# Streamlining API Management and Governance with MuleSoft Flex Gateway

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## Key Issues

- Multi-cloud environment complexity affecting environment setup and connections.

- Challenges in finding and applying suitable API Manager APIs for varied policies.

- Complex authentication with unique Azure AD tokens per API and dual-token models (OAuth + AD).

- Requirements for non-weighted, header-based blue-green deployment.

- Manual configuration challenges within existing CI/CD pipeline and Flex Gateway integration

## Solutions

Aspire designed and implemented a robust MuleSoft Flex Gateway architecture deployed in Azure Kubernetes Service (AKS), integrating seamlessly with the existing DevOps ecosystem. The migration began in the Dev environment and progressed through Test and Production in stages. Aspire enhanced

## About the Customer

The customer is one of the largest convenience store chains in the Midwestern and Southern United States, operating over 2,500 stores across 16 states. With annual revenues exceeding $9.35 billion, the customer has a strong commitment to innovation and operational excellence. To continue leading in customer experience and digital transformation, the company set out to modernize and consolidate its API management approach.

## Highlights

The customer had an existing Azure-based API ecosystem with a well-established CI/CD pipeline, Azure Function Apps, and API policies applied across Dev, Test, and Production environments. However, to improve control, governance, and API reusability, they aimed to migrate all Azure APIs to MuleSoft API Manager via Flex Gateway, MuleSoft's lightweight, high-performance API gateway.

The initiative also required deploying Flex Gateway within an Azure Kubernetes Service (AKS) cluster and updating existing DevOps scripts to support automated deployment, policy enforcement, and secure access management. Aspire was engaged to drive the end-to-end implementation and standardize the platform for long-term scalability.

the CI/CD pipeline by clearly separating Azure Function App deployments from API Manager configurations, enabling flexible, policy-driven API governance. Key features included real-time monitoring, custom header-based routing, security policies (JWT, OAuth 2.0), container probes for high availability, and OKTA-based self-service access to APIs.

## Benefits

- Simplified API migration from Azure to MuleSoft Flex Gateway with zero downtime.

- Centralized API security using MuleSoft Secret Manager with TLS, OAuth, and custom header policies.

- Automated deployment and policy application reduced manual effort and configuration errors.

- Real-time API monitoring and health checks improved visibility and operational control.

- Enabled scalable governance and onboarding with self-service API access through OKTA.

## The Challenges

Complex Environment Setup: Integrating multiple components such as Azure Function Apps, Flex Gateway, API Manager, and AKS, across cloud platforms made environment setup and connectivity challenging.

- **Policy Mapping for APIs:** Identifying the appropriate MuleSoft API Manager APIs and aligning them with the specific policy requirements of each Azure Function App was time-consuming and error-prone.

- **Dual Authentication Complexity:** Each API required a unique Azure Active Directory (AD) token along with OAuth 2.0, making it difficult to create standardized Flex Gateway policies across services.

- **Blue-Green Deployment Constraints:** Traditional weight-based traffic distribution was not an option. The customer required header-based routing, which added configuration complexity to ensure seamless version rollouts.

- **CI/CD Integration Challenges:** The existing Azure DevOps scripts needed significant enhancements to integrate smoothly with MuleSoft API Manager. Ensuring accurate policy application and version control within the pipeline required extensive customization.

## The Solution

- Deployed Flex Gateway on Azure Kubernetes Service (AKS) for scalable, high-performance API handling.

- Implemented real-time monitoring, liveness/readiness probes, and auto-scaling to ensure uptime and availability.

- Applied OAuth 2.0, JWT validation, and API-level header management policies for secure, customized API access.

- Enhanced CI/CD pipeline using Azure DevOps to automate deployment and apply policies consistently across all environments.

- Configured OKTA as the identity provider, enabling developers and consumers to request API access via self-service.

- Managed blue-green deployments using complex header-based routing instead of traditional traffic weighting.

- Supported full API lifecycle: from design and test to secure production deployment via Any point API Manager.

