TRIGGERMESH
CLOUD NATIVE INTEGRATION PLATFORM

The DevOps Guide to Cloud Integration

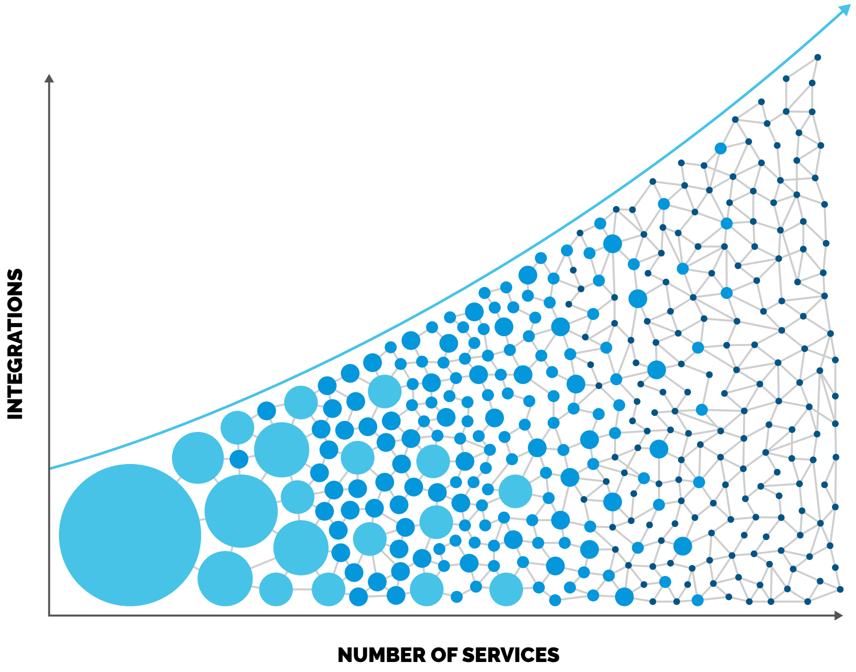
As today's businesses move toward an event-driven multicloud model, cloud integration is sorely needed. Managing this increasing level of complexity generally takes one of two paths: proprietary or open source. This paper examines those two paths and argues in favor of the open source option offered by TriggerMesh, which gives full control over multicloud integrations by treating those integrations like source code.

DECEMBER 2021

ENTERPRISE INTEGRATION TRENDS

Saying that a particular technology "democratizes" something is so cliché, but let's face it, SaaS and cloud have totally democratized computing. The powerful automations that used to be the sole province of large enterprises are now accessible to every business. You don't need massive data centers and big budgets to equip every team with the IT tools to work faster, smarter, and better.

An interesting implication to this is that the need to integrate applications—also formerly only needed by massive corporations—is now needed by everyone. Businesses today are increasingly multicloud, utilizing a composition of cloud-based software. You recognize their names: Salesforce, ServiceNow, SAP or Oracle ERP, Workday, Jira, GitHub, and CircleCI, Asana, and Slack—just to name a few. Layered on top of these SaaS offerings are the back-end systems running in public clouds that power our applications, like AWS DynamoDB, Kinesis, SQS, Google BigQuery and ML, Azure Cosmos DB and Active Directory. And to make things more interesting, many businesses are migrating to hybrid-cloud solutions, running any number of legacy and cloud apps on a local Kubernetes-based cloud like Red Hat Openshift, VMware Tanzu, or Google Anthos. All of this makes a next-generation integration strategy essential.



GROWTH IN SERVICES DRIVES INTEGRATION GROWTH

Managing the Move Toward Complexity

As businesses begin to move more and more toward multicloud solutions, they are at danger of increasing complexity to a point where their developers and IT teams won't be able to keep up. Modern applications are built on microservice-based models, packaged into containers, and deployed using highly complex orchestration systems like Kubernetes. These applications may need to be orchestrated across multiple cloud service providers. Each of these layers is just increasing complexity and making it harder and harder for DevOps teams to keep up.

