

# VM-Series for GCP

---



## **GCP Deployment Manager Template Deployment Guide**

How to deploy a two-tiered application environment secured by the VM-Series firewall

<http://www.paloaltonetworks.com>

# Table of Contents

---

<b>Version History .....</b>	<b>3</b>
<b>1. About Deployment Manager Templates .....</b>	<b>4</b>
<b>2. Support Policy .....</b>	<b>5</b>
<b>3. Instances used.....</b>	<b>5</b>
<b>4. Prerequisites.....</b>	<b>5</b>
4.1 Create GCP account.....	5
4.2 Install the Google Cloud SDK .....	5
4.3 Accept the EULA (TBD?) .....	6
4.4 Create a Project .....	6
4.5 Enable the API.....	7
4.6 Create a Bootstrap Bucket.....	9
4.7 Download the Template Files .....	13
4.8 Extract the Files.....	14
4.9 Gather Information and Update the Template File.....	14
<b>5. Launch the Template .....</b>	<b>15</b>
<b>6. Review what was created .....</b>	<b>21</b>
<b>7. Access the firewall.....</b>	<b>24</b>
<b>8. Access the Webserver.....</b>	<b>27</b>
<b>9. Launch some attacks .....</b>	<b>30</b>
9.1 SSH from Web Server to DB Server .....	30
9.2 SQL Brute force attack.....	30
<b>10. Cleanup .....</b>	<b>32</b>
10.1 Delete the deployment .....	32
<b>11. Conclusion .....</b>	<b>33</b>
<b>Appendix A.....</b>	<b>33</b>
Troubleshooting tips .....	33

## Version History

Version number	Comments
1.0	Initial Draft
1.1	Update links
1.2	Update topology diagram

# 1. About Deployment Manager Templates

GCP Deployment Manager Templates, are Python (or Jinja) files that can launch nearly all GCP resources including VPCs, subnets, security groups, route tables, plus many more. Templates are used for ease of deployment and are key to any auto-scaling environment.

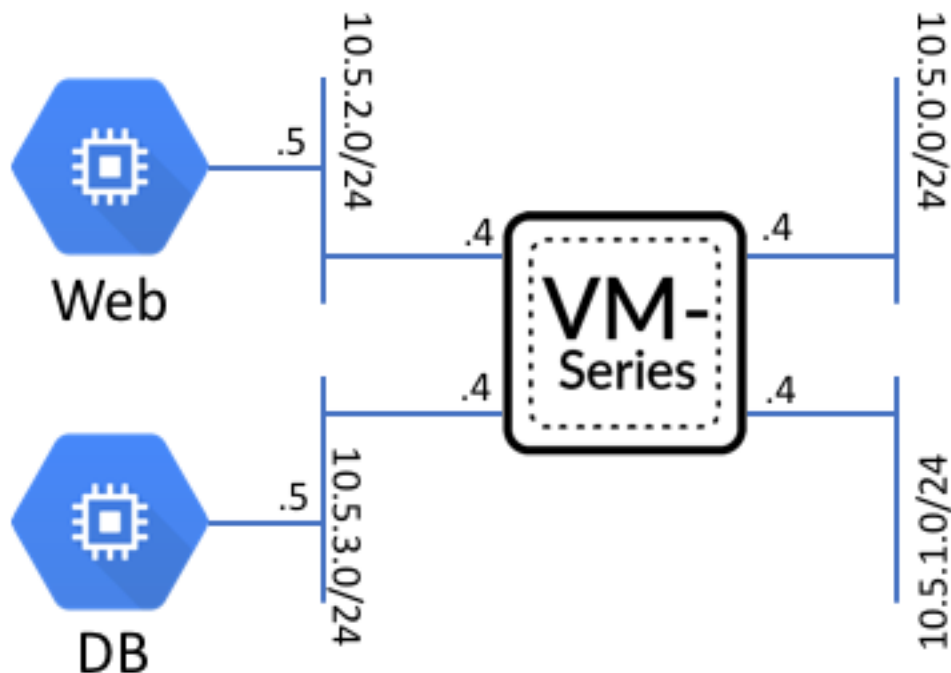
For more information on Templates refer to Google's documentation

<https://cloud.google.com/deployment-manager/docs/how-to#adding-templates>

There are also many sample templates available here

<https://github.com/GoogleCloudPlatform/deploymentmanager-samples/tree/master/templates>

This document will explain how to deploy a sample template that launches everything that is shown below. This includes, a WordPress server, a MySQL server, a VM-Series firewall and the subnets. In addition, the firewall uses a native bootstrapping feature that allows for additional configuration of the firewall (such as routes, security policies, etc.) Once the sample template has been deployed, the network topology should align with the following:



## 2. Support Policy

This template is released under an as-is, best effort, support policy. These scripts should be seen as community supported and Palo Alto Networks will contribute our expertise as and when possible. We do not provide technical support or help in using or troubleshooting the components of the project through our normal support options such as Palo Alto Networks support teams, or ASC (Authorized Support Centers) partners and backline support options. The underlying product used (the VM-Series firewall) by the scripts or templates are still supported, but the support is only for the product functionality and not for help in deploying or using the template or script itself.

Unless explicitly tagged, all projects or work posted in our GitHub repository (at <https://github.com/PaloAltoNetworks/googlecloud>) or sites other than our official Downloads page on <https://support.paloaltonetworks.com> are provided under the best effort policy.

## 3. Instances used

When using this sample CFT the following machine types are used:

Instance name	Machine Type
WordPress Web Server	f1-micro
WordPress DB Server	f1-micro
VM Series Firewall	n1-standard-4

**Note:** There are costs associated with each machine type launched, please refer to the Google instance pricing page <https://cloud.google.com/compute/pricing>

## 4. Prerequisites

Here are the prerequisites required to successfully launch this template:

### 4.1 Create GCP account

If you do not have a GCP account already, go to <https://cloud.google.com/free/> and create an account.

### 4.2 Install the Google Cloud SDK

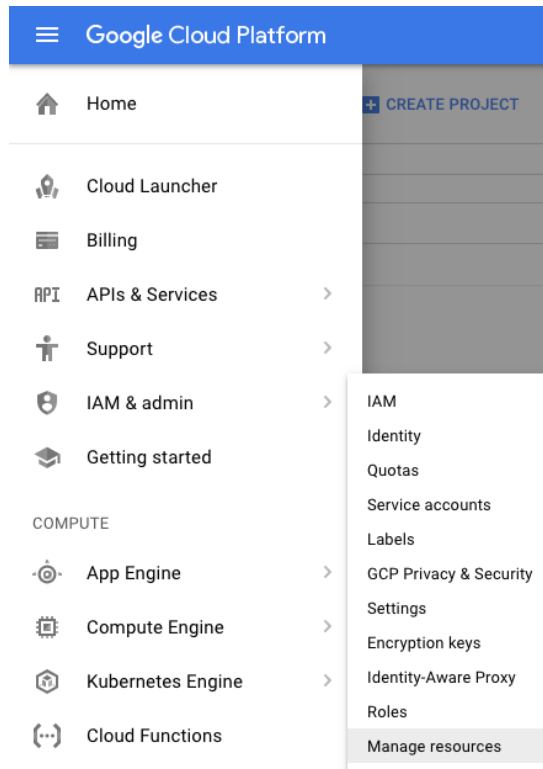
Template installations in GCP are performed from the CLI. Install the SDK/CLI by selecting the relevant platform from the following link and following the installation instructions:

<https://cloud.google.com/sdk/>

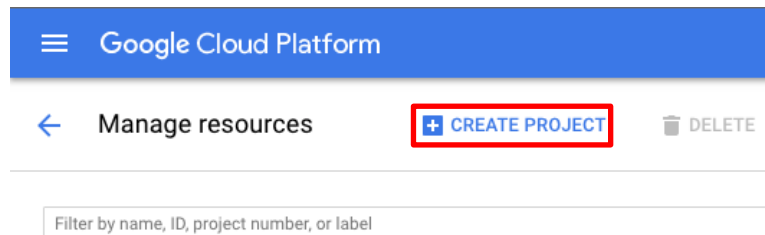
## 4.3 Accept the EULA (TBD?)

## 4.4 Create a Project

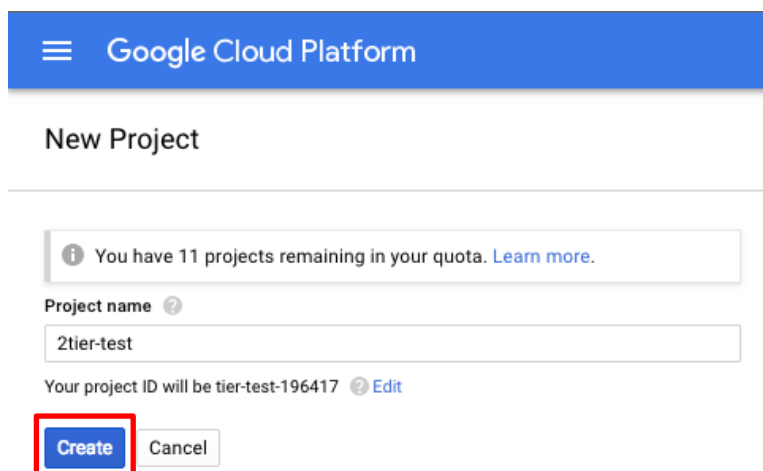
All GCP resources are deployed to a project, which is an organizational boundary that separates users, resources, billing information, etc. It is similar to an AWS VPC or an Azure Resource Group. By default, GCP will create a project upon creation of an account. If that is not the case or to create a dedicated project, use the drop-down on the left and select **IAM & admin > Manage Resources**:



Click **Create Project**:



Specify a name for the project and click **Create**:



Google Cloud Platform

New Project

You have 11 projects remaining in your quota. [Learn more.](#)

Project name ?

2tier-test

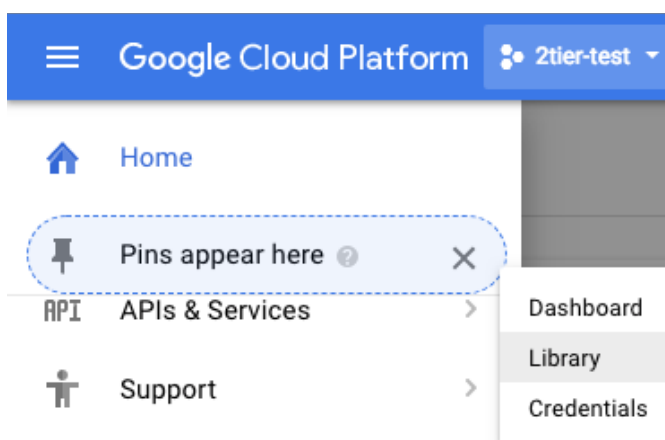
Your project ID will be tier-test-196417 ? [Edit](#)

Create Cancel

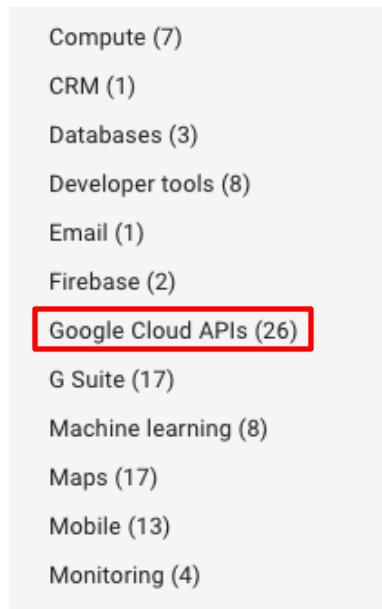
Note that project creation will take a few minutes.

