

Rsync Tree Construction Complexity Proof

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1 Theorem: Rsync Tree Construction Complexity

Statement: Building splay tree from file with b blocks takes $O(b \log b)$ time.

2 Proof

For each of b blocks:

1. Compute checksums: $O(1)$
2. Insert into tree: $O(\log i)$ where i is current tree size

Sum: $\sum_{i=1}^b \log i = \log(b!) = b \log b$ (by Stirling's approximation)

Conclusion: Rsync tree construction has $O(b \log b)$ time complexity.