INSTALLATION GUIDE

A guide for installing and upgrading CircleCI Server on AWS.

docs@circleci.com

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Installation Overview

This document is intended for system administrators of self-hosted installations of CircleCI Server.

The following sections provide planning information, system requirements and step-by-step instructions for installing CircleCI Server on Amazon Web Services (AWS) with Terraform.

Refer to the What's New page for full details of what's new and fixed in this release.

If you are looking to update an existing installation, see our guide to Upgrading a Server Installation.

Support Packages

CircleCI 2.0 may be installed without a support package, on AWS, using the examples and instructions in this document. Alternatively, if you do decide to go ahead with a support package, there are a number of benefits, as detailed below:

Non-AWS Platform Support

With a Platinum CircleCI support package it is possible to install and configure CircleCI on Azure or any other platform used in your organization. Contact CircleCI support or your account representative to get started.

Externalization

With a Platinum support agreement, it is possible to improve performance and resilience by configuring the following services to run externally to the Services machine:

- PostgreSQL
- MongoDB
- Vault
- Rabbitmq
- Redis
- Nomad

Contact CircleCI support or your account representative to evaluate your installation against the current requirements for running external services.
CircleCI Server v2.19 What’s New

This document provides a summary of features and product notes for the release of CircleCI Server v2.19. For a full list of changes, including patch releases, refer to the changelog. For a step by step guide to upgrading your CircleCI Server installation to v2.19, see our upgrade guide.

Requirements for Upgrading

- For AWS installs, before upgrading to v2.19, follow this guide to update your nomad launch configuration.

- If at any time your organization name has been changed, there is a script that must be run before stating the upgrade process. If you are already running v2.18.x, you will have run this already.

Notes and Best Practices

- We now require a minimum 32GB of RAM for the Services Machine.
- We made some changes to our Redis configuration in v2.18. If you have externalized Redis then you’ll need to update your configuration. Please contact your Customer Success Manager if you are upgrading from pre v2.18 to v2.19.
- We have made changes to our Postgres version and require at least postgresQL v9.5.16. If you have externalized postgresQL then please update to at least that version in 2.17.x before upgrading to 2.19.

What’s New in Release 2.19

- You can now customize resource classes for your installation to provide developers with CPU/RAM options for the Jobs they configure. For more information see our guide to customizing resource classes in Server v2.19.
- CircleCI Server installations on AWS can now be configured to work on GovCloud.
- The image used to run the RabbitMQ server has been updated to fix vulnerabilities.

Known Issues

- The first user to access a CircleCI Server installation should be granted admin access. Currently, there is an issue preventing this from happening when LDAP authentication is in use. Follow this guide for a workaround.
Nomad Client Launch Configuration Update

**IMPORTANT**

⚠️ This update must be run before upgrading to Server v2.19

- **THIS WILL REQUIRE DOWNTIME.** Please schedule a maintenance window before proceeding.
- This change is only compatible with CircleCI Server versions greater than or equal to 2.19.0
- If you are using the Static version of CircleCI Server, you will need to recreate your builders manually. Refer to the guide linked [here](#) for the updated scripts and further instruction.

**Sign in to AWS**

1. Login to the AWS
2. Select the region that your CircleCI Server (Server) resides in
3. Select the **Services** tab and select **EC2**

**Find the Launch Configuration and Service Box IP address**

1. Select **Auto Scaling Groups** located near the bottom of the left navigation pane
2. Select the auto scaling group configuration associated with your Server installation. Typically resembles `-ghe_nomad_clients_asg`
3. Make note of the name of **Launch Configuration** under the **Details** tab. Typically resembles `terraform-20200114212820082700000001`
4. In the left navigation pane, select **Launch Configurations**
5. Locate the launch configuration that matches the one found in step 3.
6. In the bottom pane, select the `View User Data` link
7. Scroll down or search for the **Creating config.hcl** section.
8. Write down or copy the service box private IP address located in the client portion of the config located next to `servers = ["IP_ADDRESS:4647"]` You will need this in the next step.

```hcl
... 
... 
client {
  enabled = true
  # Expecting to have DNS record for nomad server(s)
  servers = ["YOUR_SERVICES_BOX_IP_ADDRESS:4647"]  <==== YOU WILL NEED THIS IP ADDRESS
  node_class = "linux-64bit"
  options = {
    "driver.raw_exec.enable" = "1"
  }
}
... 
```
Create a New Launch Configuration

1. Right-click the launch configuration and select Copy Launch Configuration
2. At the top of the screen, select `3. Configure details`
3. Update the name to something meaningful and easy to identify IE nomad-client-lc-20200117
4. Select the Advanced Details dropdown
5. Below you will find the updated Nomad client configuration. Replace the contents of the User data pane with the script below.
6. IMPORTANT: Locate the section of code you found in step 8 above and replace the IP address with that of your services box.
7. Select the Skip to review button at the bottom right of the screen
8. Select the Create Launch Configuration Button
9. Verify that the SSH key-pair name is correct and select Create launch configuration button

Update the Auto Scaling group

1. Return the Auto Scaling Groups page
2. Locate the auto scaling group we identified in the Find the Launch Configuration and Service Box IP address section above
3. Right-click the auto scaling group and select Edit from the menu
4. Select the launch configuration created in the previous section from the Launch Configuration dropdown menu.
5. Press the Save button

Rolling the Nomad Client Instances

There are many strategies you can use to update the builders. Some ideas include but are not limited to:

- Terminate all of the existing nomad client instances and allow the auto scaler to recreate them.
- Edit the auto scaling configuration and set the Desired Capacity to 0. Once the existing instances have terminated, set the Desired Capacity to the original number.