## 4.5 Enable the API

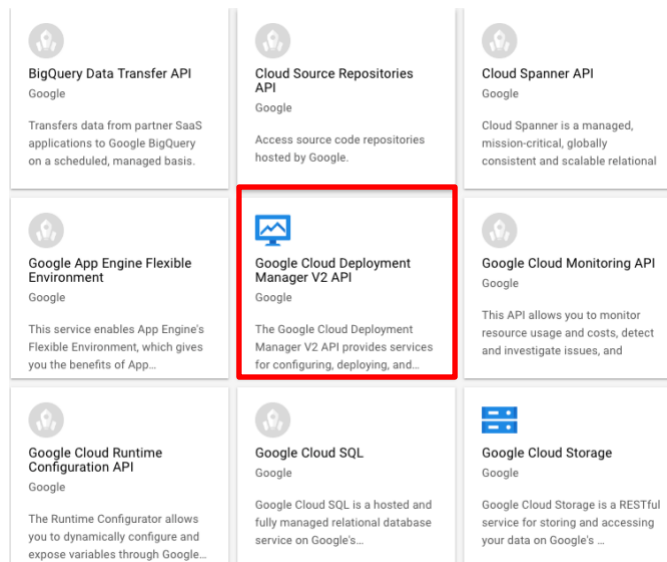
Deploying a template requires the API be enable on the project. Navigate to **APIs & Services > Library**:



Select Google Cloud APIs on the left-hand-side:

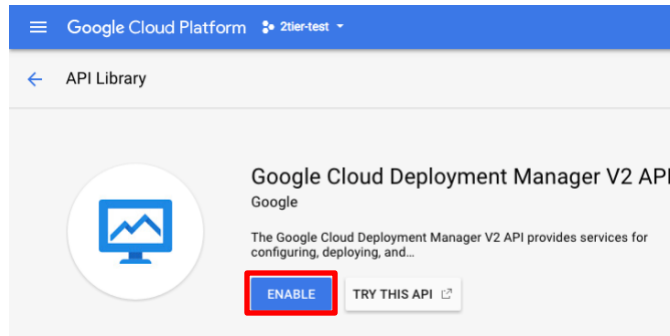


Select Google **Cloud Deployment Manager V2 API**:



Select **Enable**:



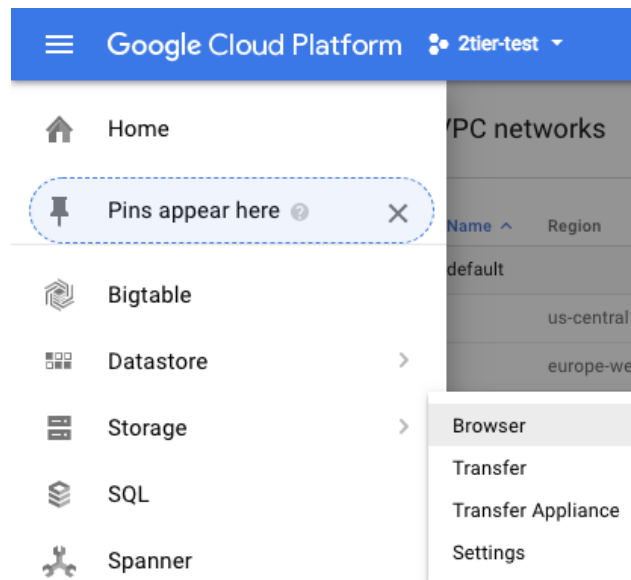


Enabling the API for the project will take a few minutes to complete.

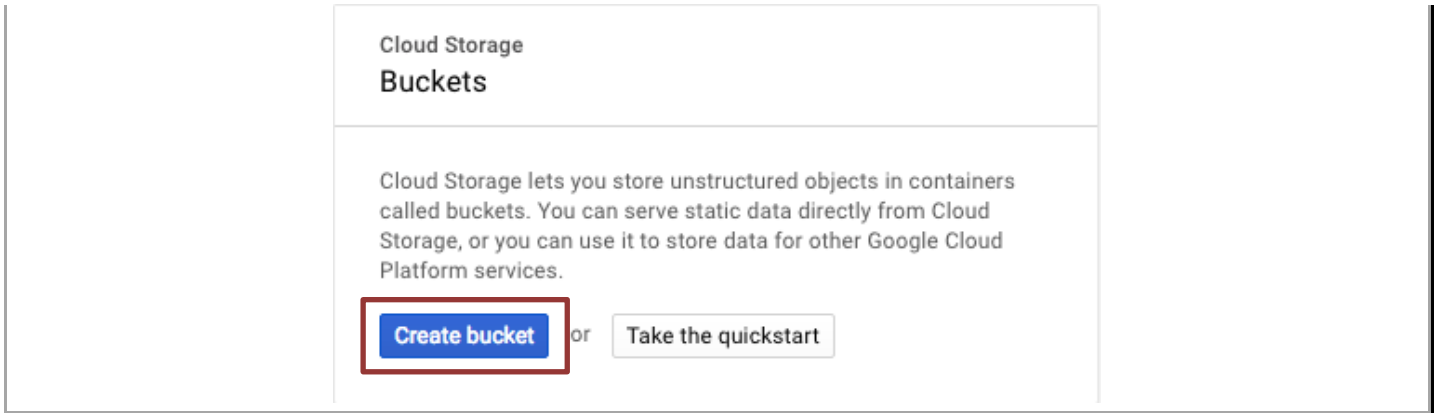
## 4.6 Create a Bootstrap Bucket

Bootstrapping is a feature of the VM-Series firewall that allows you to load a pre-defined configuration into the firewall during boot-up. This ensures that the firewall is configured and ready at initial boot-up, thereby removing the need for manual configuration. The bootstrapping feature also enables automating deployment of the VM-Series.

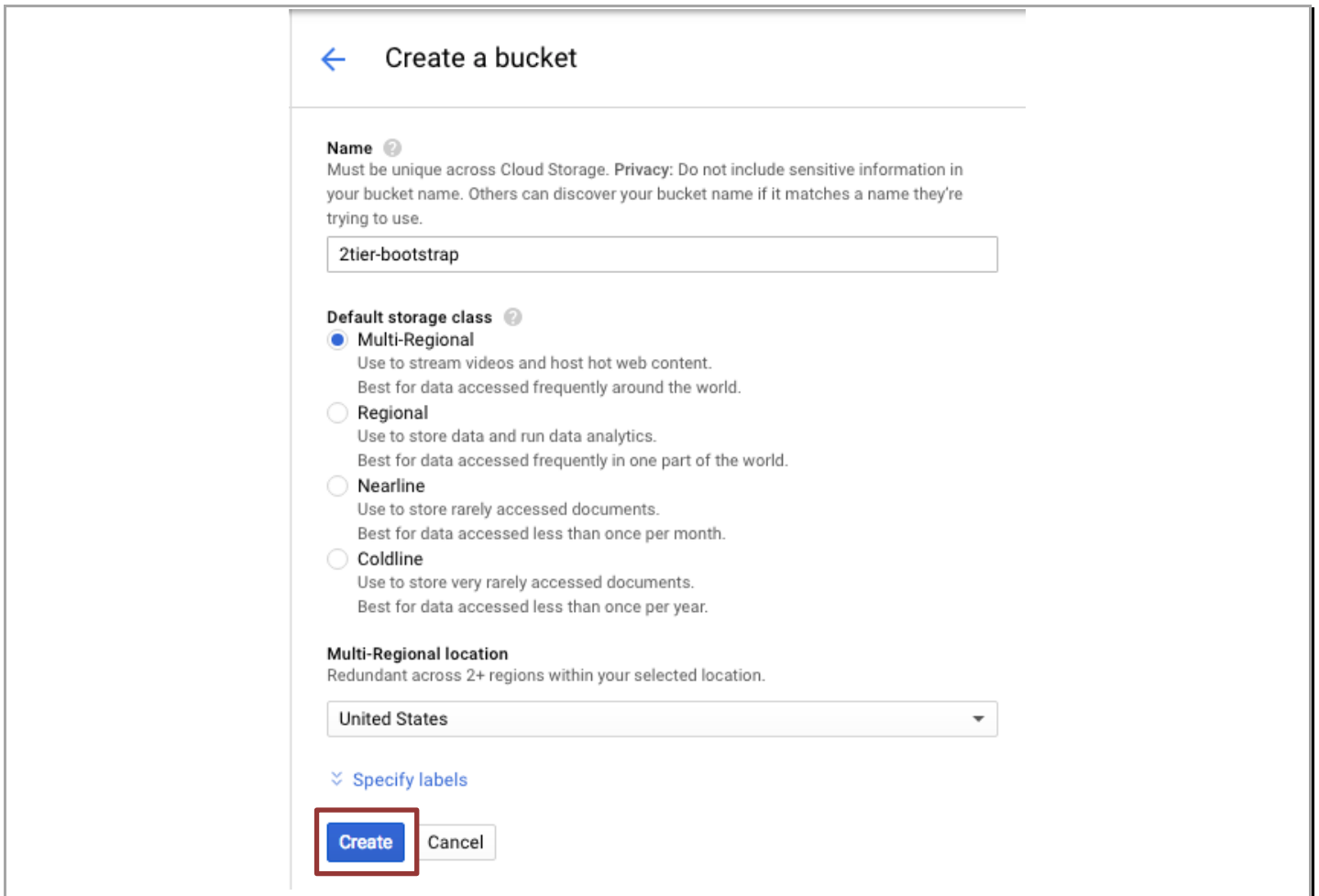
In order to create a Bootstrap bucket, navigate to **Storage > Browser**:



Click **Create Bucket**:

