The Impact of eScience on Industry:

Revolutionizing Research, Innovation, Efficiency, and Competitiveness

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Introduction

- eScience includes:
  - Advanced computing
  - Big data analytics
  - AI/ML
  - Collaborative tools
- These have reshaped industry globally
- Industry innovates through eScience
- NCSA (and its Industry program) has aligned eScience with industry challenges since 1986, offering consulting and expertise in:
  - AI/ML/data analytics
  - Modeling & simulation
  - Genomics/bioinformatics
  - Cyberinfrastructure including cybersecurity

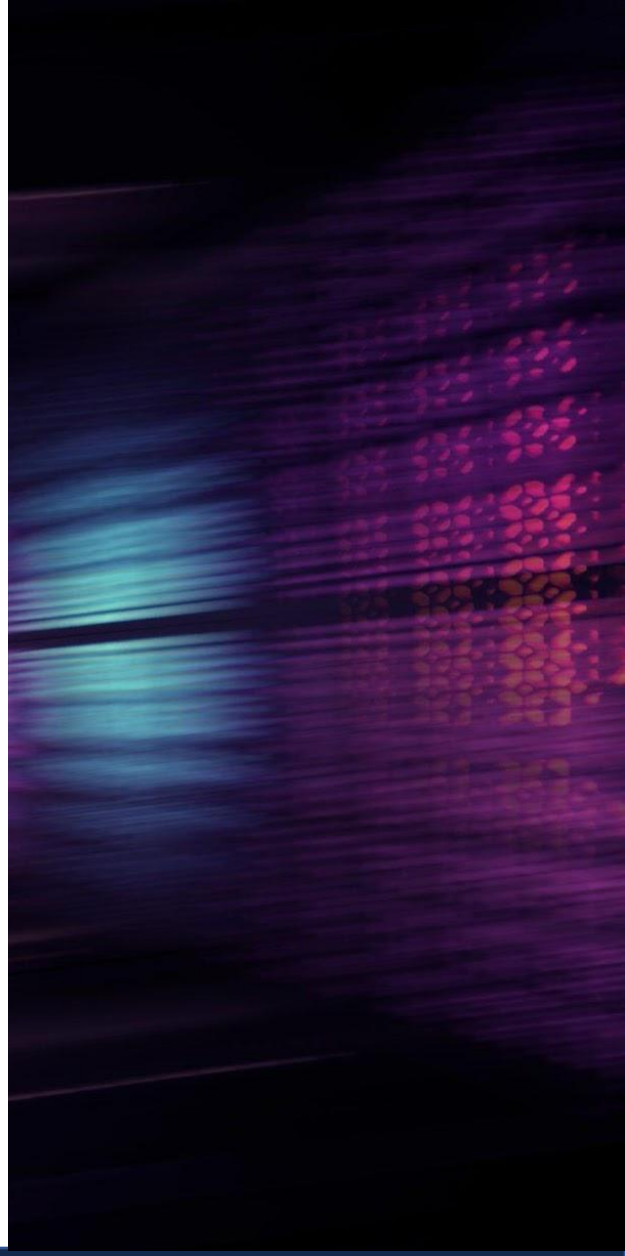
Enhancing industrial research

Companies continue to learn what advanced computing, AI, and more can do

- Optimizing workloads → speed = ROI
- Deeper solutions, thanks to GenAI, LLMs, etc.
- Impacts many parts of operations, not as specialized as in years past
    - Supply chain, trading, digital twins, genome mapping, hazardous detection, digital agriculture, and more

NCSA first listens to industry's needs

- May need compute
- Identify domains (AI, modeling, etc.) for solutions
- Align expertise to provide consulting
- Not pushing our own research