## Architecture Diagram
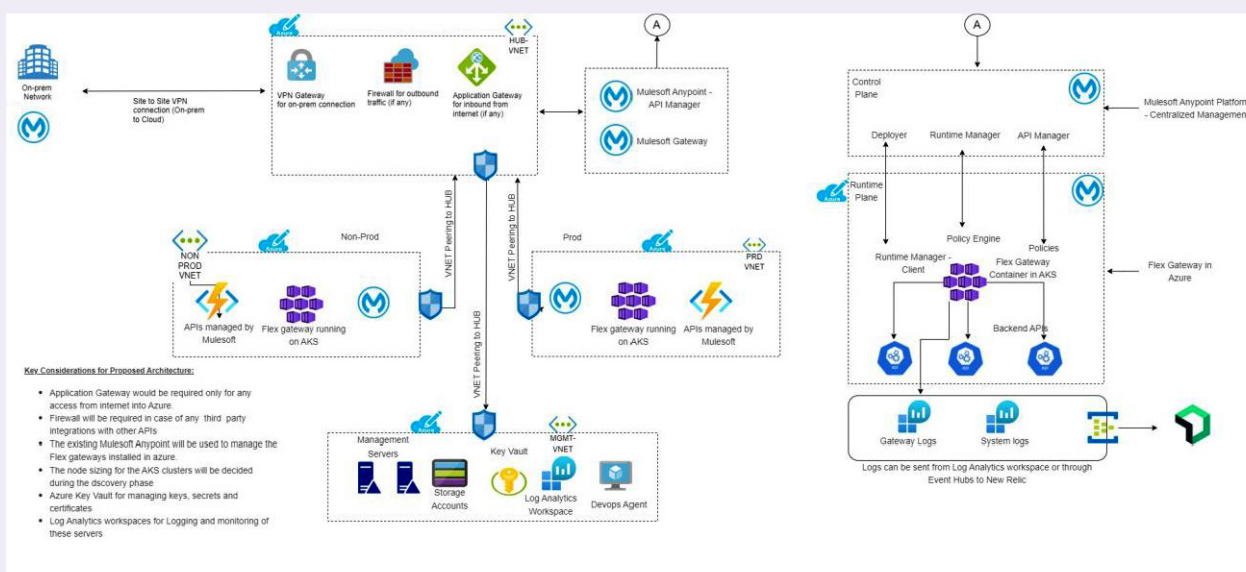
## The Results

Aspire's implementation of MuleSoft Flex Gateway delivered a unified, secure, and scalable API management framework that met the customer's goals of performance, governance, and automation. The migration from Azure API Gateway to MuleSoft was executed without service disruptions and significantly improved API visibility, access control, and deployment efficiency.

**KEY OUTCOMES:**

» **Centralized API Management:** Migrated 18 Azure Function App APIs to MuleSoft Flex Gateway, enabling streamlined governance, monitoring, and policy control from a single platform.

» **Enhanced API Security:** Applied OAuth 2.0 and JWT validation policies to secure all APIs. TLS context was configured via MuleSoft Secret Manager for secure API communications.

» **Improved Deployment Efficiency:** Integrated MuleSoft API Manager APIs into the Azure DevOps pipeline, automating deployment tasks and ensuring consistent policy application.

» **Zero Downtime Deployment:** Implemented a header-based blue-green deployment strategy to support seamless release of new API versions without impacting users.

» **Custom Header Management:** Enabled fine-tuned API behavior by implementing header injection and removal policies, tailored to each individual API's requirements.
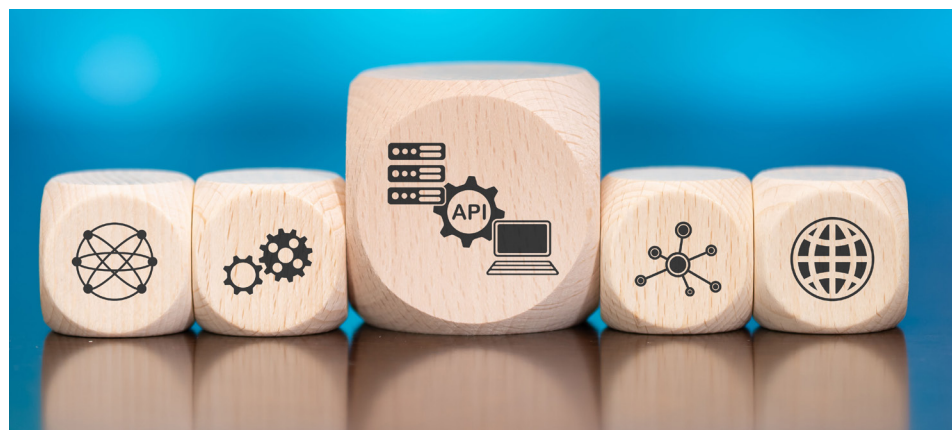
# Technology Snapshot
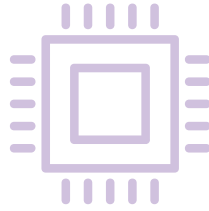
» **Container & Orchestration:** Azure Kubernetes Service (AKS)

» **API Gateway:** MuleSoft Flex Gateway 1.5

» **Runtime Management:** MuleSoft Runtime Manager

» **API Governance:** Any point API Governance

» **Marketplace:** Any point Exchange

» **Source Code Management:** Azure Repos

» **CI/CD:** Azure Pipelines

» **Testing:** Postman

» **Infrastructure as Code:** Terraform

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