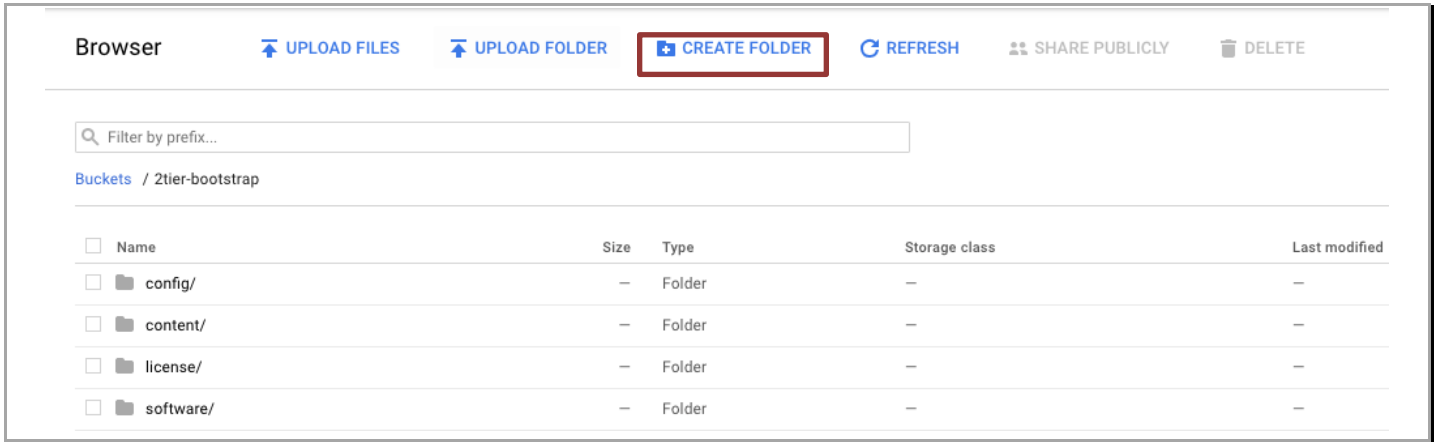


Specify a globally-unique bucket name and regional settings and click **Create**:



You will need to enter a globally unique bucket name. GCP will warn you if the name is not unique. Once the bucket is created, click on the newly created bucket and add four folders called **config**, **license**, **software** and **content** by clicking on **Create Folder**:

## Palo Alto Networks GCP Deployment Manager Deployment Guide



Download the following files and save them in a known location:

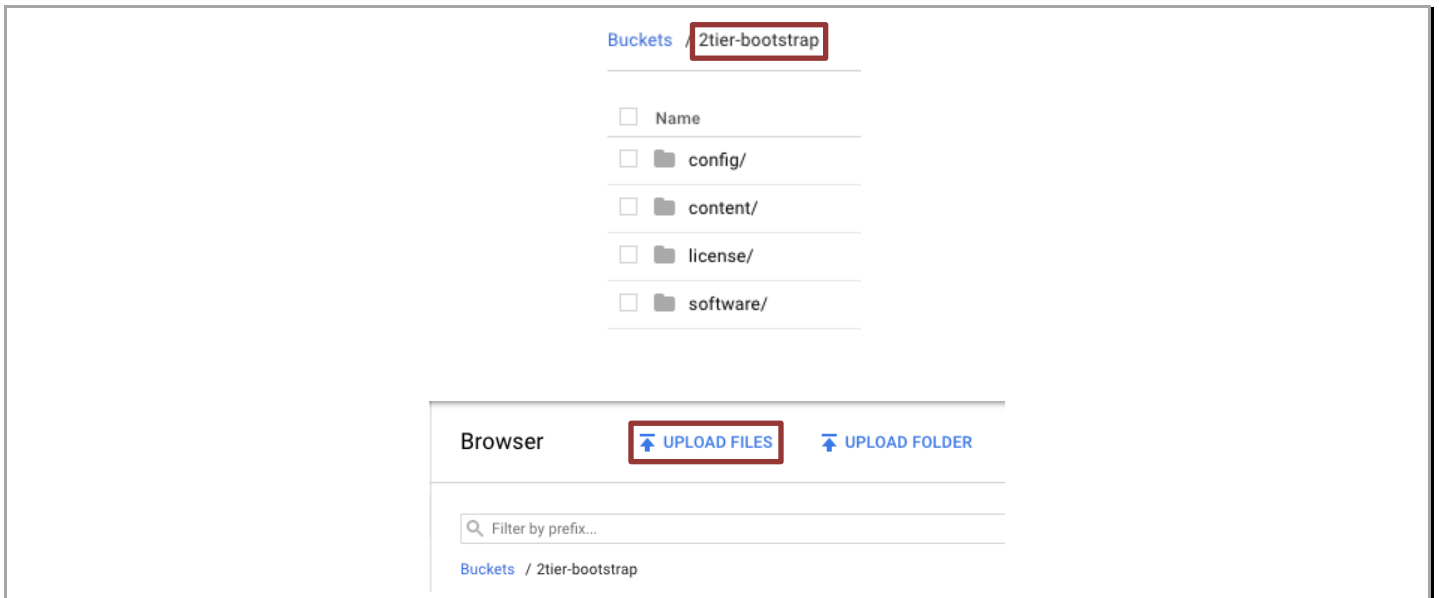
<https://raw.githubusercontent.com/PaloAltoNetworks/googlecloud/master/two-tier-template/bootstrap.xml>

<https://raw.githubusercontent.com/PaloAltoNetworks/googlecloud/master/two-tier-template/init-cfg.txt>

<https://raw.githubusercontent.com/PaloAltoNetworks/googlecloud/master/two-tier-template/dbserver-startup.sh>

<https://raw.githubusercontent.com/PaloAltoNetworks/googlecloud/master/two-tier-template/webserver-startup.sh>

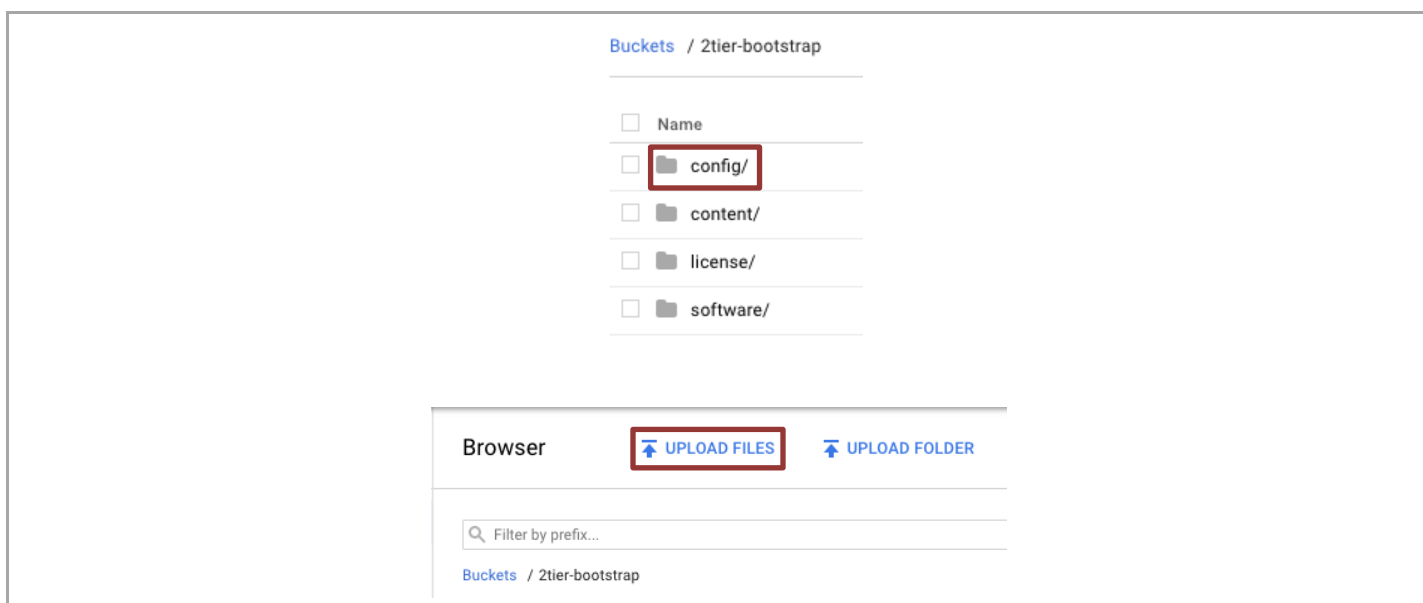
Now click on the root folder in the console and click **UPLOAD FILES**:



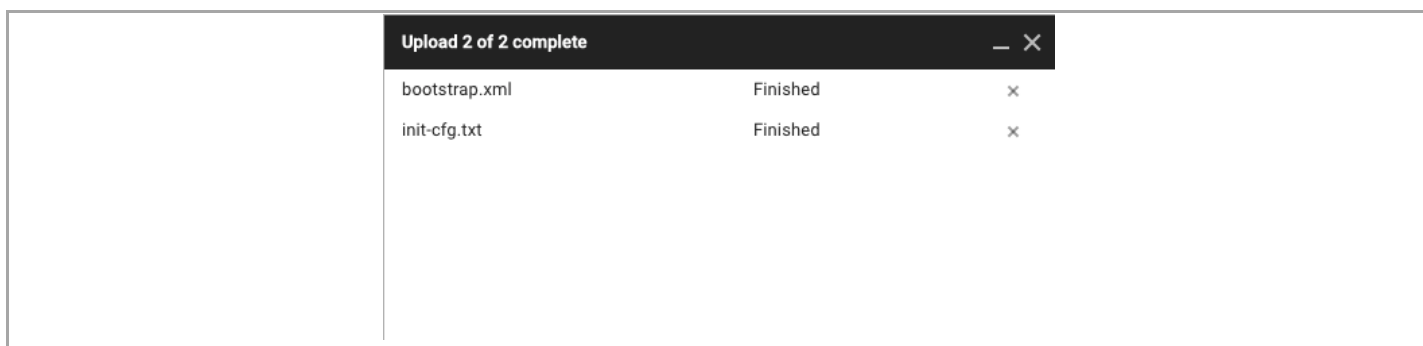
Select the two files (dbserver-startup.sh and webserver-startup.sh) downloaded previously and click **Open**:



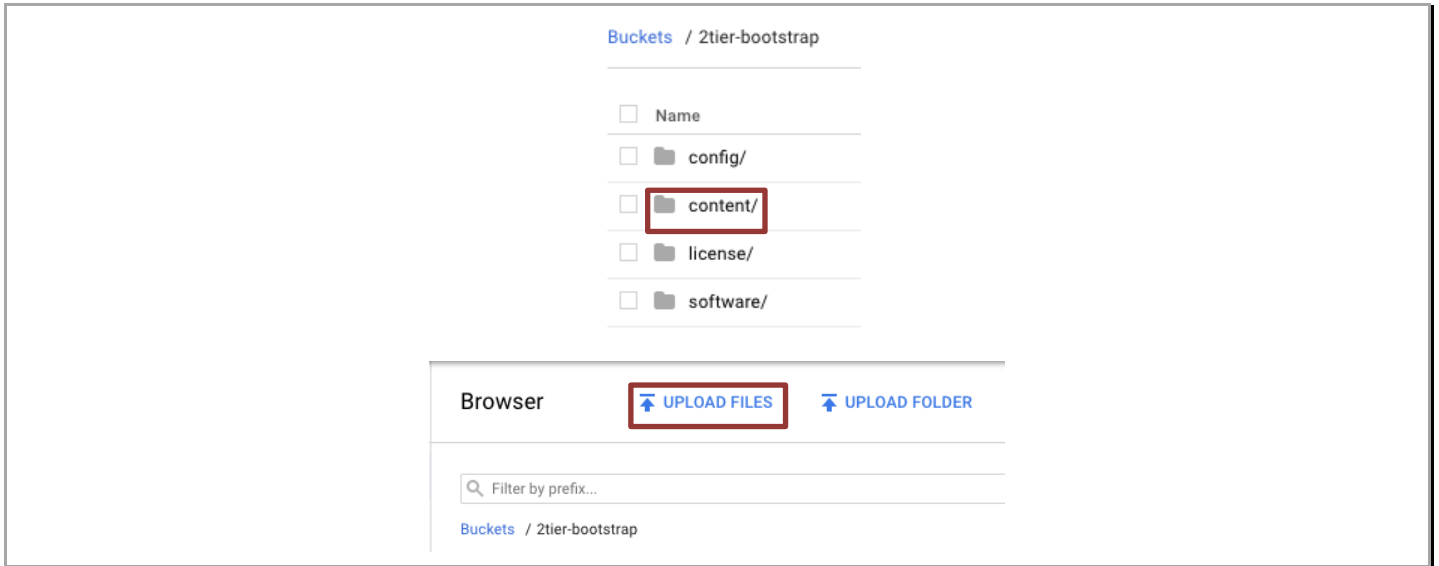
Now click on the **config** folder in the console and click **UPLOAD FILES**:



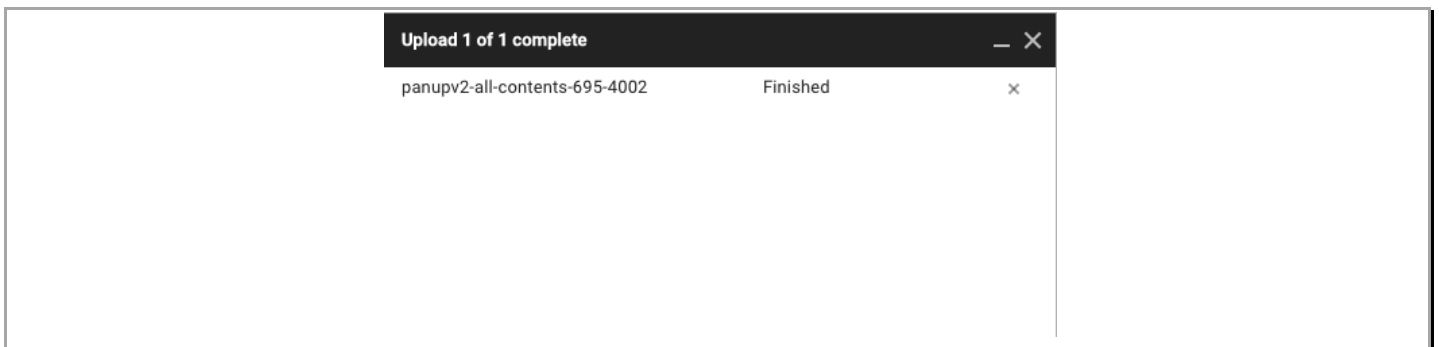
Select the two files (bootstrap.xml and init-cft.txt) downloaded previously and click **Open**:



Now click on the **content** folder in the console and click **UPLOAD FILES**:



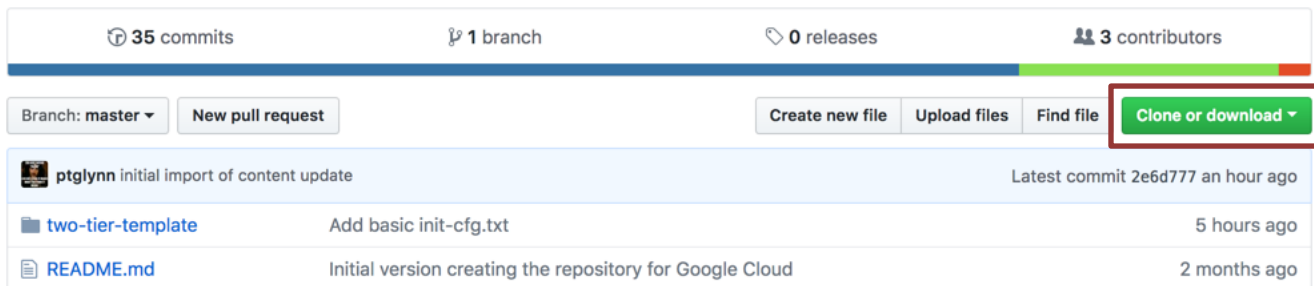
Select the content file (panupv2-all-contents-695-4002) downloaded previously and click **Open**:



**NOTE:** Please create the folders using the console. Creating folders locally on your machine and uploading them may not work as expected.

## 4.7 Download the Template Files

Download and save all of the template files to a known location by selecting **Clone or download**:



## 4.8 Extract the Files

Unzip the template files:

Name	Size	Kind	Date Added
▼ googlecloud-master	--	Folder	Today at 19:08
▼ two-tier-template	--	Folder	Today at 19:08
webserver...mplate.py	3 KB	TextWr...cument	Today at 19:08
webserver-startup.sh	3 KB	TextWr...cument	Today at 19:08
vm-series...mplate.py	4 KB	TextWr...cument	Today at 19:08
two-tier-template.py	7 KB	TextWr...cument	Today at 19:08
two-tier-sample.yaml	1 KB	TextWr...cument	Today at 19:08
subnetwo...mplate.py	1 KB	TextWr...cument	Today at 19:08
sql-attack.html	606 bytes	HTML	Today at 19:08
network-template.py	906 bytes	TextWr...cument	Today at 19:08
init-cfg.txt	156 bytes	Plain Text	Today at 19:08
dbserver-template.py	3 KB	TextWr...cument	Today at 19:08
dbserver-startup.sh	2 KB	TextWr...cument	Today at 19:08
bootstrap.xml	36 KB	TextWr...cument	Today at 19:08
Readme.md	1 KB	TextWr...cument	Today at 19:08
README.md	1 KB	TextWr...cument	Today at 19:08

## 4.9 Gather Information and Update the Template File

Deploying the template in GCP requires modification of the template files to include deployment-specific information. The required information is:

```

zone = ###ZONE (e.g. us-central1-a, us-east4-b, etc.)

region = ###Region (e.g. us-central1, us-east4, etc.)

sshkey = ## ssh key PUBLIC

    Format: <USERNAME>:<KEY FORMAT> <PUBLIC KEY> <USERNAME>

bootstrap_bucket = ###bootstrap bucket

scripts_bucket = ###bucket with web and db startup scripts

serviceaccount = ###GCP service account (Retrieve from IAM & admin > IAM)

    Format: <PROJECT NUMBER>-compute@developer.gserviceaccount.com
  
```

Once the information has been gathered, update the file “two-tier-template.py” with the information.

**NOTE: All variables MUST be enclosed in quotes. Failure to do so will result in a deployment failure.**

```
#Variables
zone = "us-central1"
region = "us-central1-a"
sshkey = "pglynn:ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQDFdrfdjQAR/cgz
URE6o/1JlqhYq+kqHxcq2ZNM4yVDhmVw+ggQpqMdot02FdYyuxmHGuxlaLBJxPomqnKS
p6yHjgj+14G+ohaZJmnAwp6audmuGVED2ybVfopg6vXwYWHhWlJY77nDI+qCU5nTe29Y6
ZoSoObbYZAjf69MtAS1vnQodwnS96oJ8dghZ31+fym1Vt0yXYfgBOaN2+Bb+GQkWkxD7P
q+PEXwq/w+2j6wwvflEFAUd5sLz8vOoUo0DaVbTUo2AhGUQfwe5RlL3SC7si4Pt7Xiel+
koMnxg32RKzPS4dwzzf1FIIGeaaSgmQModnCHqb3g37sYjrmaUHj pglynn"
bootstrap_bucket = "2tier-bootstrap"
scripts_bucket = "2tier-bootstrap"
serviceaccount = "815575352539-compute@developer.gserviceaccount.com"
image = "panos-8-1-b53"
```

## 5. Launch the Template

Navigate to the directory containing the downloaded template files:

```
root@2ccf4d39089e: ~/Development/GCP/googlecloud-master/two-tier-template# ls
Readme.md                subnetwork-template.py
bootstrap.xml             two-tier-sample.yaml
dbserver-startup.sh      two-tier-template.py
dbserver-template.py     vm-series-template.py
init-cfg.txt             webserver-startup.sh
network-template.py      webserver-template.py
sql-attack.html
root@2ccf4d39089e: ~/Development/GCP/googlecloud-master/two-tier-template#
```

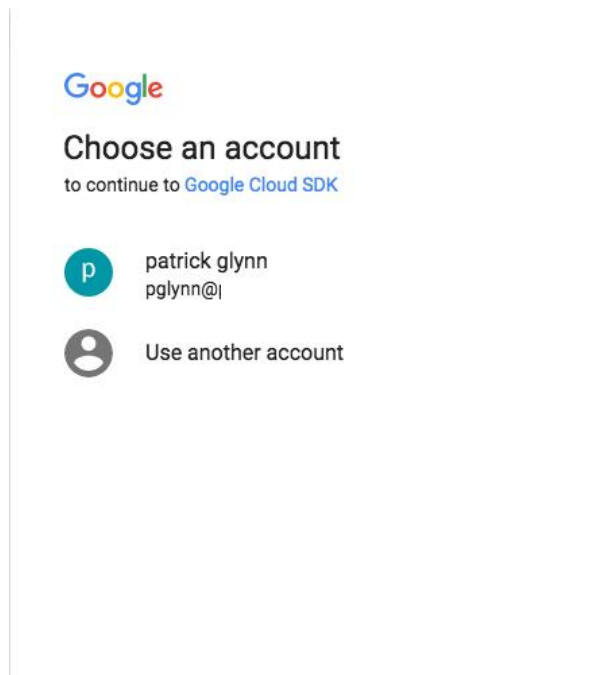
Authenticate to the GCP environment:

```
root@2ccf4d39089e: ~/Development/GCP/googlecloud-master/two-tier-template# gcloud auth login pglynn@
Go to the following link in your browser:

https://accounts.google.com/o/oauth2/auth?redirect_uri=urn%3Aietf%3Awg%3Aoauth%3A2.0%3Aoob&prompt=select_account&response_type=code&client_id=32555940559.apps.googleusercontent.com&scope=https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fuserinfo.email+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fcloud-platform+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fappengine.admin+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fcompute+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Faccounts.reauth&access_type=offline

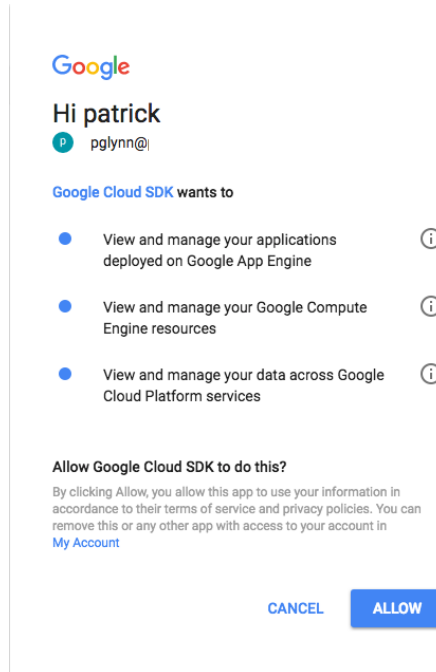
Enter verification code: 
```

