Overview

An overview of the architecture, services, and new features of CircleCI Server v3.0.0

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CircleCI Server v3.x Overview

Introduction

CircleCI Server v3.0.0 is a continuous integration and continuous delivery (CI/CD) platform that you can install on your GCP or AWS Kubernetes cluster.

The core of the CircleCI Server application runs inside Kubernetes.

The application exposes five services using load balancers, three of these load balancers are VPC-internal.

Load Balancer	Type	Ports	Description
Front-end GUI Proxy	External	80 and 443	Exposes the web application.
Front-end API	External	80 and 443	Exposes the web application.
Nomad Control Plane	Internal	4647	Exposes an RPC protocol for Nomad runners.
Output Processor	Internal	8585	Ingests output from Nomad runners.
VM Service	Internal	3000	Provisions virtual machines.

CircleCI Server schedules CI jobs using the Nomad scheduler. The Nomad control plane runs inside of Kubernetes, while the Nomad clients, which are responsible for running scheduled CircleCI jobs, are provisioned outside the cluster. CircleCI Server can run Docker jobs on the Nomad clients themselves or in a dedicated virtual machine (VM).

Job artifacts and output are sent directly from jobs in Nomad to object storage (S3, GCS, or other supported options). Audit logs and other items from the application are also stored in object storage so both the Kubernetes cluster and the Nomad clients need access to object storage.

KOTs is used to configure and deploy CircleCI Server 3.0.

Architecture

Below is a diagram describing the architecture of Server 3.x. The available services are described in greater detail in the Services section.

