Better Together:

Using Service Mesh And API Management As Complementary Components For Successful Application Modernization

Google Cloud

White paper
June 2021

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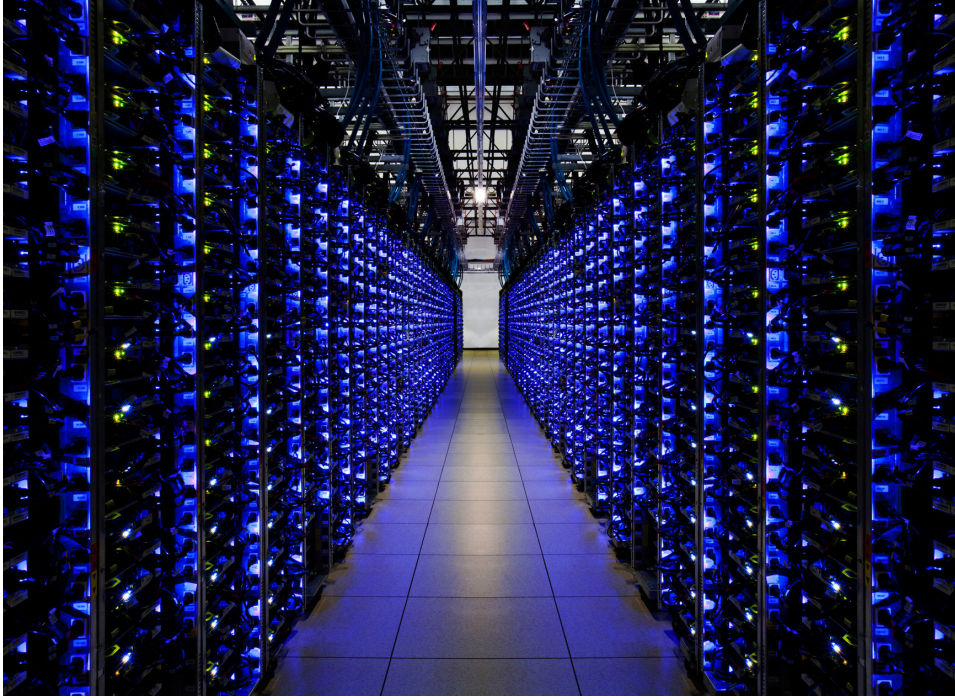

Executive Summary

Organizations across industry, geography, and size are accelerating their digital transformation efforts with a focus on application modernization. By leveraging cloud-native technologies and modern development practices, organizations are able to innovate faster by giving developers, partners, and customers unique ways to interact with existing products and services.

Two widely-used modern development practices – APIs and microservices – play a critical role in application modernization and are sometimes referred to interchangeably in the context of composing applications and service-to-service communication. Though these technologies are related, there are distinct benefits to each. While a service mesh manages service-to-service communication and helps companies to realize improved network standardization, API management allows companies to manage the lifecycle of APIs, including publishing, consumption, governance, and usage analytics.

In this report, we'll explore the role of API management and service mesh technology in the context of the enterprise application modernization journey. You'll learn about the unique benefits of the two technologies and how API management and service mesh work together to provide a comprehensive solution for the modern enterprise.

Introduction

Businesses everywhere are now operating in the new reality of rising customer expectations, rapidly evolving consumer demographics, and competition that emerges faster and from unexpected sources. From manufacturing and healthcare to retail and hospitality, there's a new urgency around working from home, e-commerce, and online logistics. As a result, the momentum around digital transformation is building across industries, and IT leaders face mounting pressure to become increasingly agile and innovative, while also keeping costs down.

To spur a faster pace of innovation, organizations are increasingly adopting a transformational approach to application modernization. Using the rapid deployment of technologies such as APIs and microservices to deliver new and innovative experiences to customers at a global scale, businesses are able to keep up in an ever-connected, always-on digital world.

