OLDS Research

AI Isn't Replacing HPC – It IS HPC

In recent discussions with industry vendor sales and marketing teams, I've repeatedly heard that HPC demand is falling while AI system demand continues to surge. I've also seen articles suggesting that AI is displacing HPC.

This just isn't the case. Period.

AI is not a separate category that is replacing HPC. **AI is a subset of HPC.**

HPC has never been a specific application. It is a broad category of computationally demanding workloads that require high-performance infrastructure to deliver meaningful results in a reasonable timeframe.

Both traditional HPC and modern AI workloads share several critical traits:

- They are extremely compute-intensive and highly sensitive to time-to-solution.
- They demand large amounts of high-bandwidth memory, fast interconnects, and efficient scaling across many nodes.
- **Most importantly, they are strategically important to the organizations running them.** These are not casual workloads — they are mission-critical efforts that justify significant investment in specialized infrastructure.

You can technically run OpenFOAM or train a large language model on a laptop. But the time to solution would be so long that the results would be irrelevant by the time they finish. That's why both rely on the same class of infrastructure: fast processors, large high-bandwidth memory, high-speed interconnects, and clustered systems designed to work together efficiently.

The idea that AI uses GPUs while "real" HPC does not is a false distinction. Many traditional HPC applications already use accelerators, and many more are incorporating AI techniques. The distinction isn't accelerators versus CPUs — it's whether the workload demands high-performance infrastructure or not.

Just because some AI practitioners don't call what they're doing "HPC" doesn't mean it isn't. Many longtime HPC users don't use the term either — they call it technical computing, simulation, or modeling. Under the hood, the infrastructure requirements are the same.

AI Augments HPC — It Doesn't Replace It

Traditional HPC workloads aren't going away. Drug discovery, fusion research, materials science, climate modeling, and aircraft design will continue to demand high-performance computing resources.

What's changing is that these domains are being significantly augmented by AI techniques, and entirely new AI-driven workloads are emerging that also require HPC-class infrastructure. The result is not displacement — it's expansion.

Trying to separate "AI spending" from "HPC spending" today is mostly an exercise in creative accounting and speculation. In reality, the industry supporting high-performance computing isn't shrinking. It is growing because AI and traditional HPC share fundamentally similar infrastructure needs — and equally high strategic value.

The real question isn't whether AI is replacing HPC.

It's how data centers — especially those that were never designed for this level of computational intensity — are going to adapt.