SuperMUC-NG

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Why SuperMUC-NG ?

- Based on Lenovo and manufactured in Germany
- Energy efficiency
- Singular refrigeration: Hot 🔥 Water to cool the nodes
- Xeon Platinum & Intel Omni-Path
- “Meta-Heuristics for Scheduling in Cluster Federated Env.” Thesis by Eloi Gabaldon

Specifications & Analysis

- Manufactured by Lenovo and located in Garching, Germany.
- Processor: Xeon Platinum 8174 24C 3.1GHz
- Internal Interconnection: Omni-Path network of 100 Gbit/s
- Cooler System: Direct Warm Water Cooling
- Total Compute Nodes: 9 Islands, 6.480 Nodes, 311,040 Cores
  - Thin Nodes: 8 Islands, 6.336 Nodes, 304.128 Cores
  - Fat Nodes: 1 Island, 144 Nodes, 6.912 Cores
- Memory (TByte): 719

Nodes

144 Fat nodes

- Single node performance
- Ultra-high reliability
- High memory capacity

6336 Thin nodes

- Inexpensive
- High-speed CPU
- Well-suited for sequential workloads

XEON Platinum

XEON Platinum 8174

- 24C 3.10Ghz
- 33MB Cache DDR4-2666
- 6 Memory Channels
- Scalability s8s 3 QPI-Links
- UPI Links
- PCI Express 3.0

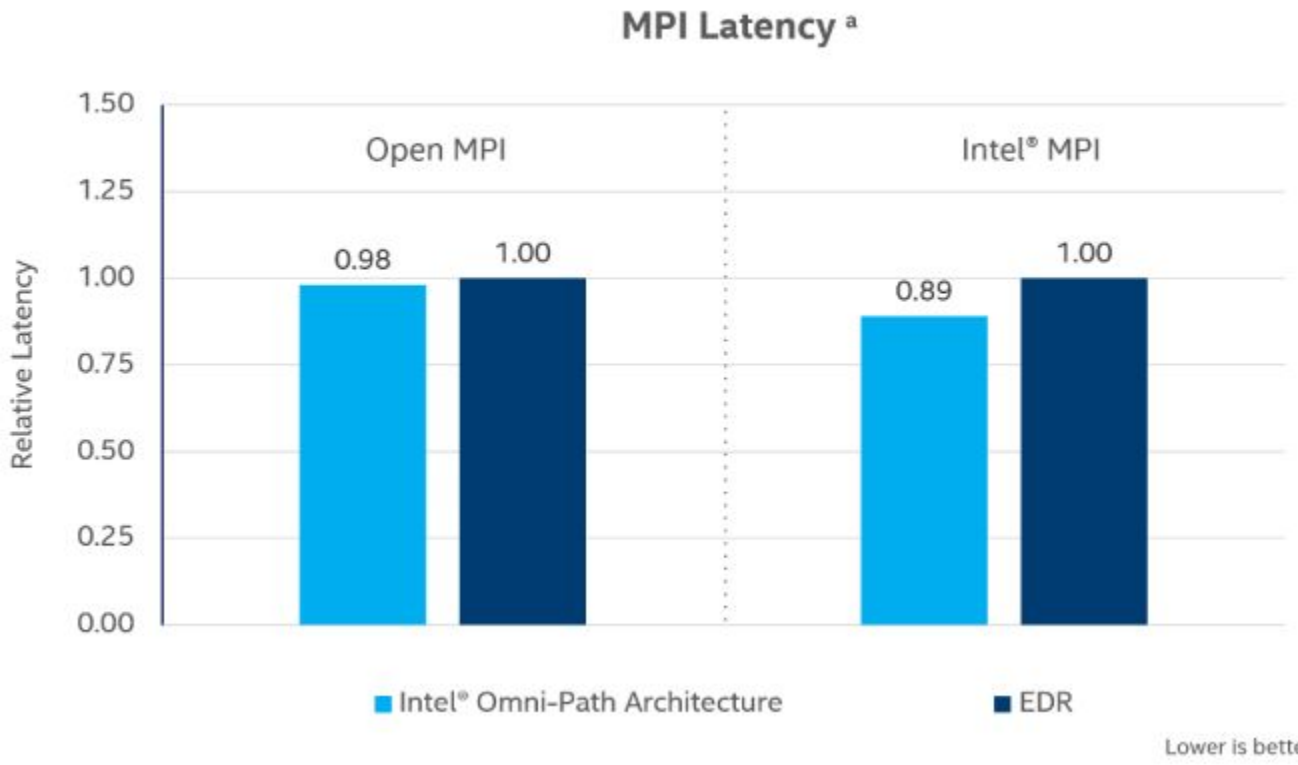
Intel Omni-Path

Intel Omni-Path

- High-performance communication
  - Low latency
  - Low power consumption
  - High throughput
- For small and large scale