Both open source software and cloud computing platforms continue to increase in popularity, but this has magnified the number of options available to developers for increasing the complexity of their applications. While these solutions may serve to make applications more modular and scalable, the move toward more complexity will soon become untenable.

Businesses need a way to manage this increased complexity, especially if they want to stay competitive. Multi-cloud integration is one of the most pressing issues in enterprise computing today. TriggerMesh is the leading Kubernetes-based integration platform responding to this need.

> "As event-driven systems become more popular, developers are realizing that integrating events across sources and environments is a big challenge. This is exacerbated by hybrid and multi-cloud topologies that lead to more disparate sources of all shapes. So when we looked at our options to provide Cloud Native Runtimes users with a single API for automating how events are consumed, regardless of the event source, TriggerMesh was the clear partner. The integration with TriggerMesh makes it easy for Knative eventing resources to consume external events across all the clouds."
>
> **GRAHAM SIENER, VP OF PRODUCT, *VMWARE TANZU***

PICKING AN INTEGRATION SOLUTION: OPEN SOURCE OR PROPRIETARY?

There is a fundamental difference between approaches to integration solutions. Proprietary solutions cause vendor lock-in, because each integration requires specialized details about the applications being integrated. Once this application logic is incorporated into the proprietary integration platform, it is very difficult to switch to a different solution. Proprietary solutions can also make it difficult to add integrations to customized, in-house, or unsupported applications.

Open source solutions like TriggerMesh, on the other hand, are based on open specifications, such as CloudEvents, Kubernetes, and Knative. TriggerMesh's open source API helps you combine on-premises systems and cloud services in an automated manner. Because TriggerMesh is itself built on Kubernetes and Knative, our integration components are loosely-coupled and modular so you have maximum flexibility.

TriggerMesh empowers you to integrate your enterprise, your way. You know what you need to integrate and how you need to integrate it. We equip you to do it quickly, robustly, and efficiently. With TriggerMesh, you do not sacrifice the sophisticated, enterprise-grade integration capabilities you need, including event transformation.

We offer a number of specific bridges and bridge components out of the box that streamline many of the most common integrations. But these are intended to serve as samples to demonstrate how you can integrate anything, running anywhere, in any combination, and manage these integrations the same way you manage your other code.

	TriggerMesh	Public Cloud Integration Tools	Legacy ESB Integration Tools
Multicloud Event Streaming	●		
On-premises Integrations	●		●
Cloud Integrations	●	○ Work best with their own cloud services	○
Modern Architecture	●	●	
Self Service / Developer Oriented	●	●	Consultants required
Enterprise Ready	●	○	●
Open Source	●		

TRIGGERMESH'S OPEN SOURCE FRAMEWORK PROVIDES A RICH FEATURE SET COMPARED TO VENDOR-SPECIFIC INTEGRATION TOOLS.

Integration platforms give you flexibility to integrate on your terms, now and in the future

Our unique approach stems from our belief that we're only at the beginning of the growth in multicloud that lies ahead of us. As the number of discreet services in use grows, the possible integrations between these services grows exponentially. This makes a flexible, programmable, cloud native integration platform the only viable long term solution.

As the number of discreet services in use grows, the possible integrations between these services grows exponentially. This makes a flexible, programmable, cloud native integration platform the only viable long term solution.

