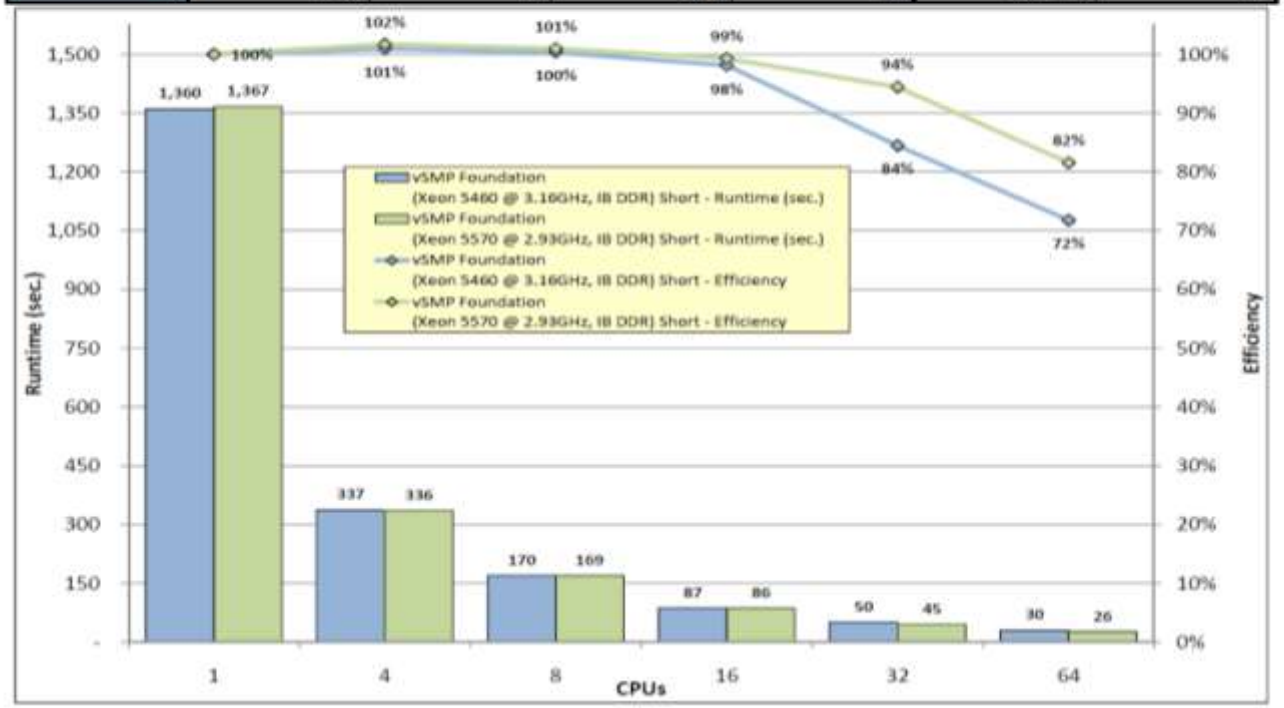
# Scale-Up: Shared Memory

## LANCZOS: OPENMP (SHARED MEMORY) ALGORITHM TO CALCULATE EIGENVALUES

**Demonstrating close to linear scalability with OpenMP code**

**82% Efficiency with 64 CPUs (X5570) vs. 72% Efficiency with previous generation (5460)**

| System & Processor | vSMP Foundation (Xeon 5460 @ 3.16GHz, IB DDR) | | vSMP Foundation (Xeon 5570 @ 2.93GHz, IB DDR) | | vSMP Foundation (Xeon 5460 @ 3.16GHz, IB DDR) | |
|---|---|---|---|---|---|---|
| Model | Short | | | | Long | |
| CPUs | Runtime (sec.) | Efficiency | Runtime (sec.) | Efficiency | Runtime (sec.) | Efficiency |
| 1 | 1,360.49 | 100% | 1,366.85 | 100% | | |
| 4 | 336.94 | 101% | 335.94 | 102% | | |
| 8 | 169.51 | 100% | 169.16 | 101% | | |
| 16 | 86.67 | 98% | 86.03 | 99% | 96,095.00 | 100% |
| 32 | 50.33 | 84% | 45.22 | 94% | 48,124.00 | 100% |
| 64 | 29.61 | 72% | 26.18 | 82% | 24,293.95 | 99% |