The challenge for modern businesses isn't simply to continue delivering innovation, but to continue delivering innovation in a sustainable, efficient, and scalable manner. Organizations must embrace a shift in the nature of supply and demand, replacing resource-constrained strategies with infinitely replicable digital assets and new opportunities around economies of scale. In other words, success requires a fundamental transition in the way companies build applications internally to power customer experiences externally.

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Successful efforts to modernize applications typically fall into two main components: a move to the public cloud and adoption of modern development practices.

Adopting public cloud technology can reduce infrastructure costs and management overhead by consuming the provider's data center assets as an operating expense and allowing for a single view of that consumption. Not only is it easy to scale consumption up and down, but new technologies (as well as security upgrades) can be adopted in real time.

Furthermore, adopting modern development practices such as serverless deployment, continuous integration/continuous delivery (CI/CD), API-first approach, and a microservices-driven architecture means teams can spend even less time on operations and more time on innovation – freeing up resources and people.

In the realm of modern development practices, APIs and microservices are sometimes referred to as interchangeably in the context of composing applications and service-to-service communication. While API management and service mesh technologies have long been used individually, we'll explore the tangible benefits of using the two technologies together to further accelerate any organization's application modernization journey.

Service Mesh: Modernized Service Networking

Microservices-based architectures are increasingly common in the modern enterprise, as the use of independent, modular services allows organizations to realize a host of benefits such as increased autonomy, flexibility, and modularity. However, challenges around standardization, fragmentation, and security can arise when decoupling monolithic applications into smaller services. Service mesh helps to address these complexities.

Most companies begin their app modernization process by adopting containerization – using cloud technologies like Kubernetes to break down monolithic applications and gradually move to services-based architectures that run across varied environments. Because containerization often leads to an exponential growth in the number of available services, this shift from monolithic legacy apps to cloud-native apps can present a number of challenges to IT teams. For example, when adopting a public cloud environment, developers must assemble apps using loosely-coupled microservices to ensure portability in the cloud, and ops teams must manage these new cloud-native apps within increasingly large and complex hybrid and multi-cloud environments.

Although networking technologies such as security and computing have modernized over time, many organizations still rely on older networking stacks. As these stacks present varying degrees of differentiation, fragmentation naturally results from the sheer complexity of managing separate platforms with different approaches. This, in turn, can cause problems across areas, including (but certainly not limited to) encryption and load balancing.

Challenges around standardization, fragmentation, and security can arise when decoupling monolithic applications into smaller services. Service mesh helps to address these complexities.

A service mesh allows network and service operators to improve reliability, bolster security and compliance, and spend less time managing.

For those seeking help in handling the ever-growing complexity, a service mesh like Istio provides a solution. Just as Kubernetes provides a consistent workload orchestration experience across environments, a service mesh aims to standardize complex paradigms at the network level. This allows teams to realize consistent service networking across platforms and workloads while gaining improved visibility and control, with in-depth telemetry for detailed insight into essential metrics and logs.

At its core, a service mesh is both an architecture that empowers **managed**, **observable**, and **secure** communication across an organization's services and the tool that enables it. This lets IT teams create robust enterprise applications made up of many microservices and on any chosen infrastructure. Because service meshes factor out common concerns of running a service such as monitoring, networking, and security, it's easier for service developers and operators to focus on creating and managing innovative applications for their users. A service mesh allows network and service operators to:

Improve reliability: A service mesh can provide deep visibility into service-to-service transactions, helping companies build more reliable services with improved visibility.

Bolster security and compliance: A service mesh can simplify compliance through more flexible security controls that allow for easier management of service-to-service encryption, authentication, as well as the authorization needed to secure services.

Deployed as a uniform layer across the entire infrastructure, service developers and operators can use Anthos Service Mesh's rich feature set without changing application code.

