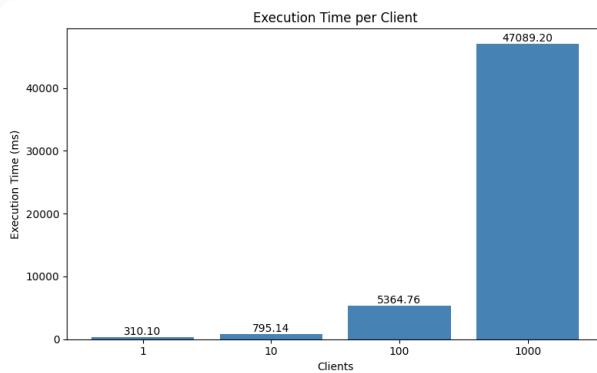
Performance analysis of Kmp Search under concurrent load conditions.

Rabin Karp Search Performance



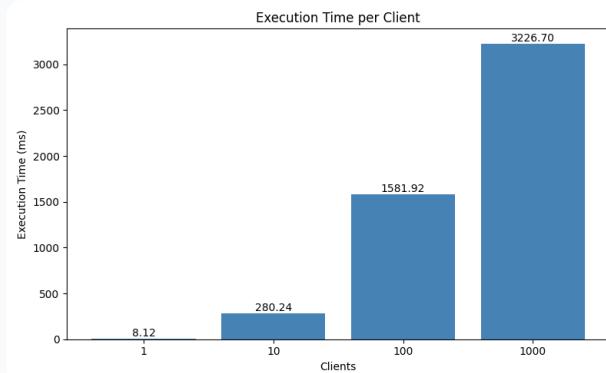
Performance analysis of Rabin Karp Search under concurrent load conditions.

Trie Search Performance



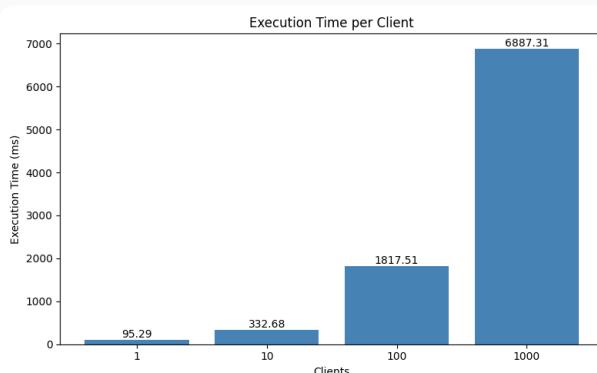
Performance analysis of Trie Search under concurrent load conditions.

Shell Grep Performance



Performance analysis of Shell Grep under concurrent load conditions.

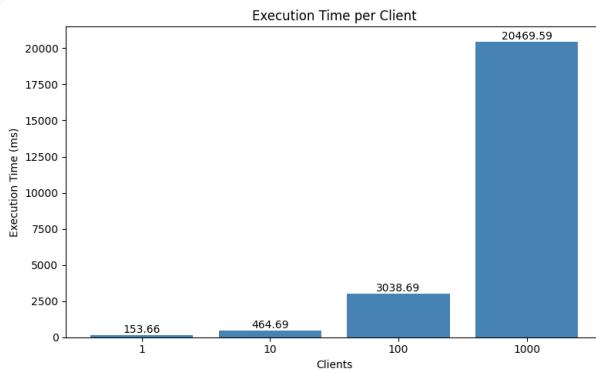
Boyer Moore Search Performance



Performance analysis of Boyer Moore Search under concurrent load conditions.

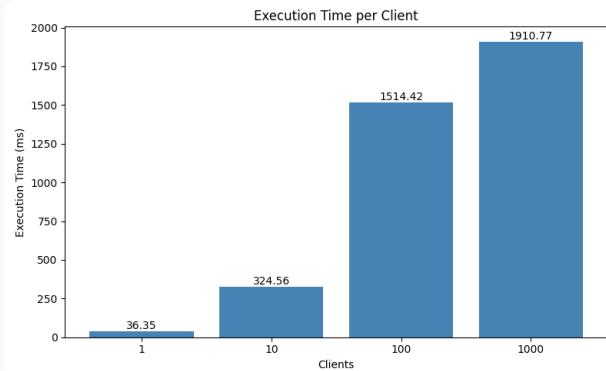
500K Data Size

Binary Search Performance



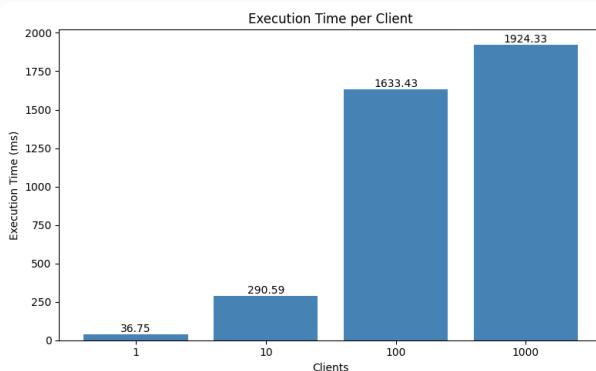
Performance analysis of Binary Search under concurrent load conditions.

Linear Search Performance



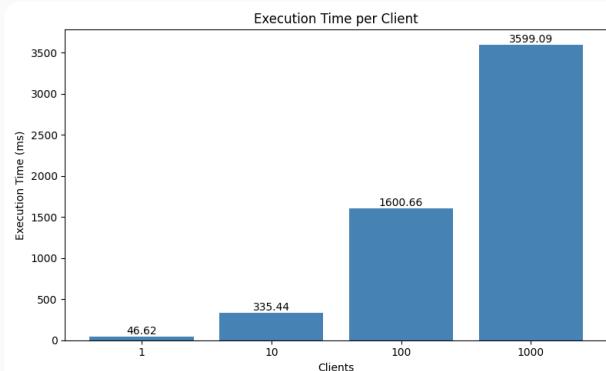
Performance analysis of Linear Search under concurrent load conditions.

Memory Mapped Search Performance



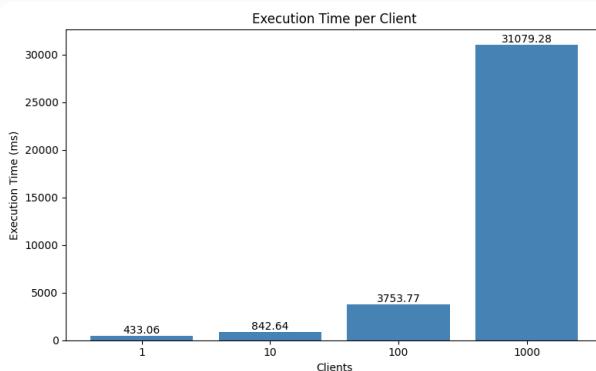
Performance analysis of Memory Mapped Search under concurrent load conditions.

Hash Set Search Performance



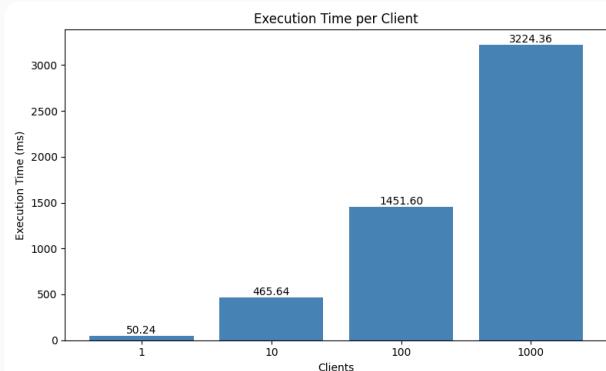
Performance analysis of Hash Set Search under concurrent load conditions.

Kmp Search Performance



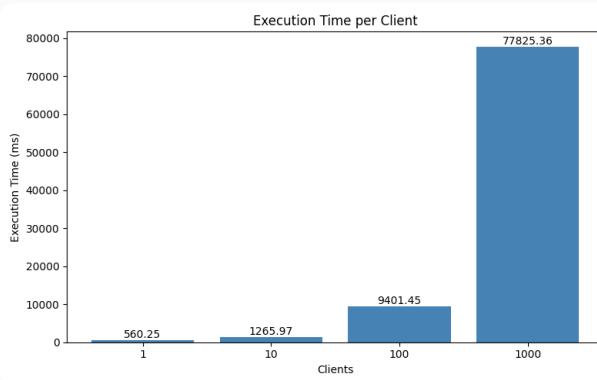
Performance analysis of Kmp Search under concurrent load conditions.

Rabin Karp Search Performance



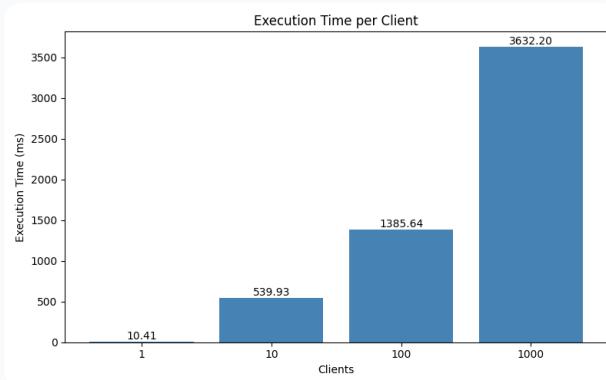
Performance analysis of Rabin Karp Search under concurrent load conditions.

Trie Search Performance



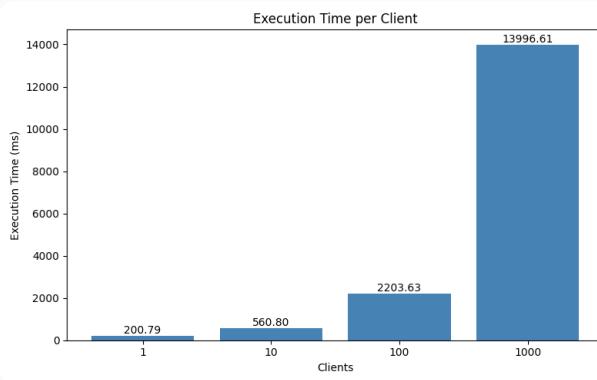
Performance analysis of Trie Search under concurrent load conditions.

Shell Grep Performance



Performance analysis of Shell Grep under concurrent load conditions.

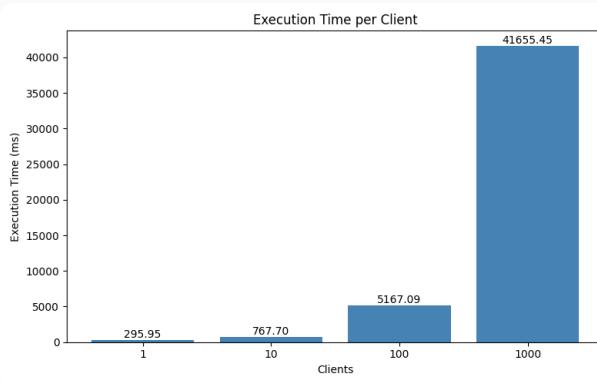
Boyer Moore Search Performance



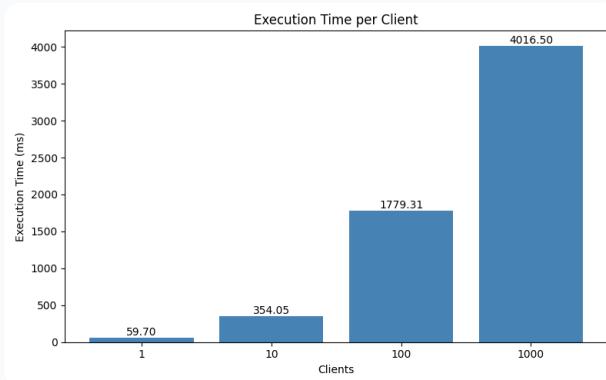
Performance analysis of Boyer Moore Search under concurrent load conditions.

1000K Data Size

Binary Search Performance



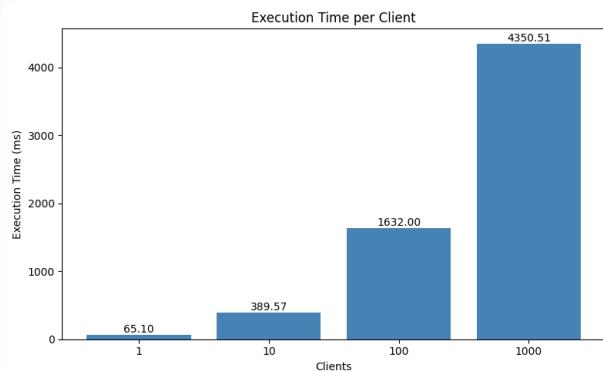
Linear Search Performance



Performance analysis of Binary Search under concurrent load conditions.