Intel OPA Performance

Intel OPA to Enhanced Data Rate (EDR) InfiniBand (IF)
Ohio State University (OSU) OMB osu_latency benchmark



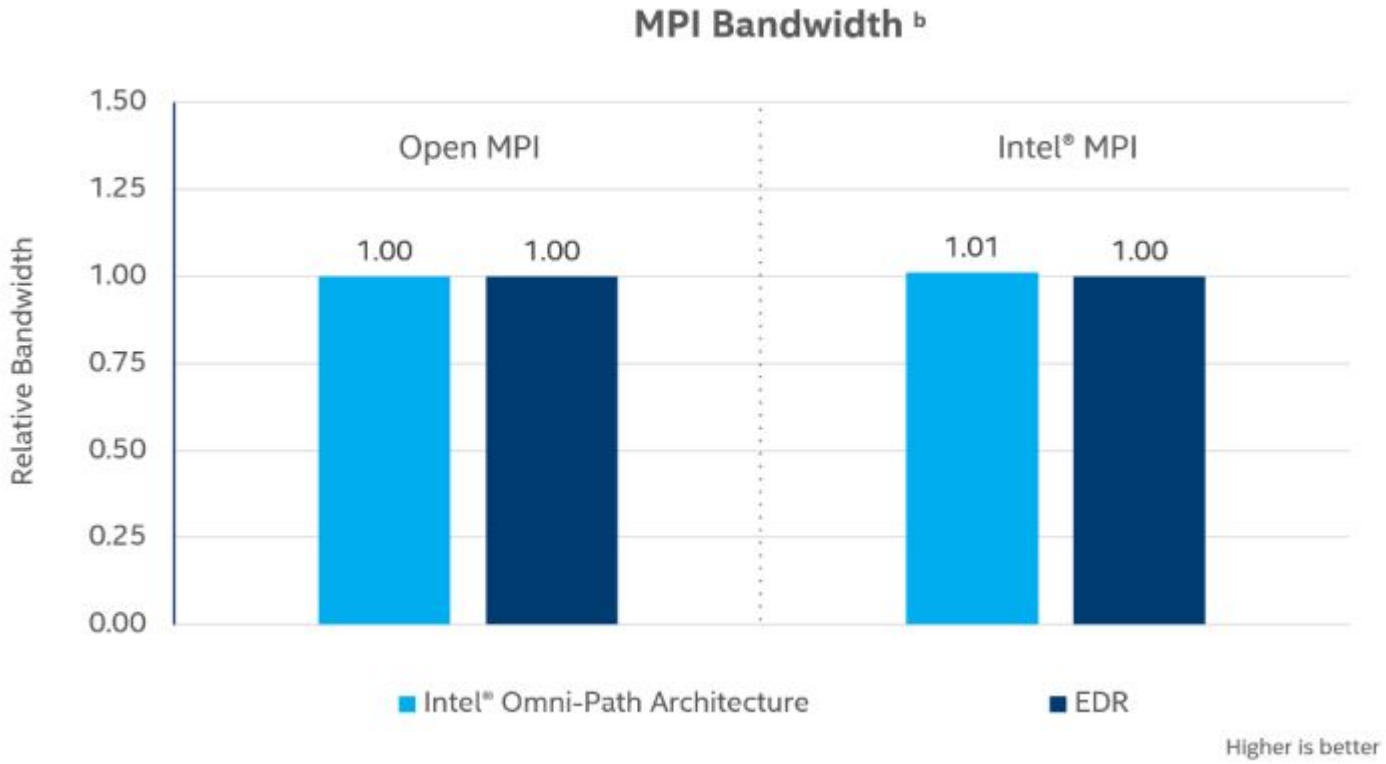
- 8 bytes message
- 11% lower

Intel OPA Performance

