

Agility 2020 Hands-on Lab Guide

Public Cloud Architectures I: Deploying F5

F5 Networks, Inc.



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Getting Started

Your instructor will provide a URL where you can access your lab environment.

Note: All work for this lab can be performed exclusively from the Linux jumphost. No installation or interaction with your local system is required.

1.1 Connecting to the Lab Environment

Your instructor will provide directions on how to connect to the Ravello Portal.

Class - Public Cloud Architectures I: Deploying F5 BIG-IP Virtual Edition in AWS

This class covers the following topics:

- Deploying AWS environments with CloudFormation Templates and Terraform
- · Service Discovery iApp for dynamically populating pool members using instance tags
- · Cross Availability Zone HA with F5
- · Autoscale WAF
- · Logging to Cloudwatch

2.1 Infrastructure As Code

This lab will use HashiCorp Terraform and AWS CloudFormation templates to deploy two common F5 use cases:

- · Cross Availability Zone High Availability
- · Autoscale WAF

The CloudFormation templates used in this lab are hosted in the official F5 Github repository:

https://github.com/F5Networks/f5-aws-cloudformation

2.1.1 Connecting to the Lab

Important: Your student account, and shortUrl value will be announced at the start of the lab.

- · For this lab, a Linux Remote Desktop jump host will be provided as a consistent starting point.
- Though the public cloud environment runs on a shared AWS account, every student will build and work in a dedicated AWS VPC.
- A convenient way to work through the lab is to split your screen in half: one side for the lab environment, the other side for the lab guide.

2

2.1.2 Lab Variables

The lab will make use of unique variables to provide access to the lab and isolate student environments.

Variable Name	Variable Value
shortUrl	Unique key that provides access to this lab (i.e. abc123)
emailid	Account name for each student (i.e. user01@f5lab.com)

2.1.3 Launch Remote Desktop Session to Linux

Ravello End-User Portal ×			Θ - σ
C Secure https://access.ravellosystems.com/simple/#/IXIILfl87Elf4NBAWnVGPYQIzE	qeNSulpqlIOPV5WVGtVhEvha8YcvhL6hZKsNGD/apps/3125669298893		☆ ○ () 88
Welcome to the Public Clo Lab Guides • http://fs-agility-labs-public-cloud.rev	ud Lab dthedocs.io/en/latest/		
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services webshell	services rdp		
ssh: 129.213.143.5 Port: 22	ssh: 129.213.189.8 Port: 22		
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- Look for ubuntu1. Note the username / password. Click on *rdp* link. Download the rdp file. Click on the rdp file to launch a Remote Desktop Session to your client.
- Alternatively, you can copy and paste the ubuntu1 IP address into your Remote Desktop client to modify settings.
 - Local Resources => Keyboard => Apply Windows key combinations: On the remote computer. This will allow you to quickly toggle (ALT + TAB) between windows inside the Remote Desktop Session.
- Login with username / password



2.1.4 SSH to the F5-Super-NetOps docker container

From the Linux desktop, click on the upper-left-hand corner "Activities" to reveal the application Dock. Click to launch the terminal application.



From the terminal, invoke the 'snops' command alias to ssh to the f5-super-netops docker container. Substitute user (su) to root.

snops default su – default	
Activities 🗔 Terminal 🕶 Sun Term	1326 : : : : : : : : : : : : : : : : : : :
File Edit View Search Terminal Help student@ubuntur=5_stops snops@docker's password: I 	
Welcome to the f3-super-netops-container. This image has the following services running: 55H tto/22	
HTTP tcp/80 To access these services you may need to remap ports on your host to the	
local container using the command:	
docker run -p 8080:80 -p 2222:22 -it Todevcentral/To-super-netops-container:base	
localhost:2222 -> f5-super-netops-container:22 localhost:8080 -> f5-super-netops-container:80	
You can then connect using the following:	
HTTP: http://localhost:8080 SSH: ssh -p 2222 snops@localhost	
Default Credentials:	
snops/default root/default	
Go forth and automate! [snopsgf5-super-netops] [-] \$ su - Password: [root@f5-super-netops] [-] \$	11 🖂

2.1.5 Set Variables

Export your student account and short URL path variables.

Your student account will be used to create an AWS console login and provide unique names for infrastructure that you create in the shared AWS account.

The short URL path will be used to grant access to the shared AWS account both via the AWS API and as the password for the AWS web console. Replace the emailid and shortUrl values below with the student account name and short URL assigned to you at the start of the lab.

Attention: REPLACE THE EXAMPLE VALUES WITH THE VALUES PROVIDED TO YOU BY YOUR INSTRUCTOR.

Copy and paste the commands below to accomplish the steps above.

```
export emailid=user55@f5lab.com
export shortUrl=abc123
printenv
```

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The printenv command will echo all your environment variables. Look for emailid and shortUrl. Confirm the exported variables are correct.

2.1.6 Initialize your Lab Environment

This will create AWS credentials that you will use to access the shared AWS account.

You will:

- Change to your home directory.
- Clone the git repository for this lab.
- Change to the working directory.
- Run the start script.

Copy and paste the commands below to accomplish the steps above.

```
cd ~
git clone -b dev https://github.com/TonyMarfil/marfil-f5-terraform
cd ~/marfil-f5-terraform/
source start
```

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config	100%[===================================	n Os
2018-07-10 01:43:39 (30.6 MB/s) - 'config' sav	ed [548/549]	
/root/marfil-f5-terraform		11 13

Git clone completes successfully.



Attention: For a smooth ride, always invoke commands from inside the cloned git repository (marfil-f5-terraform). To check you're in the right place you can run the command pwd and the output should read /root/marfil-f5-terraform

2.1.7 Launch Terraform

Now that we have created credentials to access the AWS account, we will use Terraform to deploy our lab environment.

Initialize terraform.

terraform init

Invoke terraform plan. This will output the changes that terraform will apply.

terraform plan

Terraform apply.

terraform apply

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		student@docker: ~	×
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	student@docker: ~	×
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Apply completel Resources: 22 added 0 changed 0 destroyed		
The state of your infrastructure has been saved to the path below. This state is required to modify and destroy your infrastructure, so keep it safe. To inspect the complete st use the 'terraform show' command. State path:	ate	
Outputs:		
<pre>**avs_alias** = https://fSngllity2018.sipnin.avs.amzon.com bigIgLicensetManager = 18.205.205.30 bigIgDetternlaGeurityGroup = 1g-64237b3 bigIgDetternlaGeurityGroup = 1g-6415acd managementSubmetAi = submet-1642057139 restricted5rc4dfress = 0.0 0.0 /0 shkoy = NyKayPair-user536/51ab.com ssl_certificted id = arinavsi.sim::457112751361:server-certi vpc-id = vpc-7252a00 vpc-pixter_al = 0.0.100.0/24 vpc-pixter_al = 0.0.100.0/24 vpc-pixter_al = submet-37037c7d vpc-pixter_al = submet-37037c7d</pre>	/consolo Lb.amazonaws.com ficate/elb_cert_user550f5lab.com	
vpc-public-b = 10.0.2.0/24 vpc-public-b-id = subnet-9ad779c6		
[root@f5-super-netops] [~/marfil-f5-terraform] \$		

2.1.8 F5 AWS Lab Test application

Note the elb_dns_name value in terraform output. HTTP to this site from any browser to see the example lab application.



2.1.9 What just happened?

This is the TL;DR version of the steps completed.

When you clone the git repository, you are pulling down a current version of the files you need to get started. These files are hosted on Github, the most popular online revision control repository, and include:

- Onboarding scripts that create your AWS account and other prerequisites: *f5-super-netops-install.sh*, *addUser.sh*, *export.sh*.
- Terraform configuration files-a declarative, comprehensive representation of our entire application stack:
 - main.tf Every terraform configuration has a main.tf. This contains all of the AWS specific (non-F5) environment configuration, including web instances
 - f5-cloudformation.tf files A terraform file that takes the officially supported CloudFormation template hosted in the official F5 github repo: https://github.com/F5Networks/f5-aws-cloudformation and stuffs all of the prerequisite parameters so we don't have to do it manually.
 - outputs.tf Any variable in the outputs.tf file can be rendered to the console with 'terraform output' and is exposed to other command line tools.
 - vars.tf Variables for terraform.
- Handy utilities to help move the lab along with minimum fuss: *lab-info*, *password-reset*.