BEYOND CONNECTORS TO INTEGRATION AS CODE

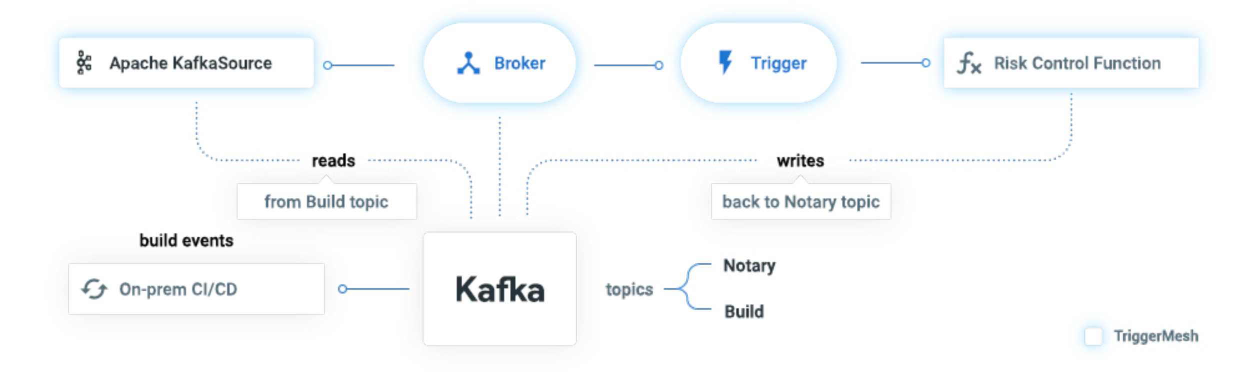
DevOps best practices extend beyond code management and today are used to automate infrastructure deployments with continuous delivery of IT systems. This is often referred to as infrastructure-as-code, which the good folks at Stackify define as follows:

Infrastructure-as-code means to manage your IT infrastructure using configuration files.

With your infrastructure configuration described in a file, you can now store and manage this file in your source code management system. This brings the benefits of speed, consistency, accountability, scalability, and, of course, the flexibility to program in all the functionality your business needs.

PNC Bank automates manual processes with TriggerMesh

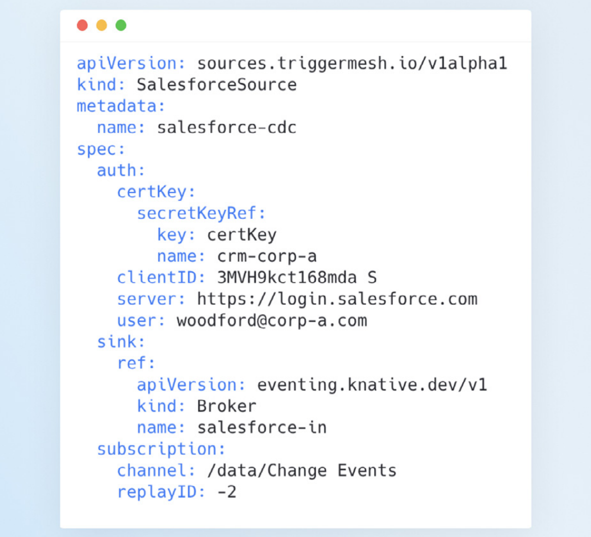
For PNC Bank, TriggerMesh integration-as-code was the perfect complement to their Policy as Code implementation. The PNC Portfolio Management team needed to automate and accelerate the Software Supply Chain security and risk control process in order to reduce application deployment time and provide a governance audit trail. The manual compliance processes that TriggerMesh replaced took 30 days, slowing developer productivity and delaying feature releases.



WORKING WITH TRIGGERMESH, PNC IMPLEMENTED AN EVENT-DRIVEN INTEGRATION IN WHICH SERVERLESS FUNCTIONS AUTOMATE THE RISK CONTROL EVALUATION AND ATTESTATION AUTHORING.

PNC automated the previously manual processes by codifying them into serverless functions and leveraging TriggerMesh to build an on-premises event-driven application flow. The team used the TriggerMesh declarative API to build an application flow between Apache Kafka and Jenkins that triggers the bank's serverless Policy-as-Code application to route pass/fail status back to Kafka. These event-driven application flows use TriggerMesh's integration-as-code approach along with continuous delivery to build a high performance, reproducible event-driven architecture that provides real-time feedback for critical infrastructure.