Ohio State University (OSU) OMB osu_bw benchmark

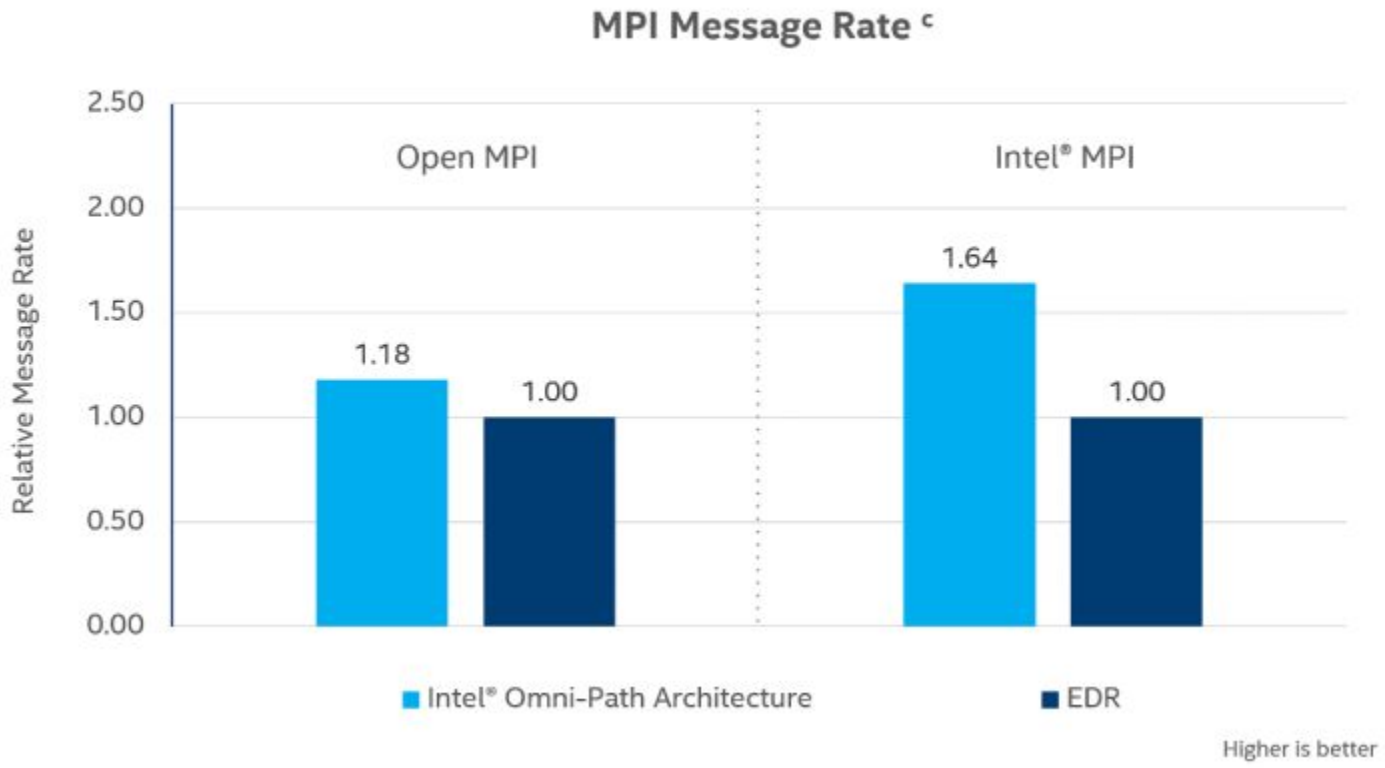
- 1MB messages
- Both full wire rate

of 100Gbps



Intel OPA Performance

Ohio State University (OSU) OMB osu_mbw_mr benchmark

