KubeVela: Make shipping applications more enjoyable

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- KubeVela maintainers -

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Designs and Principles



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Play with KubeVela



What is KubeVela



Part 1



What is KubeVela

CI

KubeVela is a modern software platform that makes delivering and operating applications across today's hybrid, multicloud environments easier, faster and more reliable.

KubeVela is infrastructure agnostic, programmable, yet most importantly, application-centric. It allows you to build powerful software, and deliver them anywhere!



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IoT/Edge

Day-2 Operating





Part 2

Designs and Principles



1



Day 1 - Application Delivery



Application Delivery: Render



Application

The higher level abstraction to model a full functional microservice unit.

Component

The main workload to run such as web services, jobs, databases.

Trait

Operational auxiliaries that help the component to work, like scaling, storage, gateway.

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Components & Traits

KubeVela applications are composed by components. Each component contains the main workload to run, such as web service or worker. Traits are attached to components and provide extra capabilities like scaling or monitoring.

X-Definitions

KubeVela leverages CUE to make abstractions for Kubernetes resources. Templates are stored in X-Definitions. KubeVela controller renders them into resources when application is applied.

Extensibility

The abstraction layer allows users to easily make extensions by adding X-Definitions to the cluster, without the need of running extra controllers.



Application Delivery: Render

ComponentDefinitions / TraitDefinitions

Templates for rendering components and traits into resources.



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Application Delivery: Orchestrate



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Dependencies

KubeVela users could configure the dependency relationship among multiple components in one application. It ensures the resources are applied in the correct order.

Workflow

To gain finer control for the delivery process, users could write workflow steps in KubeVela application. Backed by DAG and conditional execution, it is also possible to build arbitrary workflow you want.

Higher Level Abstraction

Workflow steps are defined by CUE as well. The abstraction allows user to call underlying functions provided by the controller and orchestrate them.



Application Delivery: Orchestrate

```
apiVersion: core.oam.dev/v1beta1
kind: Application
metadata:
  name: my-blog
spec:
  components:
    - type: webservice
      name: my-wordpress
      properties:
        image: wordpress
    - type: alibaba-rds
      name: my-db
      properties:
        databases:
          – name: wordpress
  workflow:
    steps:
      - type: apply-component
        name: apply-db
        properties:
          component: my-db
      - type: apply-component
        name: apply-wordpress
        properties:
          component: my-wordpress
      - type: notification
        name: send-slack-message
        properties:
          slack:
            message:
              text: "deploy succeed"
```

Workflow

Control the application delivery process by orchestrating steps.



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Application Delivery: Orchestrate

WorkflowStepDefinitions

Templates for executing functions and running commands.



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Application Delivery: Deploy

apiVersion: core.oam.dev/v1beta1 kind: Application metadata: name: nginx spec: components: - type: webservice name: nginx properties: image: nginx policies: - type: topology name: europe-clusters properties: clusterLabelSelector: region: europe - type: topology name: china-clusters properties: clusterLabelSelector: region: china

Policy

Define the behaviour pattern for the application, such as multi-cluster topology, garbage collect strategy, resource sharing rules.

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Multi-cluster Deploy

The deploy process is natively multi-cluster supported. Repetitive works could be reduced when duplicated resources and operations across clusters are organized in the same application.

Authenticated Delivery

The deploy process will use the identity of the user who created the application. Leveraging the authentication of Kubernetes, this ensures unprivileged actions to be rejected across multiclusters.

Heterogeneous Architecture

KubeVela applications can be deployed to Kubernetes provided by various providers. Edge devices are also supported through integrations.



Application Delivery: Deploy

```
apiVersion: core.oam.dev/v1beta1
kind: Application
metadata:
  annotations:
    app.oam.dev/username: alice
    app.oam.dev/group: dev-team
 name: nginx
spec:
  components:
    - type: webservice
      name: nginx
      properties:
        image: nginx
  policies:
    - type: topology
      name: europe-clusters
      properties:
        clusterLabelSelector:
          region: europe
    - type: topology
      name: china-clusters
      properties:
        clusterLabelSelector:
          region: china
```

Additional Info

Annotations contain additional information for application such as identity info or publish version.

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Day 2 - Application Operating



Application Operating: Resource Management



Deployment image edited by anonymous.

KubeVela Application

Deployment image: mallicious

Application recovers the deployment to desired.



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Final State Oriented

The KubeVela Application repeatedly checks if managed resources are always in accord with the spec declared during the delivery process. It can effectively prevent configuration drift.

Garbage Collection

The KubeVela Application recycles resources when the application itself is updated or deleted. Users can configure various strategy for outdated resources, such as keeping them or removing them.

Sharing Resources

Resources can be shared by multiple applications. Shared resources are editable by the primer application and readable by all sharers. The last exit application is responsible for recycling them.



Application Operating: Resource Management



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Application Operating: Resource Management



Primer application deleted.



Last application deleted.



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Application Operating: Version Control



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History Versions

Each KubeVela Application keeps limited history versions. Each version is a snapshot for the past delivery. Both the application and related definitions are recorded.