The start script takes care of all of the prerequisites to standing up an AWS environment. Precisely:

- Installs all of the necessary software, including: terraform, the aws cli, and various other command line tools.
- Creates your AWS console login and api account and stores the keys locally for use by the AWS command line.
- Creates SSH keys for use by all of your EC2 instances: web servers and Big-IP virtual editions.
- Creates a self-signed SSL certificate for use in deploying https services.
- Sets the default region: us-east-1 (Virginia), ap-southeast-1 (Singapore), etc.

The terraform files go into effect when you invoke *terraform apply*. This step makes use of all of the prerequisites from the step before to build the environment in AWS.

2.2 Exploring AWS

This lab will examine the AWS Lab Environment created previously.

2.2.1 Explore the F5 / AWS lab environment

Your instructor will share a view of the Big-IQ License Manager hosted on AWS. The class will see all of the instances dynamically licensed through Big-IQ.

When deploying to AWS you have flexible licensing options:

- Bring Your Own License (BYOL) Can be transferred from one Virtual Edition environment to another (i.e. VMWare => AWS)
- Hourly Launch an instance from the AWS self-service Marketplace portal and pay only for metered hourly use.

- Subscription **This is the option used in this lab**. Every Big-IP launched will query the Big-IQ License Manager for a license. From Big-IQ we can revoke licenses as well.
- Enterprise License Agreement

Attention: Below is a snapshot of the Big-IQ License Manager dynamically licensing devices in AWS. You're instructor can show this to the class during a lab session.

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				Þ						
										11 (4)

Launch the Firefox browser. Click on the bookmark for the Amazon AWS Console link in the upper-left-hand corner. Login with emailid as the username and shortUrl as password.

Parameter	value
Account:	f5agility2018
User Name:	userxx@f5lab.com, change xx to your student number
Password:	sames as shortUrl / echo \$shortUrl



Attention: In the upper right-hand corner, ensure you are in the correct region. For example: N. Virginia region (us-east-1) is the default.

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		See more		Amazon Relational Database Service (RDS)		
	Learn to build Learn to deploy your solutions through s	tep-by-step guides, labs, and videos.	See all &	RDS manages and scales your database for you. RDS supports Aurora. MySQL, PostgreSQL, MariaDB, Oracle, and SQL Server. Learn more.		
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https://console.aws.amazon.com/console/home?regi	on=us-east-1			Awo. Leam more. C		

2.2.2 CloudFormation

Navigate to Services => Management Tools => CloudFormation. In the search field type your user account name (i.e user99). You should see your CloudFormation deployment details. You launched two CloudFormation templates.

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CloudFormation Manag × +					
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🌣 Most Visited 🔞 Getting Started 🕲 Ama	zon Web Servic Q F5 Networks ·	GitHub 🚯 F5 Cloud Docs			
aws Services - Resource	Groups 🗸 🏌		û user55@f5lab.com @ f5agility ▼ N. Virgini	a 👻 Support 👻	
1 CloudFormation Y Stacks					
Create Stack Actions D	esign template			C (
Filter: Active - user55	×			Showing 2 stack	s
Stack Name	Created Time	Status	Description		
waf-user55f5labcom-vpc-7252a108	2018-07-09 18:44:33 UTC-0700	CREATE_COMPLETE	WAF v3.1.0: This template deploys an auto scaling group for BYOL instances BIG-IP licensed by BIG-IQ. Example scaling policies and CloudWatc	h alarms are ass	
ha-user55f5labcom-vpcr7252a108	2018-07-09 18:44:23 UTC-0700	CREATE COMPLETE	Template Version 3.1.0: AWS CloudFormation Template for creating a Across-AZs cluster of 2NIC BIG-IPs in an existing VPC **WARNING** This te	emplate creates A	
Overview Outputs Resources E	eents Template Parameters Ta	ags Stack Policy Chang	e Sets Rollback Triggers		
			Select a stack		

 ha-userxxf5labcom-vpc-xxxxxxxx - Is the Cross-Availability-Zone deployment well documented in the F5 Github repository: https://github.com/F5Networks/f5-aws-cloudformation/tree/master/supported/ failover/across-net/via-api/3nic/existing-stack/bigiq



• waf-userXXf5labcom-vpc-xxxxxxx - Is the Autoscale WAF deployment well documented in the

F5 Github repository: https://github.com/F5Networks/f5-aws-cloudformation/tree/master/supported/ autoscale/waf/via-lb/1nic/existing-stack/bigiq



• Click the Events tab. The F5 CloudFormation template records every successful or failed event here. Look for the final "CREATE_COMPLETE" at the top. This indicates all went well.

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-) → C û	(i) 🔒 https://console	.aws.amazon.com/cloudformation/hom	e?region=us-east-1#/stack/detail?si	tackId=arn:aws:cloudformation:us-east-1:457112751961:stack%2Fha-user55f5labco 🛛 💀 💆	
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Filter by: Status -	Search events				
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Physical ID: amawsick	oudformation:us-east-1:4571127519	61: stack/ha-user55f5labcom-voc-7252a108/c54c9cl	60-83e2-11e8-aa65-500c28b236fd		
18:47:54 UTC-0700	CREATE_COMPLETE	AWS::EC2::Instance	Bigip2Instance		
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18:47:35 UTC-0700	CREATE_IN_PROGRESS	AWS::EC2::Instance	Bigip2Instance		
18:47:31 UTC-0700	CREATE_COMPLETE	AWS::EC2::Instance	Bigip1Instance		
18:47:14 UTC-0700	CREATE_IN_PROGRESS	AWS::EC2::Instance	Bigip1Instance	Resource creation Initiated	
18:47:13 UTC-0700	CREATE_IN_PROGRESS	AWS::EC2::Instance	Bigip1Instance		
 18:47:10 UTC-0700 	CREATE_COMPLETE	AWS::IAM::InstanceProfile	bigipServiceDiscoveryProfile		
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18:45:20 UTC-0700	CREATE_COMPLETE	AWS::EC2::EIPAssociation	Bigip2ManagementEipAssociat on	á .	
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18:45:09 UTC-0700	CREATE_IN_PROGRESS	AWS::IAM::InstanceProfile	bigipServiceDiscoveryProfile	Resource creation Initiated	
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Click on the Outputs tab. When CloudFormation deployments complete successfully, they can export
key value pairs you can use to integrate other automation tools. For example, you can query these
CloudFormation outputs to find out to which region, availability zone, private IPs, public IPs your F5
Big-IP Virtual Edition instance has been assigned.

Activities	😜 Fire	fox Web	Browser -						Mon 1	8:51		. •0 ⊕ •
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Key					Value					Description	Export Name	
Bigip2s	subnet1Az2	SelfEipAdd	Iress		54.174.2.	152				P Address of the External interface attached to BIG-IP		
Bigip1N	Managemen	ntinterface			eni-3d8e2	2e59				Management interface ID on BIG-IP		
Bigip1s	subnet1Az1I	Interface			eni-4c8d2	2d28				External interface Id on BIG-IP		
bigipEx	dernalSecur	rityGroup			sg-f24752	2b9				Public or External Security Group		
Bigip1N	Managemen	ntinterface	PrivateIp		10.0.101.	93				nternally routable IP of the management interface on BIG-IP		
Bigip1E	ExternalInter	rfacePrivat	telp		10.0.1.16	0				nternally routable IP of the public interface on BIG-IP		
availab	ilityZone1				us-east-1	a				Availability Zone		
availab	ilityZone2				us-east-1	b				Availability Zone		
Bigip2N	Managemen	ntEipAddre	SS		35.170.13	39.232				P address of the management port on BIG-IP		
Bigip1U	Jrl				https://18	208.30.19	3			BIG-IP Management GUI		
Bigip2U	Jrl				https://35	170.139.2	32			BIG-IP Management GUI		
Bigip2I	nstanceId				i-0914900	cd5f33d51	le			nstance Id of BIG-IP in Amazon		
Bigip2N	Managemen	ntinterface	PrivateIp		10.0.102	111				nternally routable IP of the management interface on BIG-IP		
Bigip1V	/ipPrivateIp				10.0.1.15	0				/IP on External Interface Secondary IP 1		
Bigip1V	/ipEipAddre	ess			http://18.2	209.138.12	9:80			EIP address for VIP		
Bigip2N	Managemen	ntinterface			eni-387ad	c09				Management interface ID on BIG-IP		
Bigip2s	subnet1Az2I	Interface			eni-327ad	c03				External interface Id on BIG-IP		
Bigip1s	subnet1Az1	SelfEipAdd	ress		18.209.73	3.87				P Address of the External interface attached to BIG-IP		
Bigip1N	Managemen	ntEipAddre	SS		18.208.30	0.193				P address of the management port on BIG-IP		
Bigip2E	ExternalInter	rfacePrivat	telp		10.0.2.97					nternally routable IP of the public interface on BIG-IP		
Bigip1I	nstanceId				i-043e748	3c8b06eff7	9			nstance Id of BIG-IP in Amazon		100000

🗨 Feedback 🛛 🚷 English (US)

• Click on the Resources tab. Here we see a map (resource type to unique id) of all the AWS resources that were deployed from the CloudFormation template.

