Revolutionizing HPC Architecture

Advancing Energy Efficiency Through Next-Generation Interconnects and SoC Integration

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HPC Market Growth

$55.6B

Market Size by 2026

Projected global HPC market value, driven by scientific research and AI applications.

100K+

Processing Cores

Modern HPC systems can efficiently handle over 100,000 cores.

Scalable Interconnects

1

Previous Gen

100 Gb/s speed

Millisecond latency

2

Current Gen

400 Gb/s speed

Sub-microsecond latency

3

Impact

4x improvement

Enables exascale computing

Low-Power SoC Design

Power Reduction

Latest-generation designs show up to 75% reduction in power consumption.

Performance Density

Achieved up to 2.5 TFLOPS/mm^2, a 3x improvement over discrete solutions.

Integration

Combines CPUs, GPUs, and FPGAs on a single chip for efficiency.

Advanced Packaging Technologies

3D Stacking

Overcomes traditional scaling limitations. Enables higher integration densities.

Chiplet Design

Allows for modular chip components. Improves yield and reduces costs.

Integration Density Breakthrough

100M

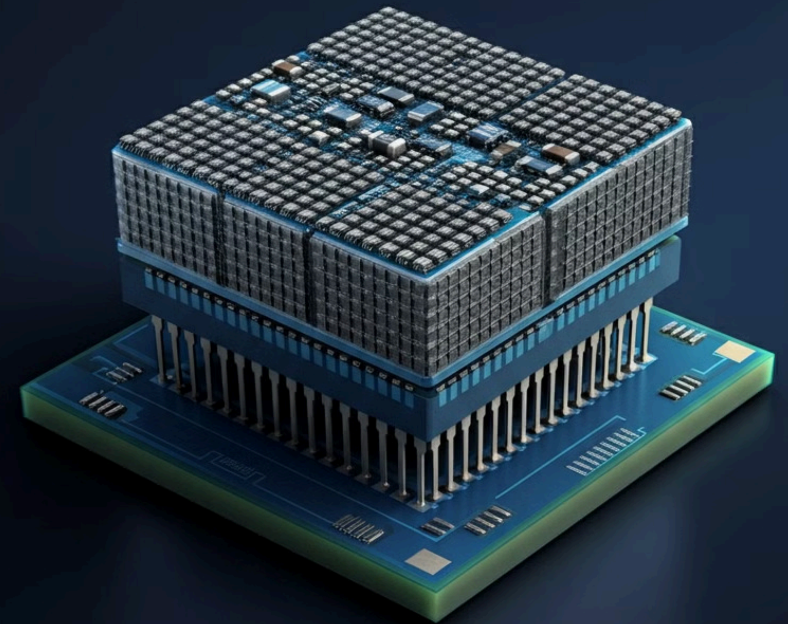
Transistors per mm²

Achieved through advanced 3D packaging technologies.

40%

Density Increase

Improvement over conventional 2D designs.



Next-Gen HPC Systems

High Performance

Delivering exceptional computational power for complex workloads.

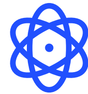
Energy Efficiency

Maintaining power envelope under 30 megawatts.

Scalability

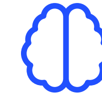
Designed to handle growing demands of scientific and AI applications.

Real-World Applications



Scientific Computing

Enabling complex simulations and data analysis in physics, chemistry, and biology.

