

Risk Management through Grid Computing Techniques in AWS

Introduction

Financial services are crucial for global economic activities, serving as intermediaries for monetary transactions and investments. The paper outlines the increasing reliance of financial services on High-performance Computing (HPC) to manage risk and evaluate portfolios. However, the complexity and costs of on-premises HPC infrastructures are escalating. The paper proposes that Amazon Web Services (AWS) offers an alternative with scalable resources that can expedite processing, reduce costs, and enhance accessibility.

Challenges

The challenges in risk management are manifold. On-premises HPC grids are capital-intensive and limited by physical space, leading to longer run times for risk calculations and potential SLA violations. Regulatory and market changes demand flexible computing infrastructure, while development and testing for new financial models require additional and separate computing environments, often leading to backlogs and inadequate computing resources.

AWS Compliance

AWS offers financial services the required compliance with its high-security infrastructure that undergoes rigorous certifications. By aligning with compliance standards such as FIPS, FINRA, FISMA, FedRAMP, and SOC, AWS provides a secure foundation that simplifies the transition from on-premises systems to cloud-based solutions.

AWS Security

Security on AWS is fortified through tools such as the Virtual Private Cloud, enabling the creation of isolated network spaces, and the Key Management Service for managing encryption keys. IAM provides granular access controls, and CloudTrail offers comprehensive logging for regulatory compliance, offering a security-first approach for sensitive financial computations.

Grid Reference Architecture

The grid computing architecture for risk management in financial services features a scalable array of compute nodes linked by a high-throughput, low-latency network, essential for parallel processing of complex simulations. A multi-tiered storage system accommodates rapid access and long-term data retention, while a central scheduler efficiently distributes tasks. An orchestration layer automates resource management, adapting to workload demands. Security measures, including encryption and access controls, ensure compliance with regulatory standards. High availability and disaster recovery mechanisms maintain system integrity, making this architecture a robust, flexible solution for financial risk analysis.

Performance

Performance on AWS is unmatched, thanks to its expansive global infrastructure, availability zones, and a proprietary network that ensures high throughput and low latency, crucial for HPC grids. Instance types are tailored to various workloads, with P2 instances featuring NVIDIA Tesla K80 accelerators that significantly reduce the size and cost of necessary grids for complex risk calculations. Storage options like EBS and EFS meet the high-performance demands of grid computing, facilitating efficient data flow during computations.

Conclusion

AWS emerges as a powerful ally for financial institutions, addressing the essential need for dynamic risk management systems. It offers scalable, flexible, and cost-effective solutions for HPC grids that surpass traditional on-premises capabilities. As financial services increasingly adopt cloud-based infrastructures, AWS stands out with its comprehensive suite of services that cater to the high stakes of financial risk management.