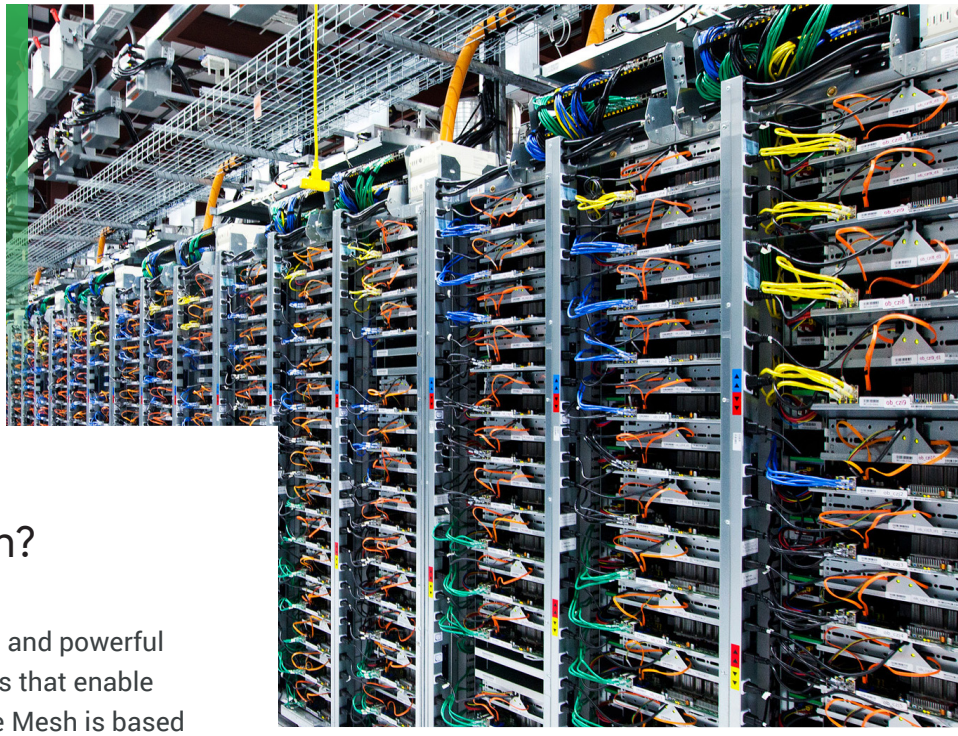
Spend less time managing: A service mesh helps IT teams to easily manage routing and load-balancing between services through a consistent traffic management control plane so that they can spend less time in the minutia of network management and more time on strategic projects to help move the company forward.

Microservices are a critical component in any organization's journey to modernize applications, and using containers and service mesh provides multi-level environmental consistency that can drastically improve their creation, delivery, and visibility.

Managed by Google, Anthos Service Mesh is a highly configurable and powerful service mesh platform powered by Istio, an open-source service mesh that helps organizations run distributed, microservices-based apps anywhere. Deployed as a uniform layer across the entire infrastructure, service developers and operators can use the rich feature set in Anthos Service Mesh without making changes to application code. This consistent transparent and language-independent approach simplifies development by removing the complexity of writing application code to interact with your network stack. Through the automation of application network functions, Anthos Service Mesh further simplifies operations by providing a consistent approach to managing networking across a diverse set of environments.

With years of experience in building and delivering services at scale, Google is uniquely positioned in this arena: Google played a key role in the development of Kubernetes and Istio – two of the world's most popular application modernization technologies. With Anthos Service Mesh, customers receive best-in-class mesh, along with built-in tooling and best practices such as:

- SLOs
- Observability dashboards
- Easy-to-adopt encryption
- Strong authentication
- Context-aware authorization through automatic mTLS and service-level access control.



What is Anthos Service Mesh?

Anthos Service Mesh is a highly configurable and powerful service mesh platform with tools and features that enable industry best practices. While Anthos Service Mesh is based on Istio, an open-source platform, Anthos Service Mesh is managed by Google, which means that organizations don't need to worry about managing upgrades on their own.

Fully managed: Anthos Service Mesh takes the guesswork and effort out of procuring and managing a service mesh solution so that organizations can focus on developing great apps (and not on managing their mesh).

