



Automating a virtual router in the hybrid cloud

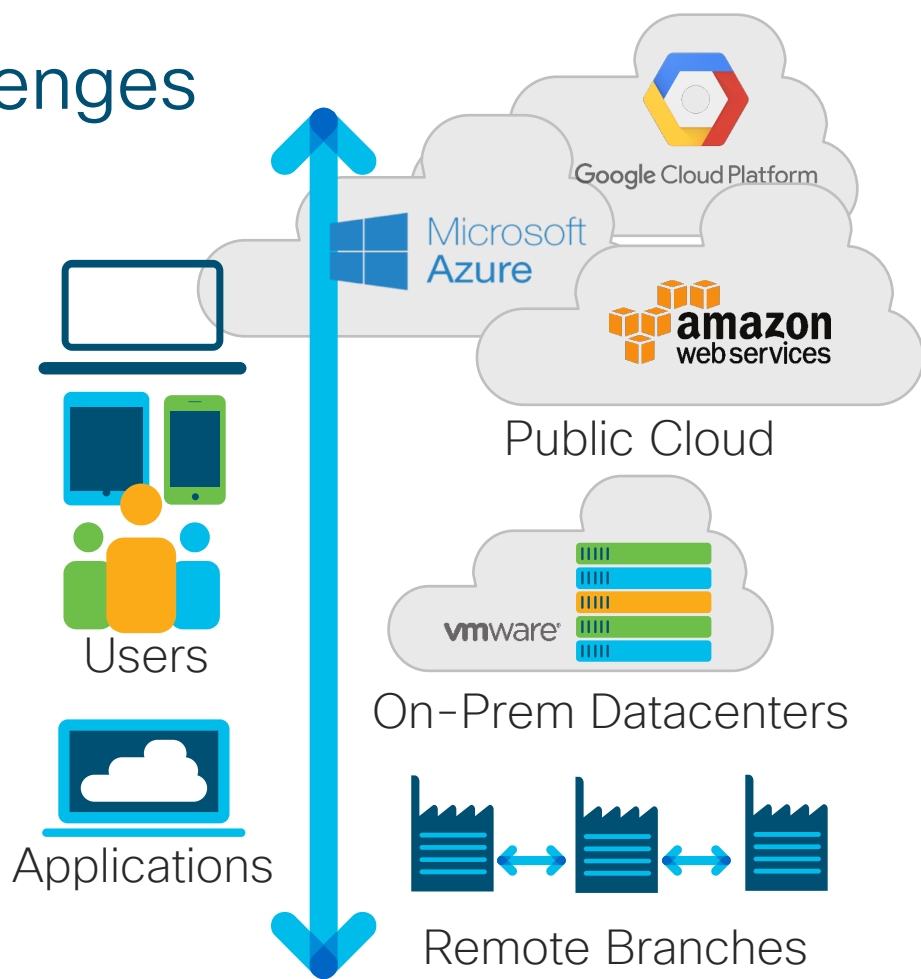
Cisco CSR 1000v deployment options in the cloud

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Systems Engineer
June 18 2020