Rollback

The KubeVela Application supports rolling back to history succeeded versions when new publish failed. Inspecting differences across versions is available as well.

Manual Publish



Application Operating: Version Control



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Manual Publish



Application Operating: Version Control



\$	vela live-diff my-app								
	- type: webservice								
	name: webapp								
properties:									
-	<pre>image: webapp:dolphin</pre>								
+	<pre>image: webapp:panda</pre>								
-+	<pre>properties: image: webapp:dolphin image: webapp:panda</pre>								

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Application Operating: Observability



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Infrastructure Integrations

Observability infrastructures can be easily integrated with KubeVela system, like Prometheus, Grafana, etc. It is achieved by the open eco-system of KubeVela.

Application Centric Monitoring

With the use of customized Components and Traits, users can define how to monitor applications, for example, the way logs are collected and the dashboards metrics are plotted on.

Declarative Management

The monitoring rules for applications are managed in declarative ways. It makes updates and migrations more convenient and controllable. Developers can leverage the power of underlying monitoring infrastructures without the need of learning varying complex syntax.



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3 KubeVela Eco-system





KubeVela Eco-system: Addons



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Catalog

The GitHub Catalog repository serves official and experimental addons contributed by community members. It is publicly accessible and continuously accepting new addons.

Reusable Application Templates

Commonly used applications can be parameterized into KubeVela addons for reuse, such as Prometheus, Traefik, FluxCD controller. Each addon contains multiple CUE/YAML files for templating.

Integrate New Capabilities

By carrying X-Definitions, addons can easily integrate external services or tools into KubeVela system. These helps make abstractions to underlying infrastructure and expose capabilities to application developers. Users will be beneficial from the consistent experiences.



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KubeVela Eco-system: Tools

Vela CLI

KubeVela CLI provides various commands that helps you to operate applications, such as managing definitions, viewing resources, restarting workflow, rolling versions.

VelaUX

VelaUX is the Web UI for KubeVela. Besides, it incorporates business logics into fundamental APIs and provides out-of-box user experiences for nonk8s-expert users.

VelaD

Building on top of k3s & k3d, VelaD integrates KubeVela with Kubernetes cores. The executable binary facilitates and accelerates the deploy of KubeVela control plane which can be extremely helpful for building dev/test environment.

Terraform Controller

The terraform controller in KubeVela allows users to use Terraform to manage cloud resources through Kubernetes Custom Resources.

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Vela Workflow

The workflow engine translates CUE-based steps and executes them. It works as a pure delivery tool and can be used aside by the KubeVela application. Compared to Tekton, it mainly organize the process in CUE style, instead of using Pods and Jobs directly.

Vela Prism

The extension API server for KubeVela, built upon the Kubernetes Aggregated API Server mechanism. It projects native APIs like creating dashboards on Grafana into Kubernetes resource APIs, so that users can manage 3rd-party resources as Kubernetes native resources.

Cluster Gateway

The gateway that provides unified multi-cluster access interface. Working as Kubernetes Aggregated API Server, the gateway leverages the native Authentication and Authorization modules and enforces secure and transparent access to managed clusters.





Part 3

Play with KubeVela



KubeVela Stability

Performance and Fine-tuning

Scale	#Nodes	#Apps	#Pods	#Threads	QPS	Burst	CPU	Memory
Small	< 200	< 3,000	< 18,000	2	300	500	0.5	1Gi
Medium	< 500	< 5,000	< 30,000	4	500	800	1	2Gi
Large	< 1,000	< 12,000	< 72,000	4	800	1,000	2	4Gi

NOTE: The above configurations are based on medium size applications (each application contains 2~3 components and 5~6 resources).

System Monitoring

The observability infrastructures also include the necessary tools for monitoring the health status of KubeVela control plane. Exceptions and performance bottlenecks will be exposed by the metrics and dashboards.

Load Testing

Several rounds of load testing of KubeVela system has demonstrated that KubeVela is capable of processing thousands of applications under limited resources. The capacity can be scaled up almost linearly given more resources.

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Customized Tunning

As KubeVela can be used under various scenarios, it is possible to crop partial capabilities of KubeVela in return of higher performance.



KubeVela Milestones

Version Releases & Key Features



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KubeVela Adopters

Areas uses KubeVela.



KubeVela is applied across various areas to help manage application systems, especially high-tech industries.

https://github.com/kubevela/community/blob/main/ADOPTERS.md







KubeVela Community

KubeVela attracts world-wide contributors and continuously evolves.





Contributors

KubeVela has attracted over 200 contributors from various countries, including China, USA, India, Germany, Korea, Spain, etc.

lssues

KubeVela received over 1,400 issues and has solved 85% of them.

Biweekly Community Meetings

KubeVela holds bi-weekly community meetings and has recorded 30+ English meetings on YouTube.

https://github.com/kubevela/community







GitHub Repo: Slack Channel ID: DingTalk Group ID: https://github.com/kubevela/ C01BLQ3HTJA 23310022