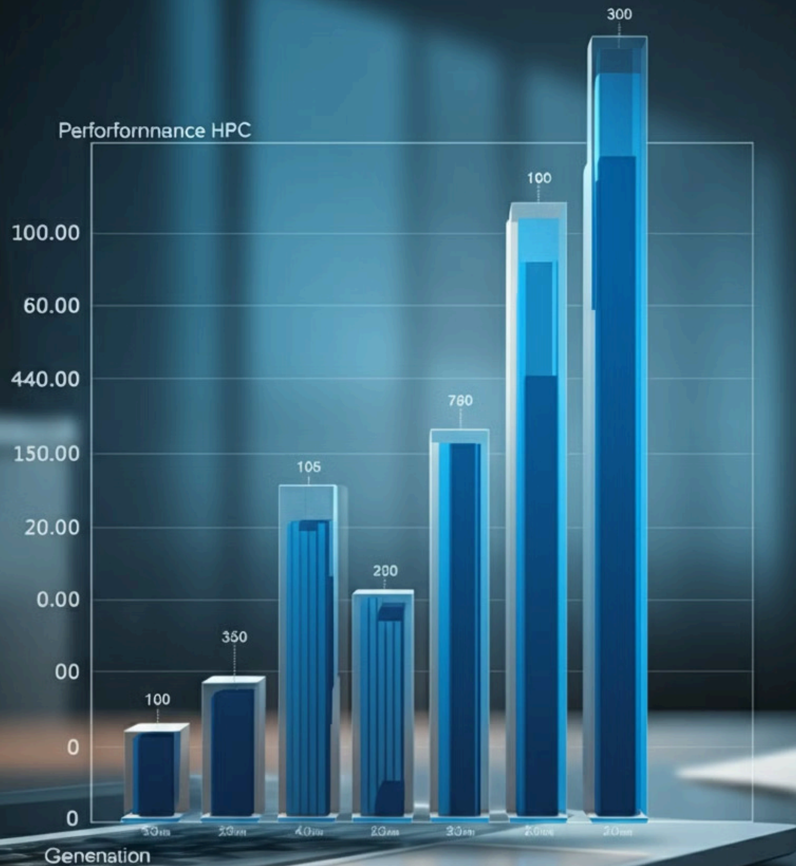


AI Training

Accelerating machine learning model training for advanced AI applications.

Data Analytics

Processing massive datasets for business intelligence and research insights.



Performance Improvements

60%

Performance-per-Watt Gain

Improvement compared to previous HPC architectures.

3x

Computational Density

Increase in FLOPS per unit area over traditional solutions.

Challenges and Future Directions

1

Thermal Management

Developing advanced cooling solutions for high-density chips.

2

Interconnect Scaling

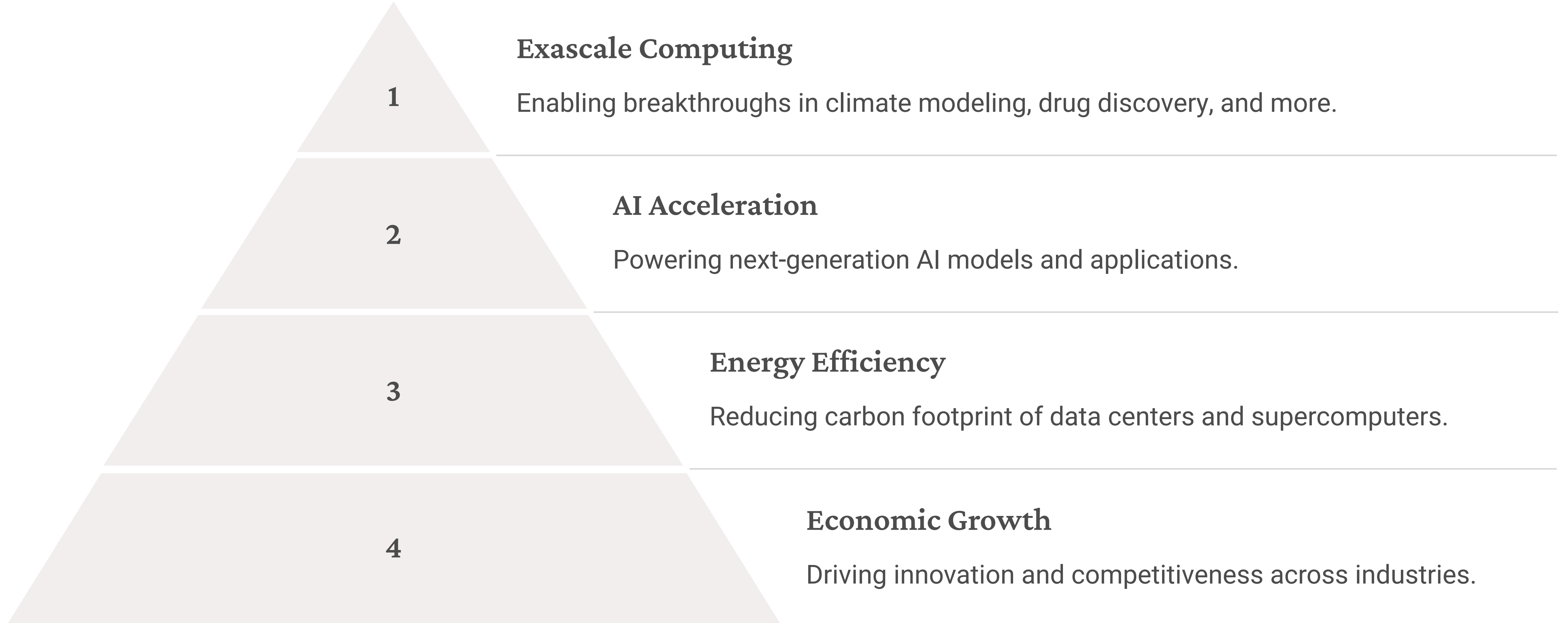
Pushing data transfer speeds beyond 1 Tb/s while reducing latency.