The previously 30-day process now runs automatically and finishes in near real-time, allowing PNC to keep up with the surge of new applications and services while maintaining 100 percent security and compliance reporting.



```
apiVersion: sources.triggermesh.io/v1alpha1
kind: SalesforceSource
metadata:
  name: salesforce-cdc
spec:
  auth:
    certKey:
      secretKeyRef:
        key: certKey
        name: crm-corp-a
    clientID: 3MVH9kct168mda S
    server: https://login.salesforce.com
    user: woodford@corp-a.com
  sink:
    ref:
      apiVersion: eventing.knative.dev/v1
      kind: Broker
      name: salesforce-in
  subscription:
    channel: /data/Change Events
    replayID: -2
```

TRIGGERMESH INTEGRATION COMPONENTS ARE STORED AS CODE. THESE CAN BE MANAGED DECLARATIVELY FROM THE COMMAND LINE, A CI/CD PIPELINE, OR INTEGRATED IN CODE.

The invention of the TriggerMesh declarative API now brings all these benefits to your **integration** layer. You simply describe the integration attributes in a Kubernetes object and then store, revise, and deploy this file the same way you do any other application or microservice.

Extending Your Cloud with TriggerMesh

Public cloud growth shows no signs of slowing, and three cloud service providers are leading the pack: Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform (GCP). These major players all show great price to performance ratios, powerful developer experiences, and constant innovation. While AWS continues to have a larger share of the market, multicloud deployment is on the rise. In 2020, Flexera found both hybrid-cloud and multicloud deployments grew. Specifically, 93 percent of enterprises have a multicloud strategy, 87 percent have a hybrid cloud strategy. Respondents used 2.2 public and 2.2 private clouds on average.

All this means that multicloud integration is becoming the norm. TriggerMesh cloud native integration, which is based on event-driven architecture (EDA), surpasses simple message-oriented integration. With TriggerMesh, the applications publishing events—also called event sources—do not need to know anything about their subscribers or targets. In this modern model, event targets decide which event sources they are interested in. This enables a constant state of awareness so that producers can stream data about various types of events or topics in real time to all potential consumers. Since it's cloud native, all this power comes in a portable, agile, scale-to-zero package.

Using Google Cloud Platform with TriggerMesh

TriggerMesh is a natural fit for GCP integrations. After all, TriggerMesh leverages cloud native technology—Kubernetes and Knative—originally developed at Google Cloud to provide an API and a visual point and click interface to tie activities in one system to outcomes in another.

TriggerMesh is compatible with Cloud Run for Anthos, a GCP offering built on Knative Serving which brings serverless practices to Kubernetes. This allows developers to focus on code while operators focus on the infrastructure. With TriggerMesh, you can integrate many Amazon services, Zendesk, OracleDB, Slack, Twilio, and others to trigger workloads on Google products and services when events happen.

Integrating Microsoft Azure with TriggerMesh

TriggerMesh integrates quickly and easily with Azure Event Grid. Event Grid provides massively scalable, reliable message delivery. While it has built-in support for events and messages from other Azure services, TriggerMesh can pass messages from Azure to practically any other platform.

This capability enables the development of fully event-driven platforms across a multi-cloud architecture. These integrations inherit a strong sense of loose coupling, allowing for unlimited extensibility and enterprise-ready serverless applications.

Not Just the Big Three

TriggerMesh integrations go beyond just the three big cloud service provider. It can integrate with your private cloud as well as any cloud service provider, including Oracle Cloud Infrastructure, IBM Cloud, and Tencent Cloud. TriggerMesh also provides a whole library of pre-built bridges, allowing you to quickly and easily deploy event-driven workflows to connect popular cloud applications and services.