Please use whatever works best with your existing methods of auto scaling group management.

Verify the New Nomad Clients are Communicating with Nomad Server

1. SSH into the CircleCI Services Box
2. Enter the following command: `sudo docker exec -it nomad nomad node-status`. The output should resemble the following:
3. Verify that there are new builders containing the **default** DC name and they are in a **ready** state.

**Updated Nomad Client Launch Configuration Script**

```bash
#!/bin/bash

set -exu

export http_proxy=""
export https_proxy=""
export no_proxy=""
export aws_instance_metadata_url="http://169.254.169.254"
export DEBIAN_FRONTEND=noninteractive
UNAME="$(uname -r)"

echo "-------------------------------------------"
echo "     Performing System Updates"
echo "-------------------------------------------"
apt-get update && apt-get -y upgrade

echo "-------------------------------------------"
echo "       Installing NTP"
echo "-------------------------------------------"
apt-get install -y ntp

# Use AWS NTP config for EC2 instances and default for non-AWS
if [-f /sys/hypervisor/uuid ] && [ `head -c 3 /sys/hypervisor/uuid` == ec2 ]; then
cat <<EOT > /etc/ntp.conf
driftfile /var/lib/ntp/ntp.drift
disable monitor
restrict default ignore
restrict 127.0.0.1 mask 255.0.0.0
restrict 169.254.169.123 nomodify notrap
server 169.254.169.123 prefer iburst
EOT
else
  echo "USING DEFAULT NTP CONFIGURATION"
fi

service ntp restart

echo "-------------------------------------------"
echo "       Installing Docker"
echo "-------------------------------------------"
apt-get install -y apt-transport-https ca-certificates curl software-properties-common
```
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | apt-key add -
ad-d apt-repository "deb [arch=amd64] https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable"
apt-get install -y "linux-image-$UNAME"
apt-get update
apt-get -y install docker-ce

apt-get update
apt-get -y install docker-ce

# force docker to use userns-remap to mitigate CVE 2019-5736
apt-get -y install jq
mkdir -p /etc/docker
[ -f /etc/docker/daemon.json ] || echo '{}' > /etc/docker/daemon.json
tmp=$(mktemp)
cp /etc/docker/daemon.json /etc/docker/daemon.json.orig
jq '.["usersns-remap"]="default"' /etc/docker/daemon.json > "$tmp" & mv "$tmp" /etc/docker/daemon.json

sudo echo 'export http_proxy=""' >> /etc/default/docker
sudo echo 'export https_proxy=""' >> /etc/default/docker
sudo echo 'export no_proxy=""' >> /etc/default/docker
sudo service docker restart

sleep 5

echo "--------------------------------------"
echo "     Installing nomad"
echo "--------------------------------------"

export PRIVATE_IP=$(/sbin/ifconfig ens3 | grep 'inet addr:' | cut -d: -f2 | awk '{ print $1}')
export INSTANCE_ID=$(curl $aws_instance_metadata_url/latest/meta-data/instance-id)

mkdir -p /etc/nomad
cat <<EOT > /etc/nomad/config.hcl
log_level = "DEBUG"
name = "$INSTANCE_ID"
data_dir = "/opt/nomad"
datacenter = "default"
advertise {
    http = "$PRIVATE_IP"
    rpc = "$PRIVATE_IP"
    serf = "$PRIVATE_IP"
}
client {
    enabled = true
    # Expecting to have DNS record for nomad server(s)
    servers = ["REPLACE_ME_WITH_SERVICE_BOX_IP:4647"]
    node_class = "linux-64bit"
    options = {"driver.raw_exec.enable" = "1"}
}
EOT
echo "--------------------------------------"
echo "      Creating nomad.conf"
cat <<EOT > /etc/systemd/system/nomad.service
[Unit]
Description="nomad"
[Service]
Restart=always
RestartSec=30
TimeoutStartSec=1m
ExecStart=/usr/bin/nomad agent -config /etc/nomad/config.hcl
[Install]
WantedBy=multi-user.target
EOT

echo "--------------------------------------"

docker network create --driver=bridge --opt com.docker.network.bridge.name=ci-privileged ci-privileged

echo "--------------------------------------"

echo "      Starting Nomad service"

service nomad restart
System Requirements

This document is intended for system administrators of self-hosted installations of CircleCI Server.

This section defines the system and port access requirements for installing CircleCI v2.19.

Services Machine

The Services machine hosts the core of our Server product, including the user-facing website, API engine, datastores, and Nomad job scheduler. It is best practice to use an isolated machine.