3

Software Optimization

Creating tools to fully utilize heterogeneous computing resources.

Industry Impact



Exascale Computing

Enabling breakthroughs in climate modeling, drug discovery, and more.

AI Acceleration

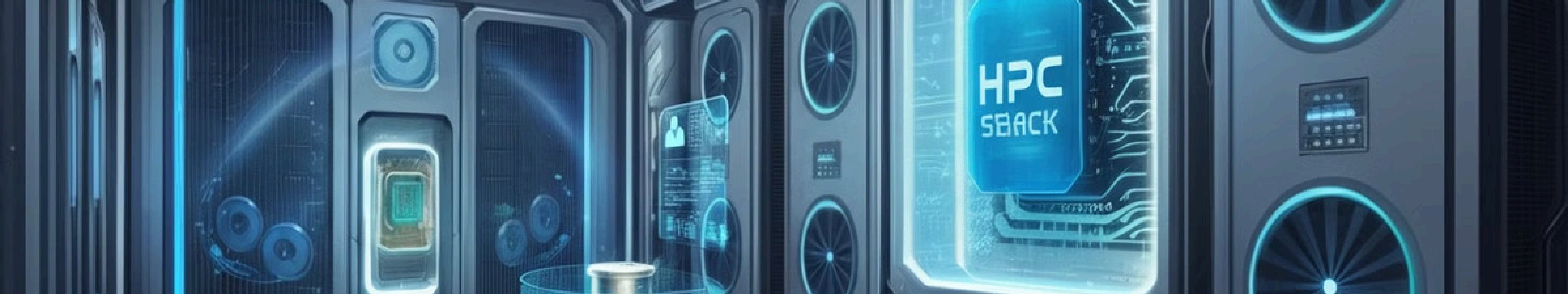
Powering next-generation AI models and applications.

Energy Efficiency

Reducing carbon footprint of data centers and supercomputers.

Economic Growth

Driving innovation and competitiveness across industries.



Conclusion: The Future of HPC

1. **Continued Innovation**

   Pushing boundaries in interconnects, SoC design, and packaging technologies.

2. **Sustainable Computing**

   Balancing performance gains with energy efficiency improvements.

3. **Collaborative Research**

   Fostering partnerships between academia, industry, and government labs.

Thank You