Using TriggerMesh as Your AWS Integration Partner

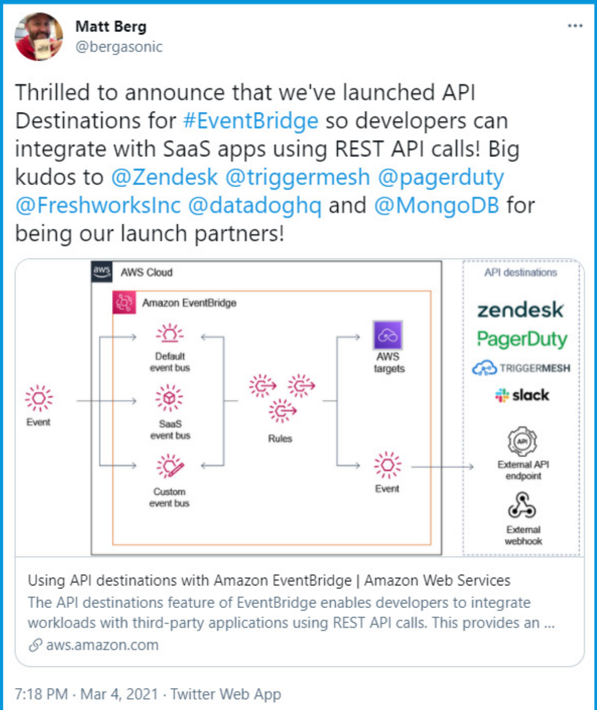
The TriggerMesh / Amazon partnership opens enormous opportunities to take control of your architectural strategy. Now, you don't need "lift and shift" in order to benefit from the cloud. You can progressively modernize on-premises applications with event-driven integration to your AWS services or any other system or service, no matter where it is running.

Combining the power of TriggerMesh and AWS EventBridge, AWS users can easily connect SaaS, cloud, and on-premises applications with Amazon Lambda and cloud-native architectures without writing any additional code. You can modernize your legacy applications to the cloud and leverage your existing IT investment by integrating with Amazon EventBridge and triggering workloads on modern architecture. Accelerate developer productivity and provide consistency when integrating non-AWS services with AWS.

In July 2021, VMware Tanzu made Cloud Native Runtimes generally available. This approach simplifies and accelerates the development and deployment of container-based applications. VMware Tanzu users can experience the power of TriggerMesh out-of-the-box with Cloud Native Runtimes, starting with Sources for Amazon Web Services (SAWS).

> "TriggerMesh is excited to support AWS EventBridge to enable event-driven integrations. TriggerMesh provides AWS EventBridge users an integration platform that provides a consistent method for cloud native applications to enable the flow of events from AWS to virtually any other application or service that can consume them."
>
> **MARK HINKLE, TRIGGERMESH CEO**

When Amazon launched their API Destinations for EventBridge in March 2021, TriggerMesh was the only integration player included as a launch partner. API Destinations enables EventBridge users to integrate with Software-as-a-Service applications using REST API calls. TriggerMesh enhances EventBridge functionality by providing a way for cloud native developers to consume and enrich events using AWS infrastructure and then forward the events to other cloud services and data center applications. TriggerMesh can act as a broker for these events to dozens of cloud services including Salesforce, Datadog, Twilio, SendGrid, Elastic, and including off the shelf or custom on-premises applications—all through one consistent cloud native platform.



Matt Berg
@bergasonic

Thrilled to announce that we've launched API Destinations for #EventBridge so developers can integrate with SaaS apps using REST API calls! Big kudos to @Zendesk @triggermesh @pagerduty @FreshworksInc @datadoghq and @MongoDB for being our launch partners!

