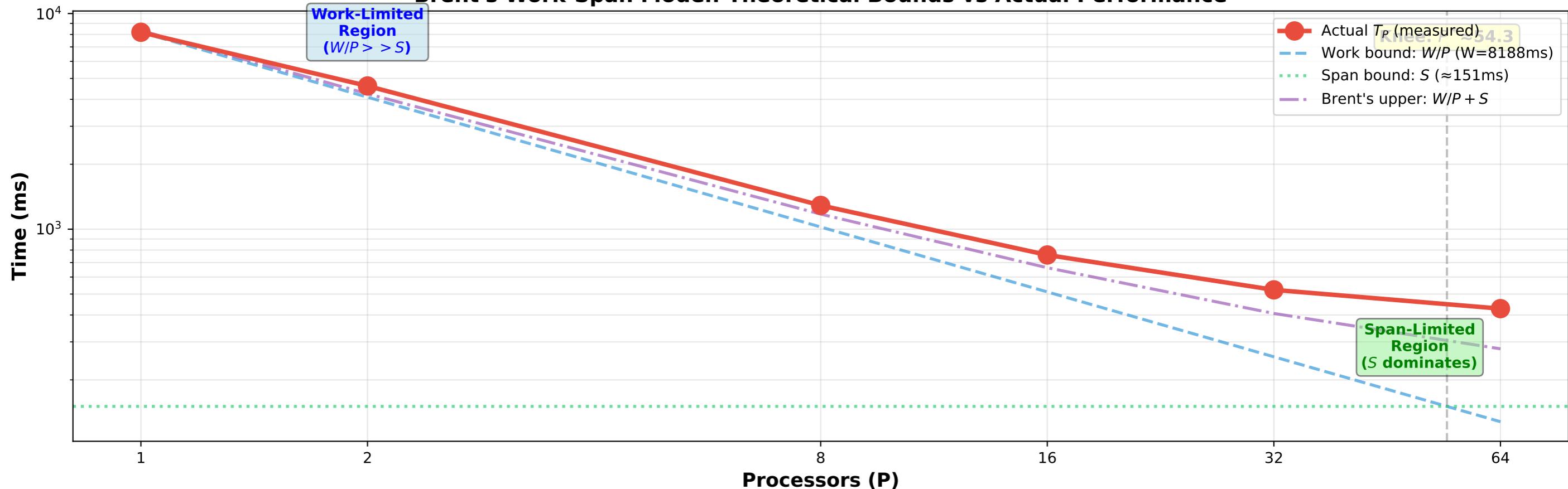# Brent's Rule: Work-Span Model Analysis (600k Dataset)