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CloudFormation Stack	2				
Overview Outputs Resources	Events Template Parameters Tags Stack Policy C	Change Sets Rollback Triggers			C ■■■
Logical ID	Physical ID	Type	Status	Status Reason	
Bigip1Instance	i-043e748c8b06eff79	AWS::EC2::Instance	CREATE_COMPLETE		
Bigip1ManagementEipAddress	18.208.30.193	AWS::EC2::EIP	CREATE_COMPLETE		
Bigip1ManagementEipAssociation	eipassoc-17c2f9cd	AWS::EC2::EIPAssociation	CREATE_COMPLETE		
Bigip1ManagementInterface	eni-3d8e2e59	AWS::EC2::NetworkInterface	CREATE_COMPLETE		
Bigip1VipEipAddress	18.209.138.129	AWS::EC2::EIP	CREATE_COMPLETE		
Bigip1VipEipAssociation	eipassoc-70c5feaa	AWS::EC2::EIPAssociation	CREATE_COMPLETE		
Bigip1subnet1Az1Interface	eni-4c8d2d28	AWS::EC2::NetworkInterface	CREATE_COMPLETE		
Bigip1subnet1Az1SelfEipAddress	18.209.73.87	AWS::EC2::EIP	CREATE_COMPLETE		
Bigip1subnet1Az1SelfEipAssociation	eipassoc-56c6fd8c	AWS::EC2::EIPAssociation	CREATE_COMPLETE		
Bigip2Instance	i-0914900cd5f33d51e	AWS::EC2::Instance	CREATE_COMPLETE		
Bigip2ManagementEipAddress	35.170.139.232	AWS::EC2::EIP	CREATE_COMPLETE		
Bigip2ManagementEipAssociation	eipassoc-592874f2	AWS::EC2::EIPAssociation	CREATE_COMPLETE		
Bigip2ManagementInterface	eni-387acc09	AWS::EC2::NetworkInterface	CREATE_COMPLETE		
Bigip2subnet1Az2Interface	eni-327acc03	AWS::EC2::NetworkInterface	CREATE_COMPLETE		
Bigip2subnet1Az2SelfEipAddress	54.174.2.152	AWS::EC2::EIP	CREATE_COMPLETE		
Bigip2subnet1Az2SelfEipAssociation	eipassoc-d62c707d	AWS::EC2::EIPAssociation	CREATE_COMPLETE		
S3Bucket	ha-user55f5labcom-vpc-7252a108-s3bucket-1jndyn7tiy4mz	AWS::S3::Bucket	CREATE_COMPLETE		
bigipExternalSecurityGroup	sg-f24752b9	AWS::EC2::SecurityGroup	CREATE_COMPLETE		
bigipManagementSecurityGroup	sg-6d435626	AWS::EC2::SecurityGroup	CREATE_COMPLETE		
bigipSecurityGroupIngressBigiqLic	bigipSecurityGroupIngressBigiqLic	AWS::EC2::SecurityGroupIngress	CREATE_COMPLETE		
bigipSecurityGroupIngressConfigSync	bigipSecurityGroupIngressConfigSync	AWS::EC2::SecurityGroupIngress	CREATE_COMPLETE		-

• Click the Events tab. The F5 CloudFormation template records every successful or failed event here. Look for the final "CREATE_COMPLETE" at the top. This indicates all went well.

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1	8:47:35	UTC-0700	CREATE_IN_	PROGRESS	AWS:	::EC2::Instance			Bigip2Instance							
1	8:47:31	UTC-0700	CREATE_COM	MPLETE	AWS:	::EC2::Instance			Bigip1Instance							
+ 1	8:47:14	UTC-0700	CREATE_IN_F	PROGRESS	AWS:	::EC2::Instance			Bigip1Instance		Resource creation Initiated					
1	8:47:13	UTC-0700	CREATE_IN_F	PROGRESS	AWS:	::EC2::Instance			Bigip1Instance							
P 1	8:47:10	UTC-0700	CREATE_COM	MPLETE	AWS:	::IAM::InstanceF	rofile		bigipServiceDisco	overyProfile						
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• Click on the Parameters tab. We used terraform to stuff all of the necessary parameters into the CloudFormation template. Here you can see the CloudFormation parameter name and value provided.

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bigIqPasswordS3Arn		arn:aws:s3:::	f5-public-cloud/pa	asswd				
bigIqUsername				admin				
costcenter				f5costcenter				
customImageId				OPTIONAL				
environment				f5env				
group				ltm				
imageName				Good				
instanceType				m4.large				
managementSubnetAz1				subnet-fd780	15b7			
managementSubnetAz2				subnet-45db	7519			
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Feedback 🔇 English (US)							© 2008 - 2018, Amazon Web Services, Inc. or its affiliates. All rights reserved. Privacy §	olicy Terms of Use

2.2.3 EC2

Navigate to Services => Compute => EC2 => INSTANCES => Instances. Enter your username in the search field (i.e. user99). The web application is hosted on webaz1.0 in one availability zone and webaz2.0

in another availability zone. Highlight web-az1.0.

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INSTANCES	web-az2.0: u	. i-02b188dcbb1d283d0	t2.micro	us-east-1b	running	2/2 checks	None 🍃	ec2-107-23-242-54.com	107.23.242.54	-	MyKeyPair-us	disabled	July 9, 201
Instances	web-az1.0: u	I-0436467958c62c0e3	t2.micro	us-east-1a	running	2/2 checks	None 🥻	ec2-174-129-63-235.co	174.129.63.235	-	MyKeyPair-us	disabled	July 9, 201
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• In the "Description" tab below, note the availability zone. Highlight web-az2.0 and do the same.

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Reserved Instances	Instance ID	I-043e748c8b06eff79	Public DNS (IPv4)	ec2-18-208-30-193.compute-1.amazonaws.com	
Dedicated Hosts	Instance state	running m4.lsrce	IPv4 Public IP	18.208.30.193	
Scheduled Instances	Elastic IPs	18.208.30.193*	Private DNS	ip-10-0-101-93.ec2.internal	
IMAGES		18.209.73.87*, 18.209.138.129			
AMIS	Availability zone	us-east-1a	Private IPs	10.0.1.160, 10.0.101.93	
Bundle Tasks	Security groups	ha-user55f5labcom-vpc-7252a108-bigipManagementSecurityGroup-L6R1I5CX813Q . view inbound rules . view outbound rules	Secondary private IPs	10.0.1.150	
	Scheduled events	No scheduled events	VPC ID	vpc-7252a108	
Volumes	AMI ID	F5 Networks BYOL BIGIP-13.1.0.2.0.0.6 - Good - Jan 16 2018 9_49_02AM-ec6e1b2a-	Subnet ID	subnet-fd7805b7	
Snanshots	Distant	8889-45e2-91f2-976aa880de9f-ami-ad84a6d7.4 (ami-d1f4c4ab)	Matural interferen		
onaponoto	Platform		Network interfaces	eth1	
NETWORK & SECURITY Committee Common Network	IAM role		Source/dest. check	True	
Security Groups	Key pair name	MyKeyPair-user55@f5lab.com	T2 Unlimited		
Eldsuc IP's		Esta -	Owner	457112751961	
Placement Groups	Root device type	ebs	Termination protection	False	
Key Pairs	Root device	/dev/xvda	Lifecycle	normal	
Network Interfaces	Block devices	/dev/xvda	Monitoring	basic	
LOAD BALANCING	Elastic GPU		Alarm status	None	
Load Balancers	Elastic GPU type		Kernel ID		
Target Groups	Elastic GPU status		RAM disk ID	•	
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• Take a look at the tags big-IP1-ha... has been assigned. In public cloud deployments you can use tags (key-value pairs) to group your devices.

