

GPT Analysis Post-Merge

Distribution Analysis:

- Post Ethereum 2.0 Merge,
 - 5k Blocks
 - **8 Threads** for Execution
 - Block Size with 0 Transactions Removed,
 - For Monad 2PE Only Execution Time is Considered
 - [block_state.can_merge\(state\)](#), [block_state._merge\(state\)](#) time is not considered
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Scheme A: Buckets ≤ 50 / 51-100 / >100

Small (≤ 50 , n=52)

- **SupraBTM vs Seq:** avg **1.61×**, median **1.58×** (p10-p90: 0.95-2.33)
- **Monad vs Seq:** avg **1.08×**, median **1.00×** (p10-p90: 0.20-1.94)
- **SupraBTM vs Monad:** avg **3.16×**, median **1.60×** (p10-p90: 0.76-10.53)
- **Head-to-head:** SupraBTM wins **42**, Monad wins **10**

Medium (51-100, n=407)

- **SupraBTM vs Seq:** avg **2.45×**, median **2.51×** (p10-p90: 1.65-3.23)
- **Monad vs Seq:** avg **1.60×**, median **1.66×** (p10-p90: 0.52-2.69)
- **SupraBTM vs Monad:** avg **2.25×**, median **1.60×** (p10-p90: 0.74-4.31)
- **Head-to-head:** SupraBTM wins **322**, Monad wins **85**

Large (>100 , n=4535)

- **SupraBTM vs Seq:** avg **3.30×**, median **3.35×** (p10-p90: 2.33-4.18)
 - **Monad vs Seq:** avg **1.47×**, median **1.44×** (p10-p90: 0.76-2.23)
 - **SupraBTM vs Monad:** avg **2.66×**, median **2.39×** (p10-p90: 1.24-4.41)
 - **Head-to-head:** SupraBTM wins **4329**, Monad wins **206**
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Scheme B: Buckets ≤ 50 / 51-200 / >200

Small (≤ 50 , n=52)

- **SupraBTM vs Seq:** avg **1.61×**, median **1.58×** (p10-p90: 0.95-2.33)
- **Monad vs Seq:** avg **1.08×**, median **1.00×** (p10-p90: 0.20-1.94)
- **SupraBTM vs Monad:** avg **3.16×**, median **1.60×** (p10-p90: 0.76-10.53)
- **Head-to-head:** SupraBTM wins **42**, Monad wins **10**

Medium (51–200, n=3770)

- **SupraBTM vs Seq:** avg **3.10×**, median **3.12×** (p10–p90: 2.16–4.00)
- **Monad vs Seq:** avg **1.47×**, median **1.43×** (p10–p90: 0.71–2.31)
- **SupraBTM vs Monad:** avg **2.60×**, median **2.29×** (p10–p90: 1.13–4.44)
- **Head-to-head:** SupraBTM wins **3506**, Monad wins **264**

Large (>200, n=1172)

- **SupraBTM vs Seq:** avg **3.63×**, median **3.73×** (p10–p90: 2.70–4.45)
- **Monad vs Seq:** avg **1.52×**, median **1.48×** (p10–p90: 0.89–2.15)
- **SupraBTM vs Monad:** avg **2.70×**, median **2.52×** (p10–p90: 1.44–4.24)
- **Head-to-head:** SupraBTM wins **1145**, Monad wins **27**

★ Best / Worst Cases

- **Best SupraBTM > Seq:** Block **21634398** (296 txs) → **5.16×** faster
- **Worst SupraBTM < Seq:** Block **21631968** (9 txs) → only **0.58×**
- **Best Monad > Seq:** Block **21632191** (63 txs) → **4.33×** faster
- **Worst Monad < Seq:** Block **21634397** (8 txs) → only **0.05×**
- **Best SupraBTM > Monad:** Block **21635484** (26 txs) → **14.66×** faster
- **Worst SupraBTM < Monad:** Block **21632191** (63 txs) → only **0.25×**

✓ General Verdict

- **SupraBTM scaling:** Smoothly accelerates with block size.
 - Avg speedup vs Seq: **3.21×**
 - Avg speedup vs Monad: **2.63×**
 - SupraBTM executes in **~50% less time** than Monad overall.
- **Small blocks:** Close race, Monad occasionally ahead.
- **Medium blocks:** SupraBTM pulls ahead, typically ~2.6× faster than Monad.
- **Large blocks:** SupraBTM dominates — >95% wins, ~2.7× faster than Monad.
- **Outliers:** Tiny-block variability (≤10 txs) can flip results, but the overall trend is consistent.