Extensive visibility: A mesh can't be efficient if an organization doesn't have visibility into how it's operating. Anthos Service Mesh features robust tracing, monitoring, and logging that provide deep insights into how services are performing, and how that performance affects other processes, as well as any issues that might exist.

Simplified security: Anthos Service Mesh helps organizationsw embrace a zero-trust security model by providing the tools to automatically and declaratively secure services and communication. Organizations can manage authentication, authorization, and encryption between services with a diverse set of features — all with little or no changes to the applications themselves.

Use Case Spotlight

Financial Services: Using Service Mesh to Secure Sensitive User Data

A financial services company running across hybrid and multi-cloud deployments was tasked with meeting compliance regulations. The organization needed to encrypt service-to-service traffic, restrict access to PII data and sensitive services to authorized users, as well as audit access to restricted services.

To tackle these challenges, the organization deployed Anthos Service Mesh, which helped them to control traffic flows and API calls between services while also providing visibility into traffic and use. The team appreciated the easy-to-use functionality of Anthos Service Mesh, as upgrades are managed by Google and do not need to be manually handled by the financial services organization itself. Furthermore, upon their initial rollout of Anthos Service Mesh, the organization was able to expand on its original use cases to better observe customer-facing applications.

Using Anthos Service Mesh, the financial services organization was able to:

- Scalably roll out consistent policies across all environments, standardizing network security and communication.
- Authenticate users to prevent unauthorized access to restricted data, services, and PII.
- Log all access to sensitive services, and monitor these services for real-time use.

API-First Approach: Enabling Modern Development Practices

To remain competitive in today's market, organizations across industries must overcome technical and organizational challenges to deliver new experiences to customers, operate more efficiently and securely, and take advantage of new data-driven intelligence. While a service mesh helps to address the fragmentation that arises during the application modernization journey, API management allows organizations to initially adopt (and rapidly scale) modern development practices.

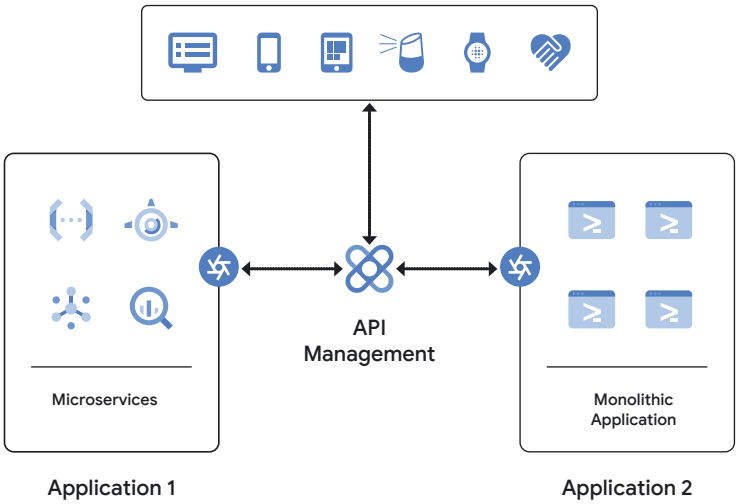
Not only does an API-first approach to application modernization inherently embrace the public cloud, but it enables organizations to extend the life of legacy applications and give older data new life in a world where constant innovation at scale is required for survival. APIs allow organizations to build a repeatable process wherein all internal services are shared as APIs. This approach reduces design and development time for new applications and spurs innovation.

The Benefits of an API-Driven Approach to Modernization

An API (or application programming interface) is commonly used to connect or build interfaces between systems. APIs play an integral role in digital transformation, where success relies on an organization's ability to package its services and other assets into modular pieces of software that can be repeatedly leveraged.

Liberating legacy data from silos to make it interoperable and reusable in different contexts allows organizations to innovate securely and at scale. In this application modernization journey, APIs play a critical role in making these digital synergies possible by easily allowing developers to access and combine digital assets in different systems. With proper API management, an API-first approach allows organizations to securely and rapidly realize a modernized approach to innovative application development.