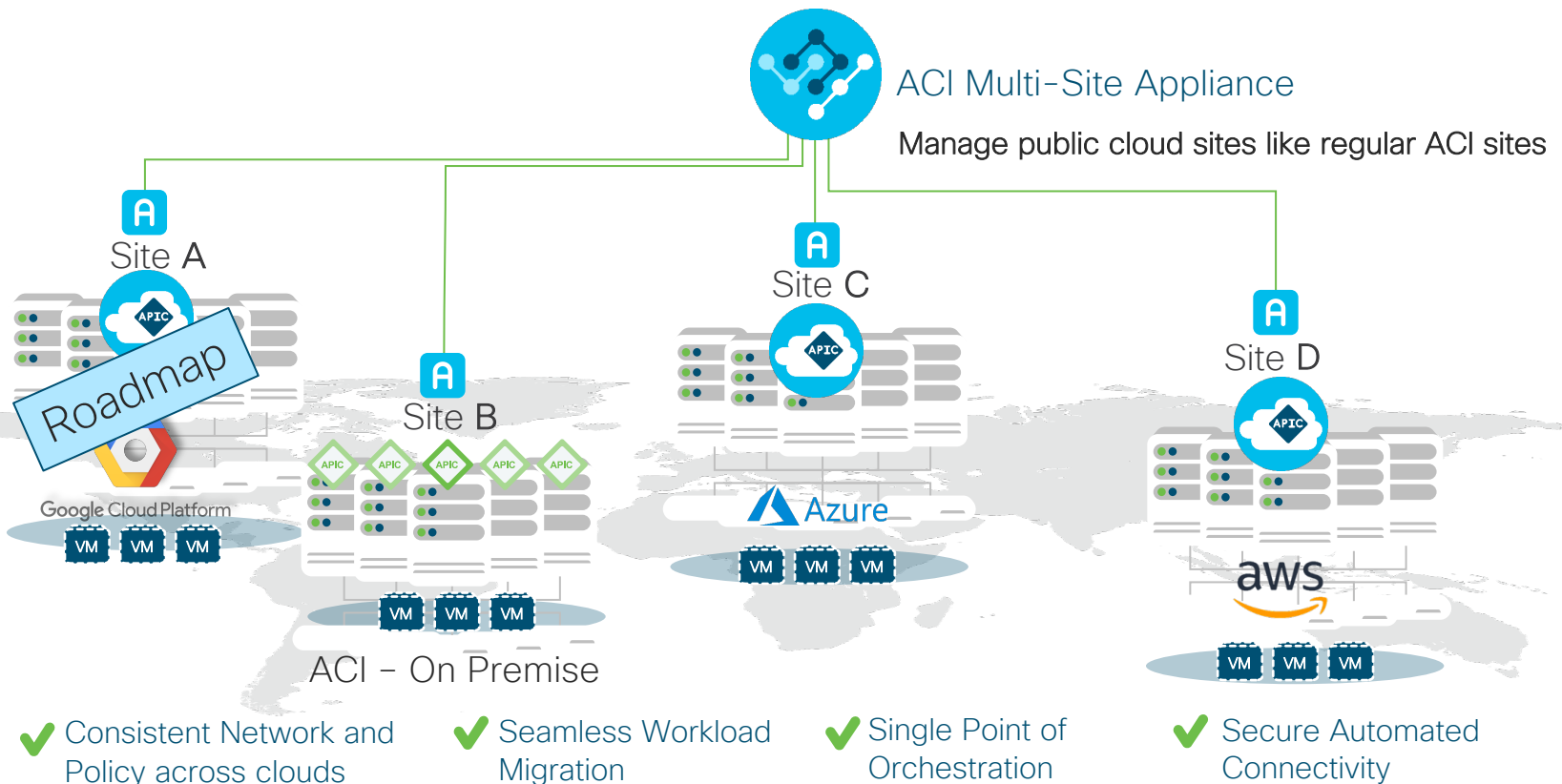


Cloud Connectivity Challenges

- Complexity & Dependency – Need a simple and scalable way to securely extend the private network across Multicloud environments
- Inconsistent security policies between private & public- Need to apply consistent security policies
- Performance and ambiguity for best path to reach the cloud – Need enhance application experience

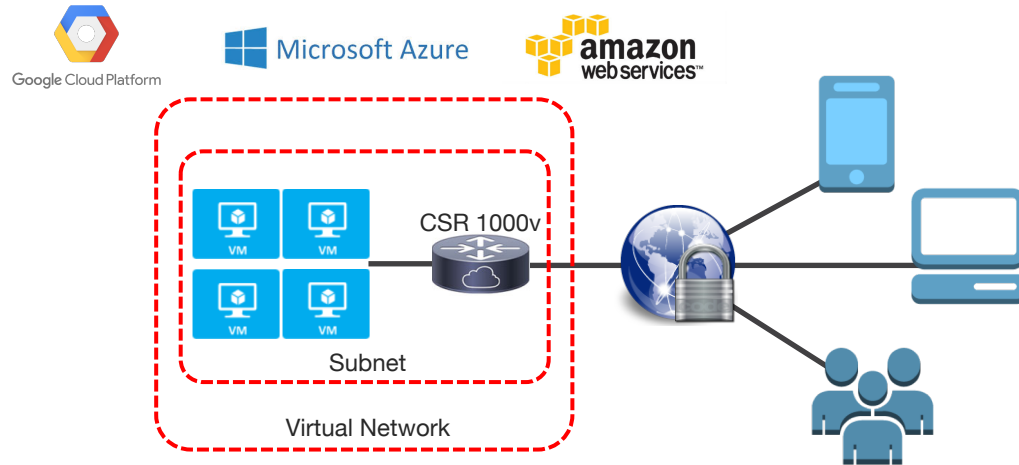


Use Case: Multi Cloud Deployment



Use Case: Connect Remote Users to the Public Cloud

Remote Access VPN Using the CSR 1000v



- SSLVPN access using Cisco AnyConnect for teleworkers and remote users
- Flexible AAA server options for remote user authentication
- Replicate or scale your applications in Public Cloud regions near your users
- Seamless transition for existing AnyConnect deployments (no new client, reuse existing configuration)

Cisco Cloud Services Router (CSR) 1000V

Cisco IOS XE Software in a virtual network function form-factor

Software

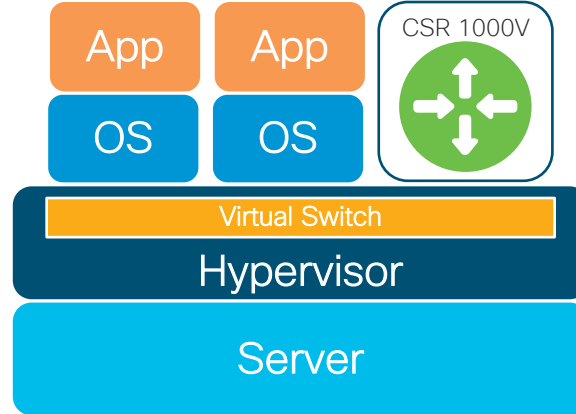
Same IOS XE software as the
ASR1000 and ISR4000

Infrastructure Agnostic

Runs on x86 platforms

Programmability

NetConf/Yang, RESTConf, Guest
Shell and SSH/Telnet



Performance Elasticity

Available licenses range from
10 Mbps to 10 Gbps

CPU footprint ranges from
1vCPU to 8vCPU

License Options

Term based 1 year, 3 year
or 5 year

Enterprise-class networking with rapid deployment and flexibility

Supported Hypervisors



Red Hat Enterprise Linux 7.4



Ubuntu 14.04 LTS



Suse Linux 12-SP3



ESXi 6.5 update 1



Microsoft
Hyper-V

Hyper-V for Windows Server 2016



XenServer 6.5

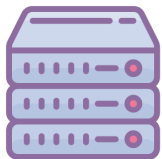
Supported Public Cloud providers



Google Cloud Platform

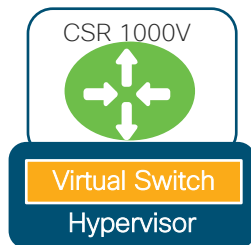
CSR1000v VM specifications

Physical Hardware:



- CPU - Intel Nehalem or AMD
- CPU with clock frequency ≥ 2.0
- Gigabit Ethernet interfaces

CSR1000v Virtual Machine specs:



- CPU: 1 to 8 virtual CPUs
- Memory: 4 GB to 16 GB
- Disk space: 8 GB
- Network interfaces: Two or more vNICs, up to maximum allowed by hypervisor

Deploy Cisco CSR 1000v on Google Cloud Platform

Options

1. Marketplace
2. Manual, with custom data
3. Programmatically
 - APIs
 - Action Orchestrator
 - Terraform
 - ...

https://www.cisco.com/c/en/us/td/docs/routers/csr1000/software/gcp/b_csrqcp/b_csrqcp_chapter_00.html

Demo #1

- Deploy a CSR 1000v router from GCP marketplace

Select a solution in the Marketplace

Google Cloud Platform

RMLAB

Search products

←

Search for solutions

Marketplace

"cisco cloud services router 1000v (csr 1000v)"

Filter by

4 results

CATEGORY

Compute (4)

Networking (4)



Cisco Cloud Services Router 1000V (CSR 1000V)

Cisco Systems

Deploy and manage enterprise-class networking services and VPN.



Cisco Cloud Services Router 1000V - 16.12 - BYOL

Cisco Systems

Deploy and manage enterprise-class networking services and VPN.



Cisco Cloud Services Router 1000V - 17.1.1 - BYOL

Cisco Systems

Deploy and manage enterprise-class networking services and VPN.



Cisco Cloud Services Router 1000V - 17.2.1r - BYOL

Cisco Systems

Deploy and manage enterprise-class networking services and VPN.

Launch deployment from Marketplace

 Google Cloud Platform

 RMLAB

 Search products





Cisco Cloud Services Router 1000V (CSR 1000V)

[Cisco Systems](#)

Estimated costs: \$98.09/month + BYOL license fee

Deploy and manage enterprise-class networking services and VPN.

LAUNCH

Runs on

Google Compute Engine

Type

[Virtual machines](#)

Single VM

BYOL

Last updated

6/17/20, 8:07 AM

Category

Overview

The Bring Your Own License (BYOL) of Cisco Cloud Services Router (CSR1000V) delivers enterprise-class networking services & VPN in the Google Compute Platform. This software supports all the four CSR Technology packages. The CSR is a full feature Cisco IOS XE router and enables enterprise IT to deploy the same enterprise-class networking services in the cloud that they are familiar with on-prem networks. It enables Routing, VPN, Firewall, High-Availability, IP SLA, AVC, WAN Opt, and more. The familiar IOS XE CLI and Netconf/Restconf/Yang API ensure easy deployment, monitoring, troubleshooting, and service orchestration. To activate this software, please obtain a license from Cisco with the following: (1) Tech Package: IPBase, SEC, AppX, or AX (2) Performance Level: 10Mbps, 50 Mbps, 100Mbps, 250Mbps, 500 Mbps, 1 Gbps, 2.5 Gbps or 5Gbps and (3) Time period: 1-year, 3-year, or perpetual. For a 60-day eval license, please click the resource link below. www.cisco.com/go/license

Leverage Solution Template

Bring your own license (BYOL)
deployment

Prerequisites: SSH keypair

Google Cloud Platform

RMLAB

New Cisco Cloud Services Router 1000V (CSR 1000V) deployment

Deployment name

meetup-marketplace

Instance name

meetup-marketplace

Username

rtortori

Instance SSH Key

ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQgQDPy7tpJb3fJS0wVB93vdyCYr

Zone

europa-west1-c

Machine type

2 vCPUs8 GB memory

Boot Disk

Boot disk type

SSD Persistent Disk

Boot disk size in GB

10

Networking

Network

default

Subnetwork

default (10.132.0.0/20)

External IP

Ephemeral

Firewall

Add tags and firewall rules to allow specific network traffic from the Internet

☒ Allow TCP port 22 traffic

☒ Allow HTTP traffic

☐ Allow TCP port 21 traffic

More

Additional Network Interfaces

Multiple network interfaces deployment is described in [Deploy a CSR1000v for GCP with Multiple Network Interfaces](#).

Show Additional Network Interfaces options

Deploy

 Cisco Cloud Services Router 1000V (CSR 1000V) overview

Solution provided by Cisco Systems

\$55.59 per month estimated

Effective hourly rate \$0.076 (730 hours per month)

Details

Software

Operating SystemIOSXE (16.9)

Launching a BYOL solution

Cisco Cloud Services Router 1000V (CSR 1000V) is a BYOL (Bring Your Own License) solution. Marketplace will deploy this solution, but you are responsible for purchasing and managing the license directly from the provider.

Terms of Service

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Google is providing this software or service "as-is" and any support for this software or service will be provided by Cisco Systems under their terms of service.

