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# Optimizing the Delivery of High-Performance Workstations for Geophysical Workflows in Subsurface Exploration

## I. Motivation

The energy industry's increasing reliance on high-performance computing (HPC) is driven by the need for advanced digital tools to support subsurface exploration and reservoir analysis. Hybrid IT environments, integrating on-premises infrastructure and cloud resources, aim to meet the growing computational demands of these workflows. However, this hybrid approach introduces complexities in managing user access, coordinating virtual workstations, and maintaining optimal performance across platforms. These challenges are critical because geophysical simulations and reservoir modeling require immense computational power and must ensure seamless end-user experiences.

## II. Hypothesis

A hybrid IT infrastructure, where cloud resources are dynamically provisioned, can optimize the balance of workloads between on-premises and cloud platforms. By integrating cloud-based virtual workstations for geophysical analysis, Chevron was able to overcome previous inefficiencies in their IT systems.

Traditional models have failed to efficiently balance computational resources and manage power, leading to underutilization and unnecessary costs. This approach differs by focusing on real-time resource provisioning, automating power management, and ensuring scalable and flexible infrastructure that aligns with the energy industry's evolving needs.

## III. Methods and Results

Chevron's approach involved the replacement of outdated systems with a modern hybrid environment that integrates on-premise and cloud resources. This system dynamically provisions virtual workstations for geophysical workflows, ensuring efficient compute usage without compromising performance. The solution led to significant operational cost savings by automating power management, provisioning, and the allocation of virtual workstations. The results showed improved computational performance, a simplified end-user experience, and a more efficient use of resources. Chevron's geophysicists saw enhanced productivity, enabling them to solve complex problems more efficiently.

## IV. Conclusion

The implementation of a dynamic, hybrid IT environment optimized Chevron's infrastructure for geophysical workflows, reducing costs and enhancing performance. This solution demonstrates the value of modular, scalable systems in high-performance computing. Future work will focus on further automating resource allocation and enhancing flexibility to adapt to emerging technologies in subsurface exploration.

 