Genomic Data Security in the Cloud

The cloud offers the dynamic scalability required for the storage and analysis of large genomic datasets, but the use of the cloud raises concerns about keeping this data secure. Hitachi High-Tech America, Inc. (HTA) has addressed these concerns without compromising accuracy or speed.

INTRODUCTION

Data integrity and security are critical to the management of genomic data. The cloud offers on-demand scalability without the need to invest in capital equipment. However, due to its remote nature, there is general mistrust that cloud computing is actually secure. Through our collaboration with Google Cloud Platform™, HTA has developed a secure framework for the analysis and storage of genomic data.

THE HCE SECURITY FRAMEWORK

Along with data encryption, Google Cloud Platform provides a cloud infrastructure with robust built-in compliance and security features applied to the physical datacenter, and the network. HTA has further built upon this infrastructure to create a secure platform for genomic data called the HCE Security Framework.

The HCE Security Framework includes the following:

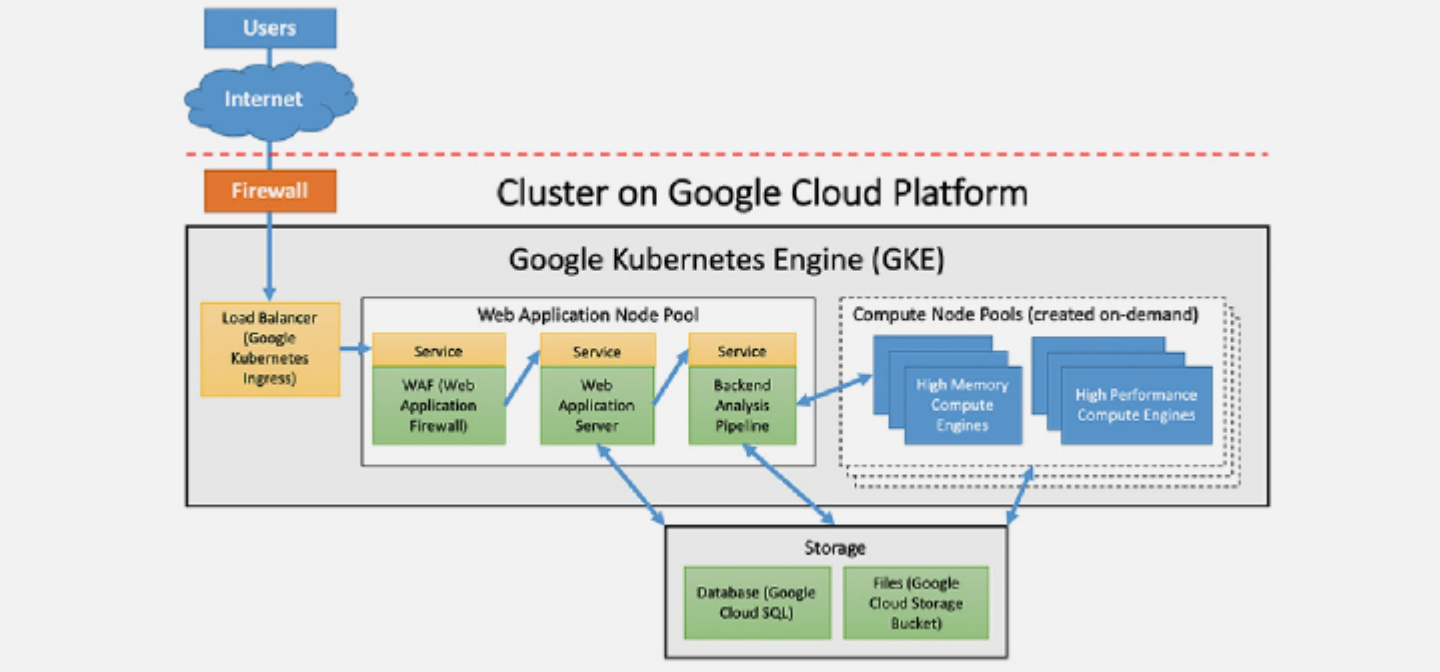
- Protection against basic attacks (e.g. port scan, DDos, etc.) by the Google Cloud
- An additional security layer applied to the default Google Firewall, called the Web Application Firewall (WAF), to prevent more sophisticated attacks such as SQL injection attacks
- Storage (Database, Files) that is 100% Google Cloud based
- Google Cloud's full data encryption

Human Chromosome Explorer is built on the HCE Security Framework.

Hitachi High-Tech America, Inc.
https://www.hitachi-hightech.com/us

For research purposes only. Not for use in Clinical Diagnostics.

The below diagram demonstrates the integration of the Google Kubernetes Engine and the HCE Cluster to form the HCE Security Framework



Attacks protected by each security component:

- Google Firewall: Port scan, IP/Port restriction, DoS/DDoS attacks
- WAF: SQL Injection, Cross-site scripting, Real-time application security monitoring, etc.

HCE SECURITY FRAMEWORK (CONT.)

In addition to the security features described above, HTA has implemented the following best practices into the HCE Security Framework to both ensure stability and further enhance security.

1. Regular assessments to discover and remediate vulnerabilities
2. Periodic penetration tests to discover vulnerabilities in the system that may not have been identified in the regular assessments
3. Audit log analysis and system-level inspection to identify suspicious behavior, potential attacks, or security breaches
4. A patch-management policy and scheduled server updates
5. Restriction of access for technical staff to resources on a per-need basis

CONCLUSION

The cloud offers a powerful platform for the storage and analysis of genomic data. However, security and privacy concerns must be addressed. Through our partnership with Google Cloud, the HCE Security Framework brings trust to the platform. Finally, as security needs, concerns, and regulations will change and evolve, so will this framework. HTA is committed to security.