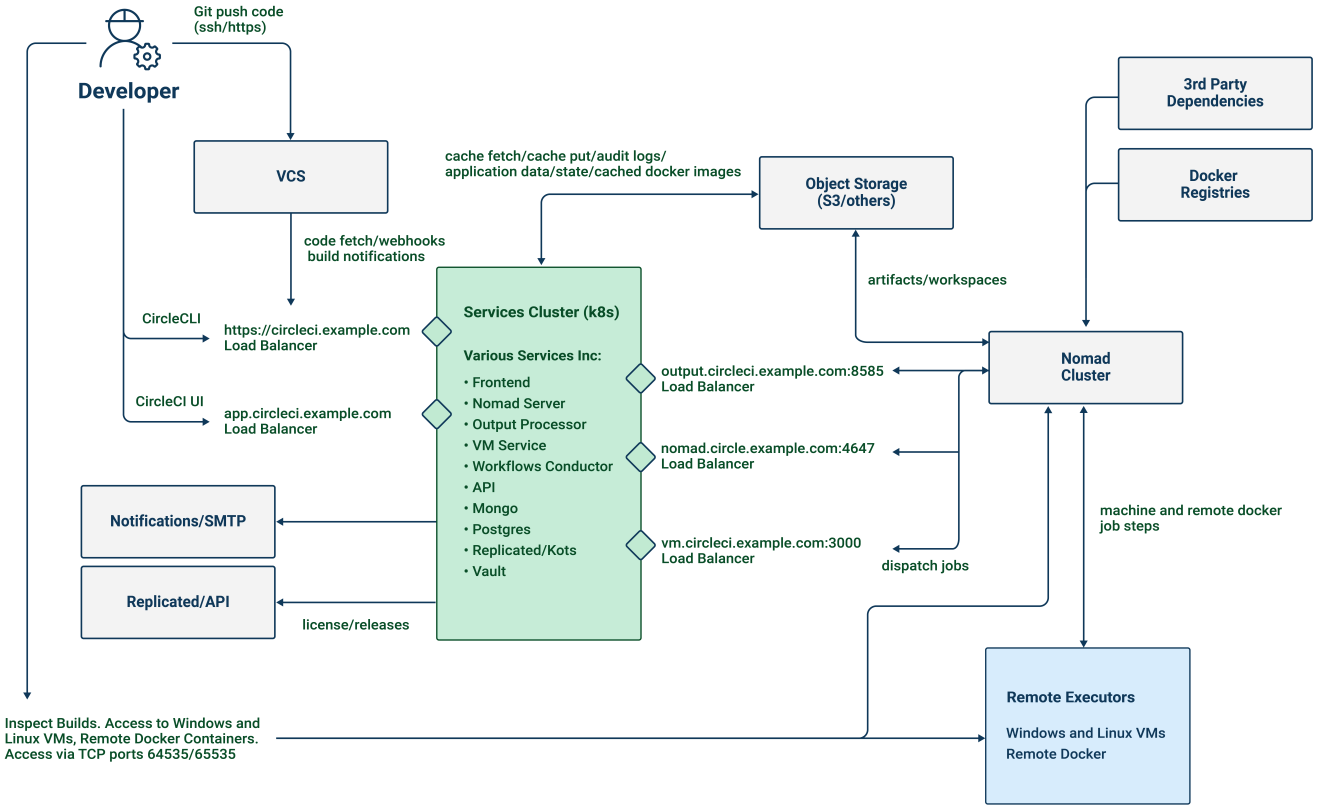

Figure 1. CircleCI Server v3.x Architecture

Services

CircleCI Server 3.0 consists of the following services. Find their descriptions and failure implications below:

Service	Component	Description	What happens if it fails?	Notes
api-service	App Core	Provides a GraphQL API that provides much of the data to render the web frontend.	Many parts of the UI (e.g. Contexts) will fail completely.	
audit-log-service	App Core	Persists audit log events to blob storage for long term storage.	Some events may not be recorded.	
builds-service	App Core	Ingests from www-api and sends to plans-service, workflows-conductor, and to orbs-service		
circle-legacy-dispatcher	Execution	Part of Compute Management. Sends to usage Q (mongo) and back to VCS.		
circleci-mongodb	Execution	Primary datastore		
circleci-postgres	Data storage for microservices			
circleci-rabbitmq	Pipelines and Execution	Queuing for workflow messaging, test-results, usage, crons, output, notifications, and scheduler		
circleci-redis	Execution	Cache data that will not be stored permanently (i.e. build logs), for request caching, and for rate limit calculations.	A failed cache can end up resulting in rate limiting from the VCS if too many calls are made to it.	

Service	Component	Description	What happens if it fails?	Notes
circleci-telegraf		Telegraf collects statsd metrics. All white-boxed metrics in our services publish statsd metrics that are sent to telegraf, but can also be configured to be exported to other places (i.e. Datadog or local-observability-stack-prometheus)		
circleci-vault		HashiCorp Vault to run encryption and decryption as a service for secrets		
config				
contexts-service	App Core	Stores and provides encrypted contexts.	All builds using Contexts will fail.	
cron-service	Pipelines	Triggers scheduled workflows.	Scheduled workflows will not run.	
dispatcher	Execution	Split jobs into tasks and send them to scheduler to run.	No jobs will be sent to Nomad, the run queue will increase in size but there should be no meaningful loss of data.	
domain-service	App Core	Stores and provides information about our domain model. Works with permissions and API	Workflows will fail to start and some REST API calls may fail causing 500 errors in the CircleCI UI. If LDAP authentication is in use, all logins will fail.	

Service	Component	Description	What happens if it fails?	Notes
exim		Will be removed in GA, but users can provide mail submission credentials to an existing MTA	No email notifications will be sent.	
federations-service	App Core	Stores user identities (LDAP). API and permissions-service	If LDAP authentication is in use, all logins will fail and some REST API calls might fail.	LDAP integration not available
frontend	Frontend	CircleCI web app and www-api proxy.	The UI and REST API will be unavailable and no jobs will be triggered by GitHub/Enterprise. Running builds will be OK but no updates will be seen.	
inject-bottoken		A Kubernetes job that inserts a "bot token" into MongoDB. Bot tokens are authorization interservice communication. Mainly for www-api		
kotsadm-kots	Licensing	The main Kots application. Runs the Kots admin console where upgrades and configuration of server take place No admin console available.	No upgrades or configuration possible for Server	
kotsadm-migrations	Licensing	Performs database migrations to handle updates of Kotsadm		

