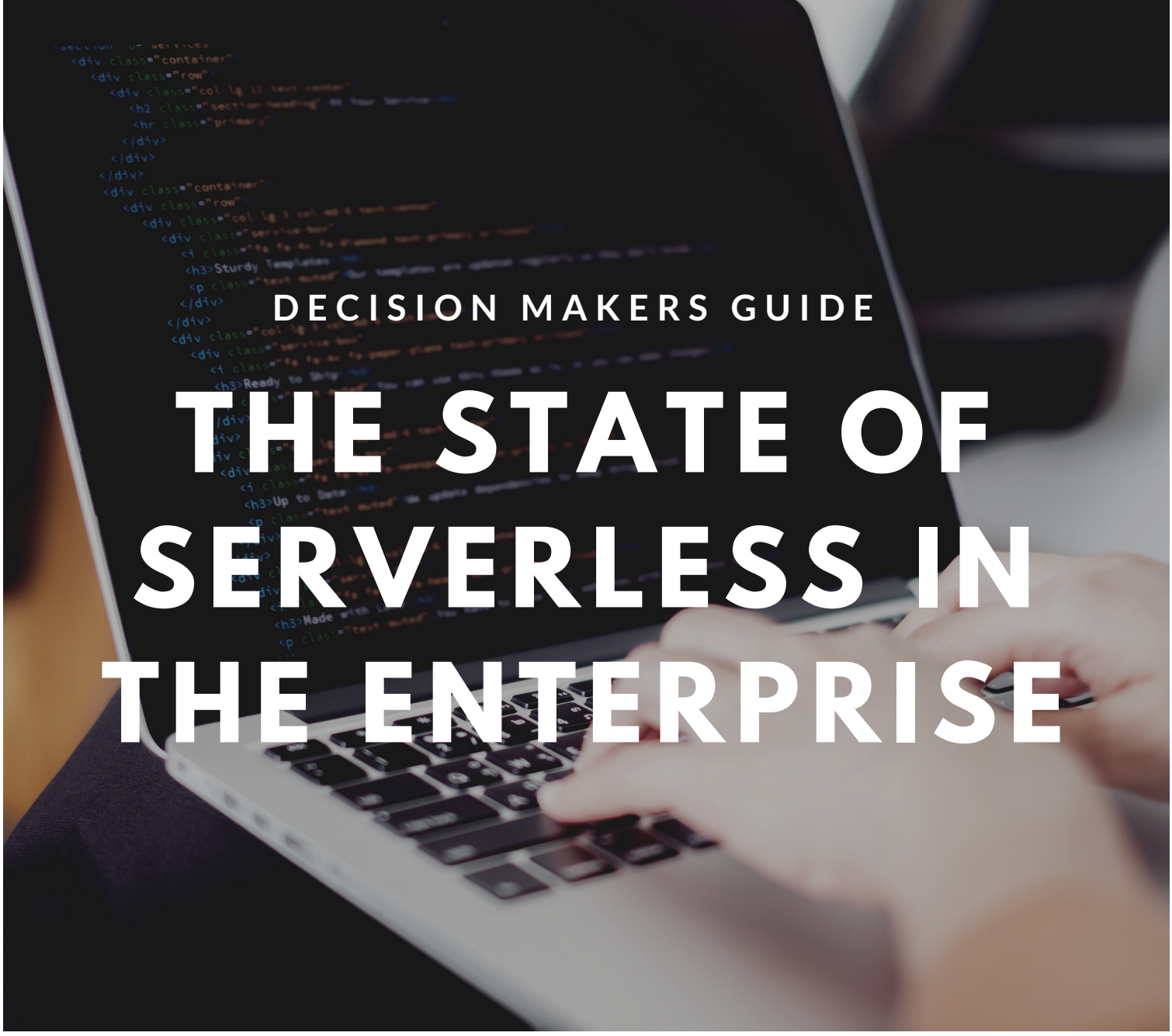

DECISION MAKERS GUIDE

THE STATE OF SERVERLESS IN THE ENTERPRISE

RISHIDOT RESEARCH GUIDE
FOR DECISION MAKERS

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INTRODUCTION

Serverless computing has been gaining momentum over the last few years mainly driven by the simplified developer abstraction and cost efficiencies. Rishidot Research estimates that the Serverless Computing market will cross $20 Billion in the next five years and almost every enterprise will have Serverless deployments in their organization. Ever since cloud computing started gaining traction in 2008, the need to reduce operational complexity for developers has been one of the critical pain points in the industry. While some expected Platform as a Service (PaaS) to be that abstraction, it also came with an overhead. Initially driven by event-driven use cases, Serverless Functions gained traction with developers because they could just focus on their code and deploy the code with simple packages like a WAR file or Zip file. This simplicity in the early day Serverless Computing platforms is the main reason for its success. With event-driven use cases, cloud providers could offer fine-grained pricing models and the compute was available for pennies. The simplicity and cost-effectiveness of Serverless Computing raised its profile and made it attractive for developers who are moving from a monolithic architecture to microservices architecture.

As Serverless gained traction in the enterprise, the shortcomings of first-generation Serverless platforms became evident. Lack of support for stateful applications increased DevOps overhead for developers, and lack of multi-cloud support had hurt enterprise adoption as the first generation platforms could not support many enterprise workloads. This gap is being filled by next-gen Serverless platforms like Nimbella and others that support stateful applications, multi-cloud, and hybrid cloud. The newer generation of Serverless platforms helps enterprises standardize the developer experience across teams, increasing their productivity while optimizing their resource utilization, leading to better ROI.

In this whitepaper, we will talk about how Serverless Computing helps enterprises; survey the landscape; highlight how Nimbella, an enterprise focussed Serverless platform fits into the enterprise needs, and then discuss some of the considerations for enterprise decision-makers as they evaluate Serverless platforms for their use. This whitepaper is designed to help you understand how you can maximize your investments with Serverless.

SERVERLESS LANDSCAPE