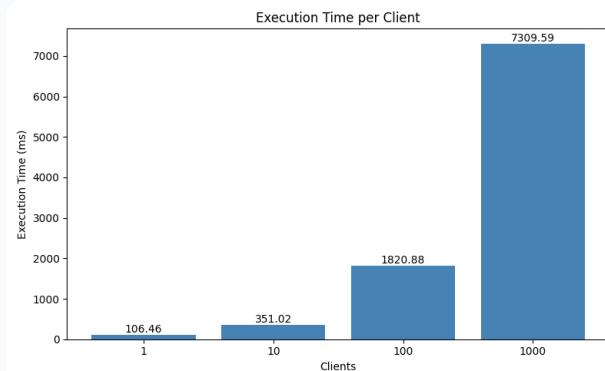
Performance analysis of Linear Search under concurrent load conditions.

Memory Mapped Search Performance



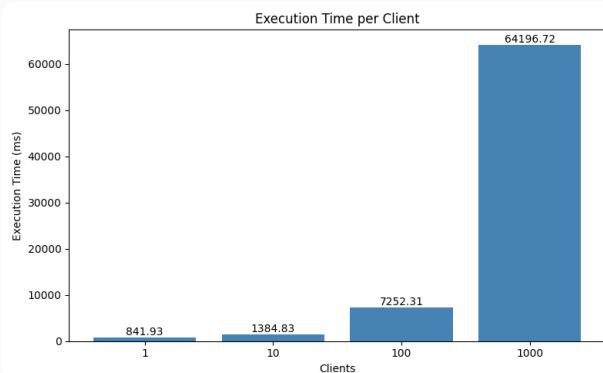
Performance analysis of Memory Mapped Search under concurrent load conditions.

Hash Set Search Performance



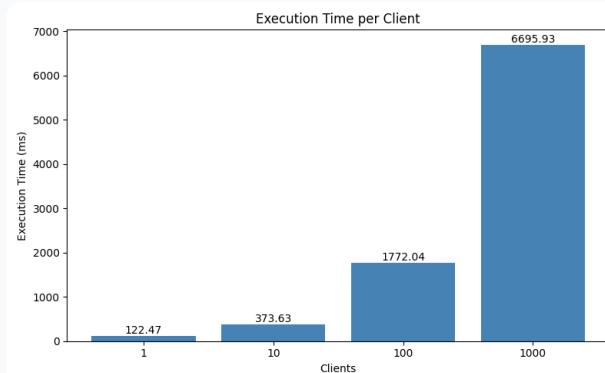
Performance analysis of Hash Set Search under concurrent load conditions.

Kmp Search Performance



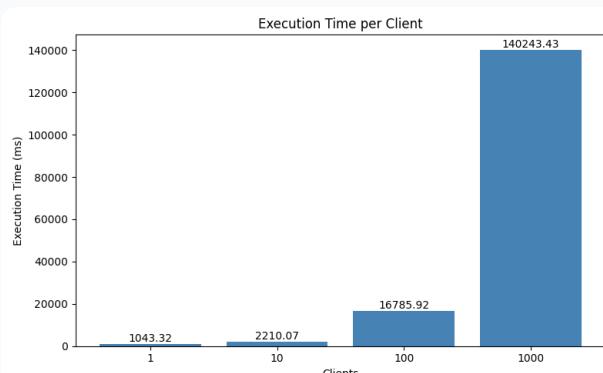
Performance analysis of Kmp Search under concurrent load conditions.

Rabin Karp Search Performance

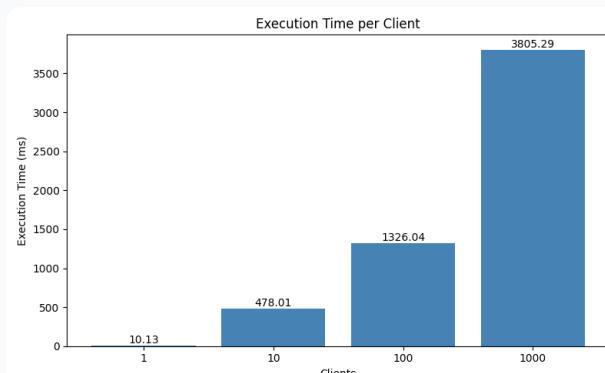


Performance analysis of Rabin Karp Search under concurrent load conditions.

Trie Search Performance



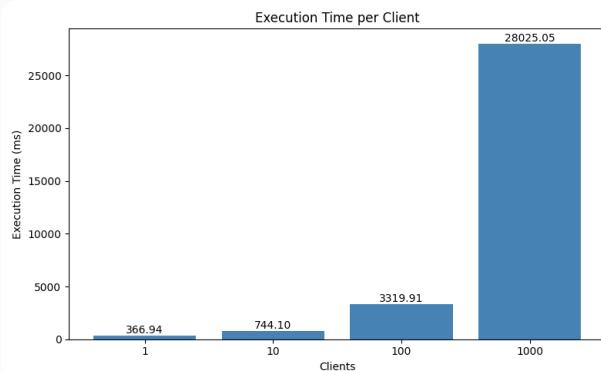
Shell Grep Performance



Performance analysis of Trie Search under concurrent load conditions.

Performance analysis of Shell Grep under concurrent load conditions.

Boyer Moore Search Performance

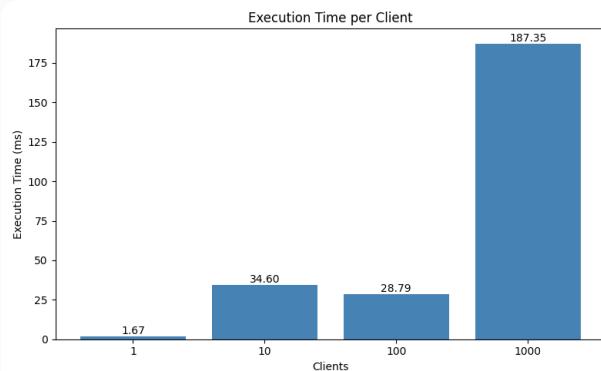


Performance analysis of Boyer Moore Search under concurrent load conditions.

Buffer Mode

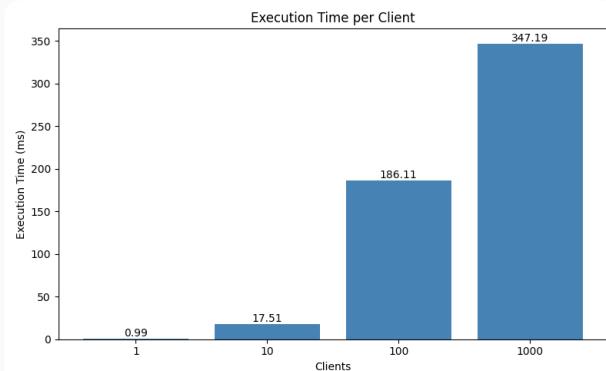
10K Data Size

Trie Performance



Performance analysis of Trie under concurrent load conditions.

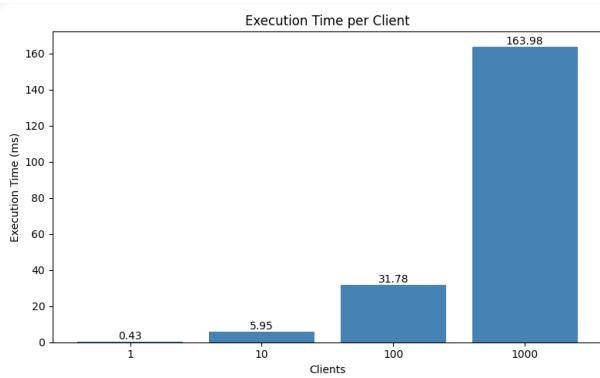
Multiprocesses Cache Performance



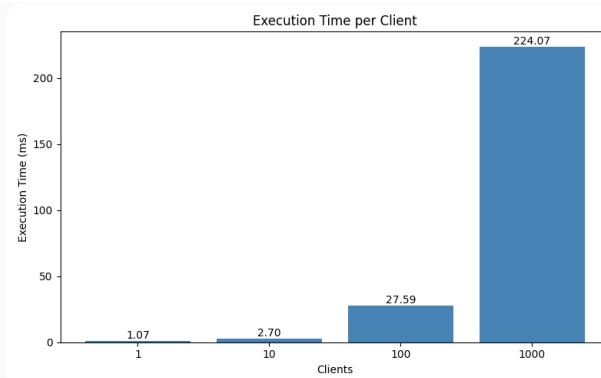
Performance analysis of Multiprocesses Cache under concurrent load conditions.

Set Performance

Fastset Performance



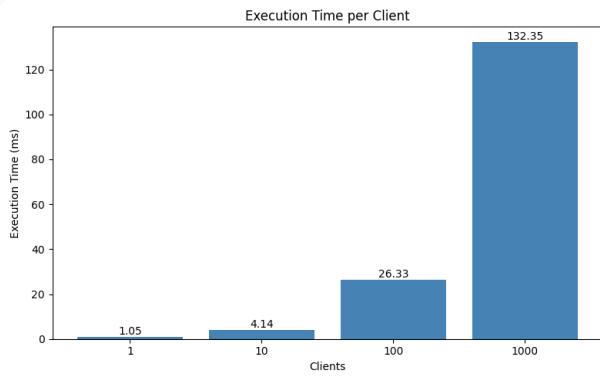
Performance analysis of Set under concurrent load conditions.



Performance analysis of Fastset under concurrent load conditions.

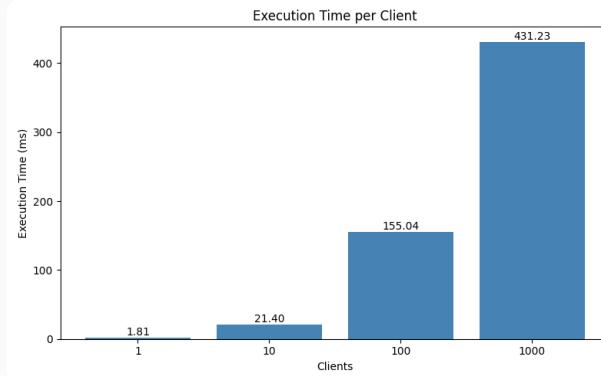
100K Data Size

Trie Performance



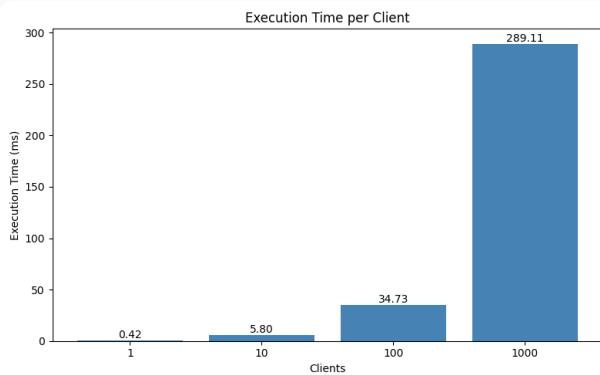
Performance analysis of Trie under concurrent load conditions.

Multiprocesses Cache Performance



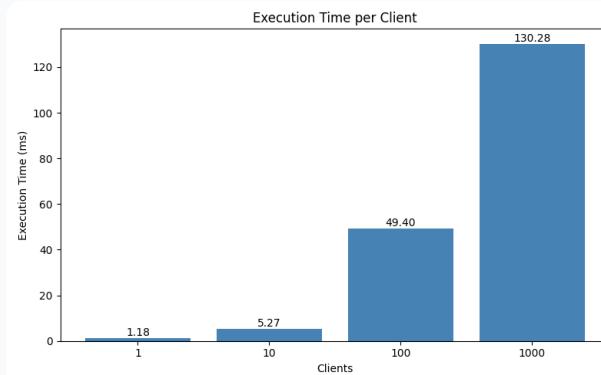
Performance analysis of Multiprocesses Cache under concurrent load conditions.

Set Performance



Performance analysis of Set under concurrent load conditions.

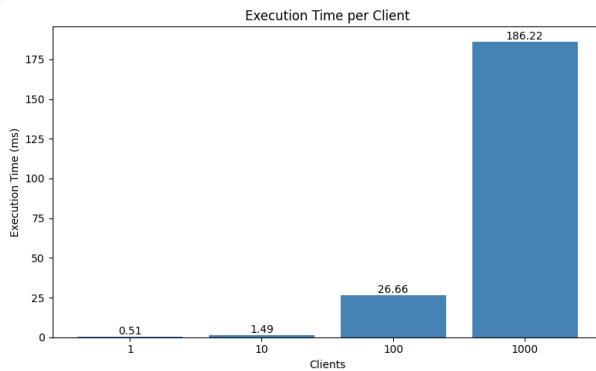
Fastset Performance



Performance analysis of Fastset under concurrent load conditions.