Copy/paste the link into a browser and select the account to authenticate:



Review the requested permissions and click **Allow**:





Copy the one-time verification code:



Please copy this code, switch to your application and paste it there:

4/AAC2EoRH6UAJWLhKHk7oYp8CWzQzZf7miebTJQxhRcw7EiSCEIE8ELo

Paste it into the window to complete the authentication request (ignore the warning):

```

root@2ccf4d39089e: ~/Development/GCP/googlecloud-master/two-tier-template
# gcloud auth login pglynn@
Go to the following link in your browser:

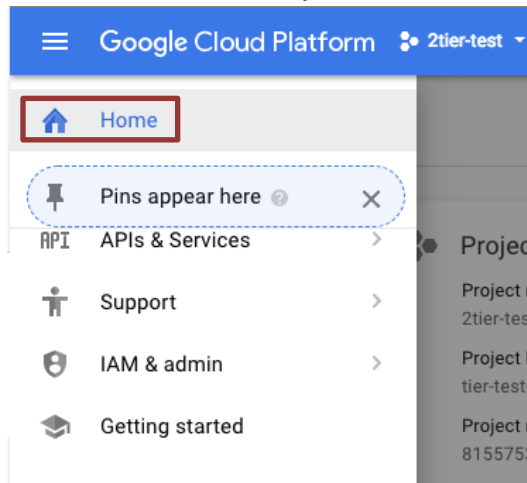
https://accounts.google.com/o/oauth2/auth?redirect_uri=urn%3Aietf%3Awg%3Aoauth%3A2.0%3Aoob&prompt=select_account&response_type=code&client_id=32555940559.apps.googleusercontent.com&scope=https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fuserinfo.email+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fcloud-platform+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fappengine.admin+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fcompute+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Faccounts.reauth&access_type=offline

Enter verification code: 4/AAC2EoRH6UAJWLhKHk7oYp8CWzQzZf7miebTJQxhRcw7EiSCEIE8ELo
WARNING: `gcloud auth login` no longer writes application default credentials.
If you need to use ADC, see:
gcloud auth application-default --help

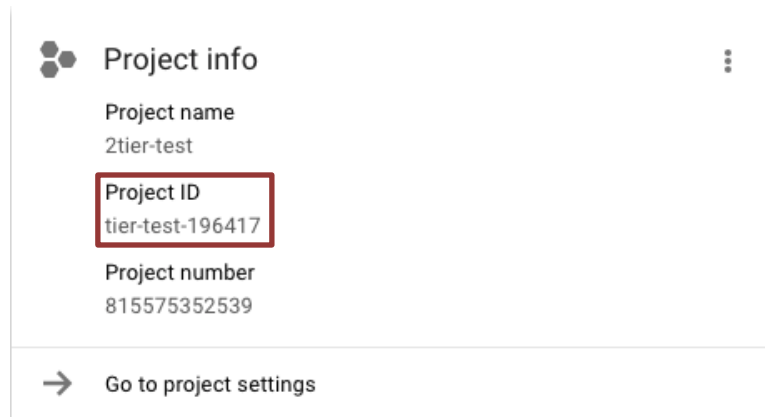
You are now logged in as [pglynn@].
Your current project is [pgtest-two-tier]. You can change this setting by running:
$ gcloud config set project PROJECT_ID
root@2ccf4d39089e: ~/Development/GCP/googlecloud-master/two-tier-template#

```

Select **Home** from the dropdown in the console:



Note the Project ID:



Set the target project for template deployment:

```
root@2ccf4d39089e: ~/Development/GCP/googlecloud-master/two-tier-template# gcloud config set project tier-test-196417
Updated property [core/project].
root@2ccf4d39089e: ~/Development/GCP/googlecloud-master/two-tier-template#
```

Initiate template deployment using the file “two-tier-sample.yaml” as the configuration file using the command “gcloud deployment-manager deployments create <deployment name> --config two-tier-sample.yaml --automatic-rollback-on-error” where <deployment name> is the tag used to identify the deployment (“deployment1” in this example):

```

root@2ccf4d39089e: ~/Development/GCP/googlecloud-master/two-tier-templ
ate# gcloud deployment-manager deployments create deployment1 --confi
g two-tier-sample.yaml --automatic-rollback-on-error

```

Note: The “--automatic-rollback-on-error” flag instructs deployment manager to automatically roll back all changes in the event of a failure to deploy. For troubleshooting purposes, it may be desirable to omit this flag.

If all goes well, Deployment Manager will report success (state “COMPLETED” and no errors):

```

root@2ccf4d39089e: ~/Development/GCP/googlecloud-master/two-tier-templ
ate# gcloud deployment-manager deployments create deployment1 --confi
g two-tier-sample.yaml --automatic-rollback-on-error
The fingerprint of the deployment is GL54qACJ7Av8Yyjp_oWKyA==
Waiting for create [operation-1519750942493-5663497130948-c29c8c79-2
093fbc2]... done.
Create operation operation-1519750942493-5663497130948-c29c8c79-2093f
bc2 completed successfully.

```

NAME	TYPE	STATE	ERRORS	INTENT
db-firewall	compute.v1.firewall	COMPLETED	[]	
db-network	compute.v1.network	COMPLETED	[]	
db-route	compute.v1.route	COMPLETED	[]	
db-subnet	compute.v1.subnetwork	COMPLETED	[]	
db-vm	compute.v1.instance	COMPLETED	[]	
management-firewall	compute.v1.firewall	COMPLETED	[]	
mgmt-network	compute.v1.network	COMPLETED	[]	
mgmt-subnet	compute.v1.subnetwork	COMPLETED	[]	
untrust-firewall	compute.v1.firewall	COMPLETED	[]	
untrust-network	compute.v1.network	COMPLETED	[]	
untrust-subnet	compute.v1.subnetwork	COMPLETED	[]	
vm-series	compute.v1.instance	COMPLETED	[]	
web-firewall	compute.v1.firewall	COMPLETED	[]	
web-network	compute.v1.network	COMPLETED	[]	
web-route	compute.v1.route	COMPLETED	[]	
web-subnet	compute.v1.subnetwork	COMPLETED	[]	
web-vm	compute.v1.instance	COMPLETED	[]	

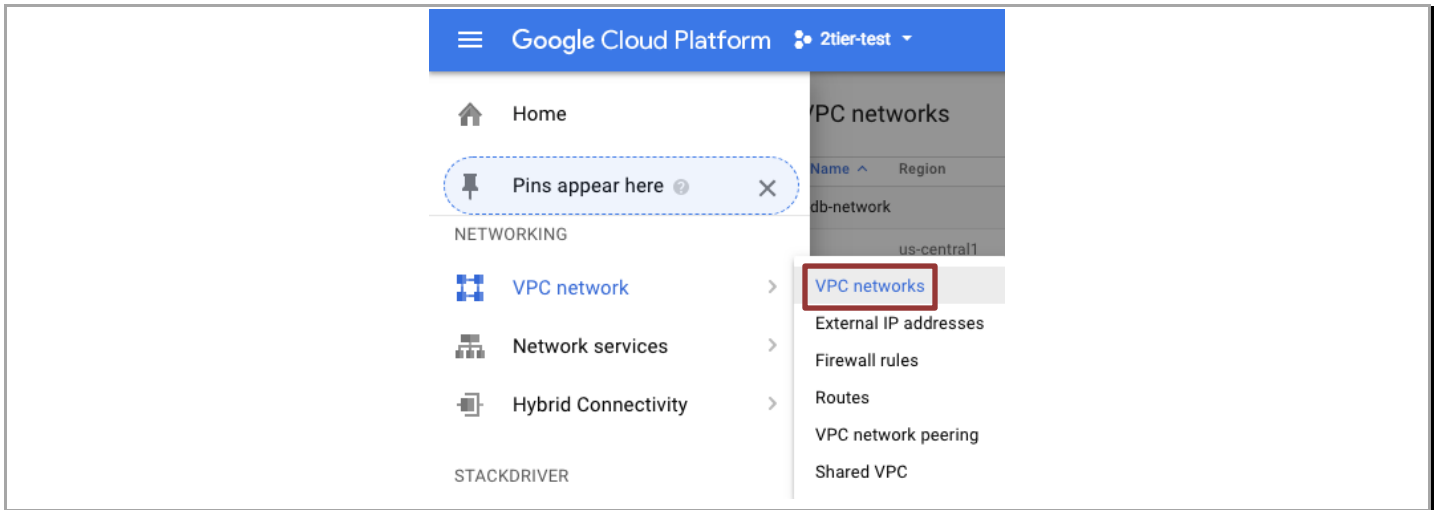
```

root@2ccf4d39089e: ~/Development/GCP/googlecloud-master/two-tier-templ
ate#

```

## 6. Review what was created

Let's review what the template has launched. The newly created networks can be viewed via **VPC Networks > VPC Network**:



The template creates four networks: db-network, mgmt-network, untrust-network, and web-network:

# Palo Alto Networks GCP Deployment Manager Deployment Guide

VPC networks

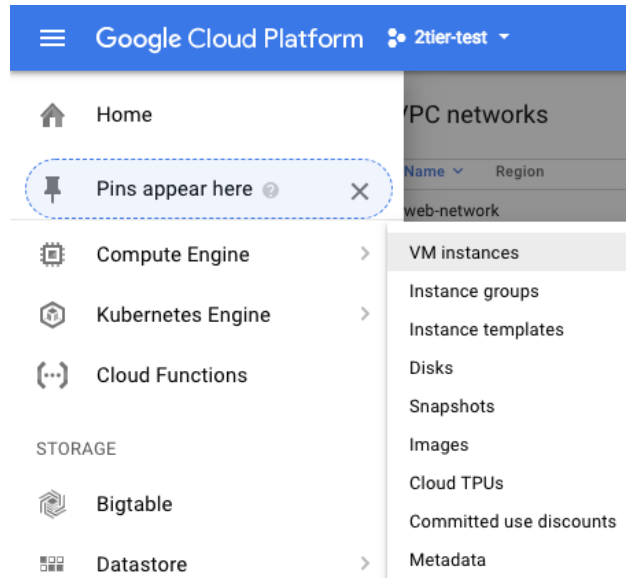
+ CREATE VPC NETWORK

REFRESH

Name	Region	Subnets	Mode	IP addresses ranges	Gateways	Firewall Rules	Global dynamic routing
web-network		1	Custom			1	Off
	us-central1	web-subnet		10.5.2.0/24	10.5.2.1		
untrust-network		1	Custom			1	Off
	us-central1	untrust-subnet		10.5.1.0/24	10.5.1.1		
mgmt-network		1	Custom			1	Off
	us-central1	mgmt-subnet		10.5.0.0/24	10.5.0.1		
default		15	Auto			4	Off
	us-central1	default		10.128.0.0/20	10.128.0.1		
	europe-west1	default		10.132.0.0/20	10.132.0.1		
	us-west1	default		10.138.0.0/20	10.138.0.1		
	asia-east1	default		10.140.0.0/20	10.140.0.1		
	us-east1	default		10.142.0.0/20	10.142.0.1		
	asia-northeast1	default		10.146.0.0/20	10.146.0.1		
	asia-southeast1	default		10.148.0.0/20	10.148.0.1		
	us-east4	default		10.150.0.0/20	10.150.0.1		
	australia-southeast1	default		10.152.0.0/20	10.152.0.1		
	europe-west2	default		10.154.0.0/20	10.154.0.1		
	europe-west3	default		10.156.0.0/20	10.156.0.1		
	southamerica-east1	default		10.158.0.0/20	10.158.0.1		
	asia-south1	default		10.160.0.0/20	10.160.0.1		
	northamerica-northeast1	default		10.162.0.0/20	10.162.0.1		
	europe-west4	default		10.164.0.0/20	10.164.0.1		
db-network		1	Custom			1	Off
	us-central1	db-subnet		10.5.3.0/24	10.5.3.1		

Note: The default network was automatically created when the project was instantiated. It can be ignored or deleted.