The following table defines the Services machine CPU, RAM, and disk space requirements:

<table>
<thead>
<tr>
<th>Number of daily active CircleCI users</th>
<th>CPU</th>
<th>RAM</th>
<th>Disk space</th>
<th>NIC speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50</td>
<td>8 cores</td>
<td>32GB</td>
<td>100GB</td>
<td>1Gbps</td>
</tr>
<tr>
<td>50-250</td>
<td>12 cores</td>
<td>64GB</td>
<td>200GB</td>
<td>1Gbps</td>
</tr>
<tr>
<td>251-1000</td>
<td>16 cores</td>
<td>128GB</td>
<td>500GB</td>
<td>10Gbps</td>
</tr>
<tr>
<td>1001-5000</td>
<td>20 cores</td>
<td>256GB</td>
<td>1TB</td>
<td>10Gbps</td>
</tr>
<tr>
<td>5000+</td>
<td>24 cores</td>
<td>512GB</td>
<td>2TB</td>
<td>10Gbps</td>
</tr>
</tbody>
</table>

Nomad Clients

Nomad client machines run the CircleCI jobs that are scheduled by the Nomad Server on the Services machine. Following are the Minimum CPU, RAM, and disk space requirements per client:

- CPU: 4 cores
- RAM: 32GB
- Disk space: 100GB
- NIC speed: 1Gbps

The following table defines the number of Nomad clients to make available as a best practice. Scale up and down according to demand on your system:

<table>
<thead>
<tr>
<th>Number of daily active CircleCI users</th>
<th>Number of Nomad client machines</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50</td>
<td>1-5</td>
</tr>
<tr>
<td>50-250</td>
<td>5-10</td>
</tr>
<tr>
<td>250-1000</td>
<td>10-15</td>
</tr>
<tr>
<td>5000+</td>
<td>15+</td>
</tr>
</tbody>
</table>
## Server Ports

Below all ports required by a CircleCI 2.0 installation are listed for each machine type.

### Services Machine

<table>
<thead>
<tr>
<th>Port number</th>
<th>Protocol</th>
<th>Direction</th>
<th>Source / destination</th>
<th>Use</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>TCP</td>
<td>Inbound</td>
<td>End users</td>
<td>HTTP web app traffic</td>
<td></td>
</tr>
<tr>
<td>443</td>
<td>TCP</td>
<td>Inbound</td>
<td>End users</td>
<td>HTTPS web app traffic</td>
<td></td>
</tr>
<tr>
<td>7171</td>
<td>TCP</td>
<td>Inbound</td>
<td>End users</td>
<td>Artifacts access</td>
<td></td>
</tr>
<tr>
<td>8081</td>
<td>TCP</td>
<td>Inbound</td>
<td>End users</td>
<td>Artifacts access</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>TCP</td>
<td>Inbound</td>
<td>Administrators</td>
<td>SSH</td>
<td></td>
</tr>
<tr>
<td>8800</td>
<td>TCP</td>
<td>Inbound</td>
<td>Administrators</td>
<td>Admin console</td>
<td></td>
</tr>
<tr>
<td>8125</td>
<td>UD</td>
<td>Inbound</td>
<td>Nomad Clients</td>
<td>Metrics</td>
<td></td>
</tr>
<tr>
<td>8125</td>
<td>UD</td>
<td>Inbound</td>
<td>Nomad Servers</td>
<td>Metrics</td>
<td>Only if using externalized Nomad Servers</td>
</tr>
<tr>
<td>8125</td>
<td>UD</td>
<td>Inbound</td>
<td>All Database Servers</td>
<td>Metrics</td>
<td>Only if using externalised databases</td>
</tr>
<tr>
<td>4647</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>Nomad Clients</td>
<td>Internal communication</td>
<td></td>
</tr>
<tr>
<td>8585</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>Nomad Clients</td>
<td>Internal communication</td>
<td></td>
</tr>
<tr>
<td>7171</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>Nomad Clients</td>
<td>Internal communication</td>
<td></td>
</tr>
<tr>
<td>3001</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>Nomad Clients</td>
<td>Internal communication</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>GitHub Enterprise / GitHub.com (whichever applies)</td>
<td>Webhooks / API access</td>
<td></td>
</tr>
<tr>
<td>443</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>GitHub Enterprise / GitHub.com (whichever applies)</td>
<td>Webhooks / API access</td>
<td></td>
</tr>
<tr>
<td>Port number</td>
<td>Protocol</td>
<td>Direction</td>
<td>Source / destination</td>
<td>Use</td>
<td>Notes</td>
</tr>
<tr>
<td>-------------</td>
<td>----------</td>
<td>-----------</td>
<td>----------------------</td>
<td>-----</td>
<td>-------</td>
</tr>
<tr>
<td>80</td>
<td>TCP</td>
<td>Outbound</td>
<td>AWS API endpoints</td>
<td>API access</td>
<td>Only if running on AWS</td>
</tr>
<tr>
<td>443</td>
<td>TCP</td>
<td>Outbound</td>
<td>AWS API endpoints</td>
<td>API access</td>
<td>Only if running on AWS</td>
</tr>
<tr>
<td>5432</td>
<td>TCP</td>
<td>Outbound</td>
<td>PostgreSQL Servers</td>
<td>PostgreSQL database connection</td>
<td>Only if using externalised databases. Port is user-defined, assuming the default PostgreSQL port.</td>
</tr>
<tr>
<td>27017</td>
<td>TCP</td>
<td>Outbound</td>
<td>MongoDB Servers</td>
<td>MongoDB database connection</td>
<td>Only if using externalized databases. Port is user-defined, assuming the default MongoDB port.</td>
</tr>
<tr>
<td>5672</td>
<td>TCP</td>
<td>Outbound</td>
<td>RabbitMQ Servers</td>
<td>RabbitMQ connection</td>
<td>Only if using externalized RabbitMQ</td>
</tr>
<tr>
<td>6379</td>
<td>TCP</td>
<td>Outbound</td>
<td>Redis Servers</td>
<td>Redis connection</td>
<td>Only if using externalized Redis</td>
</tr>
<tr>
<td>4647</td>
<td>TCP</td>
<td>Outbound</td>
<td>Nomad Servers</td>
<td>Nomad Server connection</td>
<td>Only if using externalized Nomad Servers</td>
</tr>
<tr>
<td>443</td>
<td>TCP</td>
<td>Outbound</td>
<td>CloudWatch Endpoints</td>
<td>Metrics</td>
<td>Only if using AWS CloudWatch</td>
</tr>
</tbody>
</table>
## Nomad Clients