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Limits web-az2.0: user55f5labcom i-02b188dcbb	with key = Name and value = W	ebserver. Learn more about tag	gging your Amazon	ec2-107-23-242-54.com	107.23.242.54 -	MyKeyPair-us
INSTANCES web-az1.0: user55f5labcom H0436467958	EC2 resources.			e 🍖 ec2-174-129-63-235.co	174.129.63.235 -	MyKeyPair-us
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Launch Templates Big-IP2: ha-user55f5labcom-vpc-7252a108 I-0914900cd5	Rey	value		e 🍗 ec2-35-170-139-232.co	35.170.139.232 -	MyKeyPair-us
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Scheduled Instances	Environment	f5env	Show Column			
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AMIs	Name	Big-IP1: ha-user55f5labcon	Hide Column			
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ELASTIC BLOCK STORE Instance: i-043e748c8b06eff79 (Big-IP1: ha-user55f5labcom-v	aws:cloudformation:logical-	Bigip1Instance	Show Column			880
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Security Groups Instance type m4.large	Create Tag	Cancel Save				
Elastic IPs Elastic IPs 18.208.30.193*				ip-10-0-101-93.ec2.internal		
Placement Groups 18.209.73.87*, 18.209.138.129			Delaste IDa			
Key Pairs Availability Zone Us-east-1a	cinManagement Security Group, J 6011	5019120	Private IPs	10.0.1.160, 10.0.101.93		
Network Interfaces view outbound rules . view outbound rules .	ules	unitarity.	Secondary private IPs	10.0.1.100		
LOAD BALANCING Scheduled events No scheduled events			VPC ID	vpc-7252a108		
Load Balancers AMI ID F5 Networks BYOL BIGIP-13.1.0.2.0	0.0.6 - Good - Jan 16 2018 9_49_024	M-ec6e1b2a-	Subnet ID	subnet-fd7805b7		
Target Groups Platform -	us4abd7:4 (ann-d±14c4ab)		Network interfaces	eth0		
🗨 Feedback 🛛 🤪 English (US)				© 2008 - 2018, Amazon Web Services, Inc.	or its attiliates. All rights reserved.	Privacy Policy Terms of Use
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Cloud-init. Version 13 of Big-IP supports cloud-init. Right click on BIGIP1 => Instance Settings => View/Change User Data. Cloud-init is the industry standard way to inject commands into an F5 cloud image to automate all aspects of the on-boarding process: https://cloud-init.io/.

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Navigate to Services => Compute => EC2 => # Key Pairs. Type your username in the search field (i.e. user99). You will see the ssh key that was created for you and upload to AWS. By default, F5 Big-IP VE appliances deployed to AWS do not have any default root or admin account access. You have to enable or create these accounts. Initially, you can only connect via ssh using your private key. From the Super-NetOps terminal, see if you can find the private key in your home directory.

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Navigate to Services => Compute => EC2 => LOAD BALANCING => Load Balancers. In the search filter enter your username. You should see two load balancers. One named tf-elb-* is your newly created AWS load balancer.

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- Highlight the 'Description' tab. Note:
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• Click the "Health Check" tab => [Edit health Check]. The classic load-balancer is limited to basic health checks.

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Scheduled Instances		check. If an instance fails the health check, it is automatically removed		
IMAGES		specific needs.		
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 Click the "Listeners" tab => [Edit]. The classic load-balancer is limited to HTTP, HTTPS, TCP and SSL (no UDP).

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Navigate to Services => Compute => EC2 => AUTO SCALING => Auto Scaling Group. Highlight the "Activity History" tab. You can the autoscale WAF CloudFormation template created an auto scaling group. Read the Description and Cause.

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Elastic IPs Placement Groups			Ð
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Load Balancers Target Groups	Description: Launching a new EC2 Instance: Unath700186/2a7ee6	2020 Suly 5 20-47.04 61 61	2020 001 5 20.40.01 0101
AUTO SCALING	Cause: At 2018-07-10701:47:282 a user request update of AutoScalingGroup desired capacity from 0 to 1. At 2018/07-10701:47:322 an instance w	constraints to min: 1, max: 2, desired: 1 changing the as started in response to a difference between desired	
Auto Scaling Groups	and actual capacity, increasing the capacity from 0 to 1.		
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Run Command			
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• Click the "Scaling Policies" tab. Read through the polices to understand how the autoscale WAF deployment is programmed to both scale out during a surge and scale in when the surge subsides.

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Snapshots Auto Scaling Group: waf-user55f5labcom-vpc-7252a108-BigipAutoscaleGroup-WRGA6QEZD4RA	1
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Net years	
LOAD BALANCING Execute policy when: wal-user50f5labcom-typc-7252a108-BigbLowCpuAlarm-UX6XIKQNL62Q Load Balancers breaches the alarm threshold: timm-stat < 0 for 10 consecutive periods of 300 seconds for the metric internetions	I
Launch Configurations And then wait: 2400 seconds before allowing another scaling activity	L
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SERVICES Pointy type: Jampe Saunga Run Command Execute policy when: wal-suestSidakcom-upp-7252a108-BigipHighCpuAlarm-31SIWER46NFD	
State Manager breaches the alarm threshold: tmm-stat > 80 for 60 seconds	1
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 Click the "Instances" tab. The single instance running the F5 WAF. Notice the instance is "Protected from: Scale in". This means that AWS will guarantee a minimum of one F5 WAF instance is running at all times. If someone where to accidentally stop or terminate an instance, this policy would automatically trigger the creation of a new one.

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e Elastic block store Volumes Snapshots e Network & security	wd/see5558 wd/see5595ab.comvp 1 1 2 us-east-1a, us-east-1b 2.400 1,800 Auto Scaling Group: wd/see5595fab.comvp.cpc-7252a108-BigipAutoscaleGroup-WRGAG62E2D4RA 2.400 1,800 Details Activity History Scaling Policies Instances Monitoring Notifications Tags Scheduled Actions L/lecycle Hooks	880
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2.2.4 VPC

Navigate to Services => Networking & Content Deliver => VPC. click on VPCs. Enter your username in the search filter (i.e. user99). This is the Virtual Private Cloud (VPC) that has been dedicated to your lab environment. Select the Summary tab. You can see the IPv4 CIDR assigned is 10.0.0.0/16. Your on-premises datacenter has been assigned 10.1.0.0/16 to not conflict.