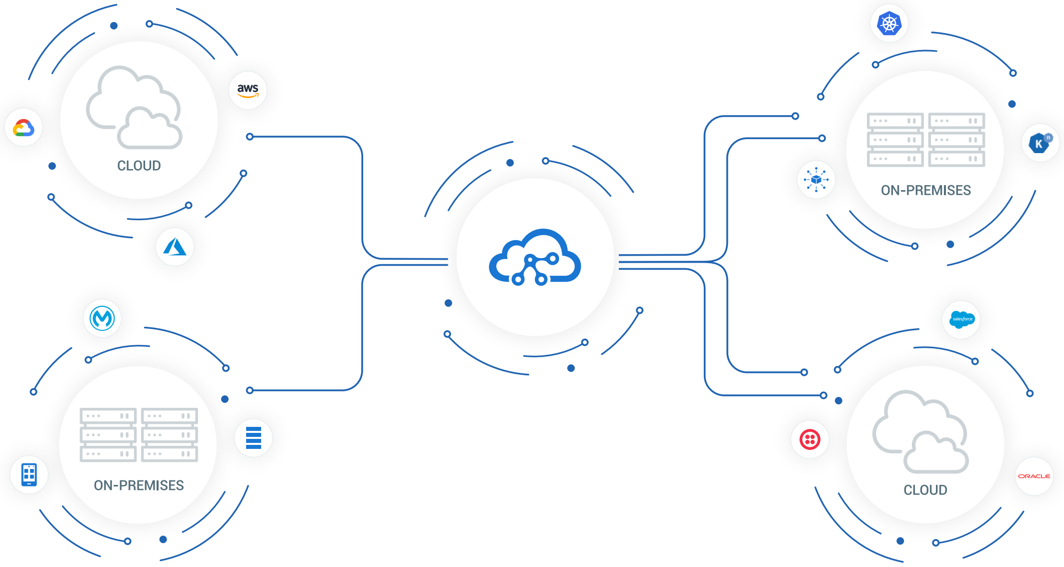
Using API destinations with Amazon EventBridge | Amazon Web Services
The API destinations feature of EventBridge enables developers to integrate workloads with third-party applications using REST API calls. This provides an ...
aws.amazon.com

7:18 PM · Mar 4, 2021 · Twitter Web App

MATT BERG, HEAD OF AWS APPLICATION INTEGRATION GTM, CELEBRATED THE TRIGGERMESH INTEGRATION TO EVENTBRIDGE ON TWITTER

USING TRIGGERMESH ACROSS MULTIPLE CLOUDS

TriggerMesh allows you to bring sources from any cloud to another cloud. For example, you can create an event-driven integration between GitHub and AWS EventBridge, allowing you to centralize your monitoring by sending all your GitHub events to CloudWatch.