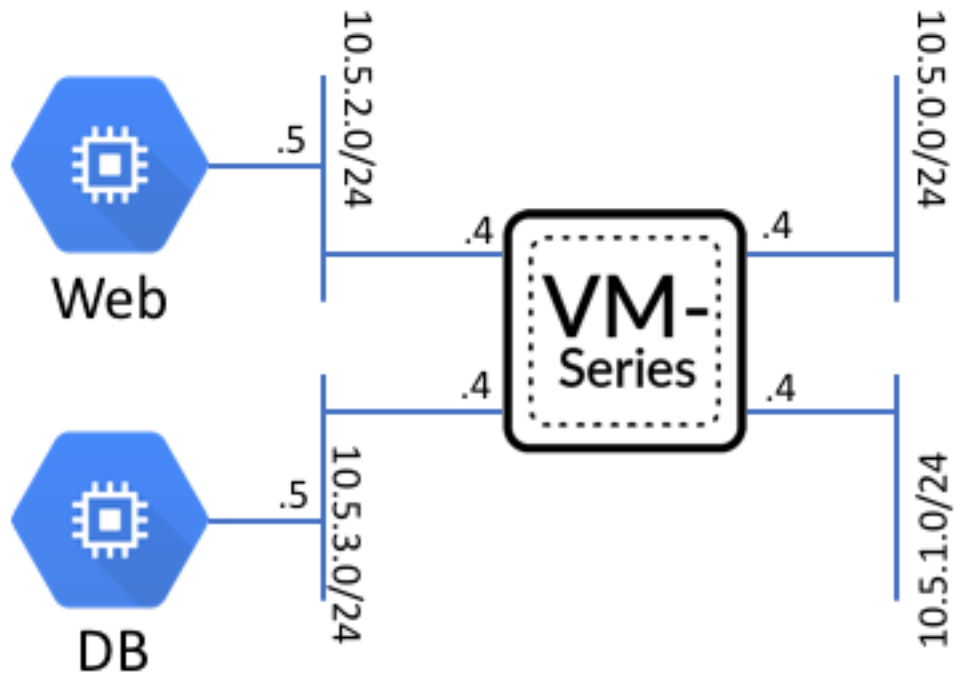
Deployed hosts can be viewed by navigating to **Compute Engine > VM Instances**:



High-level information regarding the deployed instances are available with the default view:

VM instances						
<a href="#">CREATE INSTANCE</a> <a href="#">IMPORT VM</a> <a href="#">REFRESH</a>						
Filter VM instances						
<input type="checkbox"/> Name ^	Zone	Recommendation	Internal IP	External IP	Connect	
<input type="checkbox"/> db-vm	us-central1-a		10.5.3.5	None	SSH	⋮
<input type="checkbox"/> vm-series	us-central1-a		10.5.0.4	35.224.8.98	SSH	⋮
<input type="checkbox"/> web-vm	us-central1-a		10.5.2.5	None	SSH	⋮

All of this matches the topology shown previously:



## 7. Access the firewall

**NOTE:** Bootstrapping a VM-Series firewall takes approximately 9 minutes. So once the template has been deployed successfully, it may be a while before the firewall is up and you are able to log into the firewall.

Once the template deployment is complete, the firewall will show a green checkmark indicating it is running. On the right side is the management IP address of the firewall:



## Palo Alto Networks GCP Deployment Manager Deployment Guide

VM instances

CREATE INSTANCE

IMPORT VM

REFRESH

Instance "vm-series" is underutilized. You can save an estimated \$52 per month by switching to the machine type memory). [Learn more](#)

Filter VM instances

	Name	Zone	Recommendation	Internal IP	External IP	Connect
<input type="checkbox"/>	db-vm	us-central1-a		10.5.3.5	None	SSH
<input checked="" type="checkbox"/>	vm-series	us-central1-a	Save \$52 / mo	10.5.0.4	35.224.8.98	SSH
<input type="checkbox"/>	web-vm	us-central1-a		10.5.2.5	None	SSH

You should now be able to login to the firewall using the **username: paloalto** and password: **Pal0Alt0@123**

General Information

Device Name sample-ctf-fw  
MGT IP Address 10.5.0.4 (DHCP)  
MGT Netmask 255.255.255.255  
MGT Default Gateway 10.5.0.1  
MGT IPv6 Address unknown  
MGT IPv6 Link Local Address fe80::4001:aff:fe05:4/64  
MGT IPv6 Default Gateway  
MGT MAC Address 42:01:0a:05:00:04  
Model PA-VM  
Serial # 007200000042435  
CPU ID GCP-D7060200FFB881F  
UUID C33393B-E54A-46B2-F9E5-88BC737EDC87  
VM License VM-300  
VM Mode GCE  
Software Version 8.1.0-b8  
GlobalProtect Agent 0.0.0  
Application Version 695-4002  
Threat Version 695-4002  
URL Filtering Version 0000.00.00.000  
GlobalProtect Clientless VPN Version 0  
Time Wed Feb 28 13:11:51 2018  
Uptime 1 days, 0:43:45

System Resources

Management CPU 1%  
Data Plane CPU 0%  
Session Count 3 / 819200

Logged In Admins

Admin	From	Client	Session Start	Idle For
paloalto	12.206.19.5	Web	02/28 12:56:48	00:00:00s

Data Logs

No data available.

System Logs

Description	Time
Failed password for csgoserver from 192.169.155.230 port 58787 ssh2	02/28 12:59:58
failed authentication for user 'csgoserver', Reason: Authentication profile not found for the user. From: ip-192-169-155-230.ip.secureserver.net.	02/28 12:59:42
User paloalto logged in via Web from 12.206.19.5 using https	02/28 12:56:48
authenticated for user 'paloalto', From: 12.206.19.5.	02/28 12:56:48
Session for user paloalto via Web from 47.183.71.197 timed out	02/28 12:56:37
Session for user paloalto via Web from 10.5.2.5 timed out	02/28 12:56:37
Failed password for user01 from 192.169.155.230 port 37049 ssh2	02/28 12:56:28
failed authentication for user 'user01', Reason: Authentication profile not found for the user. From: ip-192-169-155-230.ip.secureserver.net.	02/28 12:56:20
Failed password for applmgr from 192.169.155.230 port 43818 ssh2	02/28 12:52:58
failed authentication for user 'applmgr', Reason: Authentication profile not found for the user. From: ip-192-169-155-230.ip.secureserver.net.	02/28 12:52:55

Config Logs

No data available.

Locks

No locks found

ACC Risk Factor (Last 60 minutes)

4.0

paloalto | Logout | Last Login Time: 02/27/2018 12:31:46

Tasks | Language

Here are the interfaces to zone mappings:

v1.0

Page 25

# Palo Alto Networks GCP Deployment Manager Deployment Guide

The screenshot shows the Palo Alto Networks management console. The top navigation bar includes tabs for Dashboard, ACC, Monitor, Policies, Objects, Network, and Device. The left sidebar lists various configuration categories like Interfaces, Zones, Virtual Routers, IPSec Tunnels, DHCP, DNS Proxy, GlobalProtect, Portals, Gateways, MDM, Device Block List, Clientless Apps, Clientless App Groups, QoS, LLDP, and Network Profiles. The main content area is titled 'Ethernet' and displays a table of 7 interfaces.

Interface	Interface Type	Management Profile	Link State	IP Address	Virtual Router	Tag	VLAN / Virtual-Wire	Security Zone	Features	Comment
ethernet1/1	Layer3			Dynamic-DHCP Client	default	Untagged	none	Untrust		
ethernet1/2	Layer3	Allow-HTTPS		Dynamic-DHCP Client	default	Untagged	none	Web		
ethernet1/3	Layer3	Allow-HTTPS		Dynamic-DHCP Client	default	Untagged	none	Db		
ethernet1/4				none	none	Untagged	none	none		
ethernet1/5				none	none	Untagged	none	none		
ethernet1/6				none	none	Untagged	none	none		
ethernet1/7				none	none	Untagged	none	none		

At the bottom of the interface list, there are buttons for 'Delete' and 'PDF/CSV'. The footer shows the user is logged in, with a last login time of 02/27/2018 12:31:46.