Using an API-first approach, organizations can jumpstart their digital transformation initiatives, and maximize existing resources to boost developer productivity. For example, legacy applications and services that hold critical data can enable new mobile, web, and voice experiences for customers. To take advantage of legacy data, organizations are modernizing their legacy services via APIs, which unlocks and allows the legacy data to be consumed by new cloud services and apps.



API Management layer connecting legacy services with microservices to power new experiences

Then, as those legacy services are migrated or transformed into modern architectures like microservices, the API layer provides, in effect, a buffer that ensures connectivity to the front-end systems so that services remain up and running. This gives organizations the freedom to modernize backend systems without negatively impacting the customer experience on the frontend.

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APIs represent unlimited possibilities in terms of scale, security, visibility, and speed. Still, for organizations to be successful in an API-driven approach, they must adopt an API management platform that securely and centrally governs all APIs in use. Google Cloud's Apigee provides an API management platform as an abstraction layer on top of existing services and allows organizations to extend the life of their legacy applications, build modern services, and quickly deliver new experiences. Using Google's Apigee API management, organizations can modernize with ease:

Develop services faster: API management allows organizations to bring new services to market more quickly by wrapping services into modern APIs and extending the life of legacy services to build new offerings.

Ensure business continuity: APIs ensure uptime and continuity by acting as a layer between the backend and new services, reducing the risk of disruption. With API management, organizations can constantly monitor analytics, telemetry, and other data to ensure a smooth experience.

Drive consumption: Apigee helps drive and measure consumption of APIs broadly with self-service tools and usage analytics. Organizations can ensure the consumption of APIs at scale – from different business units within their organization and from partners and developers outside their organization.

Use Case Spotlight

Insurance: Modernizing Development with API Management

In 2015, one of the largest insurance companies in the United States was taking a critical step in its digital transformation journey: modernizing its backend systems. This involved a change of technology and a re-imagining of business processes to better leverage emerging technologies.

To start, the company focused on simple integrations in the form of microservices and APIs. Soon, the organization was able to make the most of APIs and Apigee API management to support more complex cloud integrations as part of their API-first strategy to facilitate innovation.

Using API management, the company successfully shifted to an IT shared services model, where all services are made available as APIs. This drastically reduced the amount of time required to develop new services and propelled innovation within the company and through partners. Using an API-driven approach, this company was able to:

- Reduce onboarding time for B2B partners from months to days.
- Empower thousands of internal developers to quickly and independently build and share APIs.
- Evolve development strategy from an application and asset ownership perspective to a product-based, shared services model.

Service Mesh and API Management: Accelerating Application Modernization

Along a successful modernization journey, IT leaders adopt cloud-native technologies to deliver software faster. This transforms the business by giving developers, partners, and customers unique ways to interact with existing products and services. To accomplish these goals, organizations often require both service management and API management. However, it can sometimes be confusing to know when to use each and how to use both technologies together.

Used together, service mesh provides standardization within service-to-service communication and allows for the management of microservices across distributed systems. Meanwhile, API management provides the mechanism to expose those microservices via APIs to other teams or organizations. API management also allows for secure access to these services, as well as the tools to measure API consumption through analytics. Both service management and API management are crucial in any organization's application modernization journey: They are complementary technologies that simply solve technical challenges at different levels.

For example, a service mesh allows organizations to build platforms with requirements around standardized security, policies, and controls and provides teams with in-depth telemetry, consistent monitoring, and policies for properly setting and adhering to SLOs. Because organizations often draw a logical boundary at business units or technology groups, each can adopt its own service mesh and subsequently rely on an API management platform to help monitor SLAs and cross-business unit consumption. The service mesh tracks visibility and provides details around service communication within the business unit, all while encrypting service-to-service traffic using mTLS.

Service management helps companies by improving network standardization and visibility, while API management focuses on managing API lifecycles and performance analytics.