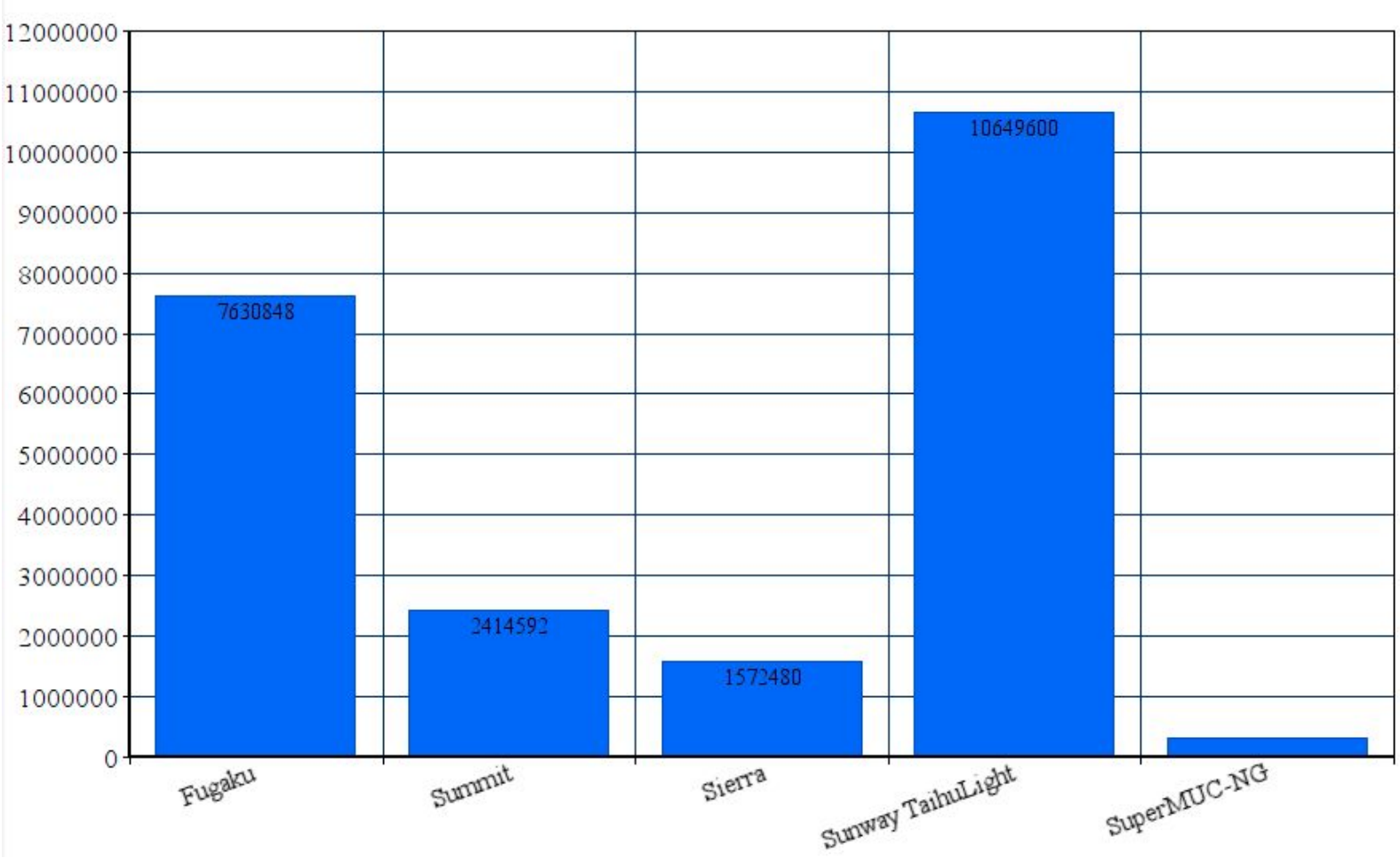


- 32 MPI rank pairs
- 64% higher

Comparison

- With the first 4 current supercomputers
  - Fugaku, Summit, Sierra, and Sunway TaihuLight
- Based on
  - Cores
  - Rpeak / Rmax
  - Nmax