Serverless Computing is a broad term that encompasses Functions as a Service along with backend services, data stores, workflow engines, and other services needed for applications. The term Serverless implies that developers need not worry about handling compute like virtual machines or containers. They can focus on their application logic and code and easily deploy the applications using the abstractions provided by these platforms.

The advantage of Serverless Computing are:

- Seamless developer abstraction without any operational overhead for developers. This dramatically increases the developer productivity
- Polyglot programming languages support out of the box
- Seamless scaling based on demand
- Support for event-driven architectures and beyond
- Serverless functions work with microservices using API
- Support for enterprise workloads in modern platforms
- Seamless DevOps without a learning curve
- Multi-cloud support in modern platforms

While the maturity of early Serverless platforms for enterprise needs was a topic of debate, modern platforms are bridging the gap, making Serverless suitable for enterprise application development. Some of the challenges imposed by the Serverless

abstraction. like the constraints on the application architecture are removed and many organizations are using Serverless to empower their developers.

The serverless compute landscape can be broadly categorized as follows:

- **Hosted FaaS Offerings** - Hosted Functions as a Service are completely managed by the cloud provider or FaaS provider, and the developers can easily deploy their applications without worrying about the underlying infrastructure. AWS Lambda, Azure Functions, Google Cloud Functions, Nimbella, IBM Functions are some of the examples of hosted Serverless compute offerings in the market.
- **On-Premises Offerings** - Many enterprises want to deploy a Serverless platform for their developers on their own data centers or private cloud. Nimbella, Red Hat, VMware, and few other providers offer software that can be deployed and managed on-premises. These platforms can be deployed entirely on-premises or in a hybrid cloud environment.
- **Multi-Cloud Offerings** - Very few platforms offer their hosted services across multiple cloud providers and Nimbella is one such platform offered across multiple cloud providers. This helps enterprises use Serverless platforms for applications running across multiple cloud providers.
- **Open Source** - Many hosted Serverless platforms like AWS Lambda, Azure Functions, and Google Functions are based on proprietary software. With OpenWhisk and Knative gaining traction, enterprises are looking for Serverless platforms that take advantage of Open Source as the underlying fabric. Nimbella, Red Hat, and VMware offer Serverless platforms based on open-source software.