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API management is used in tandem with a service mesh when, for example, the platform in question is owned by a business unit (within an enterprise) that wants to set up a shared services model. Shared services models allow other business units to discover and reuse standardized services as APIs, which leads to faster development and increased innovation.

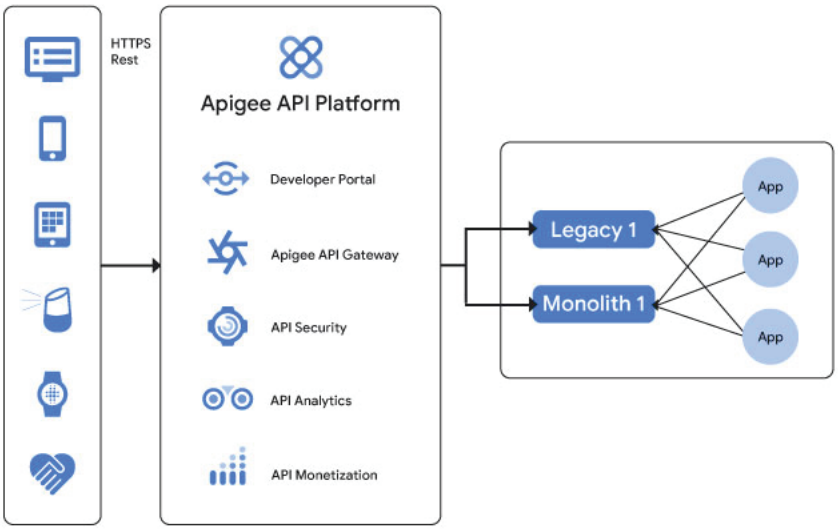
API management plays a similar role when organizations want to take a subset of their APIs to create new business opportunities via a digital ecosystem of third parties such as partners or developers. For example, an organization may choose to take an internal API that is already valuable to a set of partners and make it accessible externally. With API management, the organization can:

- Securely manage these APIs
- Provide seamless onboarding and usage experiences for partners
- Monitor traffic to drive future API development
- Build a price-structure into the exposed APIs

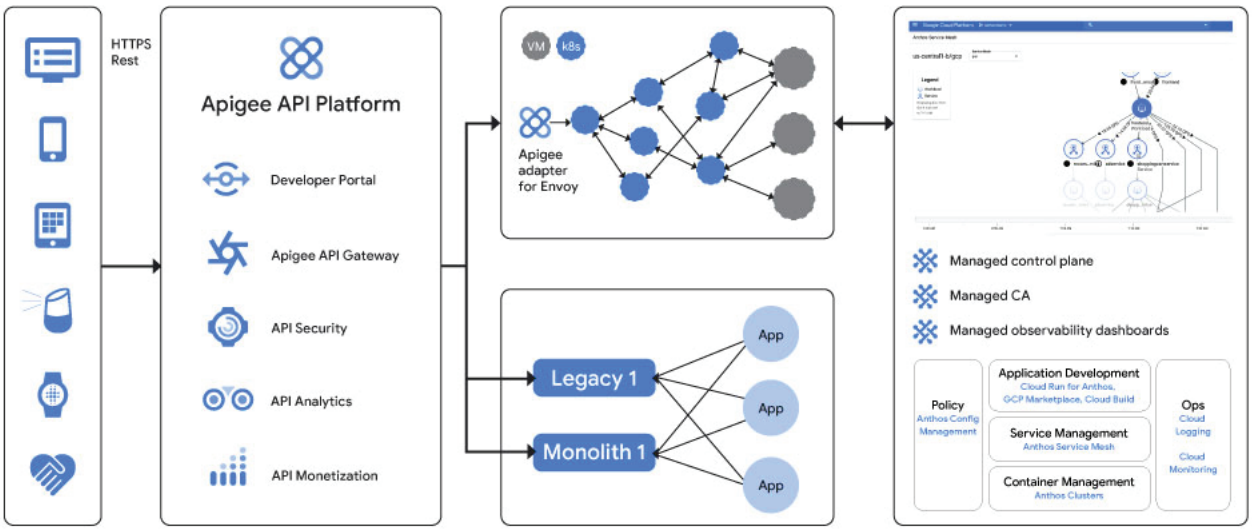
Typically, organizations on an application modernization journey will adopt API management as a first step to implement and promote API use while monitoring API consumption for their monolithic applications. Once API management is in place, organizations then begin to transform these monolithic applications into microservices. To accomplish this task in a world of growing technical complexity, companies are increasingly adopting service meshes to provide deeper and more granular visibility into their applications and services and how they interact with one another.