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Q Select a VPC	Quser55 X		\ll < 1 to 1 of 1 VPC $>$ \gg
Vistual Driveta Claud	Name VPC ID State IPv4 CIDR	IPv6 CIDR - DHCP options set - Route table - Network ACL - Tenancy	- Default VPC -
Virtual Private Cloud	terraform_user55@15lab vpc-7252a108 available 10.0.0.0/16	dopt-1e0e6378 rtb-19b20466 acl-14f5ac6e Default	No
Your VPCS	T		
Route Tables	8		
Internet Gateways			
Egress Only Internet Gateways			
DHCP Options Sets			
Elastic IPs			
Endpoints			
Endpoint Services			
NAT Gateways			
Peering Connections	vpc-7252a108 terraform_user55@f5lab.com		880
Security	CUMPANY CIDD Blocks Flow Loos Toos		
Network ACLs	VPC ID: vpc.7252a1081	Network ACI - aci-1//Sac6a	
Security Groups	terraform_user55@t5lab.com		
VPN Connections	State: available IPv4 CIDR: 10.0.0.0/16	Tenancy: Default DNS resolution: ves	
Customer Cateways	IPv6 CIDR:	DNS hostnames: yes	
Virtual Private Gateways	DHCP options set: dopt-1e0e6378 Route table: rtb-19b20466 Default	ClassicLink DNS Support: no	
VPN Connections			
VI II Comicciona			
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Find in page	A V Highlight All Match Case Whole Words		×
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2.2.5 Github

- Fully supported F5 Networks Solutions are hosted in the official F5 Networks GitHub repository: https: //github.com/f5networks
- We are running the lab from the F5 Super-NetOps container: https://github.com/f5devcentral/ f5-super-netops-container
- AWS CloudFormation templates: https://github.com/F5Networks/f5-aws-cloudformation
- Native template formats are also available for Microsoft Azure (arm templates): https://github.com/ F5Networks/f5-azure-arm-templates
- Native template formats are also available for Google Cloud Platform (gdm templates): https://github. com/F5Networks/f5-google-gdm-templates

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Repositories		
Pinned repositories		
f5-common-python Python SDK for configuration and monitoring of F5® BIG-IP® devices via the iControl® REST API. ● Python ★ 93 ¥40	f5-ansible Ansible modules that can manipulate F5 products ● Python ★ 89 ♀ 53	f5-openstack-Ibaasv2-driver F5 LBaa5v2 service provider driver for OpenStack Liberty and beyond ● Python ★9 ¥27
k8s-bigip-ctlr Repository for F5 BIG-IP Controller for Kubernetes. ● Go ★ 16 ¥ 13	f5-aws-cloudformation Cloudformation Templates for quickly deploying BIG- IP services in Amazon Web Services EC2 ● Python ★ 25 ¥ 9	15-azure-arm-templates Azure Resource Manager Templates for quickly deploying BIG-IP services in Azure • Shell ★ 13 ¥ 12
Search repositories		Type: All 🗸 Language: All
f5-openstack-agent The F5 Agent for OpenStack Neutron allows you to d in an OpenStack environment. openstack bigip ● Python ★ 5 ¥ 24 Updated 20 hours ago	leploy BIG-IP services	Top languages • Python • JavaScript • Shell • Tcl • Go Most used topics
f5-openstack-lbaasv2-driver F5 LBaaSv2 service provider driver for OpenStack Libr openstack load-balancer openstack-neutron f	erty and beyond	bigip openstack openstack-neutron orchestration automation
● Python ★ 9 ¥27 Updated 20 hours ago F5-openstack-docs Technical documentation related to the use of F5 pro	oducts and tools in	People 0 : This organization has no public members. You must be a member to see who's a part of this organization.

2.3 Explore the F5 Big-IP Virtual Editions Deployed

In this lab we'll take a close look at the Big-IP Virtual Editions deployed.

2.3.1 Explore the F5 Big-IP Virtual Editions Deployed

From the Super-NetOps terminal, run the handy lab-info utility. Confirm that "MCPD is up, System Ready" for all three of your instances.

lab-info



Attention: Do not attempt to reset the Big-IP password until MCPD is up, System Ready.

Initially, you can only login to an F5 Big-IP VE in AWS via SSH using an SSH key. You will have to enable admin and root password access. Invoke the reset-password utility with the IP address of each of your Big-IP VE's as the argument. **REPLACE THE x.x.x.x PLACEHOLDER WITH THE MANAGEMENT IP ADDRESSES OF YOUR THREE F5 BIG-IP VE'S.** This will enable the admin account on all three of your Big-IP's and change the password to the value of the shortUrl.

```
reset-password x.x.x.x
reset-password y.y.y.y
reset-password z.z.z.z
```

Run terraform output and note the value of elb_dns_name.

terraform output

Open a new tab in the Firefox browser. HTTP to elb_dns_name. Confirm the sample application is up.



Open a new tab in the Firefox browser. HTTPS to the MGMT URL of BIG-IP Autoscale Instance. Don't miss management port is :8443!

lab-info

Г

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	Your connection is not secure The owner of 18.208.30.193 has configured their website improperly. To protect your information from being stolen, Firefox has not connected to this website. Learn more Report errors like this to help Mozilla identify and block malicious sites Gor Back Advanced		
	18.208.30.193 uses an invalid security certificate. The certificate is not trusted because it is self-signed. The certificate is only valid for . Error code: MOZILLA_PKIX_ERROR_SELF_SIGNED_CERT		
			_



Login with Username: admin Password: value of shortUrl.

Main => System => Resource Provision. Note an F5 WAF is provisioned for both LTM and ASM.

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Hostname: Ip-10-0-2-149.ec2.internal D IP Address: 10.0.2.149 Ti	ate: Jul 10, 2018 User: admin ime: 2:08 AM (UTC) Role: Administrator				Partition: Common	Log out
ONLINE (ACTIVE) Standalone						
Main Help About	System ·· Resource Provisioning					
Statistics	🔅 🗸 Module Allocation License 🖻					
IApps						
间间 Local Traffic	Current Resource Allocation CPU MGMT TMM(88%)					
	Disk (24GB) MGMT			ASM		
Acceleration	Memory (15.4GB) MGMT TMM		ASM			
Device Management	Montride	Provisioning	License Status	Remited Dick (GB)	Required Memory (MB)	
Security	Management (MGMT)	Small	N/A	0	1564	
Retwork	Carrier Grante NAT (CONAT)	Disabled	Unlicensed	0	0	
() P System		Nominal	Licensed	0	1856	
Configuration	Application Security (ACAR)		Licensed	20	1492	
File Management			N/A	12	544	
Certificate Management	Fraud Protection Service (FPS)		E Informat	0	149	
Disk Management	Giobal Traffic (DNS)	None	E Unicersed		140	
Software Management	Link Controller (LC)	None	Unlicensed	0	148	
Resource Provisioning	Access Policy (APM)	None	No. Consed	12	494	
Platform	Application Visibility and Reporting (AVR)	None	Normal Licensed	16	576	
High Availability	Policy Enforcement (PEM)	None 🔓	E Unlicensed	16	1223	
Archives () >	Advanced Firewall (AFM)	None	Unlicensed	16	1058	
Services	Application Acceleration Manager (AAM)	None	E Unlicensed	32	2050	
Preterences	Secure Web Gateway (SWG)	None	Unlicensed	24	4096	
SNMP	IDudes Lessures Extensions (Dudes) V)	- Home	Licensed	0	748	
Crypto Offloading	Indes Language Existences (IndesEX)			36	2048	
Users	URLDB Minimal (URLDB)	L None			2040	

Main => Security => Application Security => Policies List. A starter "linux-low" policy has been deployed.

Activities 🕴 Firefox Web I	Browser 🕶		Mon 19:09	· ••• ① ·
			BIG-IP® - ip-10-0-2-149.ec2.internal (10.0.2.149) - Mozilla Fire	fox
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Hostname: Ip-10-0-2-149.ec2.internal 0 IP Address: 10.0.2.149	Date: Jul 10, 2018 User: admin Fine: 2.09 AM (UTC) Role: Administrator			Partton: Common 🗸 Log out
CONLINE (ACTIVE) Standalone	Receiving configuration data from yo	ur device.		
Main Help About	Security ·· Application Security : Security	Policies : Policies List		
Statistics	🔅 🗸 Policies List Policy Groups			
IApps	Q- II Name- A to Z t			Total Entries: 1
() International Traffic	Inux-low waf-user55t	Delete Apply Save as	Template Export - Save Changes	Create 👻
			Policy Summary	Inharitance Sattings
Acceleration			ronoy communy	nano oscarga
Device Management		On this screen you can configure Once a policy is configured, some	policy settings for new policies and review policy settings for existing policies. • settings on this page will have a link for editing the setting.	
Security		Policy Name	linux-low 🖻	Specifies the name of the policy,
Overview			Partition / Path: /Common	
Application Security		Description	N/A	Specifies an optional description of the policy.
Protocol Security >		Policy Type	Security	Specifies the type of the policy.
Network Firewall		Parent Policy	None	Specifies the parent of the policy.
DoS Protection		Version	2018-07-10 01:57:37 /2 Source Host Name: Ip-10-0-2-149.ec2.internal Source Policy Name: Common/Inux-low	Displays additional information about policy version.
Reporting		Application Language	Unicode (utf-8)	Specifies the language encoding for the web application, which determines how the security policy processes the character sets
Security Updates		Virtual Server	waf-user55f5labcom_vs 🗷	Displays the name of the protected virtual server, or virtual servers, which have assigned to them a security
Options				policy with Application Security enabled.
Network		Enforcement Mode	Biooking View Learning and Blocking Settings	Specines now the system processes a request that triggers a security policy violation.
Herwork				
System				
Transferring data from 54.172.1	88.81			

Click on "Learning and Blocking" settings to see exactly what a "linux-low" policy consists of. This starter policy is often times imported in to Big-IQ for central management.