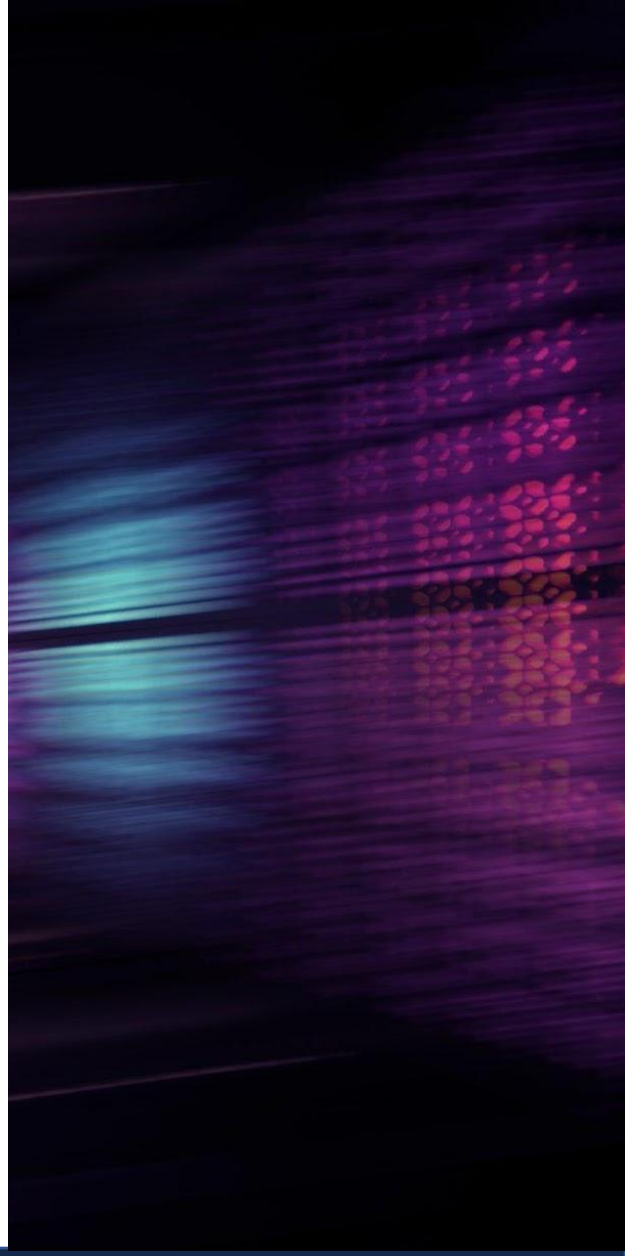
Case study: Pharmaceutical

Company: AbbVie

- Fortune 500 #77 despite split from parent company (Abbott, #108)
- Leading innovative drug discovery company
- US HQ with operations globally

Needs & Solutions

- Compute: we host all R&D compute resources and advise on updates and future direction
- Genomics domain expertise: we do some work at their request, other work collaboratively with their teams
- AI: we understand their challenges/opportunities and offer AI-driven solutions



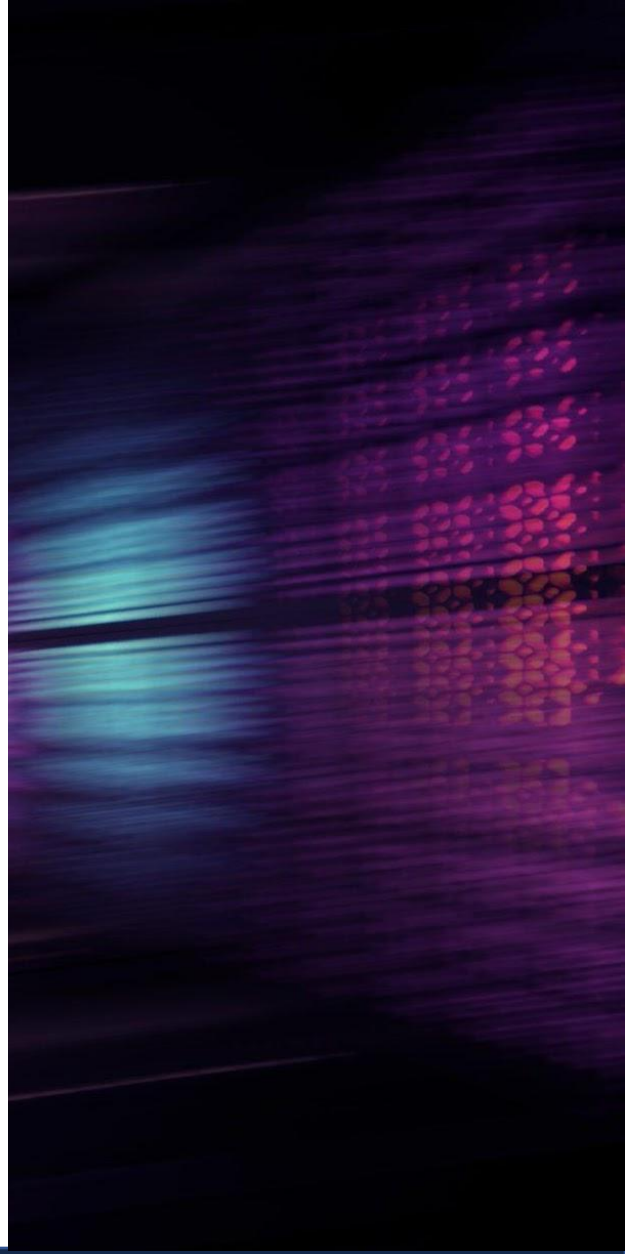
Case study: Energy

Company: Phillips 66

- Fortune 500 #17
- Multinational company in the midst of digital transformation from traditional oil & gas to energy company

Needs & Solutions

- Global supply chain bottlenecks: particularly during pandemic, developed analysis and optimization of supply chain management
- Methane leak detection pipelines around the world: working closely with them to develop predictive analysis and maintenance, impacting safety and bottom line
- Octane optimization: advanced data analysis allowed us to optimize refinement performance, resulting in $18-24 million in annual savings for each level of octane