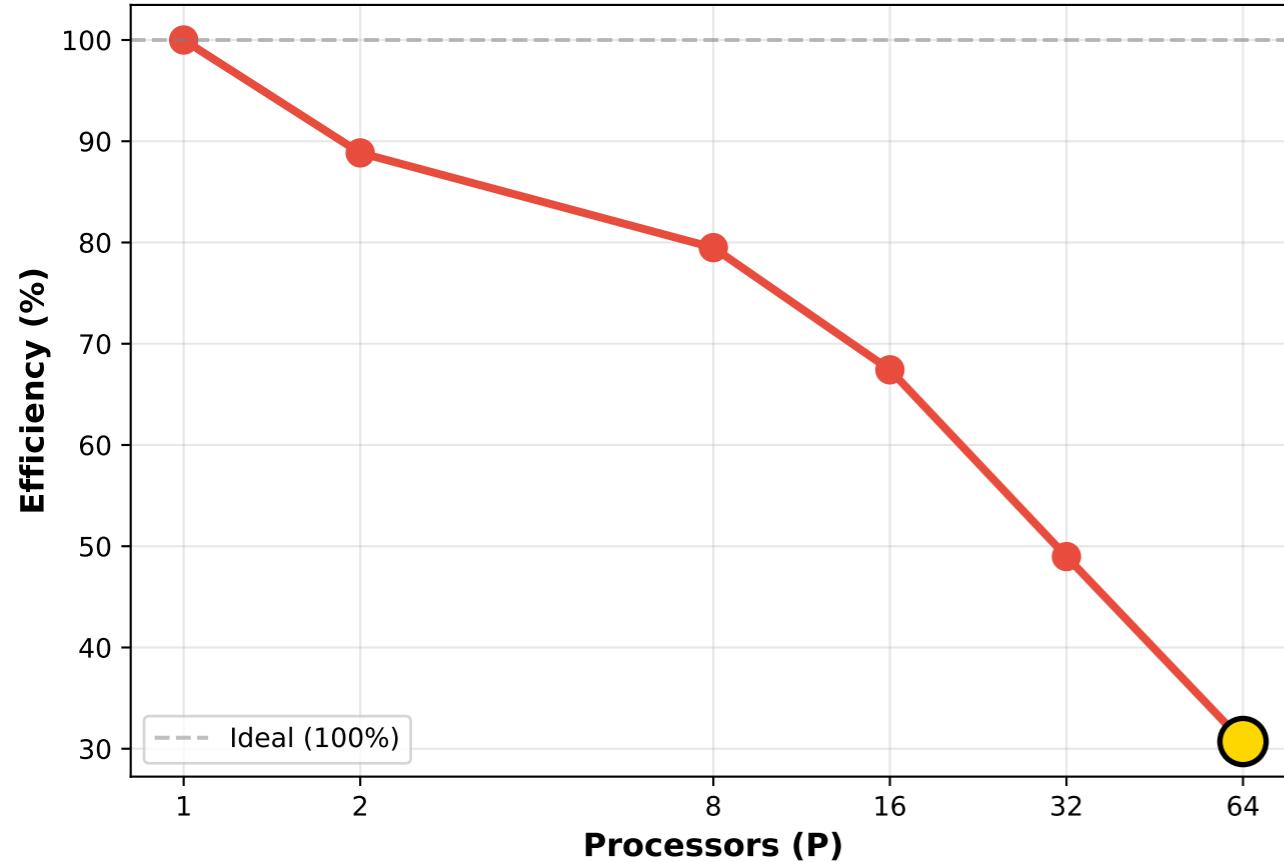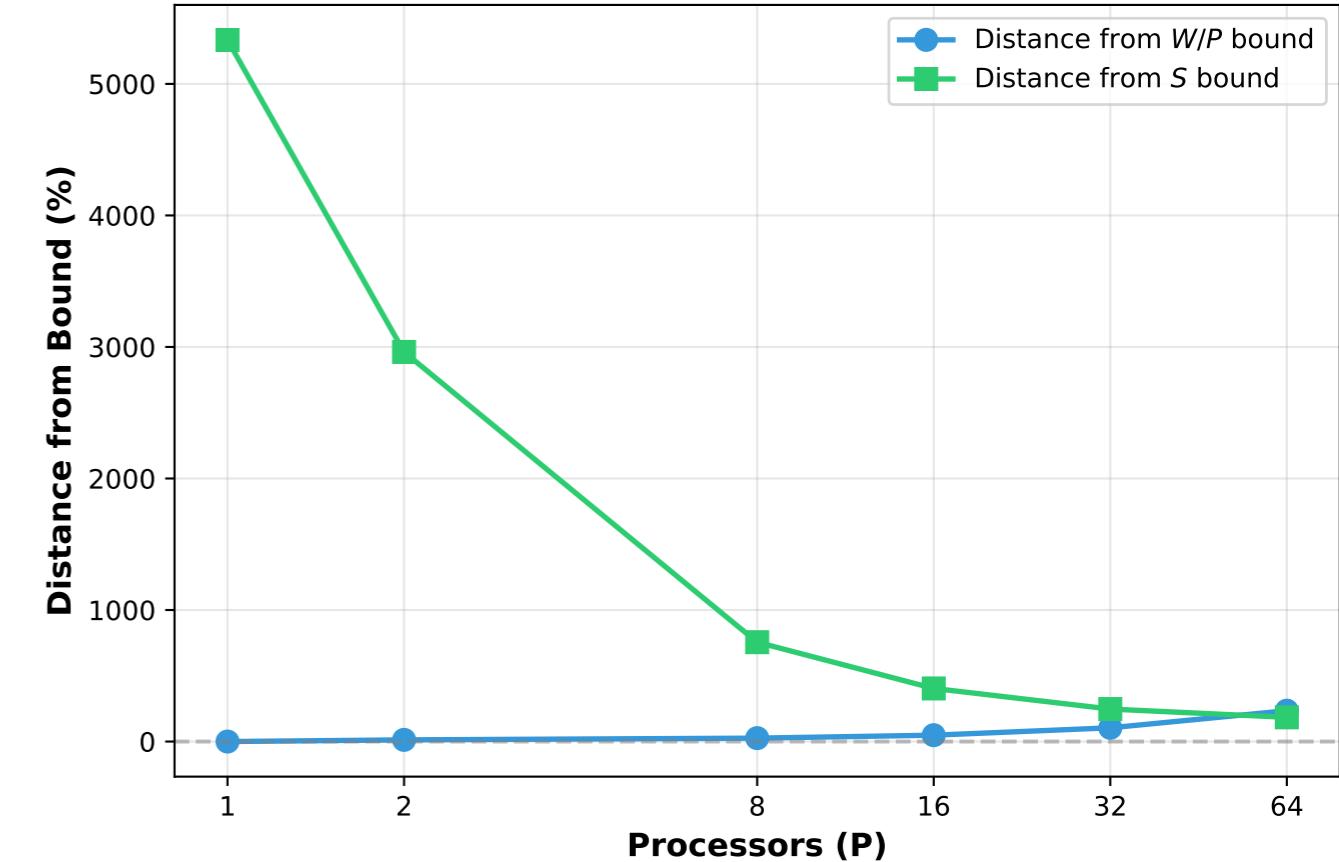

