Driving Innovation: Insights on HPC/AI/QC/Cloud architectures to support the future of science & engineering

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Agenda

- ❑ Vision & Convergence
- ❑ Next-Gen Compute for CAE & Chemistry
- ❑ The Cloud Journey – More Than Technology
- ❑ Semiconductor Real-World Impact & Emerging Trends
- ❑ Looking Ahead – Future of Scientific Computing

The Computational Frontier: Transforming Science and Engineering Through Integrated Architectures

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- Rapid advancements in science and engineering demand scalable, intelligent, and flexible computing
- Convergence of HPC, AI, Cloud, and Quantum is a foundational enabler
  - HPC: Foundation for physics-based modeling, simulation, and design
  - AI: Accelerating model discovery, defect prediction, and optimization
  - Cloud: Elasticity, global access, platform unification
  - Quantum: Disruption in molecular modeling and complex systems
- Focus: CAE, computational chemistry, and semiconductor R&D

Scalable Cloud Architectures for Advanced Engineering Workflows

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- Use cases: CFD, FEA, Molecular Dynamics, Quantum Chemistry simulations
- Cloud bursting for simulation-intensive workloads (ANSYS, Gaussian, LAMMPS, etc.)
- Accelerated design iterations with AI/ML in the loop
- Secure collaboration across globally distributed teams

Transforming Culture, Finances, and Technology: The Real Cloud Journey

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- **Cultural:** Upskilling, DevOps mindset, agile experimentation
- **Financial:** Shift from CapEx to OpEx, cost transparency, right-sizing
- **Technical:** Automation, CI/CD, resilient architectures
- **The 7 Rs of Migration:** Retire, Retain, Rehost, Replatform, Refactor, Repurchase, Relocate

Accelerating Semiconductor R&D with Intelligent Infrastructure

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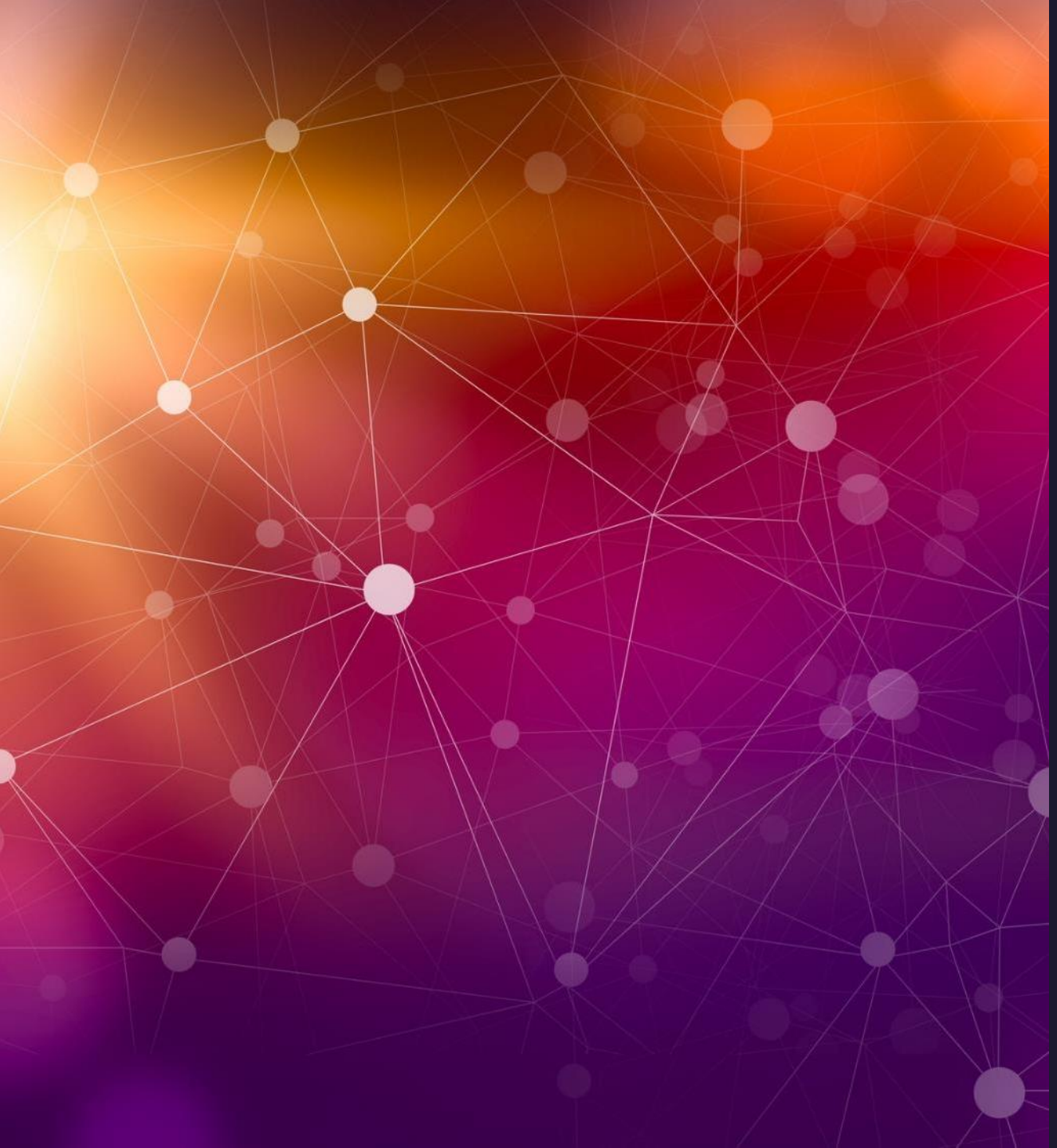
- AI + HPC in defect modeling, failure analysis, process optimization
- Quantum + Cloud for material simulation and photonics modeling
- Use cases: faster tape-out, reduced design cycles, higher yield
- Metrics: reduced turnaround time, cost savings, global engineering agility