Beyond these categorizations, enterprise Serverless platforms can be categorized based on whether there is a DevOps overhead in putting together the services needed for applications and whether

the platform supports stateful applications. Nimbella platform is built from the ground up to allow developers to deploy applications without DevOps overhead and support for stateful applications, making the platform more suitable for enterprises.

NIMBELLA PLATFORM

OVERVIEW OF NIMBELLA PLATFORM

Nimbella is the next-gen enterprise-grade Serverless platform built on top of open-source software. Nimbella platform offers enterprise developers a seamless way to deploy applications either on their choice of the cloud provider or on-premises. Enterprises can deploy the Nimbella platform with one click on any infrastructure and give developers a standardized user experience independent of the cloud provider or data centers. Unlike some of the other Serverless platforms in the market, Nimbella supports a wide variety of workloads including stateless, stateful, JAMstack, streaming, and long-running applications. The developer experience in the platform is seamless without the DevOps overhead that is part of the Serverless platform offered by hyperscale providers. Developers could define the workflow and deploy applications from various tools they are already comfortable with. Since the Nimbella platform is available on all major cloud providers, organizations can standardize the developer experience across all cloud providers and give them a chance to deploy the applications in any cloud of their choice. For on-premises deployment, they provide a single-click deployment and an Operators dashboard which gives IT operations the visibility they need. Nimbella offers enterprises the flexibility to deploy applications on any infrastructure while giving their developers a more standardized interface.

Since Nimbella supports stateful applications out of the box, it can

support many enterprise workloads including big data and ML/AI workloads. The support for stateful applications and gentle migration options for enterprise applications makes Nimbella a compelling enterprise-grade Serverless platform.

For enterprises, the Nimbella platform provides:

- Simpler developer experience across various skill sets. Enterprises can standardize how developers deploy their applications, thereby reducing friction in the DevOps process.
- Virtual machines and containers on the cloud add complexity to both developers and IT operations. By using a Serverless platform like Nimbella, enterprises can abstract away these complexities, dramatically increasing the productivity of developers and IT operations.
- Nimbella supports custom runtimes so enterprises can bring their container runtimes thus supporting a gentle migration from containers to functions while running both of them alongside. The enterprises can easily build and deploy larger workloads such as machine learning or data-intensive workloads. Just like functions packaged as ZIP archives, functions deployed as container images benefit from the same operational simplicity, automatic scaling, and high availability.
- Support for stateful applications. Most serverless platforms support stateless applications but enterprises need support for the state. They also have legacy applications that cannot be migrated without the support of the state. Nimbella platform meets this critical enterprise need by offering built-in support for the state.
- Enterprises want the flexibility to deploy their applications across multiple cloud providers and on-premises in order to give their developers choice as well as for regulatory reasons. Nimbella platform is available across all major hyperscale providers and can be deployed on-premises. The support for multi-cloud and hybrid cloud makes Nimbella an ideal candidate for enterprise needs.

ARCHITECTURE

Nimbella platform is built on top of open-source platforms like Kubernetes and OpenWhisk, making the platform compliant with open source standards. This allows Nimbella to take advantage of the innovation in the open-source communities while adding unique value on top of these components.

Nimbella uses OpenWhisk to execute the Serverless functions while using Kubernetes for container engine and container orchestration. As shown in the figure, the Nimbella platform abstracts away the complexity of handling the compute, storage, networking, security, global CDN, and other components needed for deploying applications on a global scale. The other day 2 operations like monitoring, backup, etc. are also automated and abstracted away by the Nimbella platform. The key factor is the abstraction layer provided by Nimbella that takes away all the complexities associated with running various infrastructure components underneath. This abstraction makes Nimbella a powerful platform for a modern enterprise providing them the necessary agility needed to operate at the speed of business.