Brent's Work-Span Model: Theoretical Bounds vs Actual Performance

Work-Limited Region ($W/P >> S$)
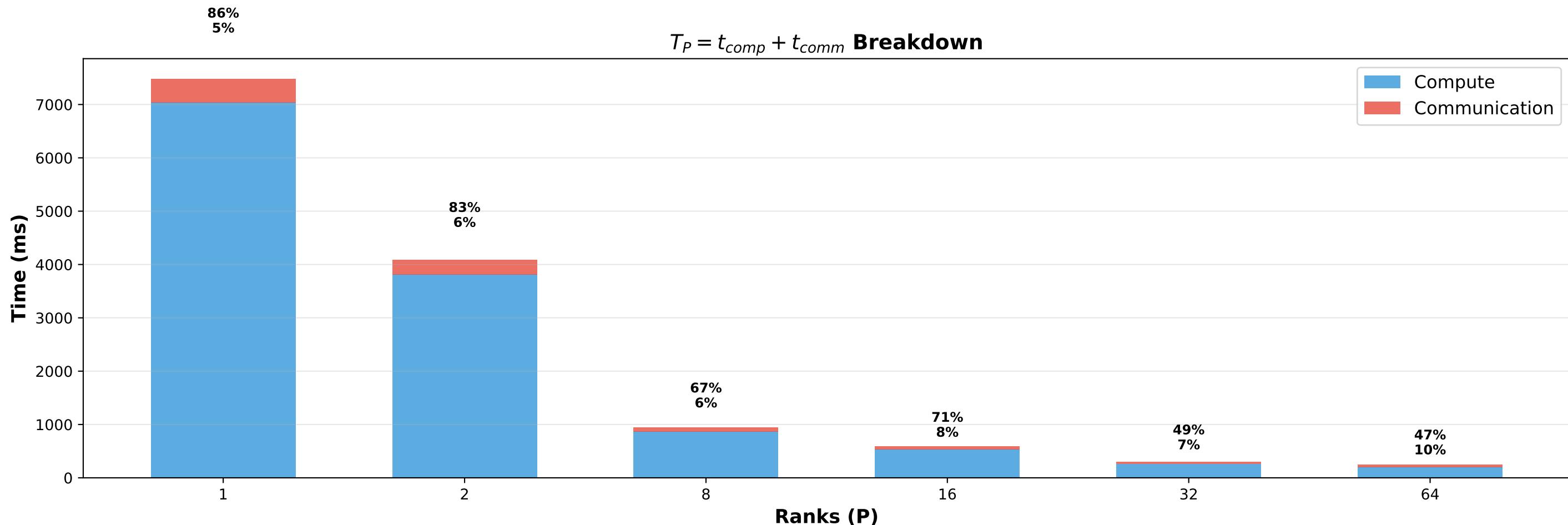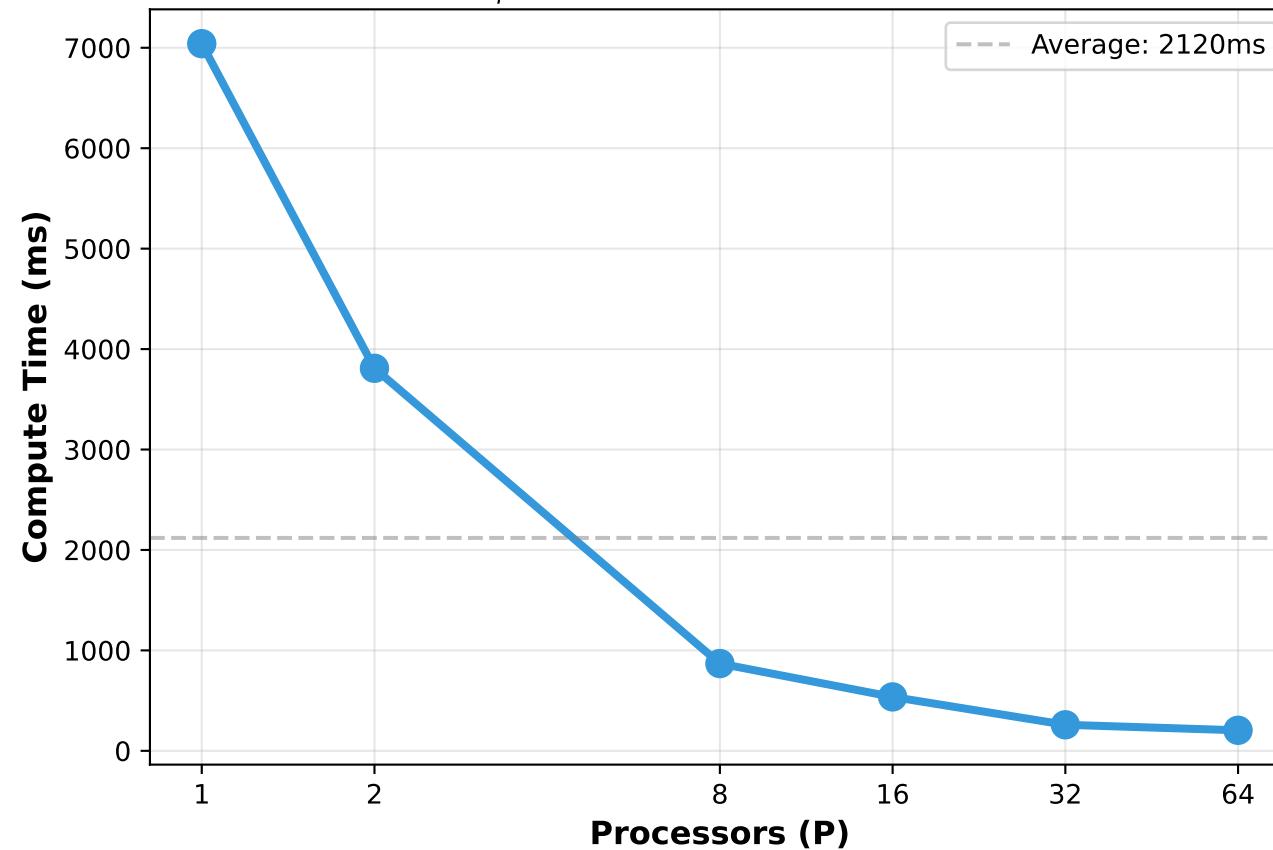
Span-Limited Region (S dominates)

- Actual T_P (measured)
- Work bound: W/P (W=8188ms)
- Span bound: S (≈151ms)
- Brent's upper: $W/P + S$

Parallel Efficiency vs Rank

Ideal (100%)

How Close to Theoretical Bounds?

- Distance from W/P bound
- Distance from S bound

Compute vs Communication Separation (600k Dataset)

$T_P = t_{comp} + t_{comm}$ Breakdown

t_{comp} vs Rank (Should be Flat)

t_{comm} vs Rank (Grows with P)