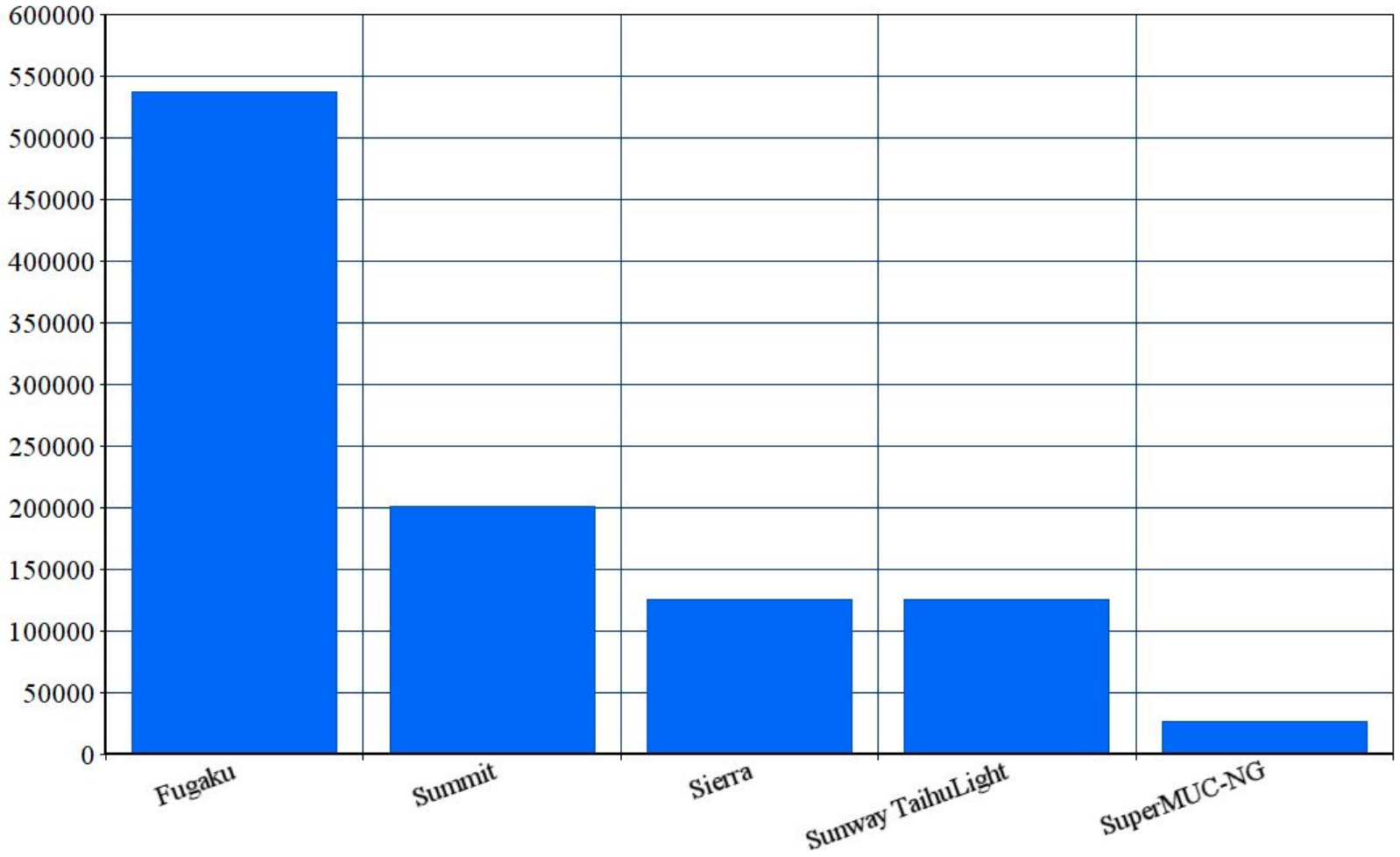
Comparison - Cores



- Clear difference