Deployment Manager

Google Cloud Platform

RMLAB

Search products and resources

Deployment Manager

meetup-marketplace

STOP

DELETE

cisco-csr-1000v

Deployments

Type registry

meetup-marketplace is being deployed

Overview - meetup-marketplace

cisco-csr-1000v cisco-csr-1000v.jinja

cisco-csr-1000v-vm-templ vm_instance.py

meetup-marketplace vm instance

meetup-marketplace-tcp-22 firewall

meetup-marketplace-tcp-80 firewall

 Cisco Cloud Services Router 1000V (CSR 1000V)
Solution provided by Cisco Systems

Username	rtortori
External IP Address	\$(ref.meetup-marketplace.networkInterfaces[0].accessConfigs[0].natIP)
Instance	meetup-marketplace
Instance zone	europa-west1-c
Instance machine type	n2-standard-2
Number of NICs	1
Message	VM got attached with 0 additional NICs as expected.
SSH Command	ssh -i /private-key-path rtortori@\$(ref.meetup-marketplace.networkInterfaces[0].accessConfigs[0].natIP)

[MORE ABOUT THE SOFTWARE](#)

Get started with Cisco Cloud Services Router 1000V (CSR 1000V)

You will be able to use Cisco Cloud Services Router 1000V (CSR 1000V) after the deployment is completed.

Documentation

- [CSR 1000V Configuration Guides](#)
- [CSR 1000V Home Page](#)
- [CSR 1000V Youtube Channel](#)

Support

Cisco support is available for BYOL license, please contact Cisco sales representative or partner to purchase a license. For support during free trial, please use community forum: [Go to Cisco Systems support](#)

Template properties

[SHOW MORE](#)

Solution deployed email notification

Your Cisco Cloud Services Router 1000V (CSR 1000V) solution has been deployed.



Google Cloud Platform <CloudPlatform-noreply@google.com>

To: [Riccardo Tortorici \(rtortori\)](#)



Google Cloud Platform

[MY CONSOLE](#)

GCP Marketplace

Your Cisco Cloud Services Router 1000V (CSR 1000V) solution has been deployed on Google Cloud Platform.

Project: rmlab-sandbox-qdt8

[VIEW DEPLOYMENT](#)

To get started with your solution:

1. View the getting started documentation for Cisco Cloud Services Router 1000V (CSR 1000V):

- [CSR 1000V Configuration Guides](#)
- [CSR 1000V Home Page](#)
- [CSR 1000V Youtube Channel](#)

2. Learn how to [manage](#) and [troubleshoot](#) your deployment.

We're always adding new solutions to the GCP Marketplace. To check out some of the other software packages you can deploy, explore [GCP Marketplace](#).

See you in the cloud,

The Google Cloud Platform Team

Access the CSR 1000v Router

Google Cloud Platform

RMLAB

Search products and resources

Compute Engine

VM instances

CREATE INSTANCE

IMPORT VM

REFRESH

START

STOP

RESET

DELETE

VM instances

Instance groups

Instance templates

Sole-tenant nodes

Machine images

Disks

Snapshots

Images

TPUs

Migrate for Compute Engine

Committed use discounts

Metadata

Health checks

Instance "cqjw-dbb4f42a8" is overutilized. Consider switching to the machine type: custom (1 vCPU, 2.75 GB memory). [Learn more](#)

Filter VM instances

Columns

Name	Zone	Recommendation	In use by	Internal IP	External IP	Connect
☐ cqjw-dbb4f42a8	europe-west3-a	Increase perf.		10.156.0.42 (nic0)		RDP
☐ gke-meetup-default-pool-06efa25f-3hsc	europe-west1-b		2 more	10.132.0.29 (nic0)		SSH
☐ gke-meetup-default-pool-06efa25f-6q8l	europe-west1-b		2 more	10.132.0.30 (nic0)		SSH
☐ gke-meetup-default-pool-06efa25f-b14j	europe-west1-b		2 more	10.132.0.28 (nic0)		SSH
☐ gke-titanic-default-pool-21c2001f-86h1	us-central1-c		2 more	10.128.0.35 (nic0)		SSH
☐ gke-titanic-default-pool-21c2001f-qgwc	us-central1-c		2 more	10.128.0.36 (nic0)		SSH
☐ gke-titanic-default-pool-21c2001f-rc0f	us-central1-c		2 more	10.128.0.34 (nic0)		SSH
☐ meetup-marketplace	europe-west1-c			10.132.0.31 (nic0)	35.241.137.197	SSH
☐ wordpress-1-vm	us-west3-a					

```
terraform_gcp_csr1k > ssh -i csrtingcp rtortori@35.241.137.197
The authenticity of host '35.241.137.197 (35.241.137.197)' can't be established.
RSA key fingerprint is SHA256:YG4DCp0v9pELcI0/0mIoTsKuJmL38h6JubuEuQ4dfbc.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '35.241.137.197' (RSA) to the list of known hosts.

meetup-marketplace#sh ver | i uptime
meetup-marketplace uptime is 1 minute
meetup-marketplace#
```

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Cleanup from Deployment Manager

Google Cloud Platform RMLAB

Deployment Manager

Deployments

+ DEPLOY MARKETPLACE SOLUTION STOP DELETE

Filter deployments

		Name ↑	Created on	Last modified	Labels	
☒	✓	meetup-marketplace	4 minutes ago	3 minutes ago	cloud-mark... : cisco-publ...	▼
☐	✓	wordpress-1	1 hour ago	1 hour ago	cloud-mark... : click-to-d...	▼

Demo #2

- Deploy a CSR 1000v router manually on GCP using Cloud SDK
- Customize options
 - New VPC with autosubnets

Create a new VPC (autosubnets)

The screenshot shows the Google Cloud Platform console interface. On the left, the navigation menu is visible with the 'VPC network' option highlighted by a red box. A dropdown menu is open, showing 'VPC networks' as the selected option, also highlighted by a red box. The main content area displays a table of VPC networks.