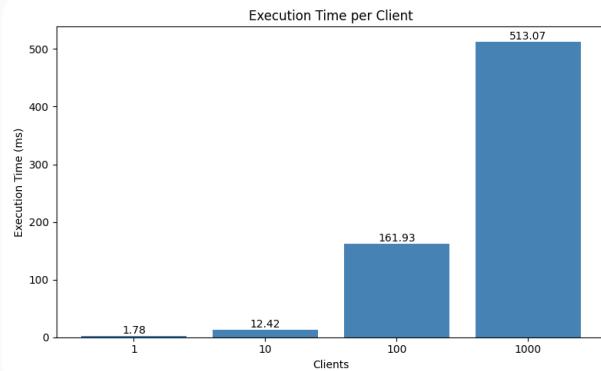
200K Data Size

Trie Performance



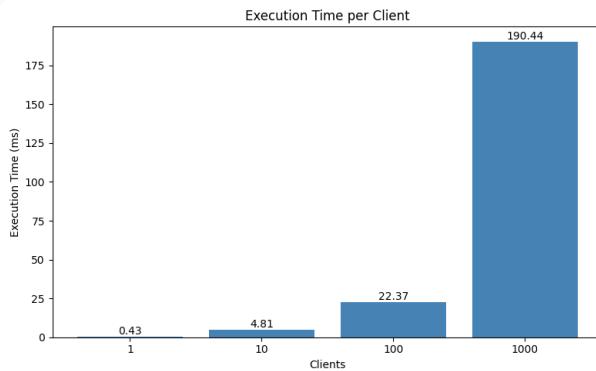
Performance analysis of Trie under concurrent load conditions.

Multiprocesses Cache Performance



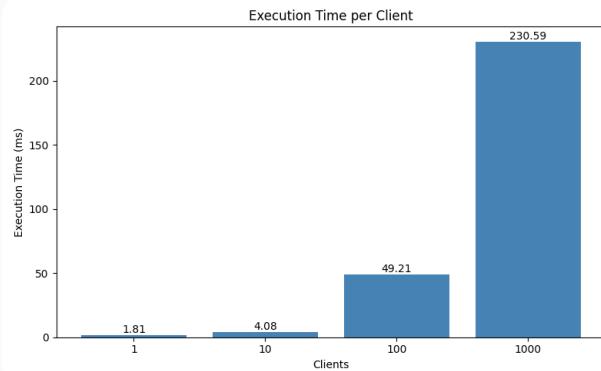
Performance analysis of Multiprocesses Cache under concurrent load conditions.

Set Performance



Performance analysis of Set under concurrent load conditions.

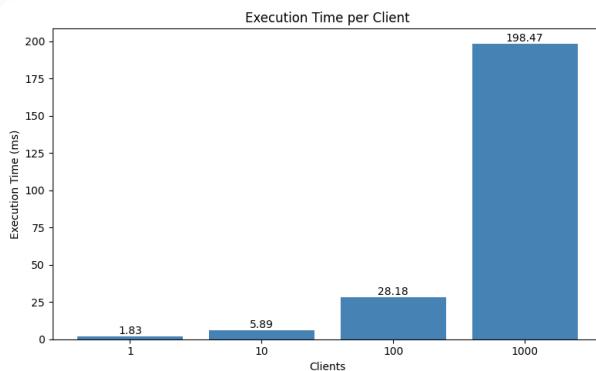
Fastset Performance



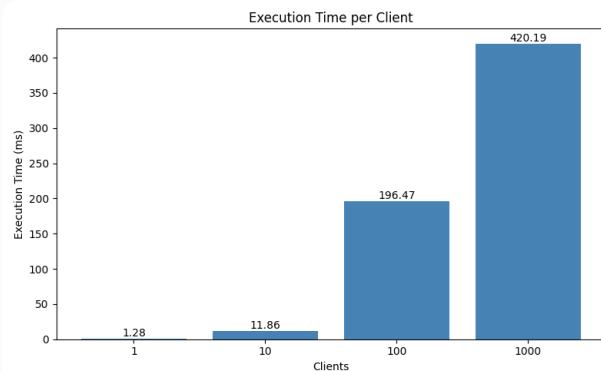
Performance analysis of Fastset under concurrent load conditions.

250K Data Size

Trie Performance

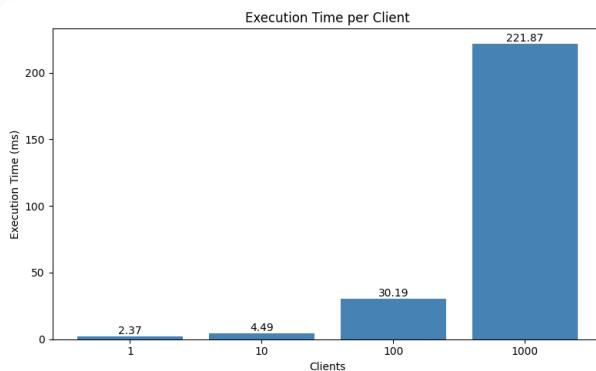


Multiprocesses Cache Performance



Performance analysis of Trie under concurrent load conditions.

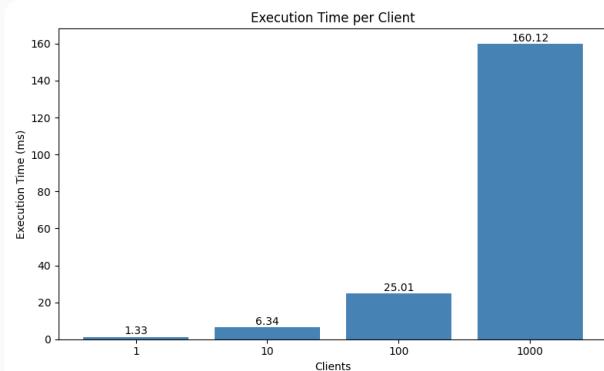
Set Performance



Performance analysis of Set under concurrent load conditions.

Performance analysis of Multiprocesses Cache under concurrent load conditions.

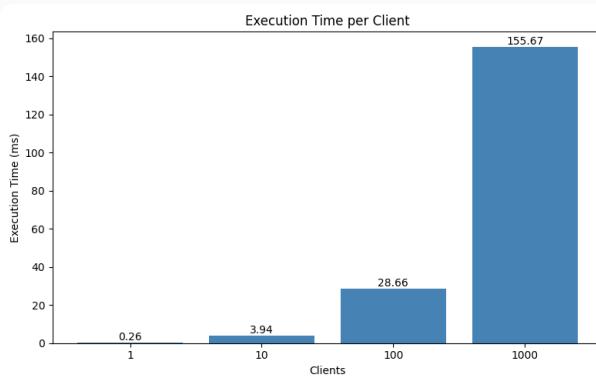
Fastset Performance



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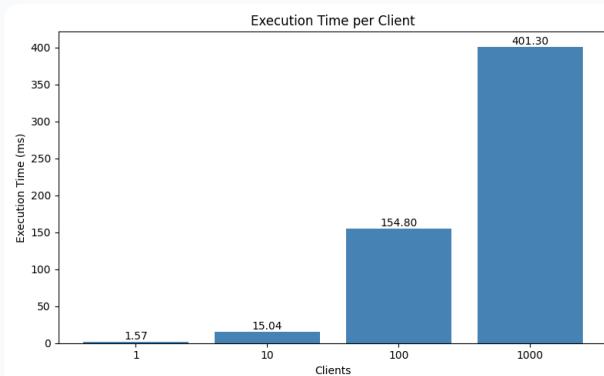
500K Data Size

Trie Performance



Performance analysis of Trie under concurrent load conditions.

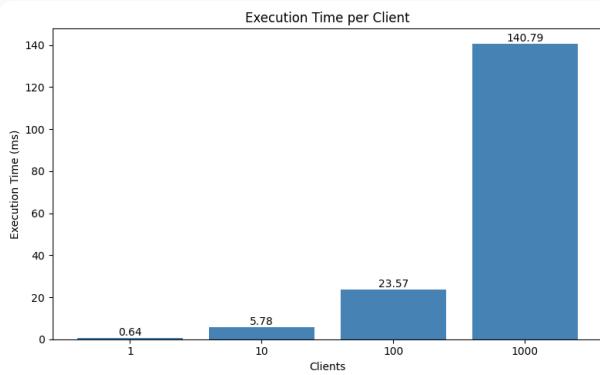
Multiprocesses Cache Performance



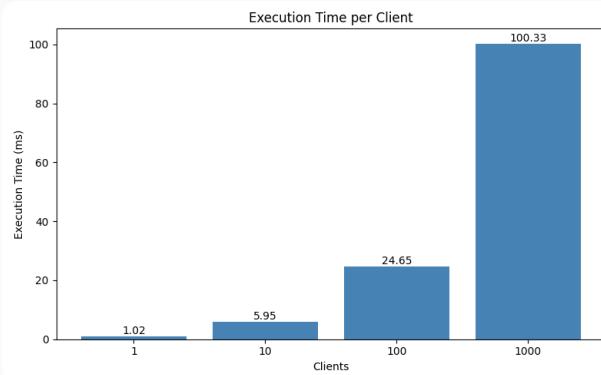
Performance analysis of Multiprocesses Cache under concurrent load conditions.

Set Performance

Fastset Performance



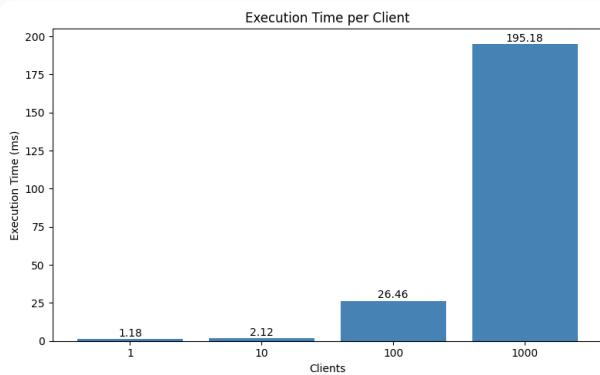
Performance analysis of Set under concurrent load conditions.



Performance analysis of Fastset under concurrent load conditions.

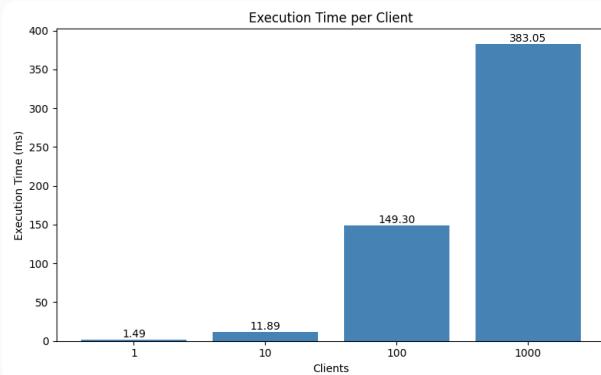
1000K Data Size

Trie Performance



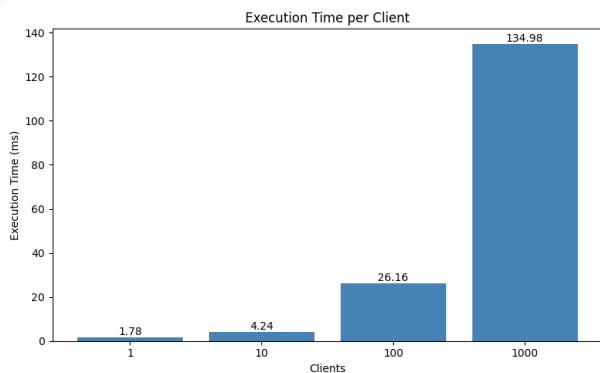
Performance analysis of Trie under concurrent load conditions.

Multiprocesses Cache Performance



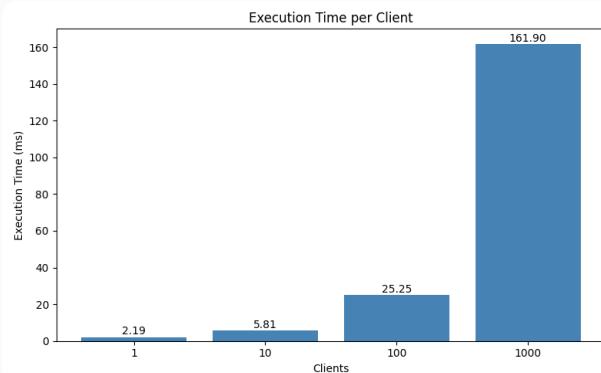
Performance analysis of Multiprocesses Cache under concurrent load conditions.

Set Performance



Performance analysis of Set under concurrent load conditions.

Fastset Performance



Performance analysis of Fastset under concurrent load conditions.

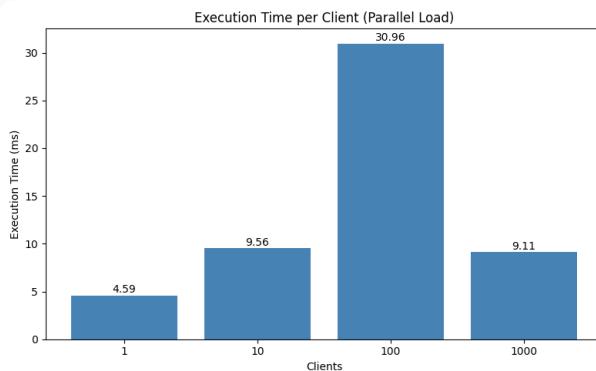
3. Parallel Load Performance

Analysis of algorithm performance under true parallel execution, showing how each algorithm handles multiple simultaneous processes.