- But, it really affects

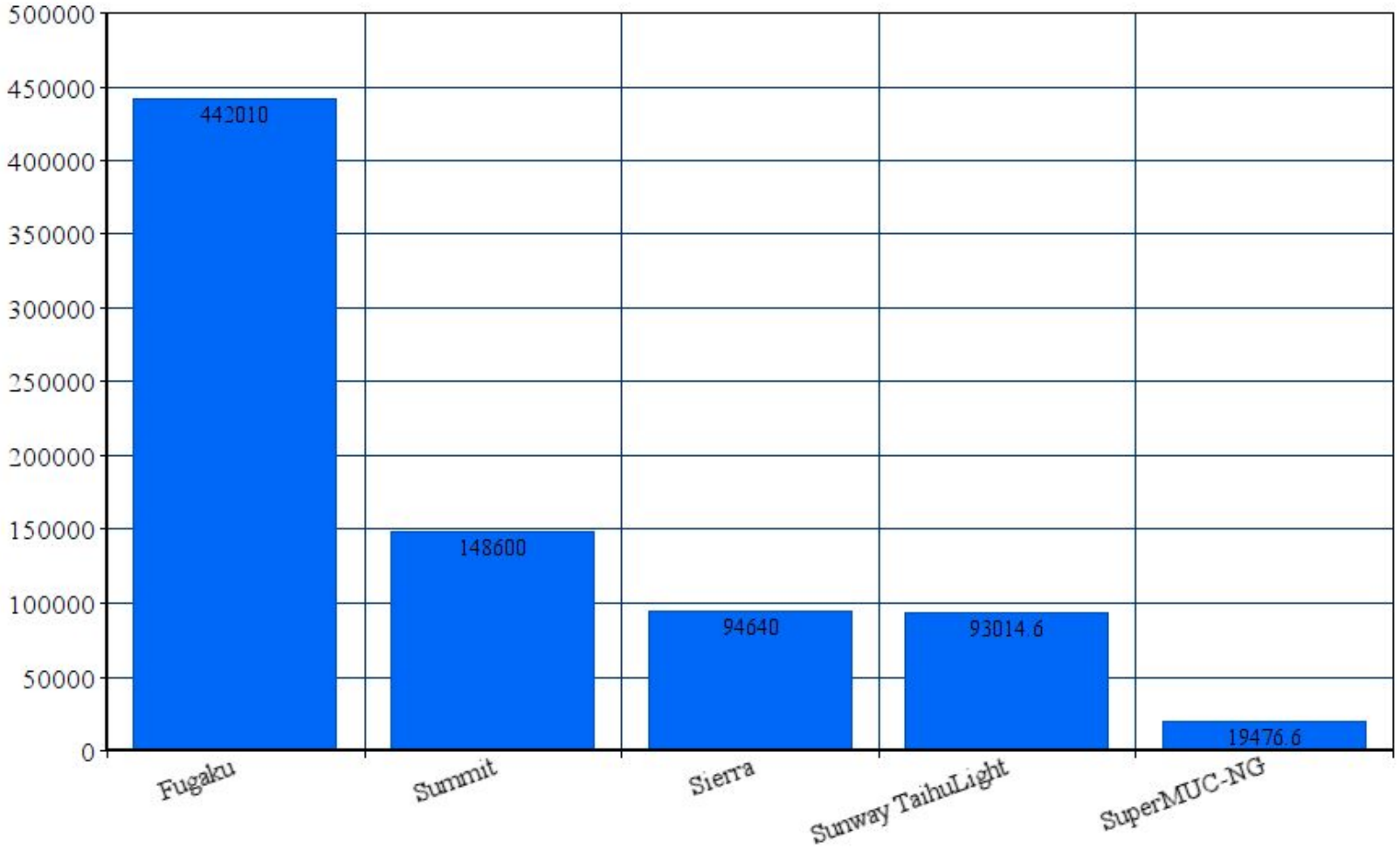
direcly the performance?