The modern enterprise nirvana is to operate as efficiently as hyperscale providers without incurring the operational overhead that comes with managing such complex infrastructure. By abstracting away the complexities and giving a simpler interface for developers, the Nimbella platform allows enterprises to operate at an efficiency comparable to hyperscale providers while also empowering their developers to be agile and productive.

SUPPORT FOR STATEFUL APPLICATIONS

Most enterprise applications are stateful and they require a persistent storage volume to be mounted to maintain the state. The first generation Serverless platforms were built for stateless applications and deployment of stateful applications required a heavy DevOps overhead, reducing the benefits of Serverless platforms. Enterprise applications use Databases, object or file storage, big data tools, and more. Without support for these use cases, Serverless will become a niche platform in enterprises. Nimbella platform provides comprehensive support for the state by offering out of the box support for:

- Built-in database support
- Key-value storage like Redis
- Object storage
- File storage

With an out of box support for these datastores, the Nimbella platform can accelerate application deployments without any DevOps overhead.

INTEGRATIONS

While the abstraction layer removes the operational overhead associated with running an application platform, the Nimbella platform provides a CLI and Workbench for developers to deploy

applications. They also provide integrations that greatly enhance developer productivity by making it easy to build applications. Some of the integrations are:

- Integration with collaboration platforms like Slack, Microsoft Teams, and Mattermost to build bots and applications. These integrations simplify the overhead on the developer side to build applications on these platforms while giving their end-users the same experience they get with these collaborative platforms. With remote work becoming the norm and the need to integrate enterprise business processes into these collaboration platforms, you need a platform that can provide easy access to set up the endpoints needed for deploying Chatbots. ChatOps is becoming a critical part of the enterprise IT toolkit. With Nimbella Commander, you can connect the API endpoints created with the Serverless platform to various messaging platforms in three steps and empower your team with ChatOps capabilities. In a typical enterprise, organizations deploy across cloud providers and on-premises data centers with a complex DevOps toolchain driving the automated deployments. Using the Nimbella platform, ChatOps can be easily leveraged across hybrid cloud
- As enterprises move towards web applications and microservices architectures, APIs play a significant role in communication between different services and applications. By providing an out of box integration with Postman, the Nimbella platform aids developers to leverage APIs as first-class citizens in their application development strategy
- Nimbella's integration with Netlify allows developers to build stateless and stateful applications using any language they are familiar with and deploy the application to any cloud provider. It dramatically reduces the overhead associated with the packaging of application code and dependencies, bringing in the necessary agility needed for modern enterprise application development.

These integrations form the bedrock of developer productivity-enhancing tools offered by the Nimbella platform. By integrating with Kafka, Nimbella will support event-driven applications, covering more use cases than many other Serverless platforms in the market.

USE CASES

Serverless platforms support many enterprise use cases. While some of the platforms in the market don't support long-running jobs needed for enterprise use cases, the Nimbella platform is well suited to support a wide range of enterprise use cases.

- **Stateless Applications:** All Serverless platforms in the market support stateless applications wherein any invocation of applications do not involve a stored previous state. With Microservices architecture gaining traction among the enterprises, more stateless applications are built today in the enterprise than at any time in the past. For example, a fintech organization can build an event-driven application that detects fraud. From a stream of transaction data, any anomalous data could act as the trigger to invoke a fraud detection algorithm using the Serverless function.
- **Stateful Applications:** Many enterprise applications need support for stateful applications. The state includes user preferences, environment variables, session data, etc. which are critical for the proper functioning of applications. For example, an eCommerce application will need to store the shopping cart changes and needs a way to store the state. Also, stateful applications are usually long-running applications. Next-gen platforms like Nimbella are built to support state and long-running jobs without any operational overhead. This makes such platforms more suitable for stateful applications in the enterprise.

