

High Performance Computing (HPC) has diverse applications across various industries. Here's a summary of typical HPC applications, systems, and important aspects like FP32/FP64 performance by industry

### Manufacturing and Engineering

**Applications:**

- Product design and simulation
- Crash testing simulations
- Aerodynamic modeling
- Virtual prototyping

**Systems:**

- Clusters with high-speed interconnects (InfiniBand)
- GPU-accelerated systems for visualization and simulation

**Performance:**

- FP64 crucial for precise engineering calculations

### Oil and Gas

**Applications:**

- Seismic data processing
- Reservoir simulation and modeling
- Geospatial analytics

**Systems:**

- Large-scale clusters with high-bandwidth storage
- Specialized hardware for seismic processing

**Performance:**

- Mix of FP32 and FP64, depending on application

### Weather and Climate

**Applications:**

- Weather forecasting
- Climate modeling

**Systems:**

- Massive supercomputers (exascale systems)
- High-bandwidth storage for large datasets

**Performance:**

- Primarily FP64 for accurate atmospheric simulations



### Financial Services

**Applications:**

- Risk analysis
- Algorithmic trading
- Fraud detection

**Systems:**

- Low-latency clusters
- FPGA-accelerated systems for trading

**Performance:**

- FP64 for precise financial calculations
- FP32 for some risk models

### Healthcare and Life Science

**Applications:**

- Genomic sequencing
- Drug discovery and design
- Medical imaging analysis

**Systems:**

- GPU-accelerated clusters for AI/ML
- High-memory nodes for genomics

**Performance:**

- Mix of FP32 (for AI) and FP64 (for molecular dynamics)

### Education and Research

**Applications:**

- Scientific simulations
- Data analysis in physics, chemistry, and biology

**Systems:**

- Shared HPC resources (e.g., national supercomputing centers)
- Cloud-based HPC for accessibility

**Performance:**

- Varies widely, from FP32 for some simulations to FP64 for high-precision physics

### Government and Defense

**Applications:**

- Intelligence analysis
- Nuclear simulations
- Cryptography

**Systems:**

- Secure, air-gapped supercomputers
- Quantum computing research systems

**Performance:**

- FP64 for most applications, emerging use of lower precision for AI