	Zone	Recommendation	In use by
	europa-west3-a		
	europa-west1-b	⚡ Increase perf.	gke-meetup-default-pool-06efa25f-grp, a
	europa-west1-b		gke-meetup-default-pool-06efa25f-grp, a
	europa-west1-b		gke-meetup-default-pool-06efa25f-grp, a
✓ gke-titanic-default-pool-21c2001f-86h1	us-central1-c		gke-titanic-default-pool-21c2001f-grp, a
✓ gke-titanic-default-pool-21c2001f-ggwc	us-central1-c		gke-titanic-default-pool-21c2001f-grp, a
✓ gke-titanic-default-pool-21c2001f-rc0f	us-central1-c		gke-titanic-default-pool-21c2001f-grp, a
⊙ wordpress-1-vm	us-west3-a		

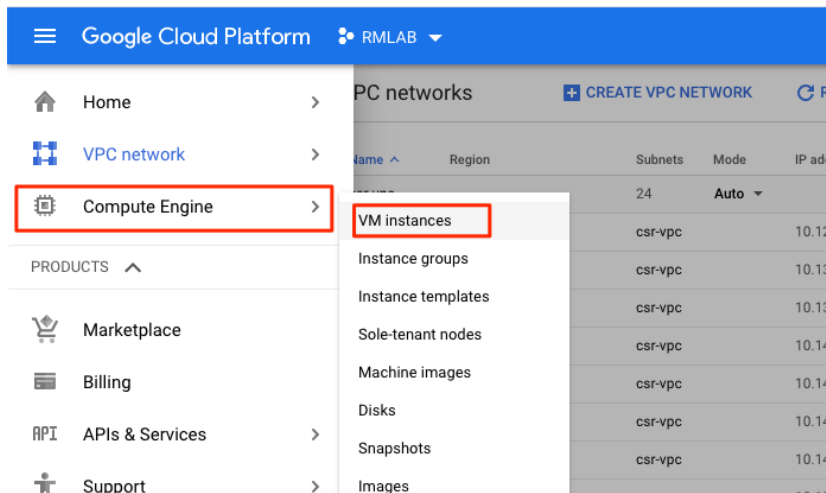
The screenshot shows the 'Create a VPC network' form. The 'Name' field is set to 'csr-vpc' and the 'Description' field is set to 'Meetup Demo'. The 'Subnets' section is expanded, showing the 'Subnet creation mode' set to 'Automatic'. A warning message states: 'These IP address ranges will be assigned to each region in your VPC network. When an instance is created for your VPC network, it will be assigned an IP from the appropriate region's address range.' Below the warning, a table lists the regions and their corresponding IP address ranges.

Region	IP address range
us-central1	10.128.0.0/20
europa-west1	10.132.0.0/20
us-west1	10.138.0.0/20
asia-east1	10.140.0.0/20
us-east1	10.142.0.0/20
asia-northeast1	10.146.0.0/20
asia-southeast1	10.148.0.0/20
us-east4	10.150.0.0/20
australia-southeast1	10.152.0.0/20
europa-west2	10.154.0.0/20

VPC and Subnets created

Google Cloud Platform RMLAB Search products and resources									
VPC network	VPC networks CREATE VPC NETWORK REFRESH								
VPC networks	Name ^	Region	Subnets	Mode	IP address ranges	Gateways	Firewall Rules	Global dynamic routing	Flow logs
External IP addresses	csr-vpc		24	Auto			0	Off	
Firewall		us-central1	csr-vpc		10.128.0.0/20	10.128.0.1			Off
Routes		europa-west1	csr-vpc		10.132.0.0/20	10.132.0.1			Off
VPC network peering		us-west1	csr-vpc		10.138.0.0/20	10.138.0.1			Off
Shared VPC		asia-east1	csr-vpc		10.140.0.0/20	10.140.0.1			Off
Serverless VPC access		us-east1	csr-vpc		10.142.0.0/20	10.142.0.1			Off
Packet mirroring		asia-northeast1	csr-vpc		10.146.0.0/20	10.146.0.1			Off
		asia-southeast1	csr-vpc		10.148.0.0/20	10.148.0.1			Off
		us-east4	csr-vpc		10.150.0.0/20	10.150.0.1			Off
		australia-southeast1	csr-vpc		10.152.0.0/20	10.152.0.1			Off
		europa-west2	csr-vpc		10.154.0.0/20	10.154.0.1			Off
		europa-west3	csr-vpc		10.156.0.0/20	10.156.0.1			Off
		southamerica-east1	csr-vpc		10.158.0.0/20	10.158.0.1			Off
		asia-south1	csr-vpc		10.160.0.0/20	10.160.0.1			Off
		northamerica-northeast1	csr-vpc		10.162.0.0/20	10.162.0.1			Off
		europa-west4	csr-vpc		10.164.0.0/20	10.164.0.1			Off
		europa-north1	csr-vpc		10.166.0.0/20	10.166.0.1			Off
		us-west2	csr-vpc		10.168.0.0/20	10.168.0.1			Off
		asia-east2	csr-vpc		10.170.0.0/20	10.170.0.1			Off
		europa-west6	csr-vpc		10.172.0.0/20	10.172.0.1			Off
		asia-northeast2	csr-vpc		10.174.0.0/20	10.174.0.1			Off
		asia-northeast3	csr-vpc		10.178.0.0/20	10.178.0.1			Off
		us-west3	csr-vpc		10.180.0.0/20	10.180.0.1			Off
		us-west4	csr-vpc		10.182.0.0/20	10.182.0.1			Off
		asia-southeast2	csr-vpc		10.184.0.0/20	10.184.0.1			Off
default			24	Auto			32	Off	
		us-central1	default		10.128.0.0/20, 2 more	10.128.0.1			Off
		europa-west1	default		10.132.0.0/20	10.132.0.1			Off