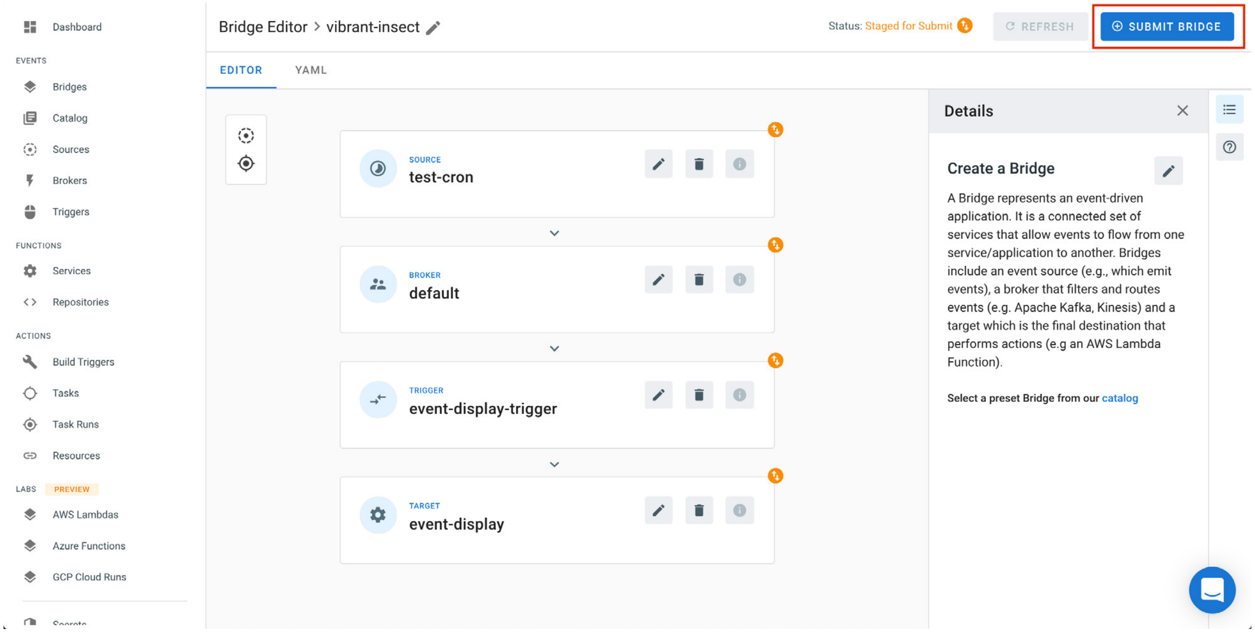
As more businesses move to multicloud deployments, it becomes ever more probable that your team will end up as part of an enterprise somewhere around the average of 2.2 hybrid clouds. In this case, you will probably find yourself needing to easily set up event-driven integrations across cloud services, local Kubernetes clusters, and remote applications.

The TriggerMesh Cloud Native Integration Platform is open source and available on GitHub. This platform gives every user a set of APIs that can be used to define integrations. To make these integrations work, the APIs provide event transformation, event routing components, and a Function-as-a-Service (Faas) offering. Leveraging TriggerMesh's open source offerings provides you with the capability of Google EventArc and AWS EventBridge combined and on-premises.

Viewing Integrations as Code

The TriggerMesh Integration Language allows you to quickly and programmatically connect data and services into event-driven applications. This innovative approach allows multicloud integrations to be conceptualized as code. These integration components are API objects that can be managed declaratively from the command line or CI/CD pipelines. Our innovative low-code TriggerMesh UI even empowers less technical users to benefit from code-based integrations.

McKinsey found that the organizations that managed the COVID-19 crisis best were those that use cutting-edge technologies and encourage experimentation and acting early. In fact, their survey found that nearly half of these successful respondents were ahead of their industry when it came to experimenting with and adopting new digital technologies.



Create a Bridge

A Bridge represents an event-driven application. It is a connected set of services that allow events to flow from one service/application to another. Bridges include an event source (e.g., which emit events), a broker that filters and routes events (e.g. Apache Kafka, Kinesis) and a target which is the final destination that performs actions (e.g an AWS Lambda Function).

Select a preset Bridge from our catalog

TRIGGERMESH HAS A LOW-CODE UI THAT EMPOWERS LESS TECHNICAL USERS TO BENEFIT FROM CODE-BASED INTEGRATIONS.

GET STARTED WITH TRIGGERMESH

TriggerMesh offers two consumption models to support an enterprise's varied use cases and skill levels. For less complex use cases, and for less technical users, our low-code UI lets you quickly create new application flows—we call them Bridges.

For teams more comfortable with DevOps approaches, TriggerMesh offers a powerful declarative API to create integrations-as-code. Customers often use the TriggerMesh API in combination with their existing CI/DC pipeline for a fully-automated GitOps approach to cloud native integration.

Your next step is easy. Install your own TriggerMesh Cloud Native Integration Platform or request a demo at www.triggermesh.com.

CONTACT

Sebastien Goasguen
Co-Founder & Chief Product Officer
Twitter: @sebgoa

Mark R. Hinkle
Co-Founder & CEO
Twitter: @mrhinkle

triggermesh.com

TRIGGER**MESH**
CLOUD NATIVE INTEGRATION PLATFORM