<table>
<thead>
<tr>
<th>Port number</th>
<th>Protocol</th>
<th>Direction</th>
<th>Source / destination</th>
<th>Use</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>64535-65535</td>
<td>TCP</td>
<td>Inbound</td>
<td>End users</td>
<td>SSH into builds feature</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>TCP</td>
<td>Inbound</td>
<td>Administrators</td>
<td>CircleCI Admin API access</td>
<td></td>
</tr>
<tr>
<td>443</td>
<td>TCP</td>
<td>Inbound</td>
<td>Administrators</td>
<td>CircleCI Admin API access</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>TCP</td>
<td>Inbound</td>
<td>Administrators</td>
<td>SSH</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>TCP</td>
<td>Outbound</td>
<td>GitHub Enterprise / GitHub.com (whichever applies)</td>
<td>Download Code From GitHub</td>
<td></td>
</tr>
<tr>
<td>4647</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>Services Machine</td>
<td>Internal communication</td>
<td></td>
</tr>
<tr>
<td>8585</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>Services Machine</td>
<td>Internal communication</td>
<td></td>
</tr>
<tr>
<td>7171</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>Services Machine</td>
<td>Internal communication</td>
<td></td>
</tr>
<tr>
<td>3001</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>Services Machine</td>
<td>Internal communication</td>
<td></td>
</tr>
<tr>
<td>443</td>
<td>TCP</td>
<td>Outbound</td>
<td>Cloud Storage Provider</td>
<td>Artifacts storage</td>
<td>Only if using external artifacts storage</td>
</tr>
<tr>
<td>53</td>
<td>UDP</td>
<td>Outbound</td>
<td>Internal DNS Server</td>
<td>DNS resolution</td>
<td>This is to make sure that your jobs can resolve all DNS names that are needed for their correct operation.</td>
</tr>
</tbody>
</table>
### GitHub Enterprise / GitHub.com

<table>
<thead>
<tr>
<th>Port number</th>
<th>Protocol</th>
<th>Direction</th>
<th>Source / destination</th>
<th>Use</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>TCP</td>
<td>Inbound</td>
<td>Services Machine</td>
<td>Git access</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>TCP</td>
<td>Inbound</td>
<td>Nomad Clients</td>
<td>Git access</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>TCP</td>
<td>Inbound</td>
<td>Nomad Clients</td>
<td>API access</td>
<td></td>
</tr>
<tr>
<td>443</td>
<td>TCP</td>
<td>Inbound</td>
<td>Nomad Clients</td>
<td>API access</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>Services Machine</td>
<td>Webhooks / API access</td>
<td></td>
</tr>
</tbody>
</table>

### PostgreSQL Servers

<table>
<thead>
<tr>
<th>Port number</th>
<th>Protocol</th>
<th>Direction</th>
<th>Source / destination</th>
<th>Use</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>5432</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>PostgreSQL Servers</td>
<td>PostgreSQL replication</td>
<td>Only if using externalized databases. Port is user-defined, assuming the default PostgreSQL port.</td>
</tr>
</tbody>
</table>

### MongoDB Servers

<table>
<thead>
<tr>
<th>Port number</th>
<th>Protocol</th>
<th>Direction</th>
<th>Source / destination</th>
<th>Use</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>27017</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>MongoDB Servers</td>
<td>MongoDB replication</td>
<td>Only if using externalized databases. Port is user-defined, assuming the default MongoDB port.</td>
</tr>
</tbody>
</table>
### RabbitMQ Servers

<table>
<thead>
<tr>
<th>Port number</th>
<th>Protocol</th>
<th>Direction</th>
<th>Source / destination</th>
<th>Use</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>5672</td>
<td>TCP</td>
<td>Inbound</td>
<td>Services Machine</td>
<td>RabbitMQ connection</td>
<td>Only if using externalized RabbitMQ</td>
</tr>
<tr>
<td>5672</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>RabbitMQ Servers</td>
<td>RabbitMQ mirroring</td>
<td>Only if using externalized RabbitMQ</td>
</tr>
</tbody>
</table>

### Redis Servers

<table>
<thead>
<tr>
<th>Port number</th>
<th>Protocol</th>
<th>Direction</th>
<th>Source / destination</th>
<th>Use</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6379</td>
<td>TCP</td>
<td>Inbound</td>
<td>Services Machine</td>
<td>Redis connection</td>
<td>Only if using externalized Redis</td>
</tr>
<tr>
<td>6379</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>Redis Servers</td>
<td>Redis replication</td>
<td>Only if using externalized Redis, and using Redis replication (optional)</td>
</tr>
</tbody>
</table>