Create a new VM Instance



Create a new VM Instance

Create an instance

To create a VM instance, select one of the options:

New VM instance

Create a single VM instance from scratch

New VM instance from template

Create a single VM instance from an existing template

New VM instance from machine image

Create a single VM instance from an existing machine image

Marketplace

Deploy a ready-to-go solution onto a VM instance

Name

Name is permanent

csr-meetup-manual

Labels

(Optional)

+ Add label

Region

Region is permanent

europa-west1 (Belgium)

Zone

Zone is permanent

europa-west1-c

Machine configuration

Machine family

General-purpose

Compute-optimized

Machine types for common workloads, optimized for cost and flexibility

Series

N1

Powered by Intel Skylake CPU platform or one of its predecessors

Machine type

n1-standard-2 (2 vCPU, 7.5 GB memory)



vCPU

2

Memory

7.5 GB

CPU platform and GPU

Container

☐ Deploy a container image to this VM instance. [Learn more](#)

Boot disk



New 10 GB SSD persistent disk

Image

csr1k-tim-image

Change

Identity and API access

Service account

Compute Engine default service account

Access scopes

☒ Allow default access

☐ Allow full access to all Cloud APIs

☐ Set access for each API

\$55.15 monthly estimate

That's about \$0.076 hourly

Pay for what you use: No upfront costs and per second billing

[Details](#)

Firewall

Add tags and firewall rules to allow specific network traffic from the Internet

☒ Allow HTTP traffic

☒ Allow HTTPS traffic

Management

Security

Disks

Networking

Sole Tenancy

Network tags

(Optional)

Hostname

Set a custom hostname for this instance or leave it default. Choice is permanent

csr-meetup-manual.europa-west1-c.c.rmlab-sandbox-qdt8.internal

Network interfaces

Network interface is permanent

Network interface

Network

csr-vpc

Subnetwork

csr-vpc (10.132.0.0/20)

Primary internal IP

Ephemeral (Automatic)

[Show alias IP ranges](#)

External IP

Ephemeral

Network Service Tier

☒ Premium (Current project-level tier, [change](#))

☐ Standard (europa-west1)

IP forwarding

On

Public DNS PTR Record

☐ Enable

PTR domain name

Done

Cancel

+ Add network interface

[Less](#)

You will be billed for this instance. [Compute Engine pricing](#)

Create

Cancel

Equivalent REST or **command line**

Create a new VM instance from Cloud SDK

```
rtortori@RTORTORI-M-MQJC:~$ terraform_gcp_csrlk > gcloud beta compute --project=[REDACTED] instances create csr-meetup-manual --zone=eu-west-1 --machine-type=n1-standard-2 --subnet=csr-vpc --network-tier=PREMIUM --metadata=ssh-keys=rtortori@rtortori.com --can-ip-forward --maintenance-policy=MIGRATE --service-account=[REDACTED] --compute@developer.gserviceaccount.com --scopes=https://www.googleapis.com/auth/devstorage.read_only,https://www.googleapis.com/auth/logging.write,https://www.googleapis.com/auth/monitoring.write,https://www.googleapis.com/auth/servicecontrol,https://www.googleapis.com/auth/service.management.readonly,https://www.googleapis.com/auth/trace.append --tags=http-server,https-server --image=[REDACTED] --image-project=[REDACTED] --boot-disk-size=10GB --boot-disk-type=pd-ssd --boot-disk-device-name=csr-meetup-manual --reservation-affinity=any

gcloud compute --project=[REDACTED] firewall-rules create csr-vpc-allow-http --direction=INGRESS --priority=1000 --network=csr-vpc --action=ALLOW --rules=tcp:80 --source-ranges=0.0.0.0/0 --target-tags=http-server

gcloud compute --project=[REDACTED] firewall-rules create csr-vpc-allow-https --direction=INGRESS --priority=1000 --network=csr-vpc --action=ALLOW --rules=tcp:443 --source-ranges=0.0.0.0/0 --target-tags=https-server
```

```
Created [https://www.googleapis.com/compute/beta/projects/[REDACTED]/zones/eu-west-1-c/instances/csr-meetup-manual].
```

NAME	ZONE	MACHINE_TYPE	PREEMPTIBLE	INTERNAL_IP	EXTERNAL_IP	STATUS
csr-meetup-manual	eu-west-1-c	n1-standard-2		10.132.0.2	35.241.137.197	RUNNING

Manual Cleanup

VM instances

[CREATE INSTANCE](#) [IMPORT VM](#) [REFRESH](#) [START](#) [STOP](#) [RESET](#) [DELETE](#)