- **Big Data Applications:** Whether it is real-time streaming data or batch processing, Serverless platforms can provide an easy way to build applications that take advantage of big data. Batch processing is an excellent use case for Serverless applications. Batch processing involves spiky loads during processing and not much at other times. Using Serverless will be a cost-efficient way to handle batch processing. Moreover, the ability to invoke functions concurrently can help accelerate the processing of data. Using streaming data sources, Serverless platforms can be used to build real-time applications that process data on the fly.
- **ML/AI Applications:** Serverless is suitable for deploying trained machine learning or artificial intelligence models. Let us take the example of a security camera streaming images for face detection and identification. Whenever an event with a person being detected in the camera, the function running the face recognition algorithm can be invoked to identify the person and a notification service can be invoked to send a notification. Serverless may not be suitable for training machine learning models but a trained model can be invoked using the Serverless function easily.
- **Media Processing:** Processing image, video or audio files is a very good use case for event-driven applications. The trigger to call the Serverless function could be a user uploading an image file to object storage which could then call the function which can do the necessary action to process the media. Serverless is the most efficient way to process media of any kind.

There are many other use cases where Serverless can play a role. With the newer generation of Serverless platforms like Nimbella with long-running jobs, the platform can be used for most enterprise use cases.

SERVERLESS DEPLOYMENT MODELS IN ENTERPRISE

The enterprise needs are much more complex and moving all-in with the cloud may not be suitable for many organizations. Enterprises have on-premises legacy systems, have regulatory issues, and unique performance needs. Using public clouds for all their applications may not be ideal for these organizations.

Serverless deployment models in the enterprise can be broadly categorized as follows:

- **Public Clouds:** One of the most common use cases in the enterprise is to use hosted Serverless offerings offered by various providers. Individual teams use these offerings to quickly deploy their applications without the operational overhead that comes with VM and Container-based deployments. Some enterprises use them for Dev/Test use cases.
- **Multi-Cloud:** Most enterprises use more than one cloud provider and the diversity of services offered by different cloud providers adds friction. Enterprises are looking at ways to standardize the developer experience so that applications are deployed fast without any friction.
- **Hybrid Cloud:** Many enterprises have their applications deployed in a hybrid cloud setting spanning on-premises data centers and one or more public clouds. They prefer to use a hosted Serverless platform for Dev and Test and deploy their production applications on their own data centers. Using a Serverless service from hyperscale providers for Dev and Test will add friction to deploying these applications on-premises for production. Organizations prefer to use the same abstraction layer that can work both on cloud and on-premises.

- **Virtual Private Cloud (VPC):** Many enterprises prefer running applications in their VPC so they can leverage public cloud infrastructure but it complies with their security policies. Using a serverless platform that can run in a VPC in the cloud that an enterprise is already running operations is what many organizations prefer.
- **On-premises:** There are some organizations that want to use their own data centers or collocated facilities for various reasons including regulatory needs, data localization needs, performance requirements, etc. Having a Serverless platform that can be deployed on-premises will help these organizations reduce operational overhead and improve developer productivity.
- **Edge Functions:** With IoT transforming organizations, processing the data at the edge, and making it work seamlessly with the cloud is becoming a critical need. With Nimbella's lightweight platform, deploying the functions at the edge for processing becomes straightforward.

The enterprise needs are different and they use different deployment models to meet these needs. But, every enterprise wants to better use its resources, reduce operational complexities with lower overhead costs, and dramatically increase developer productivity. An abstraction like a Serverless platform can meet these requirements. Higher-order abstractions give little flexibility in terms of the infrastructure organizations can use. For example, a platform like Nimbella can allow deployment in any public cloud or on-premise data centers. It should be noted that not all Serverless platforms are created equal. In the next section, we will highlight some of the considerations for enterprises as their decision-makers evaluate different platforms.