### Nomad Servers

<table>
<thead>
<tr>
<th>Port number</th>
<th>Protocol</th>
<th>Direction</th>
<th>Source / destination</th>
<th>Use</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4646</td>
<td>TCP</td>
<td>Inbound</td>
<td>Services Machine</td>
<td>Nomad Server connection</td>
<td>Only if using externalized Nomad Servers</td>
</tr>
<tr>
<td>4647</td>
<td>TCP</td>
<td>Inbound</td>
<td>Services Machine</td>
<td>Nomad Server connection</td>
<td>Only if using externalized Nomad Servers</td>
</tr>
<tr>
<td>4648</td>
<td>TCP</td>
<td>Bi-directional</td>
<td>Nomad Servers</td>
<td>Nomad Servers internal communication</td>
<td>Only if using externalized Nomad Servers</td>
</tr>
</tbody>
</table>
Installation Prerequisites

This document is intended for system administrators of self-hosted installations of CircleCI Server.

CircleCI uses Terraform to automate parts of the infrastructure for your CircleCI Server install, so you will need to install this first:

- Visit [Download Terraform](#) and choose the correct package for your architecture.

Ensure you have the following information available before beginning the installation procedure:

- A CircleCI License file (.rli). Contact CircleCI support for a license and request a cluster-enabled license to run jobs on dedicated instances for best performance.
- Your AWS Access Key ID and Secret Access Key.
- Name of your AWS EC2 key pair.
- AWS Region, for example `us-west-2`.
- AWS Virtual Private Cloud (VPC) ID and AWS Subnet ID. If your account is configured to use a default VPC, your default VPC ID is listed under Account Attributes, which you will find from the AWS management console on the EC2 dashboard page.
- Set your VPC (enableDnsSupport) setting to `true` to ensure that queries to the Amazon provided DNS server at the 169.254.169.253 IP address, or the reserved IP address at the base of the VPC IPv4 network range plus two will succeed. See the [Using DNS with Your VPC](#) Amazon Web Services documentation for additional details.

Private Subnet Requirements

The following additional settings are required to support using private subnets on AWS with CircleCI:

- The private subnet for builder boxes must be configured with a [NAT gateway](#) or an [internet gateway](#) configured for the outbound traffic to the internet via attached route tables.

  The subnet should be large enough to never exhaust the addresses.

- The [VPC Endpoint for S3](#) should be enabled. Enabling the VPC endpoint for S3 should significantly improve S3 operations for CircleCI and other nodes within your subnet.

- Adequately power the NAT instance for heavy network operations. Depending on the specifics of your deployment, it is possible for NAT instances to become constrained by highly parallel builds using Docker and external network resources. A NAT that is inadequate could cause slowness in network and cache operations.

- If you are integrating with github.com, ensure that your network access control list (ACL) whitelists ports 80 and 443 for GitHub webhooks. When integrating with GitHub, either set up CircleCI in a public subnet, or set up a public load balancer to forward github.com traffic.

- See the [Services Machine](#) section of our overview for more information on the specific ports that need to be accessible to instances in your CircleCI installation.
Planning

Have available the following information and policies before starting the installation:

- If you use network proxies, contact your Account team before beginning your install.
- Plan to provision at least two AWS instances, one for Services and one for your first set of Nomad Clients. Best practice is to use an m4.2xlarge instance with 8 vCPUs and 32GB RAM for both the Services and Nomad Clients instances.
- AWS instances must have outbound access to pull Docker containers and to verify your license. If you don't want to give open outbound access, see our list of ports that will need access.
- In order to provision required AWS entities with Terraform you will require an IAM User with the following permissions (See the AWS guidance on creating IAM users):