Comparison - Rpeak



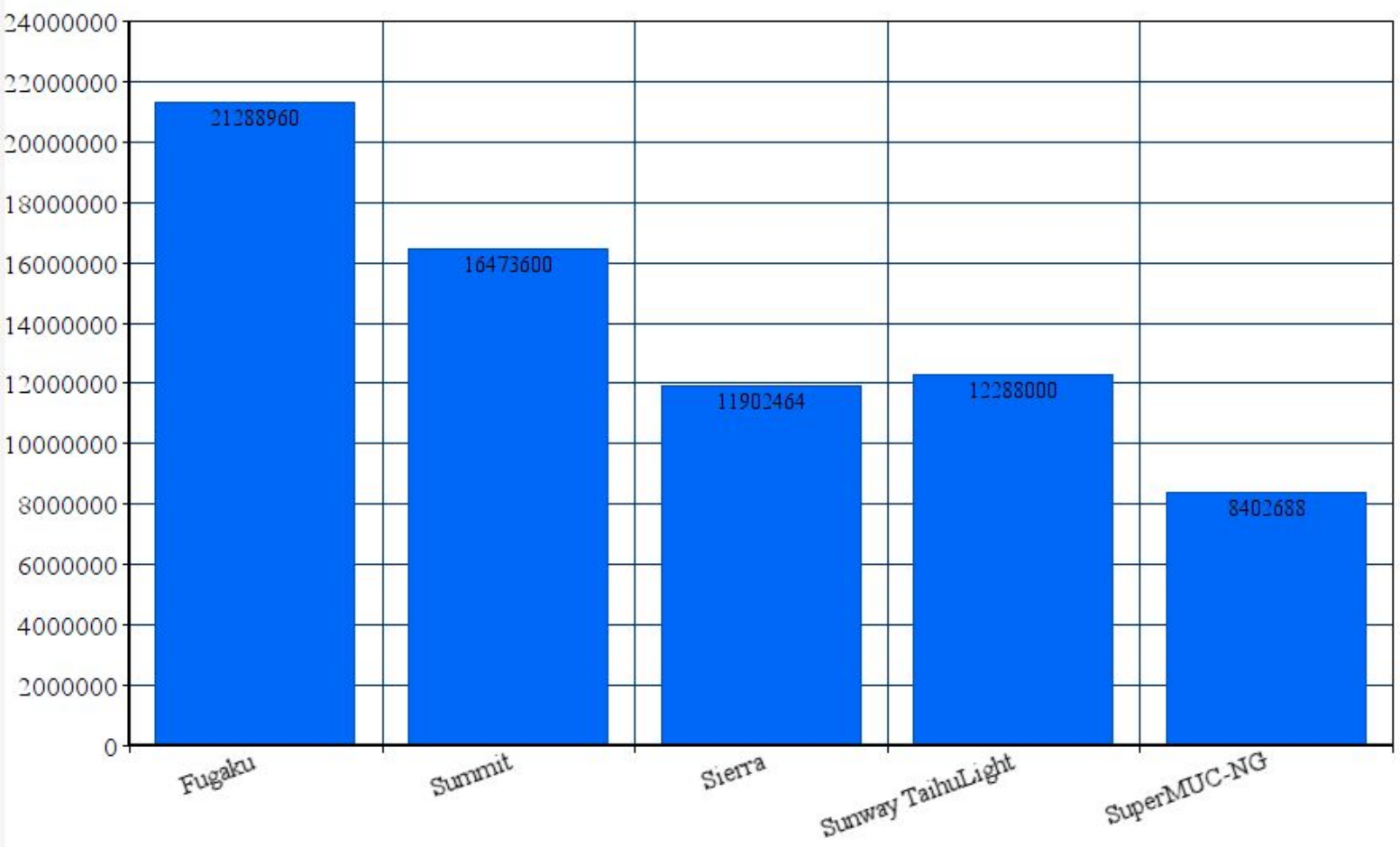
- LINPACK benchmark
- Theoretical peak performance

Comparison - Rmax



- LINPACK benchmark
- Maximal achieved performance

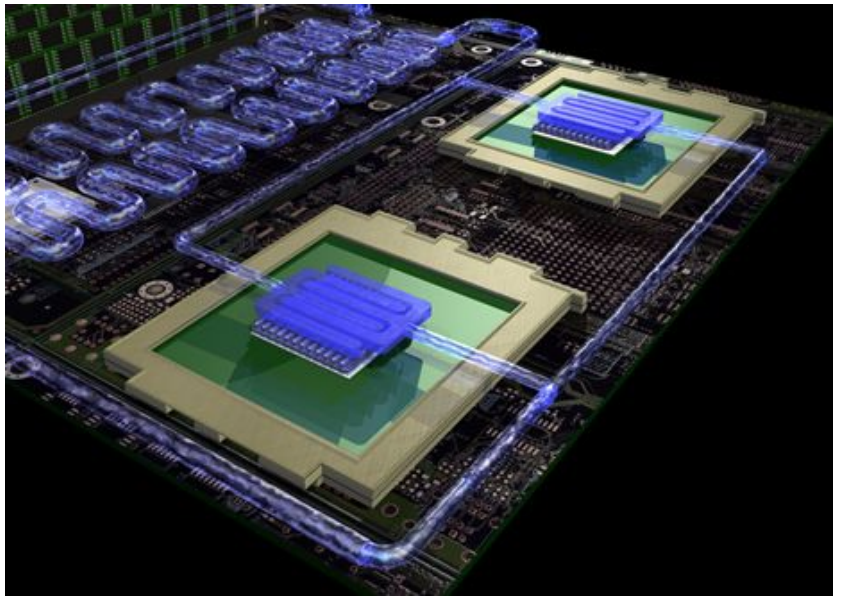
Comparison - Nmax



- Problem size
- To achieve Rmax

Cooling System

- Warm water
- 97% heat removal efficiency
- Aquasar by IBM
- Water 4000 times efficient than air
- The waste heat produced is recycled
- Renewable energy sources



https://www.youtube.com/watch?v=FbGyAXsLzIc

CONCLUSIONS

- Deepen in the Supercomputers' world
- Supercomputer vs Home Computer
- Architectures
- Energy Efficiency
- Cooling systems

Many thanks

Any questions?