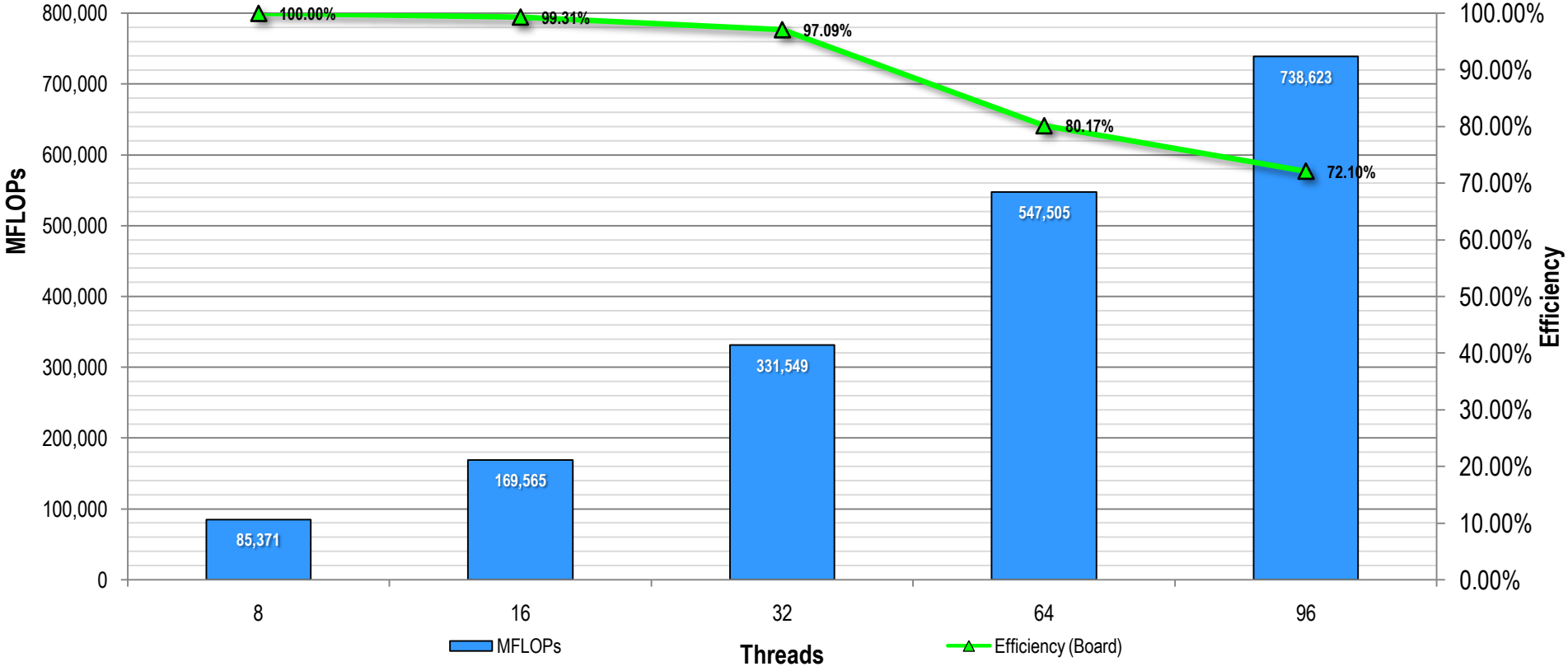


# OPENMP PARALLELIZATION

## DGEMM (INTEL MKL) – MATRIX SIZE: 12,000 X 12,000

**The benefit of using a commercial mathematical library (with no additional modifications) which is NUMA aware**

**80%% Efficiency with 64 CPUs (X5570), 72% Efficiency with 96 CPUs**




**HW Characteristics:**

12 x 2 x Intel XEON X5570 QC (2.93GHz, 6.4GT/s), HT off, Turbo Boost off; 83GB/192GB (4 x 6 x 4GB (1333MHz) + 4 x 6 x 4GB (1066MHz)); DDR; vSMP Foundation 2.0

(Source: ScaleMP)

# Scale-Up: Large Memory vs. I/O

## NASTRAN: XL0TDF1 - CAE APPLICATION, PERFORMING EXTENSIVE I/O

**Leveraging aggregated RAM results in**

**ScaleMP 3 X Faster runtime compared to HDDs, 2X compared to SSDs**