CONSIDERATIONS FOR PICKING AN ENTERPRISE SERVERLESS PLATFORM

Every enterprise has unique requirements for its application infrastructure. As a decision-maker evaluating developer platforms, you focus on picking a platform that meets your critical requirements while also providing the benefits that allow your organization to better utilize resources, have low operational overhead costs and provide much higher developer productivity. In this section, we will highlight some of the considerations for picking the right Serverless platform that is common to most enterprises.

IT OPS REQUIREMENTS

- Enterprises cannot rip and replace their applications in order to use a Modern Serverless platform. Similarly, today's business demands require that the applications communicate with each other and avoid data silos. A good enterprise Serverless platform should provide gentle migration capabilities for enterprise applications. Check if the Serverless platform will allow your applications to be migrated and re-architected over time without any business disruption
- Enterprises have legacy applications and as they modernize their applications and infrastructure, they need to support stateful applications. Check if the Serverless platform provides out-of-the-box support for stateful applications.
- Security is paramount for enterprises and the Serverless platform should support Identity and Access Management (IAM). Does the platform integrate with the IAM tool used by your organization? This is critical to ensure coherent governance policies.

- Enterprise IT infrastructure may spawn public cloud providers and on-premises. Does the Serverless platform support the cloud providers used by your organization? Can the platform be deployed on-premises to support your organizational needs? Can the platform be deployed in a cloud-of-your-choice in a VPC to meet your security requirements?
- What is the operational overhead for deploying and managing the platform on-premises? Does the platform offer 1-click deployment? Does the platform offer a single pane of glass to manage the deployment?
- Does the platform support Day 2 tasks like monitoring and logging? Does the platform support easy backup and recovery?
- Is the platform consistent with open source standards used in the industry? If the platform is built on open-source, it will be even more beneficial as the platform will be leveraging community innovation and have better security.

DEVELOPER REQUIREMENTS

- Does the platform support the programming languages your developers want to use? Does it support the data store needed for your applications?
- Does the platform support uploading code in different formats your developers are comfortable with, including zip files, Docker containers, and more?
- Does the platform integrate with developer tools used in your organization including source code management, IDE, API tools, etc.?
- Does the platform provide out of the box support for stateful applications? Does it support relational databases, key-value stores, object, and file storage without incurring any DevOps overhead?
- ChatOps is gaining traction in organizations. Does the platform provide integrations to help your developers build applications and bots for these tools?

Every organization's needs are different, and these considerations are not enough in your evaluation process, but this could be a good baseline on top of which you could add your unique requirements.

CONCLUSION

Serverless computing is transforming enterprises to better use the resources and help drive their developer productivity and agility. While virtual machines and containers will still play a role in enterprise IT, more and more developers are looking for an abstraction provided by Serverless compute offerings like the Nimbella platform. While the developer interest in Serverless is driven by the ease of use and a better overall developer experience, for enterprises, embracing the Serverless model helps them use resources better, reduce the operational overhead and the costs associated with managing the infrastructure complexity, increase developer productivity and standardizing the developer interface across the organization, and bring in a culture of innovation inside the enterprise.

However, not all Serverless platforms can meet enterprise needs. In this whitepaper, we have highlighted some of the criteria used by enterprise decision-makers to evaluate various platforms. Based on our own evaluation, the Nimbella platform meets most of these criteria and can help modern enterprises transform themselves into an innovative culture that can take advantage of emerging technologies to deliver business value.

ABOUT NIMBELLA

Nimbella is an enterprise-grade stateful serverless platform that can be deployed on any cloud to support multi-cloud or private-cloud strategy. The serverless platforms and frameworks in use today are lacking the abstractions, automation, and integrations that are necessary to accelerate the adoption of serverless technology in the enterprise and in new application domains. Nimbella fills the technology gaps and unifies the programming experience around serverless to deliver a complete and integrated solution that works across clouds. It is based on open-source and is available as a managed and hosted service and as a full-stack solution that can be deployed on any private or public cloud.

More details of the platform can be found at www.nimbella.com

Contact: info@nimbella.com
Nimbella Community: https://nimbella.com/slack
Github: https://github.com/nimbella