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Main Help	About	Security >> Application Securi	ity : Policy Building : L	earning and Blocking Set	Settings			
Statistics		🔅 🗸 Traffic Learning Lea	arning and Blocking Set	tings				
IApps		Current edited security policy	inux-low (blocking) 🔳					Apply Policy
Local Traffic		General Settings						Advanced J Save
Acceleration	2	Enforcement Mode -	Blocking	1				
Device Management		Learning Mode +	Automatic	3				
		Auto-Apply Policy -	Real Time	1				
Security		Learning Speed +	Custom	1				
Overview	>							
Application Secu	rity ⊦	Policy Building Settings					Blocking Settings Search:	
Protocol Security	-	Policy General Features						
Network Firewall		HTTP protocol compliance	falled - (7 out of 19 su	bviolations are enabled)		Learn Alarm Block		
DoS Protection		Attack Signatures						
Event Logs		Evasion technique detected	d = (3 out of 8 subviolat	ions are enabled)		Learn Alarm Block		
Reporting	÷	▶ File Types				8		
Security Updates	•	▶ URLs				8		
Options	÷	Parameters				8		
	-	Sessions and Logins						
Retwork		▶ Cookies						
E System		▶ Content Profiles						
		CSRF Protection						
		IP Addresses/Geolocations						
		▶ Headers				8		
		Redirection Protection				8		
		Bot Detection						
		Data Guard				8		11 12
		WebSocket protocol compl	llance					
		Antivirus Protection						

Local Traffic => Virtual Server => Properties. A virtual server with a "catch-all" listener of 0.0.0.0/0 has been deployed.

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ONLINE (ACTIVE) Standalone				
Main Help About	Local Traffic >> Virtual Servers	: Virtual Server List		
Statistics	🔅 🚽 Properties Reso	urces Security - Statistics 🗩		
IApps	General Properties			
Coloration Local Traffic	Name	waf-user55f5labcom_vs		
Network Map	Application	waf-user55/5labcom		
Virtual Servers	Partition / Path	Common/waf-user55/5/abcom.app		
Policies	Description			
Profiles	Туре	Standard		
Ciphers	Source Address	0.0.0.0		
iRules >	Destination Address/Mask	0.0.0.0		
Pools >	Service Port	80 HTTP		
Nodes	Notity Status to Virtual Address			
Monitors (+)	Availability	Available (Enabled) - The virtual server is available		
Traffic Class 💮	Syncookie Status	or		
Address Translation	State	Enabled 1		
Acceleration	Configuration: Basic			
A	Protocol	TCP T		
Device Management	Protocol Profile (Client)	waf-user55/5labcom_15-lcp-wan		
Security	Protocol Profile (Server)	waf-user55/5/abcom_f5-kp-ian		
Retwork	HTTP Profile	waf-user55/5/abcom_http		
	HTTP Proxy Connect Profile	None		
E+ System	FTP Profile	None		
	RTSP Profile	None		
	SSL Profile (Client)	Selected Available Commens Clentssi-insecure compatible Do Clentssi-secure		11 (2)

The "linux-low" security policy is attached to this virtual server.

Activities 🕴 Firefox Web	Browser -	Mon 19:09		.t (0 •
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ONLINE (ACTIVE) Standalone				
Main Help About	Local Traffic >> Virtual Serve	ars : Virtual Server List » wal-user5515labcom_ve		
Maintics	🔅 👻 Properties Ri	escurces Security - Statistics P		
IApps	Policy Settings	þ		
E Local Traffic	Destination	0.0.0.080		
Network Map	Service	HTTP		
Virtual Servers	Application Security Policy	Enabled Policy: linux-low		
Policies	Service Policy	None		
Profiles	IP Intelligence	Disabled 🗾		
Clphers	DoS Protection Profile	Disabled 💌		
IRules >		Enabled		
Pools		Selected Available		
Nodes	Log Profile	Log illegal requests ex Log all requests >> local-dos		
Monitors (+)				
Address Translation	Update			
Acceleration				
Device Management				
Security				
Retwork				
[∄≑] System				

From the Super-NetOps terminal run "lab-info" and copy the value for WAF ELB -> URL. Open a new browser tab and HTTPS to the WAF ELB URL. Your sample application is protected behind an F5 WAF.





Login to either Big-IP1 or Big-IP2. Main => iApps => Application Services. The Cross-AZ HA Big-IP has been deployed with the F5 AWS HA iApp.

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Main Statistics	☆ → Application Service List							
IApps								F5 IApps and Resources
Application Services	•	Search						Create
Templates	Name					Template	Template Validity	Partition / Path
AWS	HA_Across_A					f5.aws_advanced_ha.v1.4.0rc3		Common/HA_Across_AZs.app
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2.4 Extending and Securing your Cloud

This lab will use the Lab Environment created previously to explore other capabilities including
- · Service Discovery
- · Failover Across Availability Zones

We can now start configuring the Big-IPs to responsibly fulfill our part of the shared responsibility security model: https://aws.amazon.com/compliance/shared-responsibility-model/

2.4.1 Deploy the Service Discovery iApp on a BigIP Cluster across two Availability Zones

From the Super-NetOps terminal, run the handy lab-info utility. Copy the Big-IP1 MGMT IP.

lab-info

The Service Discovery iApp will automatically discover and populate nodes in the cloud based on tags. Open a new browser tab and HTTPS to the MGMT IP. Login to the Big-IP Configuration utility (Web UI).

- Username: admin
- Password: value for <shortURI> will be unique to your lab.

Navigate to iApps => Application Services. Create a new iApp deployment:

- Name: service_discovery
- Template: choose f5.service_discovery from the dropdown.

Click [Finished]

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Hostname: ip-10-0-101-93.ec2.internal IP Address: 10.0.101.93	Date: Jul 10, 2018 User: admin Time: 2:13 AM (UTC) Role: Admin						Partition: Common 🗸	Log out
In Sync	Receiving configuration							
Main Help About	IApps >> Application Services :	Applications ··· New Application Serv	ice					
Statistics	Template Selection							
IApps	Name	service_discovery						
Application Services	Template	f5.service_discovery	2					
Templates	·	Show deprecated templates						
AWS	Cancel Repeat	Finished						
Local Traffic								
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Device Management								
Network								
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Question	value
Name	service_discovery
Template	f5.service.discovery
Pool	
What is the tag key on your cloud provider for the members of this pool?	findme
What is the tag value on your cloud provider for the members of this pool?	web
Do you want to create a new pool or use an existing one?	Create new pool
Application Health	
Create a new health monitor or use an existing one?	http

