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OPINION



QUANTUM
DATA CENTERS



Quantum computers will integrate into data centers, primarily as hybrid accelerators alongside CPUs and GPUs, rather than standalone replacements, starting in 2026 via co-location and cloud models.

Hybrid integration in HPC

Quantum processors join high-performance computing clusters in data centers to handle specific workloads like simulations and optimization, minimizing data transfer latency.

Projects like HPQC at Innsbruck demonstrate successful interfacing of quantum systems with classical HPC infrastructure, paving the way for broader adoption.

Co-location and rack designs

Rack-mounted quantum systems from vendors like Orca and Oxford Instruments fit standard data center footprints, with side-loading cryostats and reduced cooling demands easing deployment.

Co-location in leased facilities allows secure, low-latency access without full ownership, accelerating enterprise use.

2026-2030 rollout

2026 sees multimodal data centers with quantum alongside GPUs for AI and molecular modeling, per TQI and GQI forecasts.

Cloud giants (AWS, Azure, IBM) integrate hybrid quantum-classical via middleware like CUDA-Q, evolving to on-site QPUs in hyperscale centers.

Challenges and adaptations

Cryogenic needs (dilution refrigerators), power spikes, and custom shielding require data center retrofits, but AI-driven changes (e.g., liquid cooling) align well.

Standards from Open Compute Project streamline installations, enabling phased pilots to full production.