No Buffer Mode

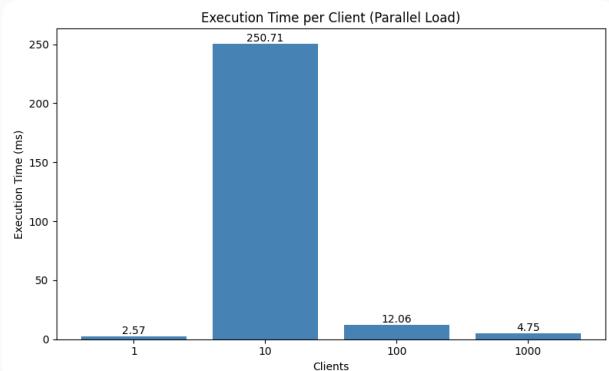
10K Data Size

Binary Search Performance



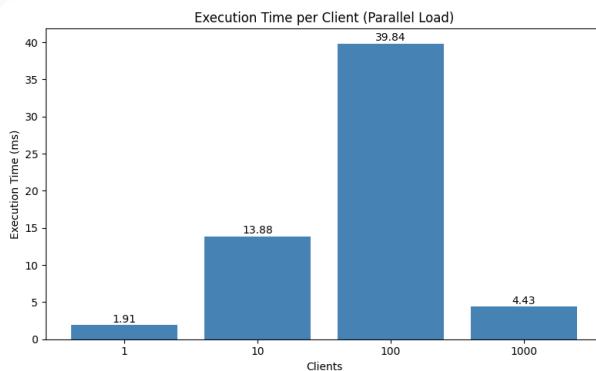
Performance analysis of Binary Search under concurrent load conditions.

Linear Search Performance



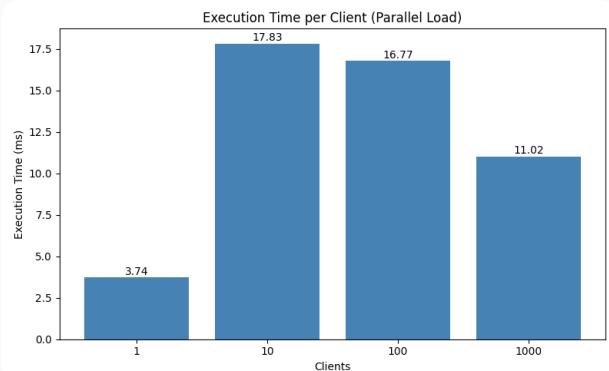
Performance analysis of Linear Search under concurrent load conditions.

Memory Mapped Search Performance



Performance analysis of Memory Mapped Search under concurrent load conditions.

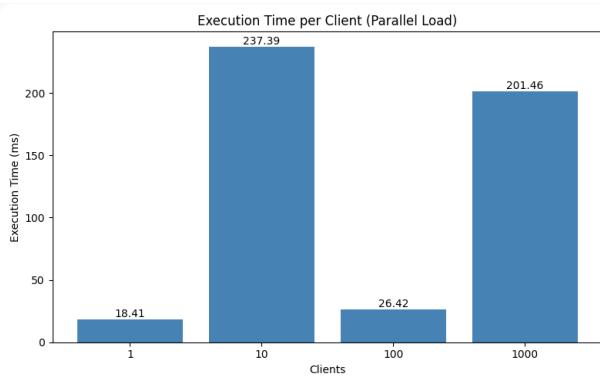
Hash Set Search Performance



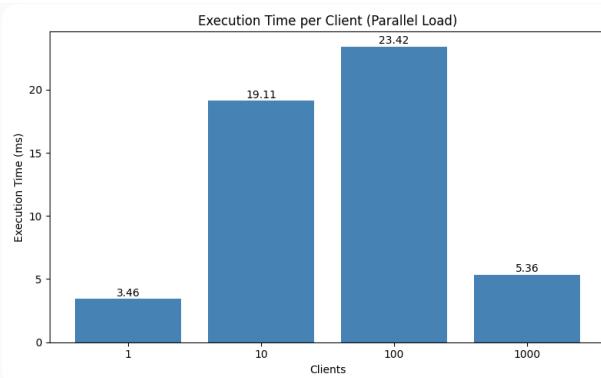
Performance analysis of Hash Set Search under concurrent load conditions.

Kmp Search Performance

Rabin Karp Search Performance

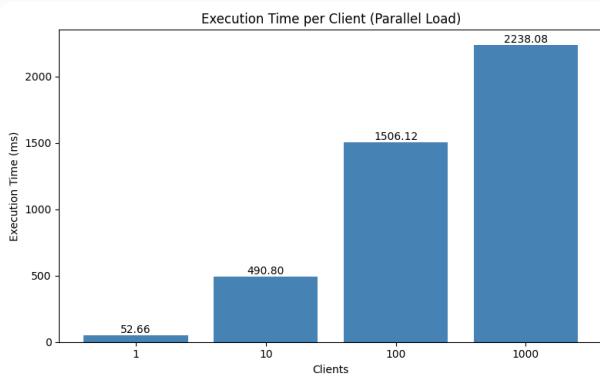


Performance analysis of Kmp Search under concurrent load conditions.



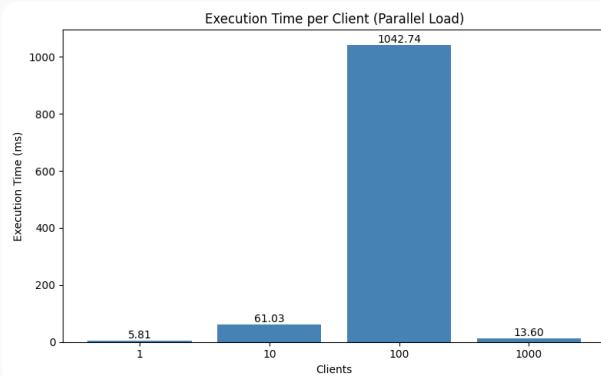
Performance analysis of Rabin Karp Search under concurrent load conditions.

Trie Search Performance



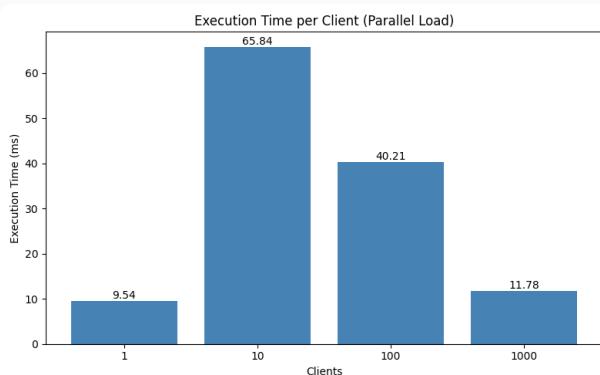
Performance analysis of Trie Search under concurrent load conditions.

Shell Grep Performance



Performance analysis of Shell Grep under concurrent load conditions.

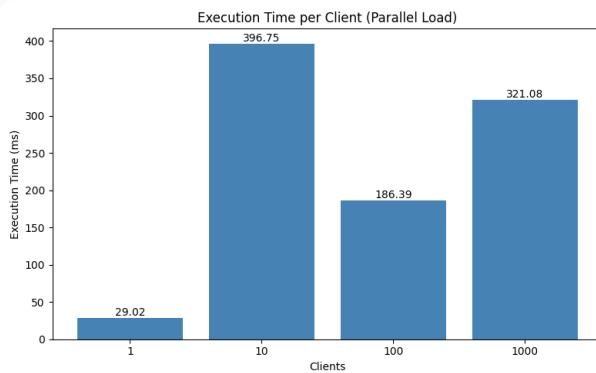
Boyer Moore Search Performance



Performance analysis of Boyer Moore Search under concurrent load conditions.

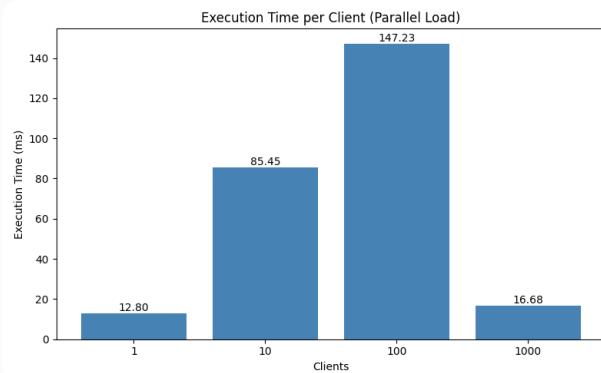
100K Data Size

Binary Search Performance



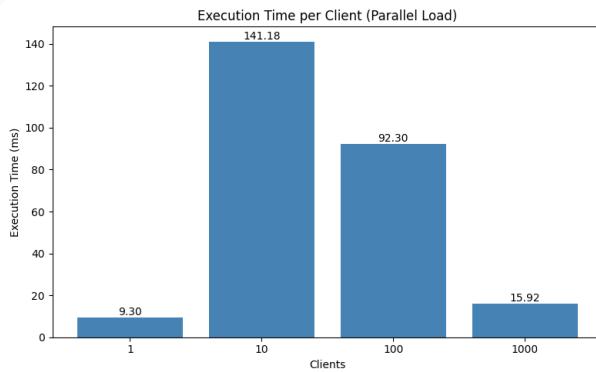
Performance analysis of Binary Search under concurrent load conditions.

Linear Search Performance



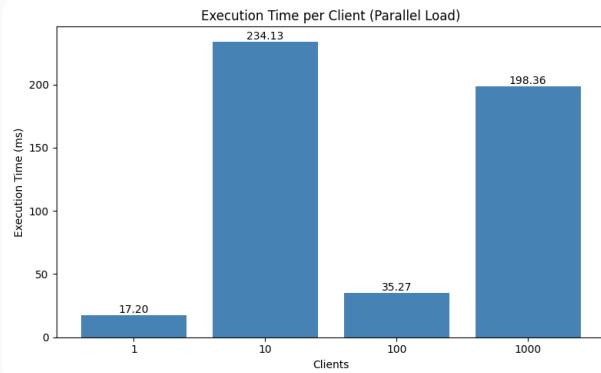
Performance analysis of Linear Search under concurrent load conditions.

Memory Mapped Search Performance



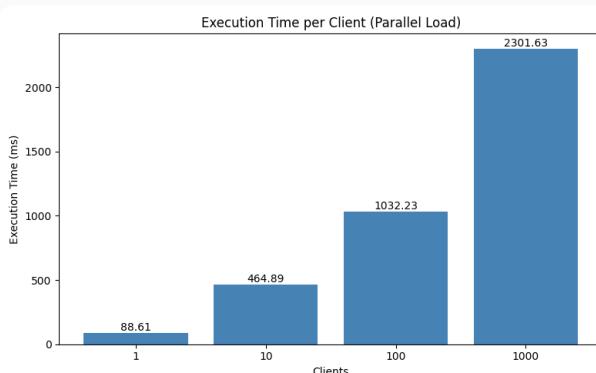
Performance analysis of Memory Mapped Search under concurrent load conditions.

Hash Set Search Performance



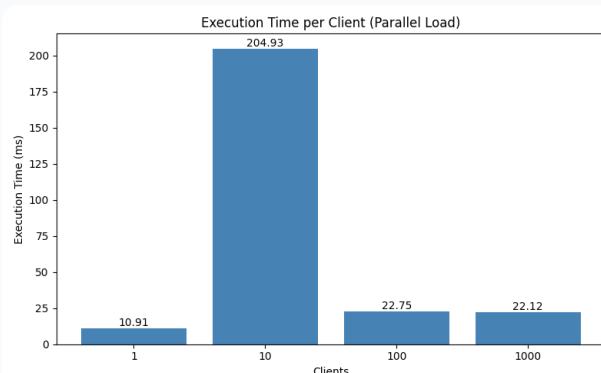
Performance analysis of Hash Set Search under concurrent load conditions.

Kmp Search Performance



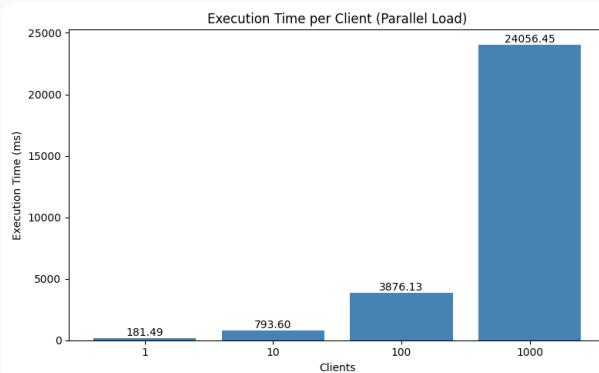
Performance analysis of Kmp Search under concurrent load conditions.

Rabin Karp Search Performance



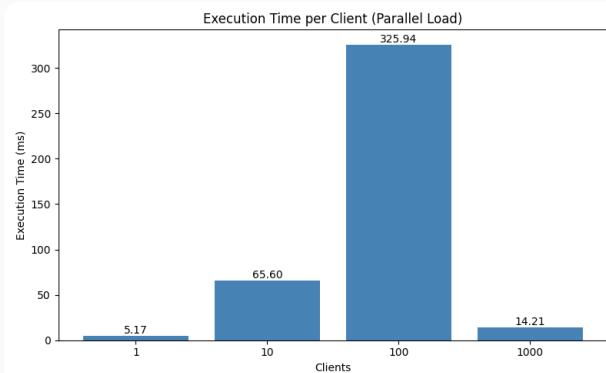
Performance analysis of Rabin Karp Search under concurrent load conditions.