In the policies tab you can review the security policies:

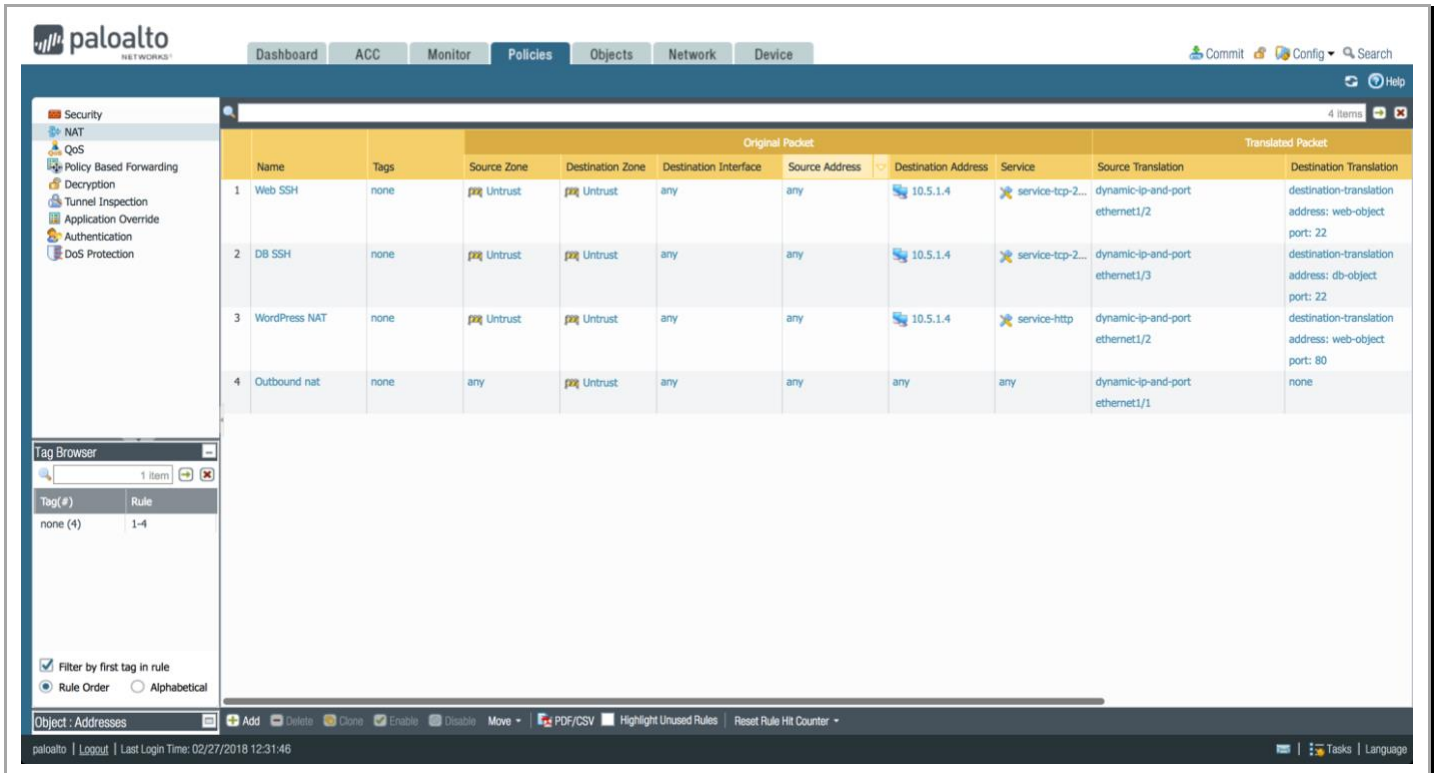
The screenshot shows the Palo Alto Networks management console with the 'Policies' tab selected. The left sidebar lists security-related categories like NAT, QoS, Policy Based Forwarding, Decryption, Tunnel Inspection, Application Override, Authentication, and DoS Protection. The main content area displays a table of 8 security rules.

Name	Tags	Type	Zone	Address	User	HTTP Profile	Zone	Address	Hit Count	Last Hit	First Hit
1 SSH inbound	none	universal		any	any	any		any	-	-	-
2 SSH 221-222 inbound	none	universal		any	any	any		any	0	-	-
3 Allow all ping	none	universal	any	any	any	any	any	any	0	-	-
4 Web browsing	none	universal		any	any	any		any	60	2018-02-28 13:03:26	2018-02-28 13:03:26
5 Allow all outbound	none	universal		any	any	any		any	35239	2018-02-28 13:12:35	2018-02-28 13:12:35
6 Web to DB	none	universal	any		any	any	any		0	-	-
7 intrazone-default	none	intrazone	any	any	any	any	(intrazone)	any	4	2018-02-27 12:31:51	2018-02-27 12:31:51
8 interzone-default	none	interzone	any	any	any	any	any	any	0	-	-

Below the table, there is a 'Tag Browser' section with a search bar and a list of tags. The 'Filter by first tag in rule' checkbox is checked. At the bottom, there are buttons for 'Add', 'Delete', 'Clone', 'Override', 'Revert', 'Enable', 'Disable', 'Move', 'PDF/CSV', 'Highlight Unused Rules', and 'Reset Rule Hit Counter'.

These policies are defined to allow ssh access on ports 221 and 222 to the web and db server respectively (for troubleshooting purposes), secures N/S traffic and E/W traffic between zones.

And the NAT policies allow for ssh access to the web and db servers as well as directing web traffic to the web server only. There is also a rule for source NAT from web and db servers to the outside world.

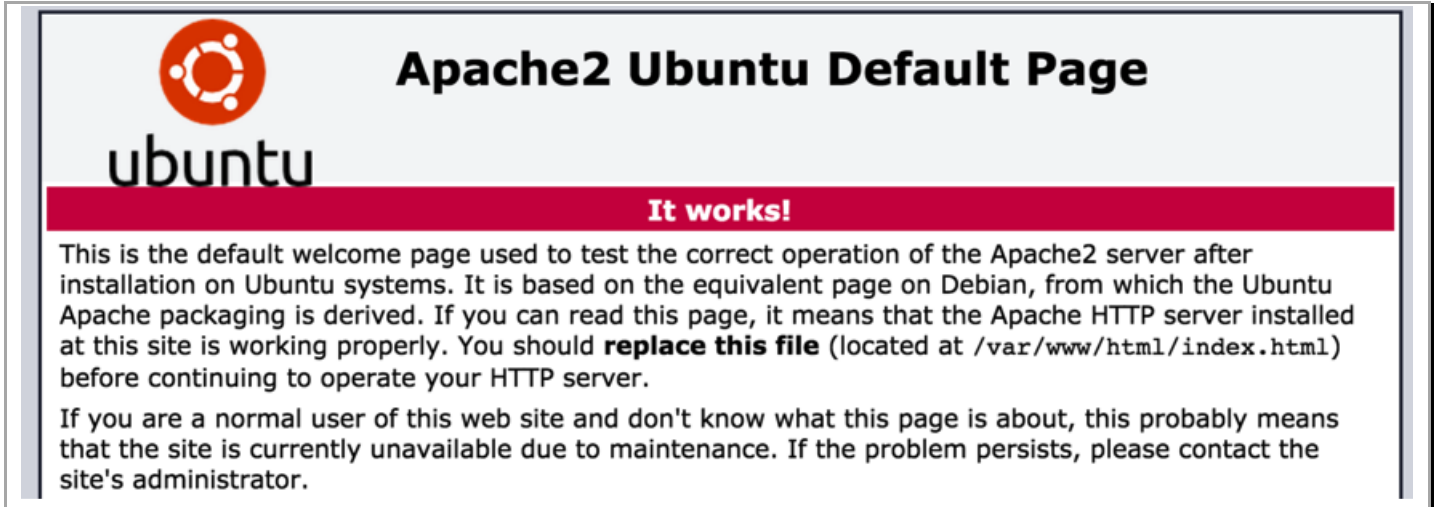


## 8. Access the Webserver

Navigate to the list of VM instances and click on the firewall. Locate the public IP address of the untrust-network interface:

<b>Creation time</b>					
Feb 27, 2018, 2:17:57 PM					
<b>Network interfaces</b>					
Network	Subnetwork	Primary internal IP	Alias IP ranges	External IP	IP forwarding
mgmt-network	mgmt-subnet	10.5.0.4	—	35.224.8.98 (ephemeral)	On
untrust-network	untrust-subnet	10.5.1.4	—	35.193.28.231 (ephemeral)	
web-network	web-subnet	10.5.2.4	—	None	
db-network	db-subnet	10.5.3.4	—	None	

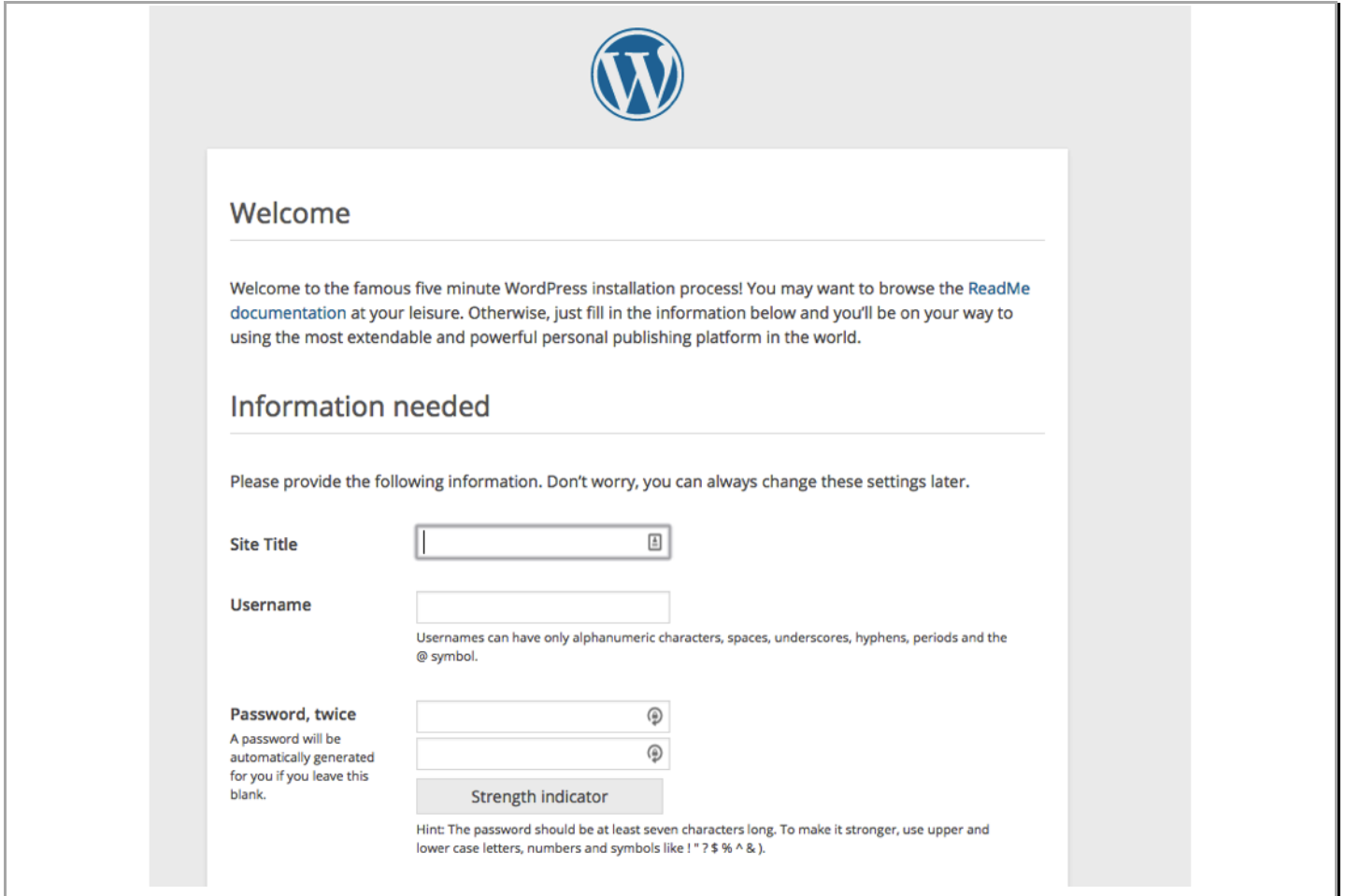
Open a new browser tab and type `http://<untrust-network-IP>/` and you should see:




Check firewall logs to verify that the traffic is passing through the firewall:

Manual [Help]													
( zone.src eq Untrust )													
	Receive Time	Type	From Zone	To Zone	Source	Source User	Destination	To Port	Application	Action	Rule	Session End Reason	Bytes
	02/28 15:29:37	start	Untrust	Web	12.206.19.5		10.5.1.4	80	web-browsing	allow	Web browsing	n/a	913
	02/28 15:28:57	start	Untrust	Web	12.206.19.5		10.5.1.4	80	web-browsing	allow	Web browsing	n/a	795

Now let us verify we pass east-West traffic through the firewall. In the browser, head to the wordpress server (<http://<untrust-network-IP>/wordpress>). You should see the WordPress welcome screen:





## Welcome

Welcome to the famous five minute WordPress installation process! You may want to browse the [ReadMe documentation](#) at your leisure. Otherwise, just fill in the information below and you'll be on your way to using the most extendable and powerful personal publishing platform in the world.