Instance "cqjw-dbb4f42a8" is overutilized. Consider switching to the machine type: cust

Filter VM instances

Name ^	Zone	Recommendation
☐ cqjw-dbb4f42a8	europa-west3-a	⚠ Increase perf.
☒ csr-meetup-manual	europa-west1-c	

VPC network

- VPC networks
- External IP addresses
- Firewall
- Routes
- VPC network

VPC networks

[CREATE VPC NETWORK](#) [REFRESH](#)

Name ^	Region	Subnets	Mode	IP address ranges
csr-vpc	us-central1	24	Auto	10.128.0.0/20
	europa-west1	csr-vpc		10.132.0.0/20
				10.138.0.0/20
				10.140.0.0/20

VPC network details

[EDIT](#) [DELETE VPC NETWORK](#)

csr-vpc

Description

Meetup Demo

Subnet creation mode

Auto subnets

Dynamic routing mode

Regional

DNS server policy

None

Subnets

Static internal IP addresses

Firewall rules

Routes

VPC Network Peering

Private service connect

Add subnet

Flow logs

Name ^	Region	IP address ranges	Gateway	Private Google access	Flow logs
☐ csr-vpc	us-central1	10.128.0.0/20	10.128.0.1	Off	Off
☐ csr-vpc	europa-west1	10.132.0.0/20	10.132.0.1	Off	Off

Demo #3

- Automate CSR 1000v deployment on GCP using Terraform GC provider
- Customize VPC, subnets and startup configuration

ACI and Terraform – Jan 8 2020

← → ↻ 🏠 🔒 https://developer.cisco.com/docs/multicloud-sw-user-group/#!/past-events-slides-and-recording/slides-and-recordings-from-past-meetings ... 🗄️ ☆ 🔍 Search

Documentation > Multicloud Software User Group

Cisco Multicloud Software User Group

Introduction

Calendar

Agenda of next virtual events

Agenda of next meetings
(suspended for covid-19)

Resources

[Past events - slides and recording](#)

Blog 

Sandbox 

Youtube 

Support 

Jan 8, 2020

- [1. Containers Ecosystem](#)
- [2. Cisco ACI and Terraform](#)
- [3. Amazon Alexa integration with the Cisco CCS API: hands-on lab](#)

Feb 5, 2020

- [1. CiscoLive update + Intersight](#)
- [2. Intersight demo](#)
- [3. Container Track: infrastructure and application monitoring - part 1](#)
- [4. Container Track: infrastructure and application monitoring - part 2](#)
- [5. Container Track: infrastructure and application monitoring - part 3](#)

Terraform – Infrastructure Resources Manager

- Use Infrastructure as Code to provision and manage any cloud, infrastructure, or service
- Compose and combine infrastructure resources to build and maintain a desired state
- Plan and execution distinct actions
- Managers all resources through APIs
- Resources and data can be reused within modules



Terraform Providers

- Providers abstract the API layer of resources providers
 - New resources are available for Terraform to provision and manage
- AAA configuration is required as part of the provider definition in the TF file
- ACI supports user and X509 certificate based authentication



GCP Create Service Account

Google Cloud Platform RMLAB

Search products and resources

IAM & Admin

Service accounts **+ CREATE SERVICE ACCOUNT** DELETE

Service accounts for project "RMLAB"

A service account represents a Google Cloud service identity, such as code running on Compute Engine VMs, App Engine apps, or systems running outside Google. [Learn more about service accounts.](#)

Organization policies can be used to secure service accounts and block risky service account features, such as automatic IAM Grants, key creation/upload, or the creation of service accounts entirely. [Learn more about service account organization policies.](#)

Filter table

☐	Email	Status	Name ↑	Description	Key ID	Key creation date	Actions
☐	@appspot.gserviceaccount.com	✓	App Engine default service account		No keys		⋮
☐	@developer.gserviceaccount.com	✓	Compute Engine default service account		No keys		⋮
☐		✓	RMLAB	CloudCenter Suite		May 27, 2019 Jul 10, 2019 Dec 10, 2019 May 11, 2020	⋮
☐	terraform@.iam.gserviceaccount.com	✓	terraform	Terraform Service Account - rrtorri		Jun 4, 2020	⋮

Labels

Settings

Privacy & Security

Cryptographic Keys

Identity-Aware Proxy

Roles

Audit Logs

Groups

```
{
  "type": "service_account",
  "project_id": "myprojectid",
  "private_key_id": "somekeyhere",
  "private_key": "-----BEGIN PRIVATE KEY-----\nreallylongstring\n-----END PRIVATE KEY-----\n",
  "client_email": "terraform@myprojectid.iam.gserviceaccount.com",
  "client_id": "longnumber",
  "auth_uri": "https://accounts.google.com/o/oauth2/auth",
  "token_uri": "https://oauth2.googleapis.com/token",
  "auth_provider_x509_cert_url": "https://www.googleapis.com/oauth2/v1/certs",
  "client_x509_cert_url": "https://www.googleapis.com/robot/v1/metadata/x509/terraform%40myprojectid.iam.gserviceaccount.com"
}
```

Demo #3

Terraform config GIST

<https://gist.github.com/rtortori/dda3711d7e49cf8da858f8b84e49bc72>

```
→ terraform_gcp_csr1k > terraform plan
```

Refreshing Terraform state in-memory prior to plan...

The refreshed state will be used to calculate this plan, but will not be persisted to local or remote state storage.