Trie Search Performance



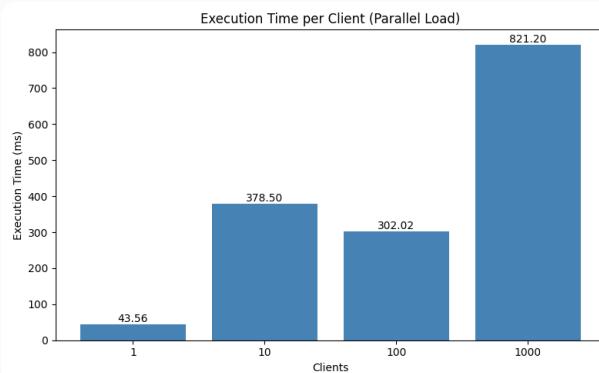
Performance analysis of Trie Search under concurrent load conditions.

Shell Grep Performance



Performance analysis of Shell Grep under concurrent load conditions.

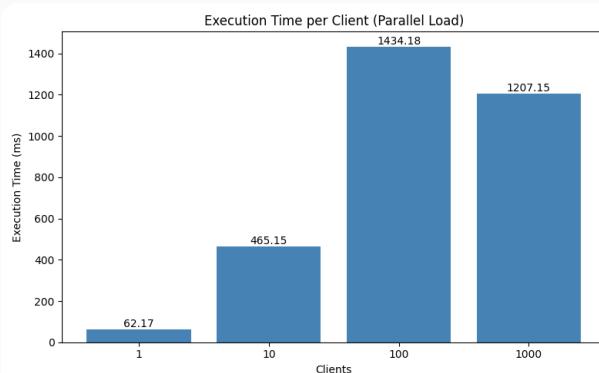
Boyer Moore Search Performance



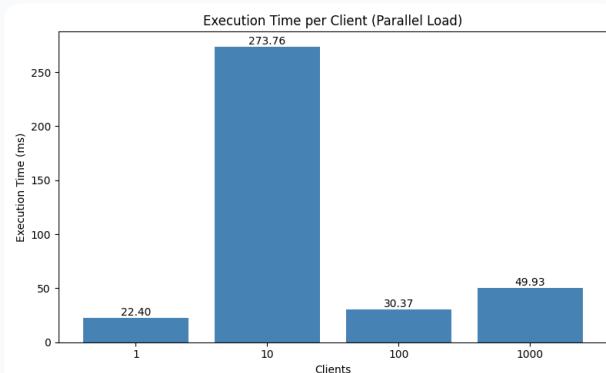
Performance analysis of Boyer Moore Search under concurrent load conditions.

200K Data Size

Binary Search Performance

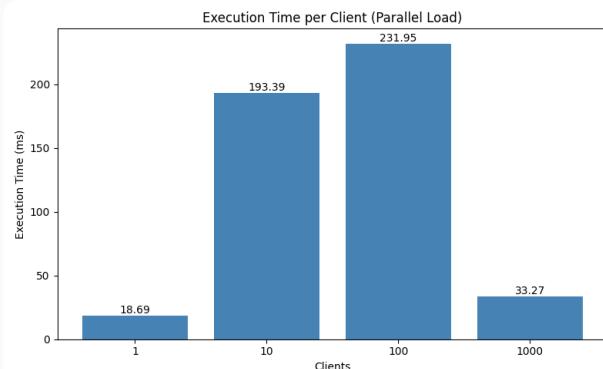


Linear Search Performance



Performance analysis of Binary Search under concurrent load conditions.

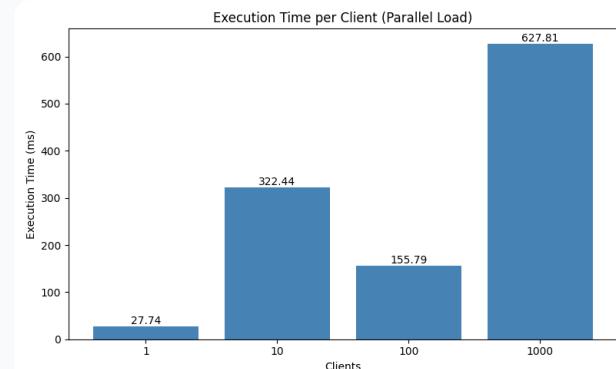
Memory Mapped Search Performance



Performance analysis of Memory Mapped Search under concurrent load conditions.

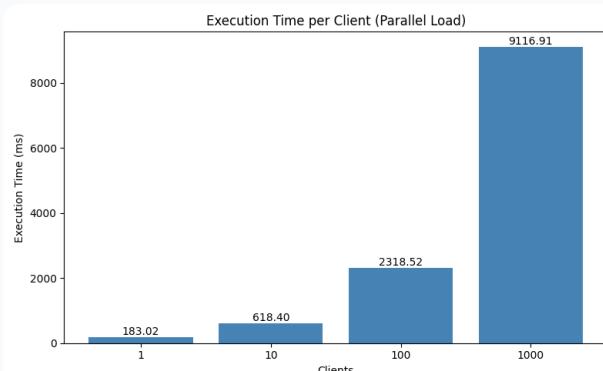
Performance analysis of Linear Search under concurrent load conditions.

Hash Set Search Performance



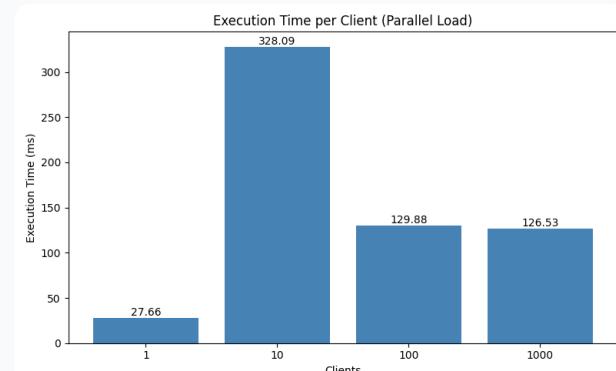
Performance analysis of Hash Set Search under concurrent load conditions.

Kmp Search Performance



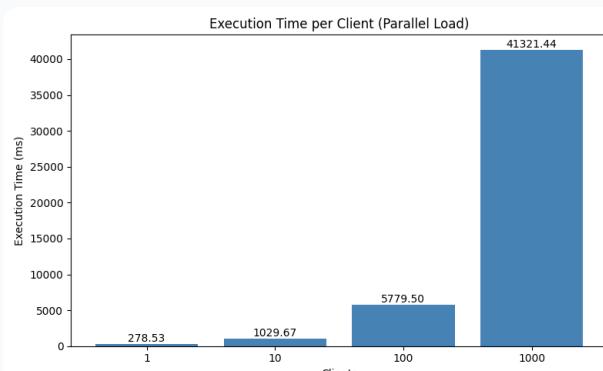
Performance analysis of Kmp Search under concurrent load conditions.

Rabin Karp Search Performance

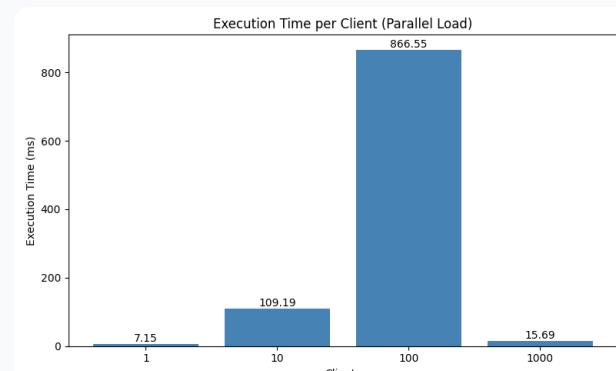


Performance analysis of Rabin Karp Search under concurrent load conditions.

Trie Search Performance



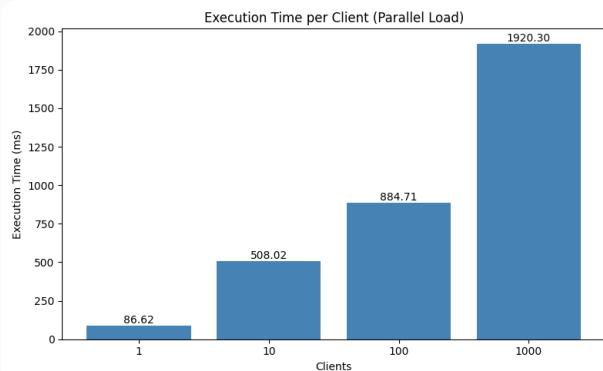
Shell Grep Performance



Performance analysis of Trie Search under concurrent load conditions.

Performance analysis of Shell Grep under concurrent load conditions.

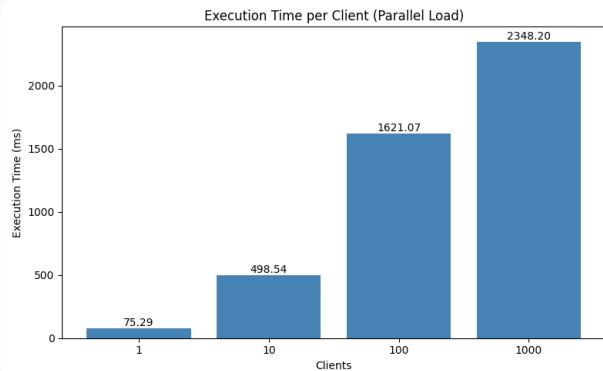
Boyer Moore Search Performance



Performance analysis of Boyer Moore Search under concurrent load conditions.

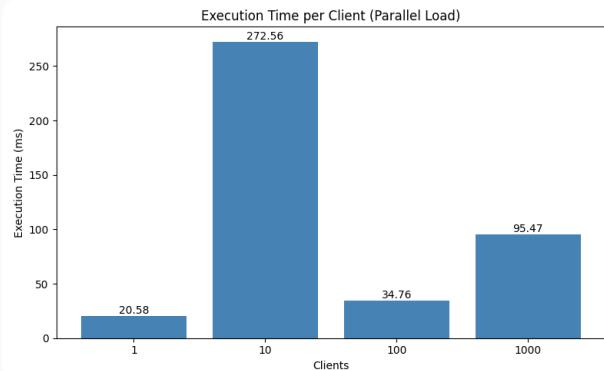
250K Data Size

Binary Search Performance



Performance analysis of Binary Search under concurrent load conditions.

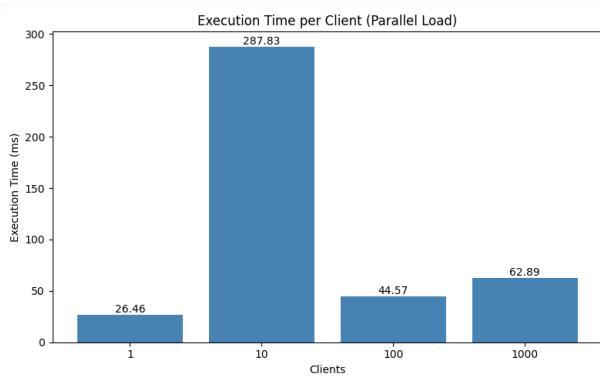
Linear Search Performance



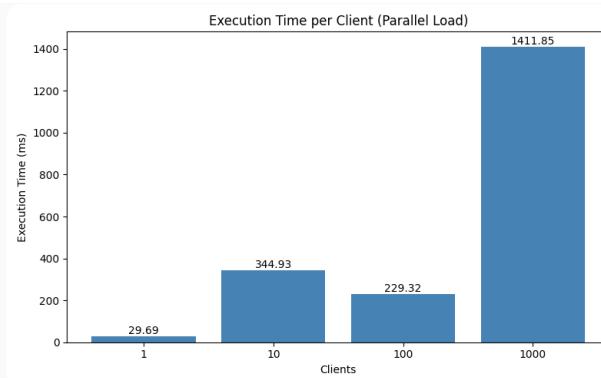
Performance analysis of Linear Search under concurrent load conditions.

Memory Mapped Search Performance

Hash Set Search Performance

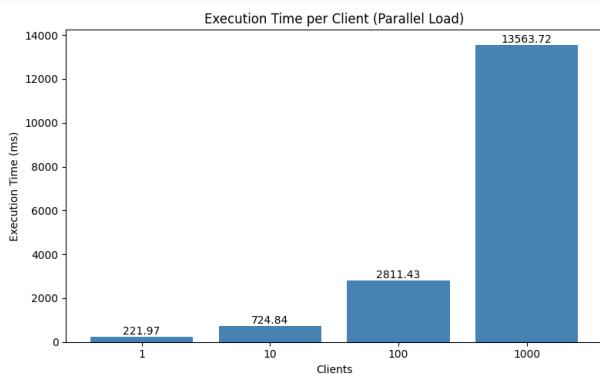


Performance analysis of Memory Mapped Search under concurrent load conditions.