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Action": [
        "s3:*
      ],
      "Effect": "Allow",
      "Resource": [
        "arn:aws:s3:::circleci-*",
        "arn:aws:s3:::circleci-/*",
        "arn:aws:s3:::*"
      ]
    },
    {
      "Action": [
        "autoscaling:*",
        "sqs:*",
        "iam:*",
        "ec2:StartInstances",
        "ec2:RunInstances",
        "ec2:TerminateInstances",
        "ec2:Describe*",
        "ec2:CreateTags",
        "ec2:AuthorizeSecurityGroupEgress",
        "ec2:AuthorizeSecurityGroupIngress",
        "ec2:CreateSecurityGroup",
        "ec2:DeleteSecurityGroup",
        "ec2:DescribeInstanceAttribute"
      ]
    }
  ]
}
```
"ec2:DescribeInstanceStatus",
"ec2:DescribeInstances",
"ec2:DescribeNetworkAcls",
"ec2:DescribeSecurityGroups",
"ec2:RevokeSecurityGroupEgress",
"ec2:RevokeSecurityGroupIngress",
"ec2:ModifyInstanceAttribute",
"ec2:ModifyNetworkInterfaceAttribute",
"cloudwatch:*",
"autoscaling:DescribeAutoScalingGroups",
"iam:GetUser"
],
"Resource": [
  "*
]
,
"Effect": "Allow"
}
Installation on AWS with Terraform

This document is intended for system administrators of self-hosted installations of CircleCI Server.

Following is a step by step guide to installing CircleCI Server v2.19 with Terraform.

Define Variables for Terraform

1. Clone the Setup repository. If you already have it cloned, make sure it is up-to-date and you are on the master branch by running:

   ```bash
   git checkout master && git pull
   ```

2. Go to the top directory of the enterprise-setup repo on your local machine.

3. Run `terraform init` to initialize your working directory.

4. Run `make init` to initialize a `terraform.tfvars` file (your previous `terraform.tfvars` if any, will be backed up in the same directory).

5. Open `terraform.tfvars` in an editor and fill in appropriate AWS values for section 1.

6. If you plan to use 1.0 builders, specify a `circle_secret_passphrase` in section 2, replacing `…` with alpha numeric characters, if not, leave it as is. 1.0 builders are disabled by default in section 3.

7. Specify the instance type to use for your Nomad clients. By default, the value specified in the `terraform.tfvars` file for Nomad Clients is `m4.2xlarge` (8 vCPUs, 32GB RAM). To increase the number of concurrent CircleCI jobs that each Nomad Client can run, modify section 2 of the `terraform.tfvars` file to specify a larger `nomad_client_instance_type`. Refer to the AWS Amazon EC2 Instance Types guide for details.

   The `builder_instance_type` is only used for CircleCI 1.0 and is disabled by default in section 3.

8. In section 3 you can:
   a. choose to use 1.0 Builders if your project requires it (by changing the count to 1)
   b. enter proxy details, and enter a prefix if there will be multiple installations within your AWS region – the Services and Nomad client instances will be displayed with this prefix in the AWS console.
# 1. Required Cloud Configuration

aws_access_key = "...
aws_secret_key = "...
aws_region = "eu-central-1"
aws_vpc_id = "...
aws_subnet_id = "...
aws_ssh_key_name = "...

# 2. Required CircleCI Configuration

circle_secret_passphrase = "...
services_instance_type = "m4.2xlarge"
builder_instance_type = "r3.4xlarge"
nomad_client_instance_type = "m4.2xlarge"

# 3. Optional Cloud Configuration

# Set this to `1` or higher to enable CircleCI 1.0 builders
desired_builders_count = "0"

# Provide proxy address if your network configuration requires it
http_proxy = ""
https_proxy = ""
no_proxy = ""

# Use this var if you have multiple installation within one AWS region
prefix = "...

services_disable_api_termination = "false"
force_destroy_s3_bucket = "true"

---

Figure 1. Example tfvars

Above is an example of the `terraform.tfvars` file you will be editing. The table below shows some of the default settings, and some optional variables that can be used to further customize your cluster. A full list of
variables and defaults can be found in the `variables.tf` file in the root of the `enterprise-setup` directory.

If you require your installation to work on AWS GovCloud, you can enable this by setting `enable_govcloud` to `true`.

Optional vars:

<table>
<thead>
<tr>
<th>Var</th>
<th>Description</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>services_instance_type</td>
<td>Instance type for the centralized services box. We recommend a m4 instance</td>
<td>m4.2xlarge</td>
</tr>
<tr>
<td>builder_instance_type</td>
<td>Instance type for the 1.0 builder machines. We recommend a r3 instance</td>
<td>r3.2xlarge</td>
</tr>
<tr>
<td>max_builders_count</td>
<td>Max number of 1.0 builders</td>
<td>2</td>
</tr>
<tr>
<td>nomad_client_instance_type</td>
<td>Instance type for the nomad clients (2.0 builders). We recommend a XYZ instance</td>
<td>m4.xlarge</td>
</tr>
<tr>
<td>max_clients_count</td>
<td>Max number of nomad clients</td>
<td>2</td>
</tr>
<tr>
<td>prefix</td>
<td>Prefix for resource names</td>
<td>circleci</td>
</tr>
<tr>
<td>enable_nomad</td>
<td>Provisions a nomad cluster for CircleCi Server v2.x</td>
<td>1</td>
</tr>
<tr>
<td>enable_route</td>
<td>Enable creating a Route53 route for the Services box</td>
<td>0</td>
</tr>
<tr>
<td>enable_govcloud</td>
<td>Allows deployment into AWS GovCloud</td>
<td>false</td>
</tr>
<tr>
<td>services_user_data_enabled</td>
<td>Set to 0 to disable automated installation on Services Box</td>
<td>1</td>
</tr>
<tr>
<td>force_destroy_s3_bucket</td>
<td>Add/Remove ability to forcefully destroy S3 bucket when your installation is shut down</td>
<td>false</td>
</tr>
<tr>
<td>services_disable_api_termination</td>
<td>Protect the services instance from API termination. Set to false if you would like to terminate the Services box automatically when your installation is shut down</td>
<td>true</td>
</tr>
</tbody>
</table>

**Provision Instances**

1. Save your changes to the `tfvars` file and run the following:
terraform plan

2. To provision your instances, run the following:

   terraform apply

You will be asked to confirm if you wish to go ahead by typing yes.

3. An IP address will be provided at the end of the Terraform output. Visit this IP to carry on the install process.

Access Your Installation

1. You will see a browser-specific SSL/TLS info box. This is just to inform you that on the next screen your browser might tell you the connection to the admin console is unsafe, but you can be confident it is secure. Click Continue to Setup and proceed to your installation IP.

   Figure 2. SSL Security

2. Enter your hostname – this can be your domain name or public IP of the Services Machine instance. At this time you can also upload your SSL public key and certificate if you have them. To proceed without providing these click Use Self-Signed Cert – choosing this option will mean you will see security warnings each time you visit the Management Console.
3. Upload your license.

4. Decide how to secure the Management Console. You have three options:
   a. Anonymous admin access to the console, anyone on port 8800 can access (not recommended)
   b. Set a password that can be used to securely access the Management Console (recommended)
   c. Use your existing directory-based authentication system (for example, LDAP)
5. Your CircleCI installation will be put through a set of preflight checks, once they have completed, scroll down and click Continue.
Installation Setup

You should now be on the Management Console settings page (your-circleci-hostname.com:8800).

You can make changes to the settings on this page at any time but changes here will require **downtime** while the service is restarted. Some settings are covered in more detail in our Operations Guide.

1. The Hostname field should be pre-populated from earlier in the install process, but if you skipped that step, enter your domain or public IP of the Services machine instance. You can check this has been entered correctly by clicking Test Hostname Resolution.

2. The Services section is only used when externalizing services. Externalization is available with a Platinum service contract. Contact support@circleci.com if you would like to find out more.

3. Under Execution Engines, only select 1.0 Builders if you require them for a legacy project – most users will leave this unchecked.

4. Select Cluster in the 2.0 Builders Configuration section. The Single box option will run jobs on the Services machine, rather than a dedicated instance, so is only suitable for trialling the system, or for some small teams.
5. Register CircleCI as a new OAuth application in GitHub.com or GitHub Enterprise by following the instructions provided onscreen.

   If you get an "Unknown error authenticating via GitHub. Try again, or contact us." message, try using http: instead of https: for the Homepage URL and callback URL.

6. Copy the Client ID and Secret from GitHub and paste it into the relevant fields, then click Test Authentication.