An execution plan has been generated and is shown below.

Resource actions are indicated with the following symbols:

+ create

Terraform will perform the following actions:

```
# google_compute_address.static will be created
+ resource "google_compute_address" "static" {
+   address           = (known after apply)
+   address_type      = "EXTERNAL"
+   creation_timestamp = (known after apply)
+   id                = (known after apply)
+   name              = "csr1k-external"
+   network_tier       = (known after apply)
+   project            = (known after apply)
+   purpose            = (known after apply)
+   region            = (known after apply)
+   self_link          = (known after apply)
+   subnetwork         = (known after apply)
+   users              = (known after apply)
}
```

[...]

Plan: 5 to add, 0 to change, 0 to destroy.

```
→ terraform_gcp_csr1k > terraform apply
```

An execution plan has been generated and is shown below.

Resource actions are indicated with the following symbols:

+ create

Terraform will perform the following actions:

[...]

Plan: 5 to add, 0 to change, 0 to destroy.

Do you want to perform these actions?

Terraform will perform the actions described above.

Only 'yes' will be accepted to approve.

Enter a value: yes

google_compute_network.vpc_network: Creating...

google_compute_address.static: Creating...

google_compute_address.static: Still creating... [10s elapsed]

google_compute_network.vpc_network: Still creating... [10s elapsed]

[...]

google_compute_firewall.default: Creation complete after 13s [id=projects/myprojectid/global/firewalls/csr1k-firewall-rule]

google_compute_subnetwork.csr-subnet: Still creating... [20s elapsed]

google_compute_subnetwork.csr-subnet: Creation complete after 24s [id=projects/myprojectid/regions/europe-west1/subnetworks/csrnet]

google_compute_instance.vm_instance: Creating...

google_compute_instance.vm_instance: Still creating... [10s elapsed]

google_compute_instance.vm_instance: Still creating... [20s elapsed]

google_compute_instance.vm_instance: Creation complete after 26s [id=projects/myprojectid/zones/europe-west1-c/instances/csr1kv-tf-1]

Apply complete! Resources: 5 added, 0 changed, 0 destroyed.

```
→ terraform_gcp_csr1k >
```


Terraform state

→ terraform_gcp_csr1k > more terraform.tfstate

```
{
  "version": 4,
  "terraform_version": "0.12.26",
  "serial": 126,
  "lineage": "829d9044-5121-bd9b-5ae1-a22ceca449b8",
  "outputs": {},
  "resources": [
    {
      "mode": "managed",
      "type": "google_compute_address",
      "name": "static",
      "provider": "provider.google",
      "instances": [
        {
          "schema_version": 0,
          "attributes": {
            "address": "35.241.137.197",
            "address_type": "EXTERNAL",
            "creation_timestamp": "2020-06-17T08:07:27.438-07:00",
            "description": "",
            "id": "projects/myprojectid/regions/europe-west1/addresses/csr1k-external",
            "name": "csr1k-external",
            "network_tier": "PREMIUM",
            "project": "myprojectid",
```

[...]

→ terraform_gcp_csr1k > terraform show

```
# google_compute_address.static:
resource "google_compute_address" "static" {
  address      = "35.241.137.197"
  address_type = "EXTERNAL"
  creation_timestamp = "2020-06-17T08:07:27.438-07:00"
```

Add startup configuration

Use 'metadata' to pass key, values to the instance.

'startup-scripts' will execute in the router anything after the 'Section: IOS configuration string

```
metadata = {  
  ssh-keys = "${var.instance["gce_ssh_user"]}:${local.gce_ssh_pub_key_file_clean}"  
  startup-script = "Section: IOS configuration \nusername cisco priv 15 pass testpass"  
}
```



Cisco Cloud Services Router (CSR) 1000V

Cisco IOS XE Software in a virtual network function form-factor

Software

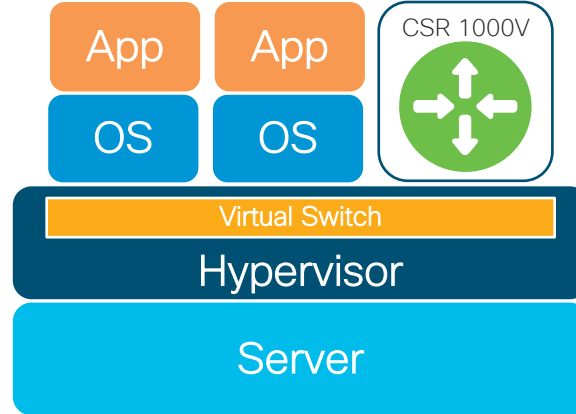
Same IOS XE software as the
ASR1000 and ISR4000

Infrastructure Agnostic

Runs on x86 platforms

Programmability

NetConf/Yang, RESTConf, Guest
Shell and SSH/Telnet



Performance Elasticity

Available licenses range from
10 Mbps to 10 Gbps

CPU footprint ranges from
1vCPU to 8vCPU

License Options

Term based 1 year, 3 year
or 5 year

Enterprise-class networking with rapid deployment and flexibility

Resources

- <https://www.cisco.com/c/en/us/products/routers/cloud-services-router-1000v-series>
- <https://www.terraform.io/docs/providers/google/index.html>
- <https://gist.github.com/rtortori/dda3711d7e49cf8da858f8b84e49bc72>



<https://www.cisco.com/c/en/us/products/routers/cloud-services-router-1000v-series>