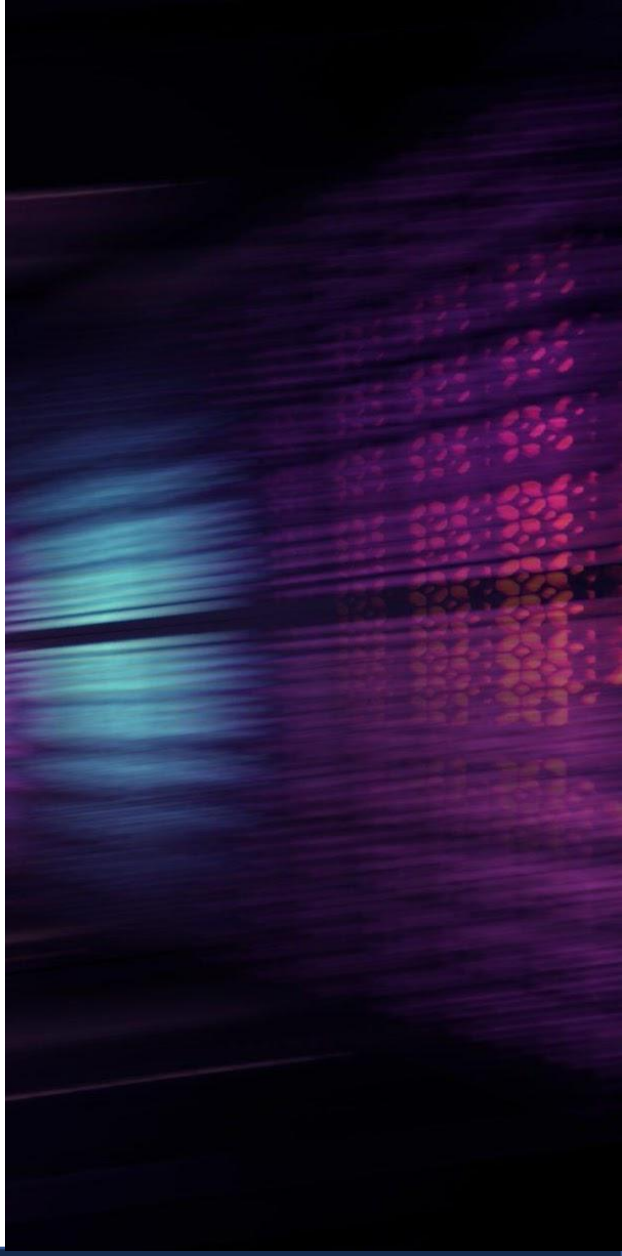
Case study: Manufacturing

Company: Caterpillar

- Fortune 500 #68
- World's largest manufacturer of construction equipment

Needs & Solutions

- Computing: Hosted advanced computing resources so that they could focus on their strengths
- Research & innovation: provided consulting and thought leadership, application development support, and advanced computing for over 30 years
- AI: Using consulting and proof-of-concept project development to demonstrate what AI can do to enhance their efficiency and operations



Quantifiable impacts

- Often difficult to share quantifiable data usually due to confidentiality
- Case studies
  - Phillips 66: as noted, $18-24 million in annual savings for each octane level
  - We have confidential data from Caterpillar and AbbVie; they continue to be satisfied with our work and continue as partners (Caterpillar since 1990, AbbVie since 2016)
- Other examples
  - John Deere: analytics work that resulted in $17 million annual savings
  - ExxonMobil: modeling reservoir opportunities in 2017 on Blue Waters returned $1B in identified reserves

Technology choices

- Cloud is an area where companies are different
  - Some migrated everything to the cloud, typically with AWS, Azure, or Google
  - Most have multiple offerings or solutions, including commercial cloud, on-prem, or others, like NCSA with a garden of different machines and architectures

- Our point-of-view (like that in other centres)
  - Keep up with system advancements in many environments, providing versatile knowledge so that companies can make best decisions
  - Relatively agnostic in terms of which machine, recommend most effective choices to address needs

Generalizing case studies

- Our expertise helps industry optimize operational efficiency
  - Advanced computing = speed
  - AI = deeper and optimized results
- Our experience with advanced resources leads to new possibilities
  - Not just what resources can bring, but how to best use them to
    - Do the same things faster, better, cheaper
    - Do more things

Future directions

- Continued advancements in AI (generative, LLMs, et al.)
- Compute progress into exascale
- Exploring and providing advice on quantum

Conclusions

- Companies often don’t understand what’s possible with supercomputers and their varied possible solutions
- We add valuable resources to their efforts without adding payroll, a top cost in large companies
- We can serve as their advanced research & development team, keeping up with constantly changing solutions, helping them stay competitive and profitable

Thank you! Questions?

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