AWS CLOUDATHON : GROUP 1 (Karanjit Singh, Tritan To, Krishma Perry, Tedrick Tang, Sania Bandekar)

Overview: San Jose State University's (SJSU) CampusHub portal is migrating its student portal infrastructure (web server + database) to AWS while maintaining on-premises faculty authentication systems. The objective is to enhance performance, security, reliability, and cross-campus connectivity, especially for the satellite campus in Boston. This hybrid architecture ensures critical systems remain accessible, scalable, and protected.

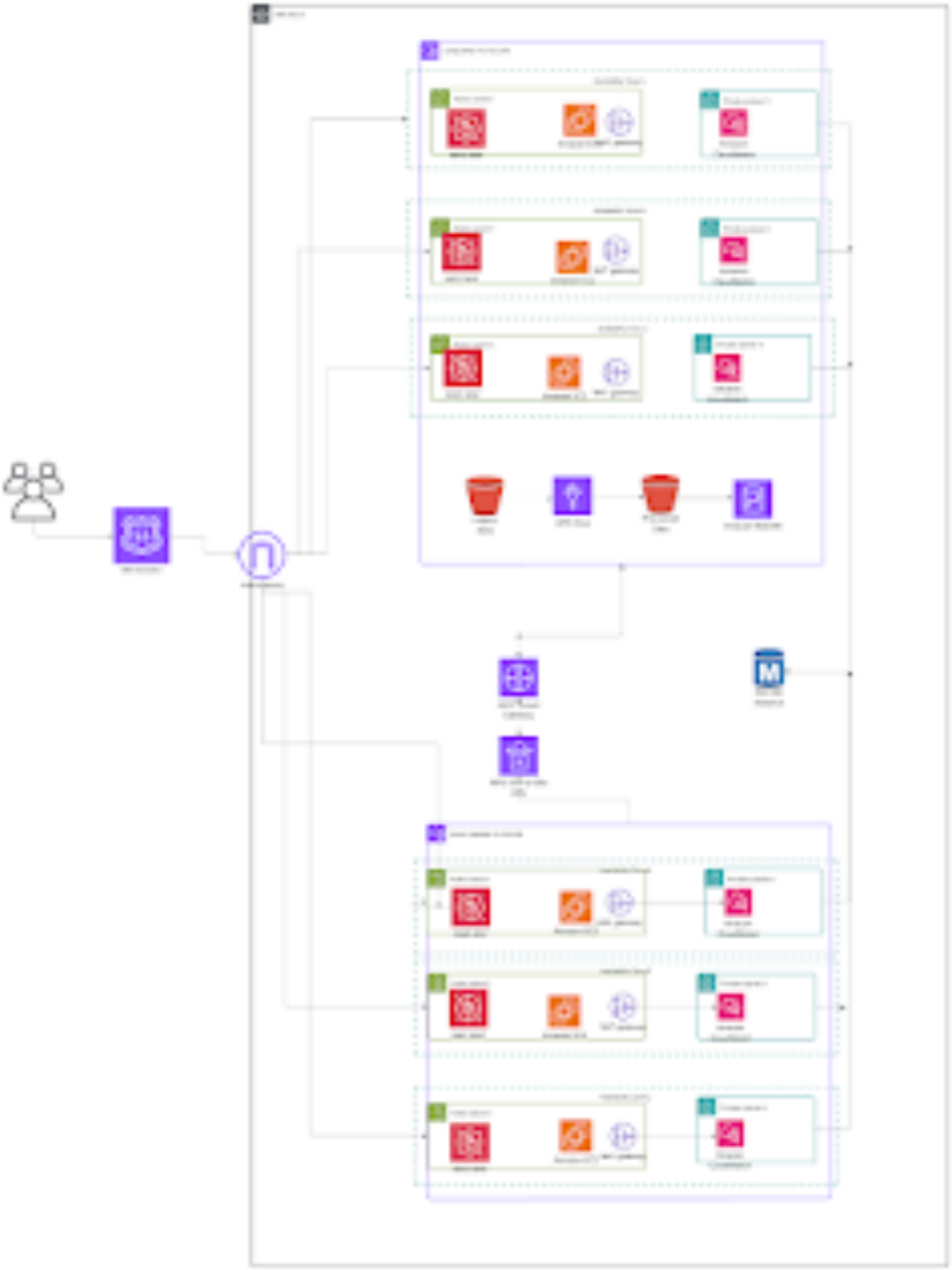
Solution Summary:

- Web application and database hosted on AWS in a secure Virtual Private Cloud (VPC).
- On-premises authentication system linked via AWS Direct Connect and Site-to-Site VPN.
- Application Load Balancer (ALB) manages web traffic, with HTTP to HTTPS redirection.
- AWS WAF (Web Application Firewall) protects against common threats.
- Monitoring through CloudWatch and logging via CloudTrail.
- Disaster Recovery using automated EC2 and RDS backups to S3.

Architecture Diagram (Textual Description):

- Users access the Application Load Balancer.
- ALB redirects HTTP to HTTPS and forwards traffic to EC2 web servers in private subnets.
- EC2 web servers communicate with RDS databases securely.
- Direct Connect links AWS to on-prem authentication servers.

- Boston campus connects via Site-to-Site VPN.
- Transit Gateway manages all network routes.
- CloudFront and Global Accelerator optimize global access.
- S3 used for backup and recovery.
- Migrating Data: Legacy Data S3 -> AWS Glue -> Processed S3 -> RedShift



Design Choices Justification

Hybrid Connectivity:

- **AWS Direct Connect:** Fast, secure private line between SJSU on-premises authentication servers and AWS VPC.
- **Site-to-Site VPN:** Cost-effective secure link for Boston campus to AWS.
- **Transit Gateway:** Simplifies network management by connecting VPCs, VPNs, and Direct Connect seamlessly.

Application Delivery and Security:

- **Application Load Balancer (ALB):** Distributes web traffic, redirects HTTP to HTTPS, supports WAF integration.
- **AWS WAF:** Protects the student portal from OWASP Top 10 vulnerabilities and DDoS attacks.
- **CloudFront (Optional):** Improves global access speed, especially for the Boston satellite.
- **IAM Roles and Security Groups:** Enforce least privilege and network access control.

Monitoring and Management:

- **CloudWatch:** Real-time dashboards and alarms for EC2, RDS, VPN, Transit Gateway traffic.
- **CloudTrail:** Logs all API actions for security auditing and compliance.
- **SNS Notifications:** Immediate alerts for critical system failures (e.g., VPN down, high CPU usage).

Backup and Disaster Recovery:

- **Automated EC2 and RDS Snapshots:** Daily backups managed by Lifecycle Manager.
- **S3 Storage:** Stores backups with versioning and encryption.

- **Multi-AZ Deployments:** Ensures high availability for RDS databases.

Scalability and Resilience:

- **Auto Scaling Groups:** Add/remove EC2 instances based on traffic demands.
- **Global Accelerator:** Reduces latency for geographically dispersed users.
- **Multi-AZ and optional Multi-Region DR:** Ensures business continuity during outages.

Estimated Monthly Costs:

AWS Service	Estimated Monthly Cost
AWS Direct Connect (1 Gbps)	~$250
Transit Gateway Attachments	~$100
Site-to-Site VPN (Boston Campus)	~$37
EC2 Instances (Web Servers)	~$500 (depends on usage and auto-scaling)
Application Load Balancer (ALB)	~$20
S3 Storage (Backups and DR)	~$25
CloudWatch Monitoring + Alarms	~$30
AWS WAF (Web Application Firewall)	~$20
AWS Global Accelerator (Optional)	~$18

Total Estimated Cost: ~$1,400 to $1,600 per month *(varies depending on actual usage, data transfer, and scaling)*

Predicted Challenges:

- **Traffic Flow Issues:** Ensuring proper routing between Direct Connect, VPN, and VPCs without introducing bottlenecks.

- **Transitive Routing Management:** Correct configuration of Transit Gateway attachments and route tables is crucial.

- **Latency Concerns:** CloudFront and Global Accelerator minimize, but not eliminate, East Coast user latency.

- **Failover Complexity:** Proper DNS failover setup in Route 53 for disaster recovery is vital.

Conclusion: This AWS hybrid network migration empowers SJSU CampusHub with secure, scalable, and resilient infrastructure. It modernizes the student experience while maintaining mission-critical on-premises faculty systems, future-proofing the university's digital transformation.