7. If you are using GitHub.com, move on to the next step. If using Github Enterprise, you will also need to supply an API Token so we can verify your organization. To provide this, complete the following from your GitHub Enterprise dashboard:

   a. Navigate to Personal Settings (top right) > Developer Settings > Personal Access Tokens.

   b. Click “generate new token”. Name the token appropriately to prevent accidental deletion. Do not tick any of the checkboxes, we only require the default public read-level access so no extra permissions are required. We recommend this token should be shared across your organization rather than being owned by a single user.

   c. Copy the new token and paste it into the GitHub Enterprise Default API Token field.
8. If you wish to use LDAP authentication for your installation, enter the required details in the LDAP section. For a detailed runthrough of LDAP settings, see our [LDAP authentication guide](#).

9. We recommend using an SSL certificate and key for your install. You can submit these in the Privacy section if this step was missed during the installation.

10. We recommend using S3 for storage and all required fields for Storage are pre-populated. The IAM user, as referred to in the planning section of this document, is used here.
11. Complete enhanced AWS Integration options.

12. Complete the Email section if you wish to configure your own email server for sending build update emails. Leave this section if you wish to use our default email server.

   Due to an issue with our third party tooling, Replicated, the Test SMTP Authentication button is not currently working.

13. Configure VM service if you plan to use Remote Docker or machine executor (Linux/Windows) features. We recommend using an IAM instance profile for authentication, as described in the planning section of this document. With this section completed, instances will automatically be provisioned to execute jobs in Remote Docker or use the machine executor. To use the Windows machine executor you will need to build an image. For more information on VM Service and creating custom AMIs for remote Docker and machine executor jobs, see our VM service guide.

   You can preallocate instances to always be up and running, reducing the time taken for Remote Docker and machine executor jobs to start. If preallocation is set, a cron job will cycle through your preallocated instances once per day to prevent them getting into a bad/dead state.

   If Docker Layer Caching (DLC) is to be used, VM preallocation should be set to 0, forcing containers to be spun up on-demand for both machine and Remote Docker. It is worth noting here that if these fields are not set to 0 but all preallocated instances are in use, DLC will work correctly, as if preallocation was set to 0.

14. If you wish to use AWS Cloudwatch or Datadog for collating metrics for your installation, set this up here. For more information see our Monitoring guidance:
You can also customize the metrics received through Telegraf. For more on this see our Custom Metrics guide.

15. Artifacts persist data after a job is completed, and may be used for longer-term storage of your build process outputs. By default, CircleCI Server only allows approved types to be served. This is to protect users from uploading, and potentially executing malicious content. The Artifacts setting allows you to override this protection. For more information on safe/unsafe types see our Build Artifacts guidance.

16. After agreeing to the License Agreement and saving your settings, select Restart Now from the popup. You will then be redirected to start CircleCI and view the Management Console Dashboard. It will take a few minutes to download all of the necessary Docker containers.

If the Management Console reports `Failure reported from operator: no such image` click Start again and it should continue.

**Validate Your Installation**

1. When the application is started, select Open to launch CircleCI in your browser, and sign up/log in to your CircleCI installation and start running 2.0 builds! You will become the Administrator at this point as you are the first person to sign in. Have a look at our Getting Started guide to start adding projects.
2. After build containers have started and images have been downloaded, the first build should begin immediately. If there are no updates after around **15 minutes**, and you have clicked the Refresh button, contact CircleCI support for assistance.

3. Next, use our realitycheck repo to check basic CircleCI functionality.

4. If you’re unable to run your first builds successfully please start with our Troubleshooting guide for general troubleshooting topics, and our Introduction to Nomad Cluster Operation for information about how to check the status of Builders in your installation.
Teardown

This document is intended for system administrators of self-hosted installations of CircleCI Server.

If you wish to delete your installation of CircleCI Server, please let us know first in case there are any specific, supplementary steps required for your installation. Below is our basic step by step guide to tearing down an installation of CircleCI Server that was made with Terraform:

1. First you need to manually disable the termination protection on the Services machine from the AWS Management Console (If you set `services_disable_api_termination = "false"` in your `terraform.tfvars` file, skip this step). To do this:
   a. Navigate to the EC2 Dashboard and locate the Services machine instance
   b. Click to select it
2. Click Actions > Instance Settings > Change Termination Protection
3. Navigate to the S3 dashboard, locate the S3 bucket associated with your CircleCI cluster and delete the bucket and its contents (If you set `force_destroy_s3_bucket = "true"` in your `terraform.tfvars` file, skip this step).
4. From a terminal, navigate to your clone of our enterprise-setup repo and run `terraform destroy` to destroy all EC2 instances, IAM roles, ASGs and Launch configurations created by `terraform apply`. 
Upgrading a Server Installation

This document is intended for system administrators of self-hosted installations of CircleCI Server.

This section describes the process for upgrading your CircleCI Server installation from v2.17.x to v2.19. If you have already upgraded to v2.18 and would like steps to upgrade to patch release v2.18.3, first take a snapshot and then follow the application upgrade steps.

Nomad Launch Configuration

For AWS installs, before upgrading to v2.19, follow this guide to update your nomad launch configuration.

Org Rename Script

Before upgrading please read and follow the steps below if you have ever had issues with renaming an organization within CircleCI or you suspect that an organization rename might have happened at any point.

1. SSH into your Services machine
2. REPL into workflows-conductor by running the following: sudo docker exec -it workflows-conductor lein repl :connect 6005
3. Go to this link for the org rename script. Copy/paste this script into the REPL session. It will run migration and output current progress.
4. If any ERROR messages are present in the output please report back to your CSM or reach out to support.

Upgrade Steps Overview

Follow these steps to upgrade your CircleCI Server version.

1. Snapshot for Rollback

   This step is optional but recommended

To take a snapshot of your installation:

1. Go to the Management Console (e.g. your-circleci-hostname.com:8800) and click Stop Now to stop the CircleCI service.
2. Ensure no jobs are running on the nomad clients – you can check this by running `nomad status`

3. Navigate to the AWS EC2 management console and select your Services machine instance

4. Select Actions > Image > Create Image – Select the No Reboot option if you want to avoid downtime at this point. This image creation step creates an AMI that can be readily launched as a new EC2 instance to restore your installation.
It is also possible to automate this process with the AWS API. Subsequent AMIs/snapshots are only as large as the difference (changed blocks) since the last snapshot, such that storage costs are not necessarily larger for more frequent snapshots, see Amazon's EBS snapshot billing document for details. Once you have the snapshot you are free to make changes on the Services machine.

If you do need to rollback at any point, see our guide to restoring from a backup.

2. Updating Replicated

a. Prerequisites

- Your installation is Ubuntu 14.04 or 16.04 based.
- Your installation is not airgapped and you can access the internet from it.
- We will be updating to Replicated v2.38, but first we need to check you are running at least v2.10.3 on your Services machine. To check this, SSH into the Services machine and run the following:

```
replicated --version
```

If you are running a version of Replicated pre v2.10.3 please reach out to support@circleci.com. If you are already on v2.38 you can skip the next step and move to upgrade the CircleCI application.
b. Preparations

Remember to take a snapshot (described above) before starting the Replicated update process.

1. Stop the CircleCI application by clicking the Stop Now button on the Dashboard. Application shutdown takes a few minutes. Wait for the status to become “Stopped” before continuing.

![Stop the CircleCI Application](image.png)

Alternatively you can SSH into the Services machine and stop the CircleCI application from the command line:

```
replicatedctl app stop
```

You can check the status using the following:

```
replicatedctl app status inspect
```

Example Output:
For the replicated update to succeed, it is necessary to update docker to the recommended version, 17.12.1. Check which version you are running with `docker version` and if you need to update, follow these steps:

```
sudo apt-get install docker-ce=17.12.1~ce-0~ubuntu
```

3. Pin the Docker version using the following command:

```
sudo apt-mark hold docker-ce
```

c. Perform Update

1. Perform the Replicated update by executing the update script as follows:

```
curl -sSL "https://get.replicated.com/docker?replicated_tag=2.38.0" | sudo bash
```

Double-check your replicated and docker versions:

```
replicatedctl version # 2.38.0
docker -v # 17.12.1
```

2. Restart the app with

```
replicatedctl app start
```
The application will take a few minutes to spin up. You can check the progress in the administration dashboard or by executing:

```
replicatedctl app status inspect
```

Example output:

```
[
  {
    "AppID": "edd9471be0bc4ea04dfca94718ddf621",
    "Sequence": 2439,
    "State": "started",
    "DesiredState": "started",
    "Error": ",",
    "IsCancellable": true,
    "IsTransitioning": true,
    "LastModifiedAt": "2018-10-23T22:04:05.00374451Z"
  }
]
```

### 3. Upgrade CircleCI Server

1. Once you are running the latest version of Replicated, click the View Update button in the Management Console dashboard.
2. Click Install next to the version you wish to install.

⚠️ Please refresh your screen intermittently during the install process to avoid unnecessary waiting.

The install process may take several minutes and the install status will be displayed both on the Releases
page and the main Dashboard.

3. Once the installation is finished, navigate to the Dashboard to start your installation - Note the middle box on the Dashboard will read "CircleCI is up to date" when you are running the latest version.