Overview of Application Modernization Journey

Phase 1: Power new digital experiences by unlocking legacy applications with Apigee



Phase 2: Manage microservices alongside legacy applications with Apigee and Anthos Service Mesh



Google provides service management capabilities through Anthos Service Mesh and API management capabilities through Apigee. These two products work together to provide IT teams with a seamless experience throughout the application modernization journey. Additionally, using the Apigee Adapter for Envoy, organizations can track context-aware API calls and performance end-to-end, while deploying and managing Envoy proxies through managed instances and network endpoint groups and Anthos Service Mesh. The Apigee Adapter for Envoy then allows developers to:

- Verify OAuth tokens or API keys.
- Check API consumer-based quota against API products.
- Collect API usage analytics.

The Apigee Adapter for Envoy enforces Apigee API management policies within a service mesh, which enables organizations that use Anthos Service Mesh to reap the above benefits. The adapter can be used by any organization that uses a standard Envoy proxy, including those who use Istio or Google's Anthos Service Mesh.

Google's Anthos Service Mesh and Apigee API management work together to provide IT teams with a seamless experience throughout the application modernization journey.

Use Case Spotlight

Retail:
Using Service Mesh and API Management to Drive Modern Development Practices

A large retail chain was tasked with modernizing its applications while enhancing visibility and security. Their services portfolio contains both internal and external, public-facing services like inventory visibility that allow third parties to view availability information.

The retail chain started migrating to Google Cloud and revamping its service architecture to support a microservices approach to accomplish its goal. One internal team adopted Anthos Service Mesh to monitor telemetry and ensure that services are always available, both internally and outside the company. The team now uses Anthos Service Mesh to monitor online actions, flag potential issues, and quickly resolve them. For example, when a customer adds an item to a shopping cart, several actions occur behind the scenes. With the service mesh in place, the internal retail team can view these actions as separate components and take targeted action in the case of slowed or interrupted functionality and maintain detailed anomaly tracking.

Teams external to the team above, responsible for developing new models of interaction and maintaining security, publishing, and self-governance, adopted Apigee API management. Using the Apigee Adapter for Envoy, all teams can now consistently manage and analyze traffic, as the Envoy Adapter pulls data from Anthos Service Mesh to provide a consolidated view with the Apigee API management system.

Conclusion

APIs and microservices are both critical to any application modernization journey, and while the two technologies are related and sometimes used to accomplish similar tasks, there are distinct benefits to each. By adopting API management and service mesh as part of a modernization journey, organizations become better equipped to rapidly respond to changing markets securely and at scale. Though the journey to application modernization doesn't always follow a clear-cut path, organizations can begin with two core components to build the foundation for innovation: migrating to the public cloud and adopting modern development practices.

During efforts to modernize applications, most organizations will require network standardization and API management to realize the next steps in their digital journeys. A service mesh like Anthos Service Mesh allows for service-to-service communication that maintains the quality of service in a system composed of distributed services. Simultaneously, an API management platform such as Apigee will enable organizations to drive consumption of those services by exposing them as APIs for use by different business units or partners seeking to build new channels. Together, these technologies are helping organizations solve complex problems across the stack, delivering innovative experiences everywhere and anywhere their customers may be.

Wherever you are on your application modernization journey, Google Cloud can help.

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To learn more, read this white paper about how Anthos Service Mesh is transforming enterprise applications and visit the Apigee Solutions page to start your API-first modernization journey.

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