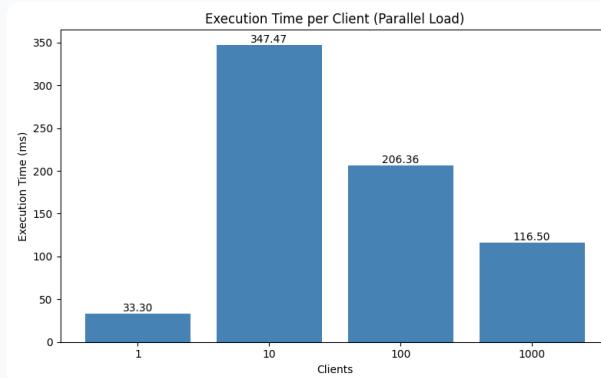
Performance analysis of Hash Set Search under concurrent load conditions.

Kmp Search Performance



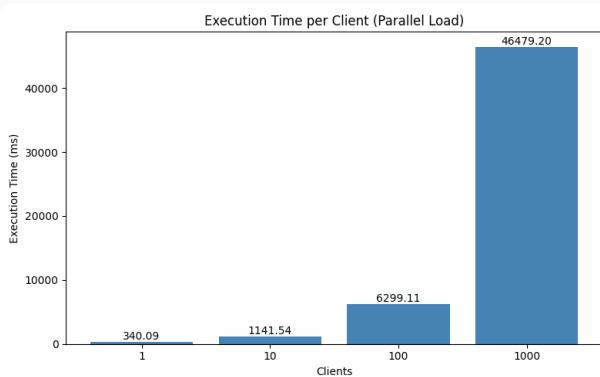
Performance analysis of Kmp Search under concurrent load conditions.

Rabin Karp Search Performance



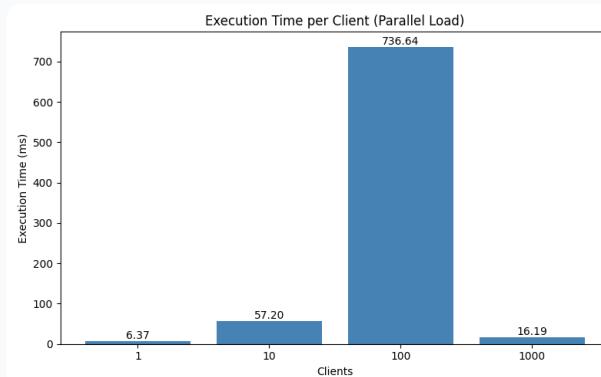
Performance analysis of Rabin Karp Search under concurrent load conditions.

Trie Search Performance



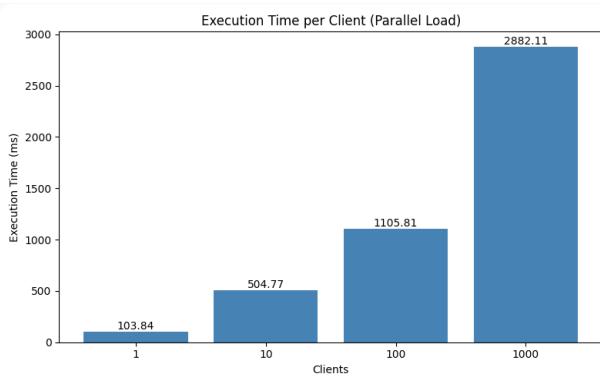
Performance analysis of Trie Search under concurrent load conditions.

Shell Grep Performance



Performance analysis of Shell Grep under concurrent load conditions.

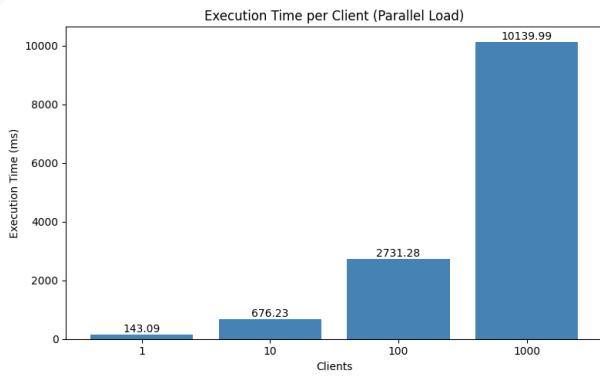
Boyer Moore Search Performance



Performance analysis of Boyer Moore Search under concurrent load conditions.

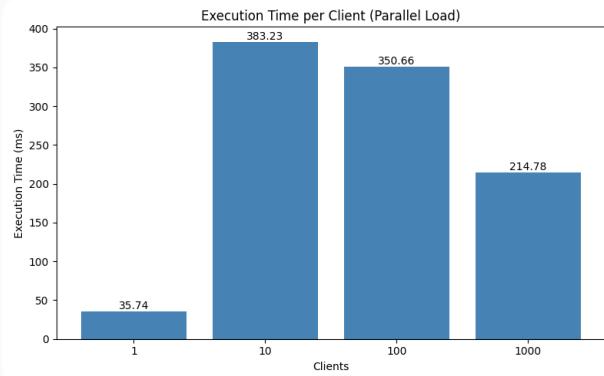
500K Data Size

Binary Search Performance



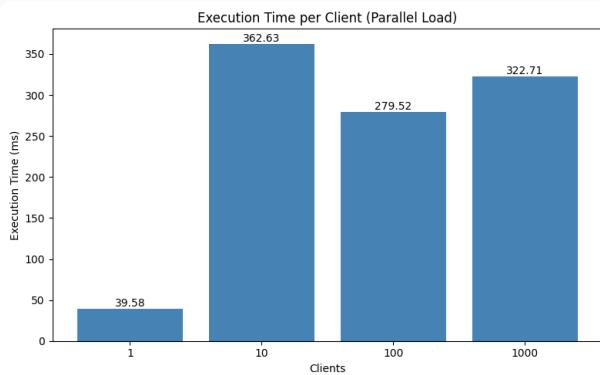
Performance analysis of Binary Search under concurrent load conditions.

Linear Search Performance



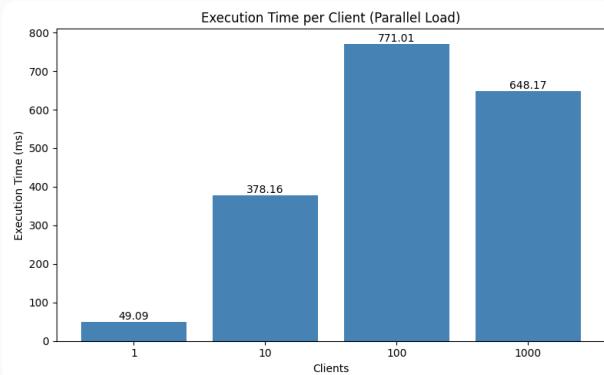
Performance analysis of Linear Search under concurrent load conditions.

Memory Mapped Search Performance



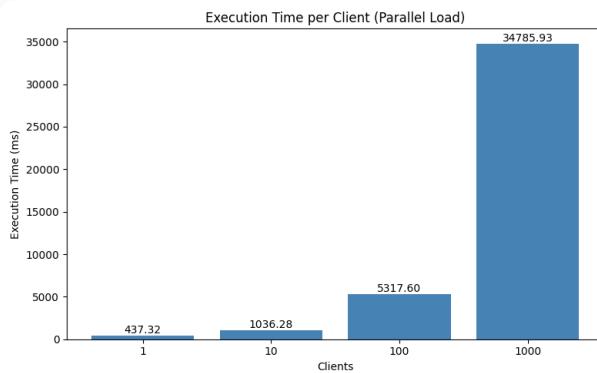
Performance analysis of Memory Mapped Search under concurrent load conditions.

Hash Set Search Performance



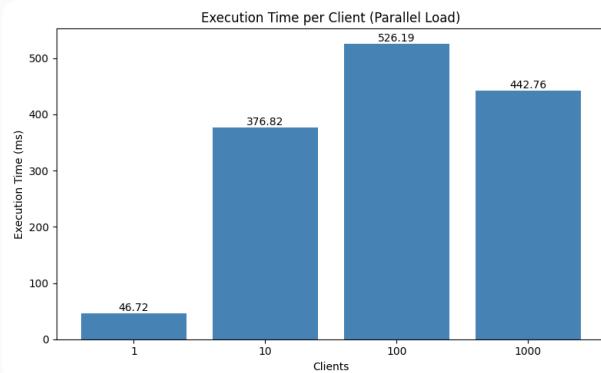
Performance analysis of Hash Set Search under concurrent load conditions.

Kmp Search Performance



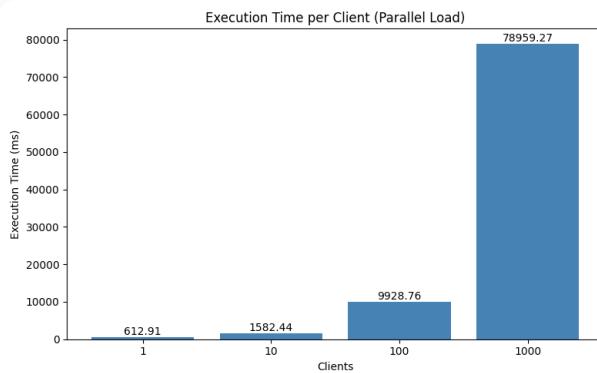
Performance analysis of Kmp Search under concurrent load conditions.

Rabin Karp Search Performance



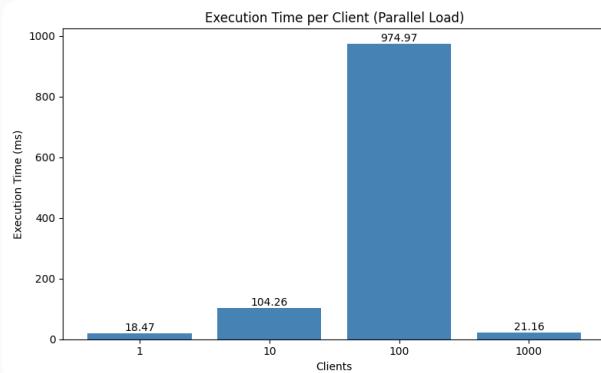
Performance analysis of Rabin Karp Search under concurrent load conditions.

Trie Search Performance



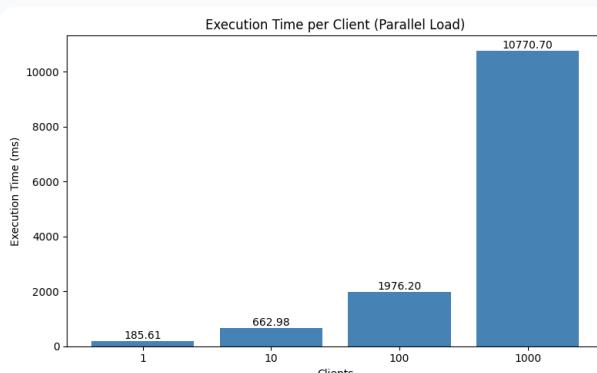
Performance analysis of Trie Search under concurrent load conditions.

Shell Grep Performance



Performance analysis of Shell Grep under concurrent load conditions.

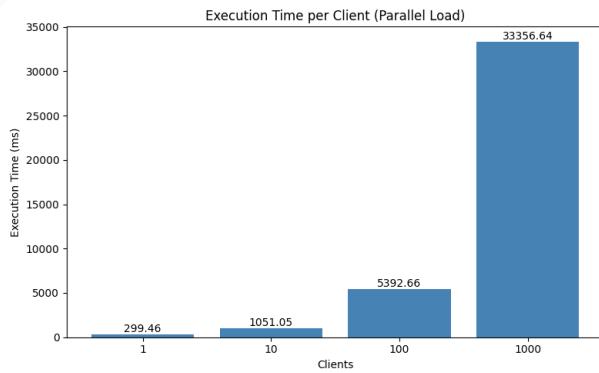
Boyer Moore Search Performance



Performance analysis of Boyer Moore Search under concurrent load conditions.

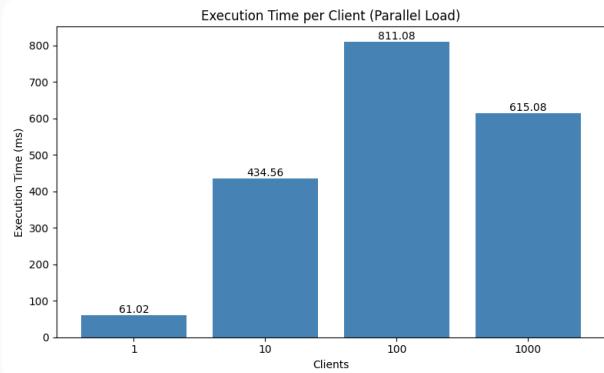
1000K Data Size

Binary Search Performance



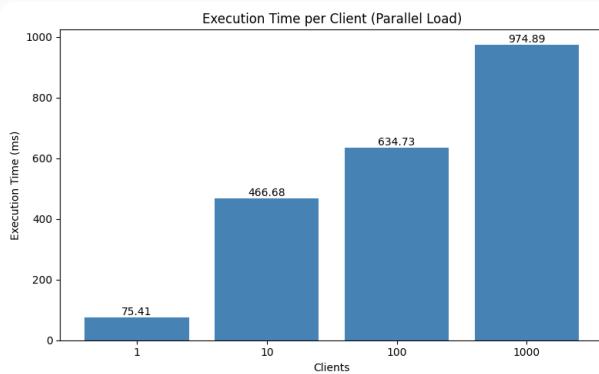
Performance analysis of Binary Search under concurrent load conditions.