Finished

Activities O Firefox Wel	b Browser 🕶	Mon 19:14	A 40 O -									
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Network	IMPORTANT	This laps uses the tag key and tag values you configure on your cloud provider to discover pool members. Make sure the tags and IP addresses you use are unique. You should not tag multiple notes with the same key/tag combination if those nodes use your cloud provider documentation for specific information on tagging.	e the same IP address. See									
System	Tagging your cloud resources	You have the following options for tagging nodes on your cloud provider.										
		* Tag a VM resource: If you lag a VM resource, the BKG-IP VE will discover the primary public or private IP address for the primary NIC configured for the tagged VM.										
		* Tag a NIC resource. If you tag a NIC resource, the BIG-IP VE will discover the primary public or private IP addresses for the tagged NIC. Use this option if you want to use the secondary NIC of a VM in the pool.										
		* (Azure only) Tag a Virtual Machine Scale Set resource: If you tag a Scale Set resource, the BIG-IP VE will discover the primary private IP address for the primary NIC configured for each Scale Set instance. Note you must select Private IP addresses i	If you are tagging a Scale Set.									
		The ldgp first looks for NC resources with the proper lags, if it finds NICs with the proper lags, if does not look for VM resources. If it does not find NIC resources, it looks for VM resources with the proper lags. If you are using Microsoft Azure only: In either case, if then looks for Scale Soft resources with the proper lags.										
	Template Options	Template Options										
	Which configuration mode do you want to use?	Basic - Use F5's recommended settings										
	Do you want to see inline help?	No, do not show infine help 3										
	Cloud Provider											
	In which cloud provider is this BIG-IP deployed?	TAWSEC2										
	Which region do you want to search?	Detaut 3										
	Do you want to assume a role?	TNo I										
	Pool											
	What is the tag key on your cloud											
	provider for the members of this pool?	l fraine										
	What is the tag value on your cloud provider for the members of this pool?	l web										
	Do you want to search for public or private IP addresses?	Private P addresses										
	How often do you want to query the cloud provider for updates (in seconds)?	60										
	Do you want to create a new pool or use an existing one?	Create a new pool										
	Which port should be assigned to the pool members?	00										
	Connection limit (optional)	[0										
	Application Health											
	Create a new health monitor or use an existing one?	[http://www.international.org/actional.org										
	Cancel Repeat	Firished										

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Hostname: lp-10-0-101-93.ec2.internal IP Address: 10.0.101.93	Date: Jul 10, 2018 User: admin Time: 2:14 AM (UTC) Role: Administrator	Partition: Common 🗸
Main Help About	Local Traffic = Pools : Pool List	
Maintain Statistics	Poor List Salisates @	
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E Local Traffic		Description - Application - Members - Destition / Della
Network Map		service discovery 2 Common/service discovery.app
Virtual Servers		
Policies		
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Clphers	·	
IRules		
Pools Jun	Poor List 💿	
Nodes	Statistics	
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Address Translation		
Acceleration		
Device Management		
Network		
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https://10.200.20.1020mu//Ca	and for a second s	

Local Traffic => Pools => track the newly created service_discovery_pool. Within 60 seconds it should light up green. The service_discovery iApp has discovered and auto-populated the service_discovery_pool with two web servers.

Activities 🕑 Firefox We	D Browser • Mon 19:15	Manilla Shedan	£ •0 O ₹
	BIG-IP @ - IP-10-0-101-93.ec2.internal (10.0.101.93)	- Mozilla Firefox	×
EC2 Management Con X	(𝔅 BIG-IP® - ip-10-0-101 · X (𝔅 BIG-IP® - ip-10-0-102 · X (𝔅 BIG-IP® - ip-10-0-2-14 · X (𝔅 F5 vLab :	X (F5 vLab X +	
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Hostname: ip-10-0-101-93.ec2.internal IP Address: 10.0.101.93	Date: Jul 10, 2018 Uerr: admin Time: 2-15 AM (UTC) Role: Administrator	Partition: Comm	ton 👻 Log out
In Sync			
Main Help About	Local Traffic >> Pools : Pool List >> service_discovery_pool		
Management Statistics	🔅 🗸 Properties Members Statistics 🗩		
IApps			
	Load Balancing		
Local Traffic	Load Balancing Method Least Connections (member)		
Network Map	Priority Group Activation Disabled	\$	
Virtual Servers	Update		
Policies	Current Hembers		Add
Ciphers	Status + Member	Address Service Port FODN Enterneral Statio Priority Group Con	nection Limit Partition / Path
iRules	> 0 10.0.1.190:80	10.0.1.190 80 No 1 0 (Active) 0	Common
Pools	0 10.0.2.118.80	10.0.2.118 80 No 1 0 (Active) 0	Common
Nodes	Enable Disable Force Offline Remove		
Monitors (+)			
Traffic Class			
Address Translation			
Acceleration			
Device Management			
Retwork			
System			
			II A

2.4.2 Deploy an AWS High-Availability-aware virtual server across two Availability Zones

Login to the active Big-IP1 Configuration utility (Web UI). The "HA_Across_AZs" iApp will already be deployed in the Common partition.

Download the latest tcp iApp template from https://s3.amazonaws.com/f5-public-cloud/f5.tcp.v1.0.0rc2. tmpl.

Activities 🛟 Firefox Web Browser - Mon 19:18	
Mozilla Firefox	×
🛢 EC2 Management Con X 🕼 BIG-IP® - ip-10-0-101 X 🕼 BIG-IP® - ip-10-0-102 X 🕼 BIG-IP® - ip-10-0-2-14 X 🕼 F5 VLab X New Tab X +	
(c) → C @ Q https://s3.amazonaws.com/5-public-cloud/5.tcp.v1.0.0rc2.tmpl	lin 🗊 😑
🔅 Most Visited 🐞 Getting Started 🤀 Amazon Web Servic 🎧 F5 Networks - GitHub 🕼 F5 Cloud Docs	
Opening F3.tcp.v1.0.0rc2.tmpl You have chosen to open: F3.tcp.v1.0.0rc2.tmpl which is: tmpl File (105 K8) Irom: Http://s3.amazonaws.com What should Firefox do with this file? Open with Browse Dot this gutomatically for files like this from now on.	
	The second se

iApps -> Templates -> import. Import f5.tcp.v1.0.0rc2.tmpl to the primary BigIP. The secondary BigIP should pick up the configuration change automatically.



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Amaz	⊙ Recent		M.	
Hostname: Ip-10-0-101-93.ec2.internal Date: Jul 10, 2018 IP Address: 10.0.101.93 Time: 2-19 AM (UTC	û Home	Name	- Size Modified	Partition: Common 🗸 Log out
ONLINE (ACTIVE)	Documents	f5.tcp.v1.0.0rc2.tmpi	107.9 kB 19:18	
	🕹 Downloads			
Main Help About IApps :: Impo	∂ Music			
Statistics	D Pictures			
Import File	Videos			
Application Services Overwrite Exist Templates Elle Name	E thinclient_drives			
AWS	G Floppy Disk			
Local Traffic	+ Other Locations			
Acceleration				
Device Management				
Retwork				
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			All Files 🕶	

Activities 🕴 Firefox Web	Browser -			Mon 19:19						
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Statistics	🔅 🗸 Template Properties									
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E Local Traffic	Cancel Uproad									
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Deploy an iApp using the f5.tcp.v1.0.0rc2.tmpl template.

iApps => Application Serves => Select f5.tcp.v1.0.0rc2 template from the dropdown. Name: virtual_server_1.

Configure iApp: Select "Advanced" from "Template Selection".



Traffic Group: UNCHECK "Inherit traffic group from current partition / path"

Question	value
Name:	virtual_server_1
Inherit traffic group from current partition / path	uncheck
High Availability. What IP address do you want to use for the virtual server?	VIP IP of Big-IP1
What is the associated service port?	HTTP (80)
What IP address do you wish to use for the TCP virtual server in the other data	VIP IP of Big-IP2
center or availability zone?	
Do you want to create a new pool or use an existing one?	ser-
	vice_discovery_poo

From the Super-NetOps terminal. Invoke terraform output and copy the value for Big-IP1 => VIP IP. Use this value in the iApp as explained in the chart above.



From the Super-NetOps terminal. Invoke terraform output and copy the value for Big-IP2 => VIP IP. Use this value in the iApp as explained in the chart above.