Service	Component	Description	What happens if it fails?	Notes
kotsadm-minio	Licensing	Object storage for Kots licensing		
kotsadm-operator	Licensing	Deploys and controls Kotsadm		
kotsadm-postgres	Licensing	Database for Kots licensing		
legacy-notifier	App Core	Handles notifications to external services (Slack, email, etc.)		
local-observability-stack-grafana	Server	Used for dashboarding and monitoring		
local-observability-stack-loki	Server	Used for log aggregation		
local-observability-stack-prometheus	Server	Used for metrics		
local-observability-stack-promtail	Server	Used to aggregate logs in a Loki instance.	Log aggregation will fail. Loki won't contain any container logs.	
orb-service	Pipelines	Handles communication between orb registry and config.		
output-processor	Execution	Receives job output & status updates and writes them to MongoDB. Also provides an API to running jobs to access caches, workspaces, store caches, workspaces, artifacts, & test results.		
permissions-service	App Core	Provides the CircleCI permissions interface.	Workflows will fail to start and some REST API calls may fail, causing 500 errors in the UI.	

Service	Component	Description	What happens if it fails?	Notes
scheduler	Execution	Runs tasks sent to it. Works with Nomad server.	No jobs will be sent to Nomad, the run queue will increase in size but there should be no meaningful loss of data.	
server-troubleshooter	Data	Runs commands inside pods and appends output to support bundles.		May not be available in GA.
slanger	Server	Provides real-time events to the CircleCI app.	Live UI updates will stop but hard refreshes will still work.	
test-results	Execution	Parses test result files and stores data.	There will be no test failure or timing data for jobs, but this will be back-filled once the service is restarted.	
vm-gc	Compute Management	Periodically check for stale machine and remote Docker instances and request that vm-service remove them.	Old vm-service instances might not be destroyed until this service is restarted.	
vm-scaler	Machine	Periodically requests that vm-service provision more instances for running machine and remote Docker jobs.	VM instances for machine and Remote Docker might not be provisioned causing you to run out of capacity to run jobs with these executors.	Different overlay for EKS vs. GKE.
vm-service	Machine	Inventory of available vm-service instances, and provisioning of new instances.	Jobs that use machine or remote Docker will fail.	

Service	Component	Description	What happens if it fails?	Notes
workflows-conductor-event-consumer	Pipelines	Takes in information from VCS to kick off pipelines.	New Pipelines will not be kicked off when there are changes in the VCS.	
workflows-conductor-grpc-handler	Pipelines	Helps translate the information through gRPC.		
web-ui-*	Frontend	Micro Front End (MFE) services used to render the frontend web application GUI.	The respective services page will fail to load. Example: A web-ui-server-admin failure means the Server Admin page will fail to load.	The MFE's are used to render the web application located at app.<my domain here>

What to read next

- What's new in 3.x
- Server 3.x Installation
- Server 3.x Migration

CircleCI Server v3.x What's New

Server 3.0 is now generally available. The newest version of server offers the ability to scale under heavy workloads, all within your own Kubernetes cluster and private network, while still enjoying the full CircleCI cloud experience. Server 3.0 includes the latest CircleCI features, such as orbs, scheduled workflows, matrix jobs, and more. For existing customers interested in migrating from 2.19 to 3.x, contact your customer success manager. Server 3.0 will receive monthly patch releases and quarterly feature releases.

New Features

- New UI
- Orbs for Server
- Pipelines
- Config 2.1
- API 2.0
- Scheduled Workflows
- Matrix Jobs
- And much more...

Known Issues

- No support for external data stores (Postgres, Mongo, Vault). This feature will be implemented in a future release.
- It is currently possible for multiple organizations under the same CircleCI server account to have contexts with identical names. This should be avoided as doing so could lead to errors and unexpected behavior. This will be fixed in a future patch release.
- CircleCI 1.0 builds are not supported. If an attempt is made to run a 1.0 build, no feedback will be available in the application to indicate the cause of the issue. If a build is run on your installation and does not show up in the CircleCI application, users should be directed to use the CircleCI CLI to validate the project configuration and get details of the possible cause of the issue.
- Account contexts are not usable in v3.0. This feature will be fixed in a future release.
- CircleCI currently assigns a public load balancer for the frontend services. For some customers, their infrastructure or security groups won't allow this. We will provide an optional internal local balancer for the frontend services in a future release.
- Telegraf metrics collection customization is not yet available.
- Support for GPU builders is not yet available.

What to read next

To learn more about Server v3.x, see the following:

- Server 3.x Overview
- Server 3.x Installation

- Server 3.x Migration
- Server 3.x Operations

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