

Architecture Diagram(s)

Overview: The architecture diagrams present a comprehensive multi-region AWS infrastructure designed for GlobalEdNet MVP testing. This solution ensures secure, compliant, and scalable environments across different geographical locations, specifically tailored for GDPR compliance in Frankfurt and Australian Privacy Act compliance in Sydney.

Key Components:

1. Regional Distribution:

- Primary regions: Frankfurt (eu-central-1), Sydney (ap-southeast-2), and Virginia (us-east-1)
- Each region follows the same architectural pattern for consistency

2. Networking:

- VPC with public and private subnets in each region
- NAT Gateway for outbound internet access from private subnets
- AWS WAF (Web Application Firewall) for edge security
- Amazon CloudFront for content delivery and edge security

3. Compute and Application Services:

- User Workloads (Student Portal, GenAI Assistant, LMS Extension)
- App Services using ECS/Lambda/API
- Lambda Proxy Layer for Bedrock InvokeModel

4. Storage and Databases:

- S3 buckets for various purposes (DataBucket, ConfigBucket, TrailBucket)
- Amazon Bedrock for AI models (region-limited)

5. Security and Compliance:

- AWS Config for conformance packs and snapshots
- AWS KMS for encryption
- AWS Security Hub for centralized security management
- AWS CloudTrail for API and user activity logging
- IAM for identity and access management

6. AI and Machine Learning:

- SageMaker Notebook for AI development and training
- Integration with Amazon Bedrock for AI model invocation

Network Flow: Internet traffic enters through CloudFront and WAF, then is directed to the appropriate region via ALB. Within each region, traffic is routed to the necessary services in public or private subnets. Cross-region communication is controlled by global policies and inter-region data guards.

Security Implementation:

- Multi-layered security approach with WAF, Security Groups, and IAM

- Encryption at rest and in transit using AWS KMS
- Continuous monitoring and compliance checks via AWS Config, CloudTrail, and Security Hub

Regional Compliance:

- Frankfurt (Region-1): Configured for GDPR compliance with audit-ready logging and EU-scoped KMS encryption keys
- Sydney (Region-2): Tailored for Australian Privacy Act compliance with region-restricted S3 data and compliance monitoring

Performance and Scalability:

- Low latency (<200ms) and 300% horizontal scalability via ALB and Auto Scaling
- Global content delivery through CloudFront

This architecture provides a robust foundation for GlobalEdNet's MVP testing, ensuring regulatory compliance, security, and scalability across multiple geographical regions.

