Architecture Diagrams

Power Grid Simulation with High Performance Computing on AWS

Power Grid Simulation with High Performance Computing on AWS: Architecture Diagrams

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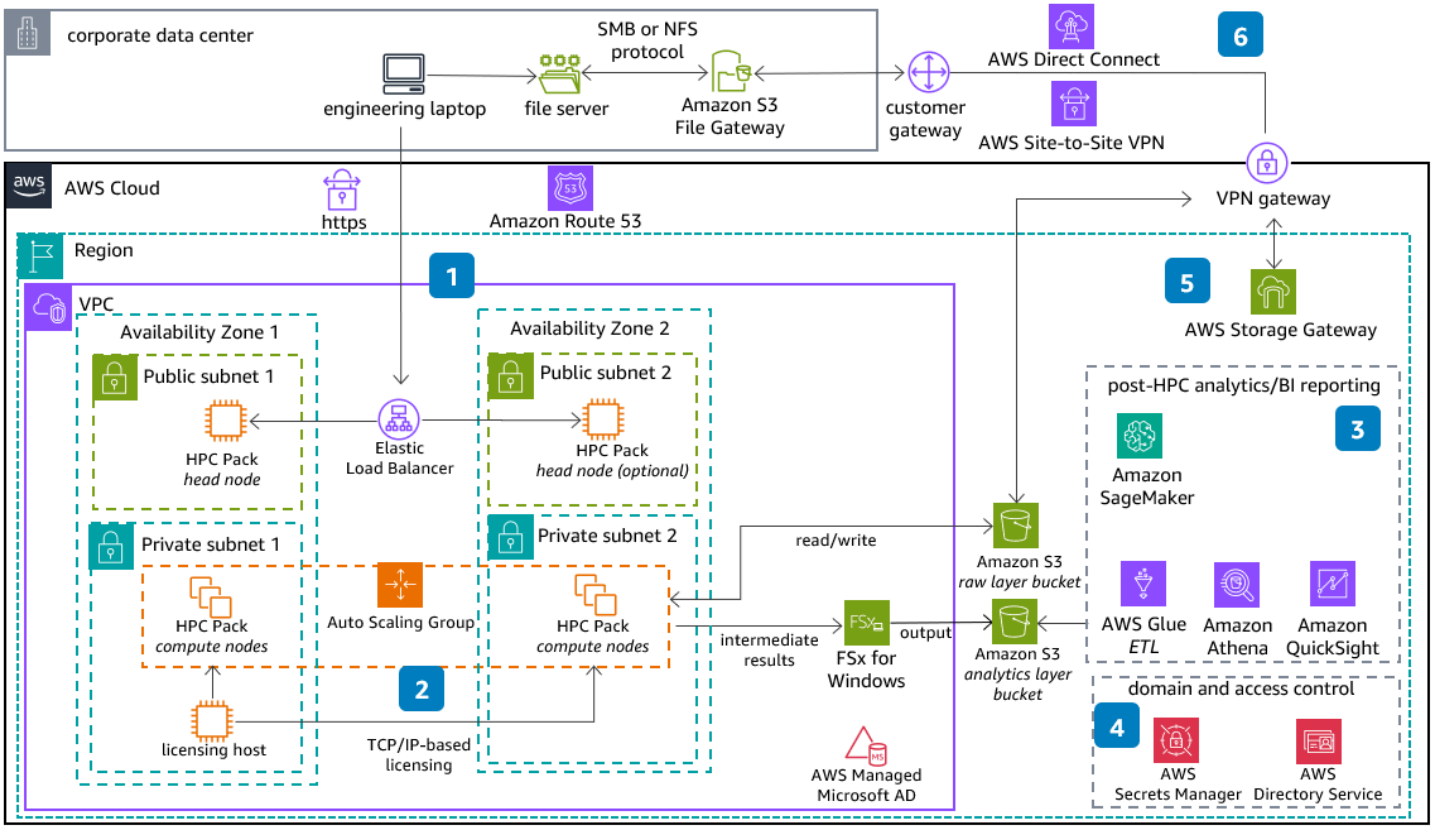
Publication date: **August 10, 2023 (Diagram history)**

This reference architecture shows power utilities how to run large-scale grid simulations with high performance computing (HPC) on AWS and use cloud-native, fully-managed services to perform advanced analytics on the study results. Find insights from output using serverless data integration, interactive query, and machine learning (ML) methods to help with grid planning and operations.

Power Grid Simulation with High Performance Computing on AWS Diagram



1. Provision a secondary head node if you need high availability (HA) for the cluster. Use an **Elastic Load Balancing** load balancer to distribute traffic to the head nodes and **Amazon Route 53** to create an alias record that points to your load balancer.

2. Install HPC Pack on the head node and compute node to form a Windows-based cluster. Use target tracking scaling policies with the right metrics—for example, number of queued jobs and online nodes—to dynamically scale the **Amazon EC2 Auto Scaling** group for compute nodes. The launched instances should be protected from being terminated before they process a certain number of jobs to reduce average waiting time due to initialization. Compute-optimized instances are recommended for the compute node (for example, c6id).
3. Use **AWS Glue** to perform the Extract, Transform, Load (ETL) task on data saved in **Amazon Simple Storage Service** (Amazon S3). Analyze the data with **Amazon Athena** through interactive Structured Query Language (SQL) queries. Connect the results with **Amazon Quick Sight** for Business Intelligence (BI) reporting and actionable insights delivery. Use **Amazon SageMaker AI** to identify power grid operation patterns and detect anomalies.
4. Use **AWS Directory Service** to run Microsoft Active Directory (AD) for the cluster and allow access to the head node. Use **AWS Secrets Manager** to store sensitive information such as AD credentials for the provisioned directory.
5. Use **AWS Storage Gateway** to allow engineers to directly store and retrieve data in **Amazon S3** through an on-premises file server. Use **Amazon FSx for Windows File Server** to store intermediate results during job processing.
6. Power utility customers can set up private network connectivity between their corporate data center and AWS with services such as **AWS Site-to-Site VPN** and **AWS Direct Connect** to meet their security, compliance and network bandwidth objectives.

Further reading

For additional information, refer to

- AWS Architecture Icons
- AWS Architecture Center
- AWS Well-Architected

Contributors

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Diagram history

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Change	Description	Date
Initial publication	Reference architecture diagram first published.	August 10, 2023

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