Linear Search Performance



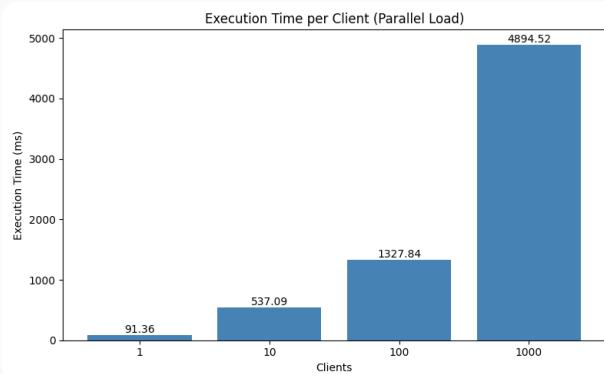
Performance analysis of Linear Search under concurrent load conditions.

Memory Mapped Search Performance



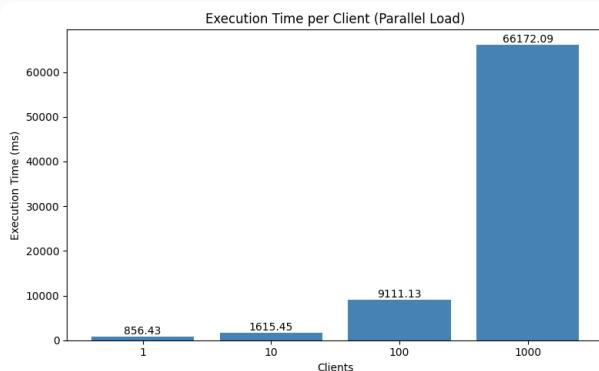
Performance analysis of Memory Mapped Search under concurrent load conditions.

Hash Set Search Performance



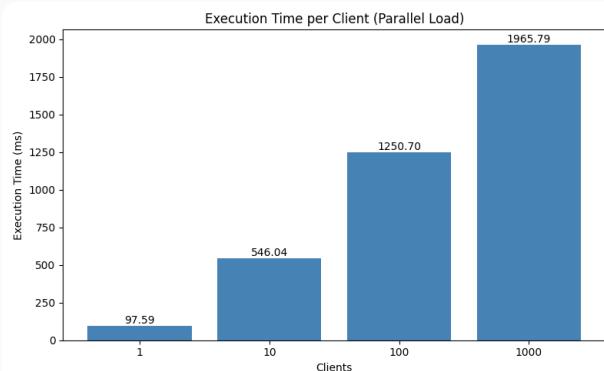
Performance analysis of Hash Set Search under concurrent load conditions.

Kmp Search Performance



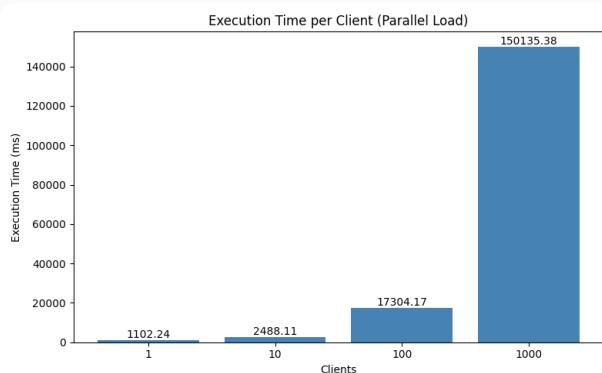
Performance analysis of Kmp Search under concurrent load conditions.

Rabin Karp Search Performance



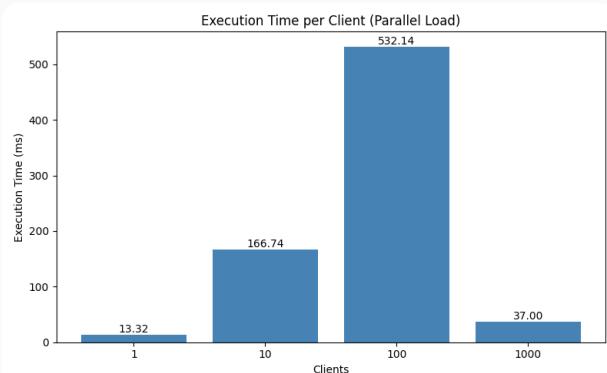
Performance analysis of Rabin Karp Search under concurrent load conditions.

Trie Search Performance



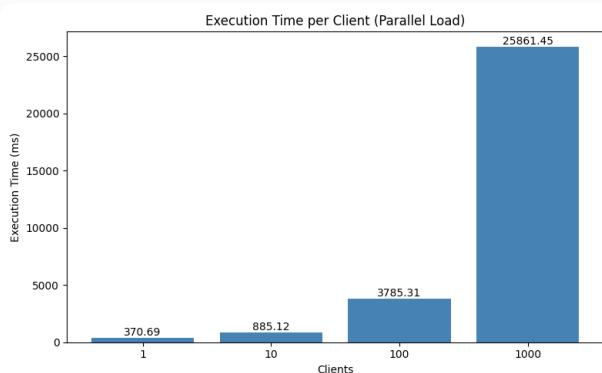
Performance analysis of Trie Search under concurrent load conditions.

Shell Grep Performance



Performance analysis of Shell Grep under concurrent load conditions.

Boyer Moore Search Performance



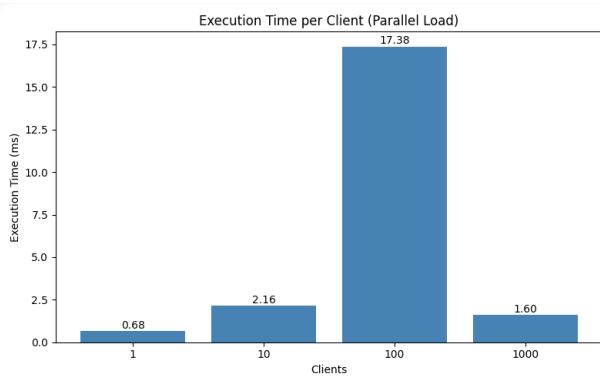
Performance analysis of Boyer Moore Search under concurrent load conditions.

Buffer Mode

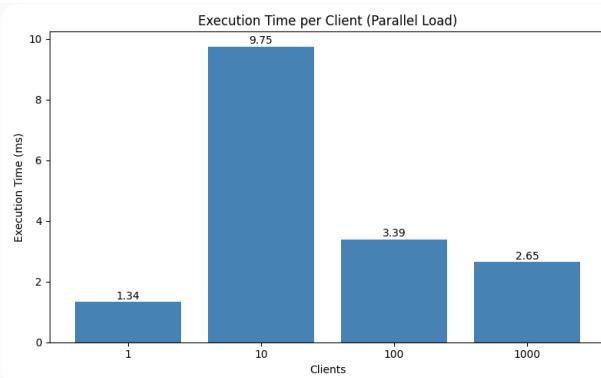
10K Data Size

Trie Performance

Multiprocesses Cache Performance

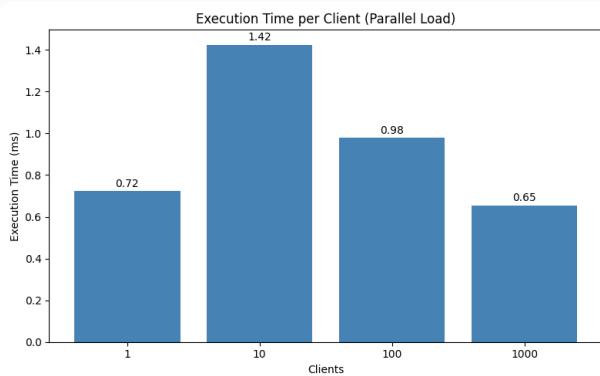


Performance analysis of Trie under concurrent load conditions.



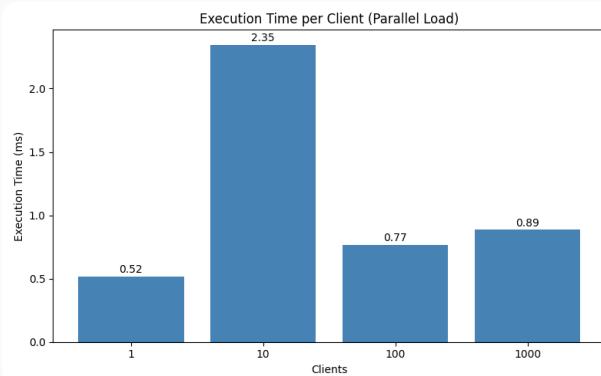
Performance analysis of Multiprocesses Cache under concurrent load conditions.

Set Performance



Performance analysis of Set under concurrent load conditions.

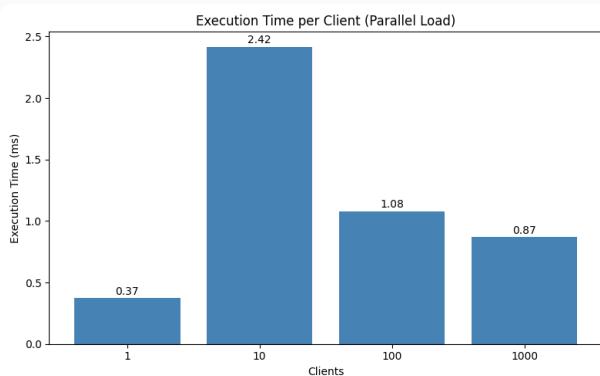
Fastset Performance



Performance analysis of Fastset under concurrent load conditions.

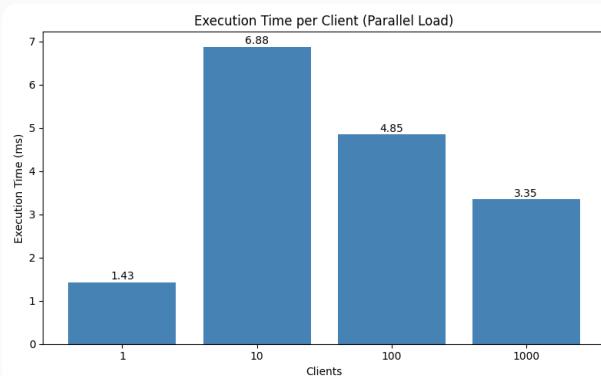
100K Data Size

Trie Performance



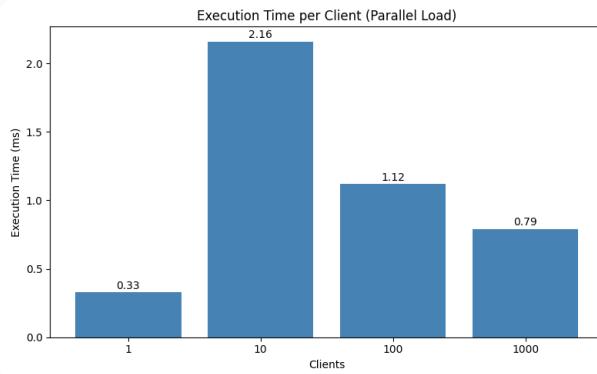
Performance analysis of Trie under concurrent load conditions.

Multiprocesses Cache Performance



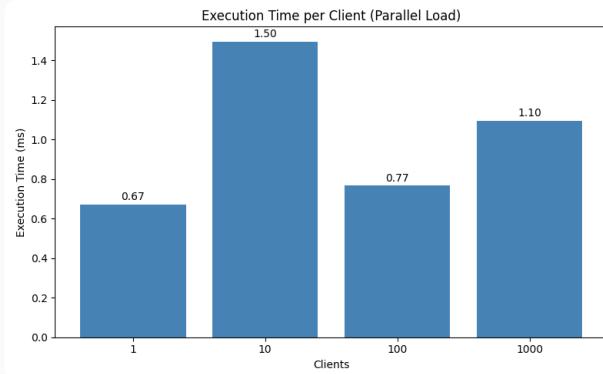
Performance analysis of Multiprocesses Cache under concurrent load conditions.

Set Performance



Performance analysis of Set under concurrent load conditions.

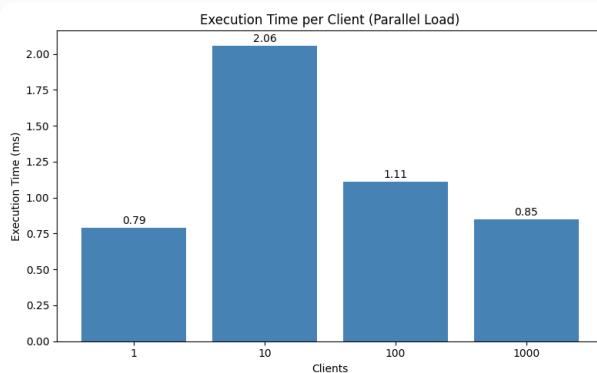
Fastset Performance



Performance analysis of Fastset under concurrent load conditions.