The Future of Engineering is Predictive, Intelligent, and Scalable

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- AI-native platforms for design & discovery
- Quantum integration to solve intractable molecular and optimization problems
- Rise of HPC-as-a-Service and cloud democratization
- Final thoughts: Organizations must invest in agility, interoperability, and innovation-ready architecture

Thank you

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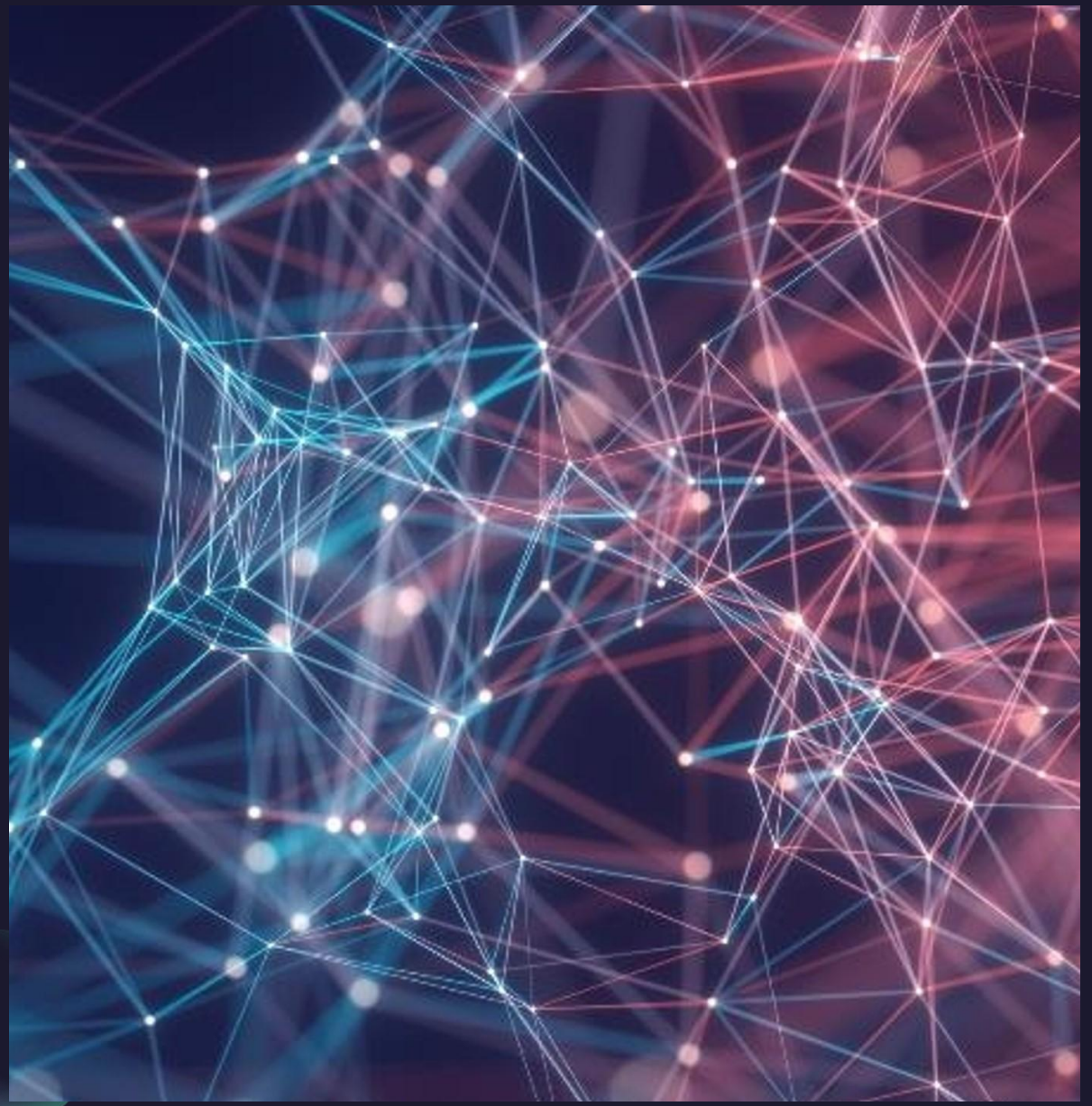
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