## Information needed

Please provide the following information. Don't worry, you can always change these settings later.

**Site Title**

**Username**

Username can have only alphanumeric characters, spaces, underscores, hyphens, periods and the @ symbol.

**Password, twice**









A password will be automatically generated for you if you leave this blank.

**Strength indicator**

Hint: The password should be at least seven characters long. To make it stronger, use upper and lower case letters, numbers and symbols like ! " ? \$ % ^ & ).

**Note:** You don't need to actually configure the new WordPress server for the purpose of the test drive. In its initial, un-configured state, it will generate the traffic we need to test the VM-Series firewall.

Now, head back to the firewall and verify that the traffic did indeed go through the firewall from web to db:

	Receive Time	Type	From Zone	To Zone	Source	Source User	Destination	To Port	Application	Action	Rule	Session End Reason	Bytes
	02/28 15:32:03	end	Untrust	Web	12.206.19.5		10.5.1.4	80	web-browsing	allow	Web browsing	tcp-fin	2.2k
	02/28 15:32:03	end	Untrust	Web	12.206.19.5		10.5.1.4	80	web-browsing	allow	Web browsing	tcp-fin	7.3k
	02/28 15:32:03	end	Untrust	Web	12.206.19.5		10.5.1.4	80	web-browsing	allow	Web browsing	tcp-fin	364.3k
	02/28 15:32:02	end	Untrust	Web	12.206.19.5		10.5.1.4	80	web-browsing	allow	Web browsing	tcp-fin	37.5k
	02/28 15:32:02	end	Untrust	Web	12.206.19.5		10.5.1.4	80	web-browsing	allow	Web browsing	tcp-fin	14.9k
	02/28 15:32:02	end	Untrust	Web	12.206.19.5		10.5.1.4	80	web-browsing	allow	Web browsing	tcp-fin	5.1k
	02/28 15:31:04	end	Web	Db	10.5.2.5		10.5.3.5	3306	mysql	allow	Web to DB	tcp-fin	27.6k
	02/28 15:31:03	end	Web	Db	10.5.2.5		10.5.3.5	3306	mysql	allow	Web to DB	tcp-fin	4.5k

You have now successfully deployed a cloud formation template with a VM-Series firewall in AWS.

## 9. Launch some attacks

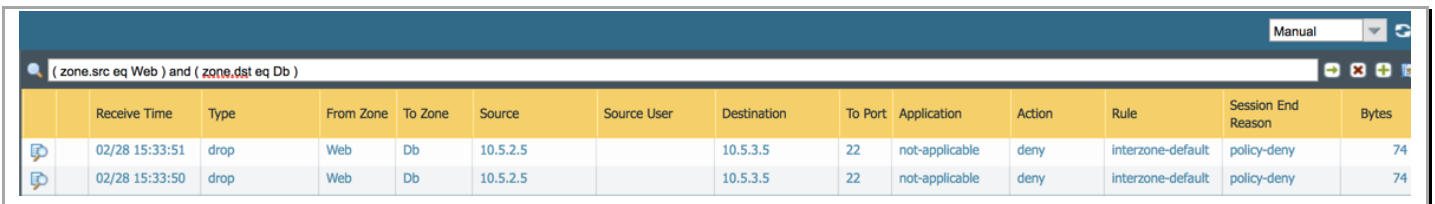
### 9.1 SSH from Web Server to DB Server

Let's simulate a compromised web server that is being used to attack the database. This is a common attack strategy of getting a foothold on the web front-end server and then expanding to the other application tiers with the ultimate goal of accessing all data in the database.

Go to <http://<untrust-network-IP>/sql-attack.html> and simulate a web to db ssh attempt by clicking on the **LAUNCH WEB TO DB SSH ATTEMPT**.

**LAUNCH WEB TO DB SSH ATTEMPT**

This launches a CGI script that attempts to ssh as root to the db server from the web server. Now return to the firewall's monitor tab to note the failed traffic:



	Receive Time	Type	From Zone	To Zone	Source	Source User	Destination	To Port	Application	Action	Rule	Session End Reason	Bytes
	02/28 15:33:51	drop	Web	Db	10.5.2.5		10.5.3.5	22	not-applicable	deny	interzone-default	policy-deny	74
	02/28 15:33:50	drop	Web	Db	10.5.2.5		10.5.3.5	22	not-applicable	deny	interzone-default	policy-deny	74

### 9.2 SQL Brute force attack

On the firewall's security policies tab, under Security, Rule 6, you will notice that the web to db traffic is protected further by a vulnerability profile:

## Palo Alto Networks GCP Deployment Manager Deployment Guide

8 items															
Tags	Type	Source				Destination		Rule Usage			Application	Service	Action	Profile	Options
Zone	Address	User	HIP Profile	Zone	Address	Hit Count	Last Hit	First Hit							
none	universal	Untrust	any	any	any	any	Web	any	-	-	-	ping	application-default	Allow	none
none	universal	Untrust	any	any	any	any	Db	any	0	-	-	ssh	service-tcp-221	Allow	none
none	universal	any	any	any	any	any	Web	any	1	2018-02-28 15:28:21	2018-02-28 15:28:21	ping	service-tcp-222	Allow	none
none	universal	Untrust	any	any	any	any	Web	any	20	2018-02-28 15:33:51	2018-02-28 15:29:37	any	application-default	Allow	none
none	universal	Untrust	any	any	any	any	Web	any	87	2018-02-28 15:28:21	2018-02-28 15:28:21	any	service-http	Allow	none
none	universal	Web	any	any	any	any	Untrust	any				any	application-default	Allow	none
none	universal	any	web-object	any	any	any	db-object	any	8	2018-02-28 15:30:49	2018-02-28 15:28:21	mysql	application-default	Allow	none
none	intrazone	any	any	any	any	(intrazone)	any	any	4	2018-02-28 15:27:42	2018-02-28 15:27:42	any	any	Allow	none
none	interzone	any	any	any	any	any	any	any	2	2018-02-28 15:33:52	2018-02-28 15:33:52	any	any	Deny	none

Now click on the icon in the Profile column and you will see all the threat protection profiles

**Profiles**

Profile Type: Profiles

Antivirus: None

Vulnerability Protection: Test Drive

Anti-Spyware: None

URL Filtering: None

File Blocking: None

Data Filtering: None

WildFire Analysis: None

OK Cancel

Note the Vulnerability Protection profile. This is a custom profile created just for this lab. It is part of the default vulnerability protection profile but is called out separately for the purpose of this demo environment.

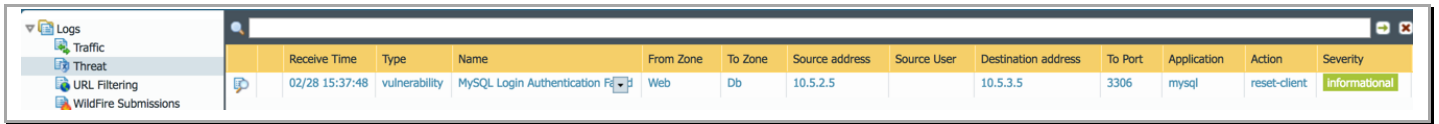
Let's finally trigger the attack. Head back to the sql-attack.html page at <http://<untrust-network-IP>/sql-attack.html>

Click on Launch Brute Force Attack to start a script that will generate multiple failed MySQL authentication attempts.

**LAUNCH BRUTE FORCE SQL ROOT PASSWORD GUESSING**

This will launch some scripted attacks on the SQL server and use the pre-configured threat protection to show and block those attacks on the VM-Series firewall. Now return to the firewall

and click the Monitor tab and then click on Threats in the left hand pane under Logs and notice the new vulnerability log message regarding the failed MySQL events:



	Receive Time	Type	Name	From Zone	To Zone	Source address	Source User	Destination address	To Port	Application	Action	Severity
	02/28 15:37:48	vulnerability	MySQL Login Authentication Failure	Web	Db	10.5.2.5		10.5.3.5	3306	mysql	reset-client	Informational

The CGI script you launched above attempted to login to the MySQL database multiple times with an incorrect password. The VM-Series firewall saw this activity and using the vulnerability profile, reset the connection and logged the activity.

## 10. Cleanup

### 10.1 Delete the deployment

Once done with the template, feel free to play around with various thins. If done, cleanup as follows. From the CLI, issue the command “gcloud deployment-manager deployments delete <deployment name>” where <deployment name> is the tag used to identify the deployment (“deployment1” in this example):

```
root@2ccf4d39089e: / # gcloud deployment-manager deployments delete deployment1
The following deployments will be deleted:
- deployment1

Do you want to continue (y/N)? y

done.
Delete operation operation-1519861499988-5664e54d08821-676e434e-cb6fceb2 completed successfully.
root@2ccf4d39089e: / #
```

This should delete all the resources created via the template.



## 11. Conclusion

You have successfully deployed a sample template in GCP and demonstrated how the next generation VM-Series firewall can not only secure traffic inbound into your project, but within the project itself.

## Appendix A

### Troubleshooting tips

#### 1. Unable to access the webserver or web page not visible

If the VM-Series firewall is up and accessible but you are unable to access the webserver (or the web page is not visible), then chances are that the startup scripts did not get downloaded from the bootstrap bucket or were corrupted during (or prior to) the upload. Ensure that the files `webserver-startup.sh` and `dbserver-startup.sh` are in the bootstrap bucket. If they are extant, replace them with new copies downloaded from the GitHub repository.

#### 2. Bootstrapping not working

If the VM-Series firewall is up and you are able to access the login page, but unable to login using the username/password: `paloalto/Pal0Alt0@123`, then chances are bootstrapping has failed. There could be several reasons:

##### *a. Corrupt configuration files*

Please ensure that the `bootstrap.xml` and `init-cft.txt` files mentioned in [Section 4.6](#) are not corrupted.

##### *b. Incorrect bootstrap bucket-name*

Another reason for bootstrapping to fail is that the bootstrap bucket name (Parameter: `bootstrapbucket`) was incorrectly entered in the template file. Please make sure the bucket name created in [Section 4.6](#) is mentioned when launching the template.