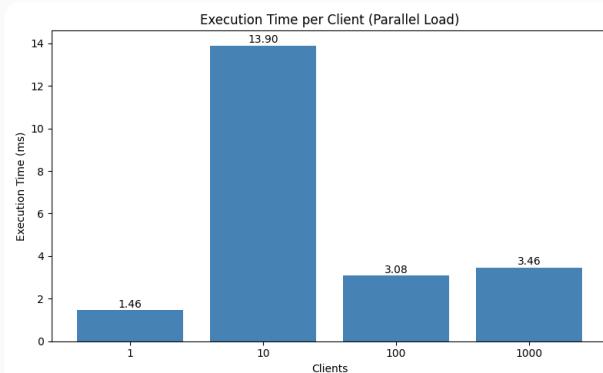
200K Data Size

Trie Performance



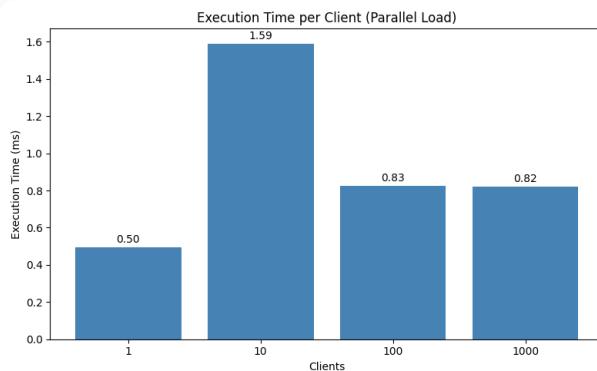
Performance analysis of Trie under concurrent load conditions.

Multiprocesses Cache Performance

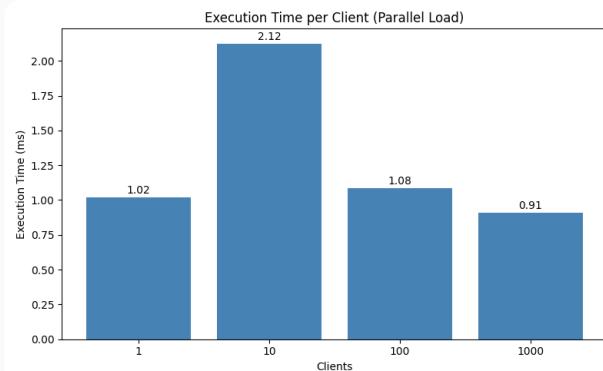


Performance analysis of Multiprocesses Cache under concurrent load conditions.

Set Performance



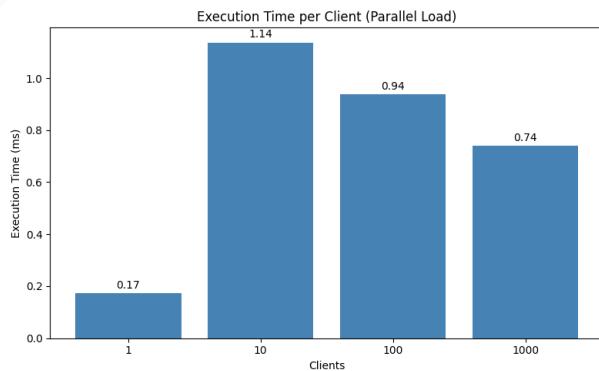
Fastset Performance



Performance analysis of Set under concurrent load conditions.

250K Data Size

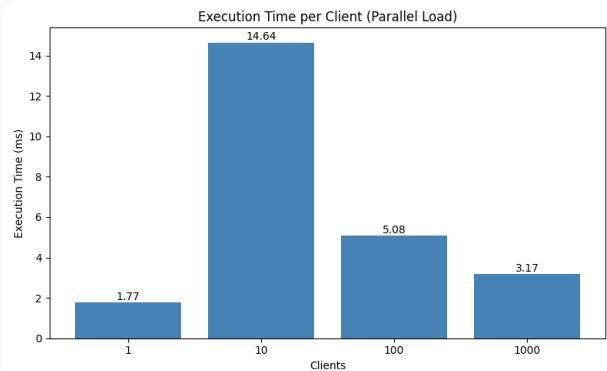
Trie Performance



Performance analysis of Trie under concurrent load conditions.

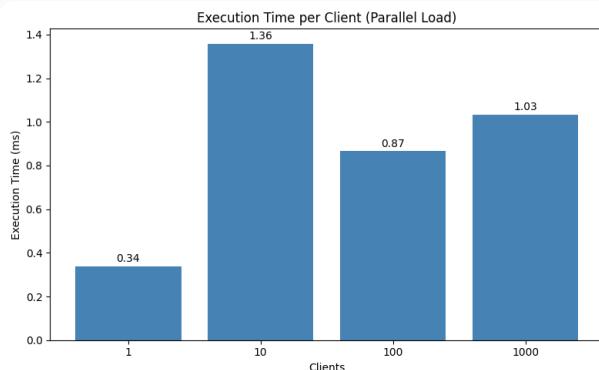
Performance analysis of Fastset under concurrent load conditions.

Multiprocesses Cache Performance



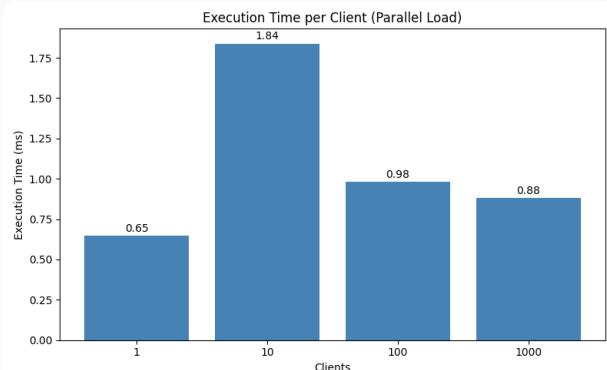
Performance analysis of Multiprocesses Cache under concurrent load conditions.

Set Performance



Performance analysis of Set under concurrent load conditions.

Fastset Performance

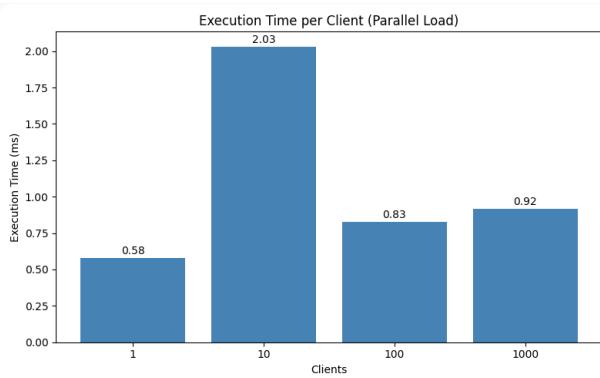


Performance analysis of Fastset under concurrent load conditions.

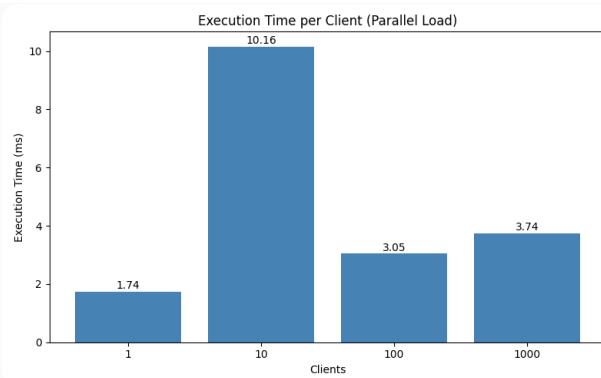
500K Data Size

Trie Performance

Multiprocesses Cache Performance

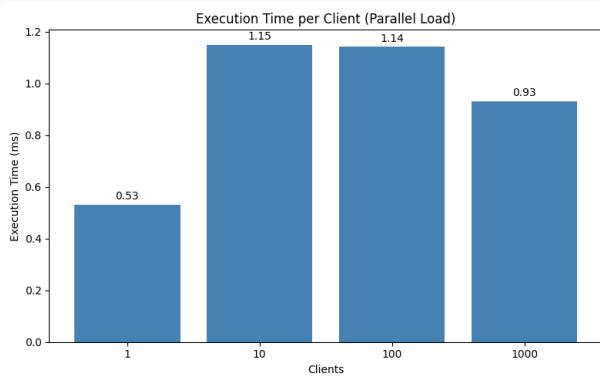


Performance analysis of Trie under concurrent load conditions.



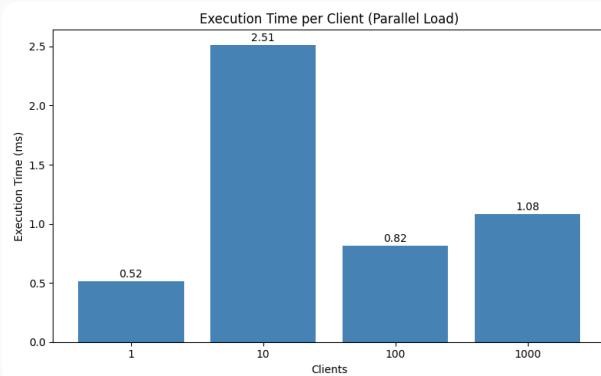
Performance analysis of Multiprocesses Cache under concurrent load conditions.

Set Performance



Performance analysis of Set under concurrent load conditions.

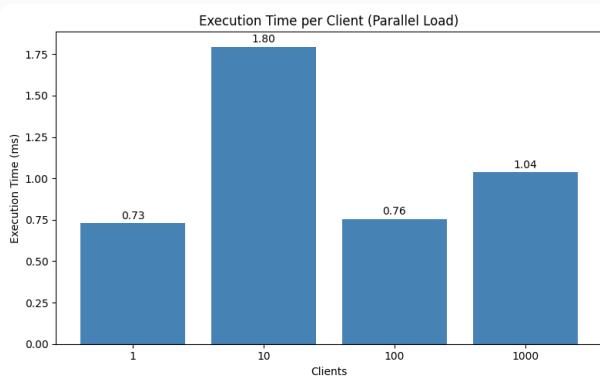
Fastset Performance



Performance analysis of Fastset under concurrent load conditions.

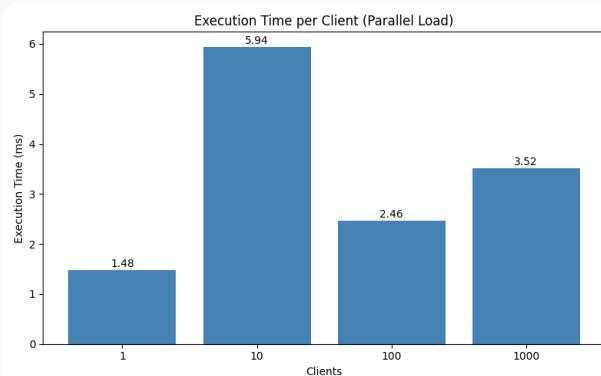
1000K Data Size

Trie Performance



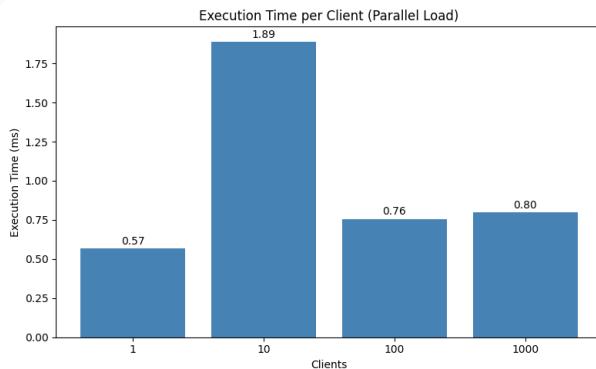
Performance analysis of Trie under concurrent load conditions.

Multiprocesses Cache Performance



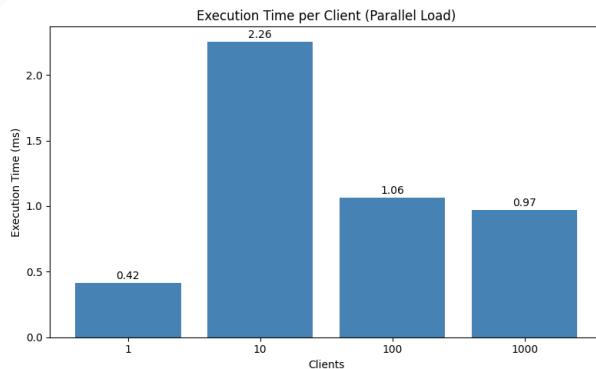
Performance analysis of Multiprocesses Cache under concurrent load conditions.

Set Performance



Performance analysis of Set under concurrent load conditions.

Fastset Performance



Performance analysis of Fastset under concurrent load conditions.

4. Implementation Details

Fastest Algorithm Implementation

Based on the results of our benchmarks, the fastest algorithm identified for buffer mode is FastSet, and the fastest algorithm identified for no buffer mode is Linear Search.

Performance Characteristics

Buffer Mode - FastSet

- Average Response Time: ms
- Success Rate: 100.0 %
- Memory Usage: 5.944183429082234 MB

No Buffer Mode - Linear Search

- Average Response Time: 503.3122300165722 ms
- Success Rate: 100.0 %
- Memory Usage: 5.985113779703776 MB

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For technical review and implementation guidance.