Activities 🗔 Terminal 🗸	Mon 19:20	.L 40 O -
	student@docker: ~	×
File Edit View Search Terminal Help		
<pre>[root@f5-super-netops] [-/marfil-f5-terraform] \$ AWS Console URL: https://f5agility2018.signin.aws.amazon.com Username: user55@f5lab.com / Password: cloudy MAF ELB URL: https://waf-user55f5lab.com-3256385.us-east</pre>	lab-info m/console7us-east-1 t-1.elb.amazonnws.com	
web-azl.0: user55f5labcom PRIVATE IP: 10.0.1.190		
Big-IP1: ha-user53f3labcom-vpc-7252a108 MORT IP: 18.208.30.193 STATUS: MCP0 is up. System Ready MCMT URL: https://18.208.30.193 STATUS: Sh - 0 UserKnowH0515F1le=/dev/nu VF5F1: 10.30.1150 Elastic IP1: 18.209.188.199		
web-az2.0: user55f5labcom PRIVATE IP: 10.0.2.118		
BIG-IP Autoscale Instance: waf-user55f5labcom MGMT IP: 54.172.188.81 STATUS: MCPD is up, System Ready MGMT UBL: https://st.124.188.18443 SSH: ssh -0 UserKnownHostsFile=/dev/nu	ull -o StrictHostKeyChecking=no -o ConnectTimeout=3 -i MyKeyPair-user55@f5lab.com.pen admin@54.172.188.81	
Big-IP2: ha-user55f5labcom-vpc-7252a108 MGHT IP: 35.170.139.232 STATUS: MCFD Is up. System Ready MGTURL: https://S.170.139.232 SSH: ssh-o-UserKnowHostSF1le=/dev/nu VIP IP: Bigcor548		
SI = 0/3/a [root@f5-super-netops] {		
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How have you configured routing	For environments in which the virtual server P address is on a submit different turn the TCP servers, select BIG-P virtual server P and the TCP servers are on different submit. For environments in which the virtual server P address produces so that a set TCP servers in the associated pox, select BIG-P virtual server P and the TCP servers are on the same submit. This enables Secure Network Address Translation (SNAT configuration results in the BIG-P system replacing the client P address of an incoming connection with its local facing self P address, ensuring the server response returns through the BIG-P system.	f Auto Map). This
on your servers?	For environments in which the virbule some P is on a submit different two the TCP servers, information regarding the P setting of the TCP servers is required to ensure the correct BiG-P system configuration. If the TCP servers use the BiG-P system as their default galaxies, select TCP servers have a route to clients through the BiG-P. This enables Secure Network Address Translation (SNAT Auto Map). This configuration results in the BiG-P system replacing the BiG-P. This enables Secure Network Address Translation (SNAT Auto Map). This configuration results in the BiG-P system replacing the BiG-P. This enables Secure Network Address Translation (SNAT Auto Map). This configuration results in the BiG-P system replacing the BiG-P. This enables Secure Network Address Translation (SNAT Auto Map). This configuration results in the BiG-P system replacing the BiG-P. This enables Secure Network Address Translation (SNAT Auto Map). This configuration results in the BiG-P system replacing the BiG-P. This enables Secure Network Address Translation (SNAT Auto Map). This configuration results in the BiG-P system replacing the BiG-P. This enables Secure Network Address Translation (SNAT Auto Map). This configuration results in the BiG-P system replacing the BiG-P. This enables Secure Network Address Translation (SNAT Auto Map). This configuration results in the BiG-P system replacing the BiG-P. This enables Secure Network Address Translation (SNAT Auto Map).	e client IP address
How many connections per server do you expect?	or an anoming contector with its local nating set IP address ensuing the saver response initian's trough the BC-IP system. For environments with lever than 64,000 concurrent contections per server For environments with lever than 64,000 concurrent contections per server, the BC-IP system reabiles SNAT Auto May, which uses a unique Popol combination for each client request It sends to the TCP server. For environments with more than 64,000 concurrent Contections per server, the BC-IP system reabiles SNAT Auto May, which uses a unique Popol combination for each client request It sends to the TCP server. BC-IP system childres and the Popular materials and the available.	connections per
High Availability		
What IP address do you want to use for the virtual server?	10.0.1.150	

The iApp will create two virtual servers on *both* Big-IP's. The iApp deployment on Big-IP1 will automatically and immediately sync to Big-IP2.

created a custom FastL4 profile for this

es), you must enter the full r

wing the IApp to

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T to specify a

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ently. Unless you have

What is the associated service HTTP (80)

CP virtual server in the enter or availability

Cancel Repeat Finished

If using a network virtual address, what is the IP mask in the other data center or availability zone? Do you want to create a new pool or use an existing one? 10.0.2.5

Which FastL4 profile do you want to apply to your virtual server(s)?

service_discovery_pool

A load balancing pool is a logical set of devices, such as TCP servers, grouped pool.

The FastL4 profile helps manage Layer 4 traffic more efficient

Activities 🕴 Firefox Web	Browser 🕶					Mon 19:21									- (1) () -
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Virtual Servers		virtual_server1_	vs_10.0.2.58		N			virtu	al_server1	10.0.2.58	80 (HTTP)	Performance (Layer 4) Edit	Common/virtu	al_server1.app
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Pools	•														
Nodes	×														
Monitors 🕞															
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Address Translation	2 														
Acceleration															
Device Management															
Network															
System															
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From the Super-NetOps terminal. Invoke terraform output and copy the value for the primary Big-IP's Elastic IP. Open a browser tab and HTTP to this Elastic IP.



In order to enable request logging and apply a client SSL profile, let's re-configure our TCP / Fast L4 virtual server to a Standard virtual server with an http profile applied.

iApps => Application Services => select the "virtual_server_1" iApp we just deployed.

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Hostname: lp-10-0-101-93.ec2.internal IP Address: 10.0.101.93	Date: Jul 10, 2018 User: admin Time: 2:22 AM (UTC) Role: Administrator					Partition:	Common 🗸 Log out
I ONLINE (ACTIVE)							
Main Help About	IApps ··· Application Services : Applications						
Statistics	🔅 🐱 Application Service List						
IApps							F5 iApps and Resources
Application Services	•	Search					Create
Templates	Name				≑ Template	Template Val	idity + Partition / Path
AWS	HA_Across_AZs				15.aws_advan	ced_ha.v1.4.0rc3	Common/HA_Across_AZs.app
师问 Local Traffic	service_discovery				15.service_dise	covery	Common/service_discovery.app
())	virtual servert				15.tcp.v1.0.0rc	2	Common/virtual_server1.app
Acceleration	Delete						
Device Management							
Network							
📳 System							

Properties => uncheck/disable "Strict Updates"

Activities 🚯 Firefox We	b Browser 🔻	Mon 19:2	2			.t. •0 · -
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Application Services	Application Service	virtual_server1				
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Alla	Description	E has ut 0.0xx0				
Local Traffic	Strict Lindates					
Acceleration	Lindate Dates	C(recommended)				
Device Management	Optime Denem	-				
Device management						
Network						
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Local Traffic => Virtual Servers => virtual_server1. Change only the values below and leave the rest as they are.

Question	value
Туре	Standard
Service Port	443 / HTTPS
HTTP Profile	http
SSL Profile (Client)	clientssl

[Update]

Activities O Firefox web	Browser •	Mon 19722 BIG-IP® - ip-10-0-101-93.ec2.internal (10.0.101.93) - Mozilla Firefox	× ••• •• •
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En Local Traffic	Name	Virhaal_server1_vs_10.0.1.150	
Network Map	Application	virial_server1	
Virtual Servers	Partition / Path	CommonVirtual_server1.app	
Policies	Description		
Profiles	Туре	Standard	
Ciphers	Source Address	0.0.0.0	
iRules	Destination Address/Mask	10.0.1.150	
Pools	Service Port	443 [HTTPS -	
Nodes	Notify Status to Virtual Address		
Monitors (+)	Availability	Available (Enabled) - The virtual server is available	
Traffic Class (+)	Syncookie Status	Cer	
Address Translation	State	Enabled =	
	Configuration: Basic +		
Acceleration	Protocol	TCP +	
Device Management	Protocol Profile (Client)	len vi	
Network	Protocol Profile (Server)	I the Clark Prefix	
(7 *) System	HTTP Profile		
	HTTP Proxy Connect Profile	None m	
	FTP Profile	None vi	
	RTSP Profile	None 1	
		Selected Available	
	SSL Profile (Client)	Common Clentsal clentsal insecure compabble Clentsal accure crypto-server default clentsal spillession - default clentsal	
	SSL Profile (Server)	Selected Available sem Approximation sem Sequence pcop/default-serversal pcop/default-serversal	
	SMTPS Profile	None -	111111
	Client LDAP Profile	Nona -	11 24
	Server LDAP Profile	None -	
		-	
Activities 😆 Firefox Web	Browser 🕶	Mon 19:23	. •() () →
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Retwork	Protocol Profile (Server)	Use Client Profile)	
System	HTTP Profile	The H	

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Network	Protocol Profile (Server)	Use Client Profile)					
§∳ System	HTTP Profile	Trap I					
	HTTP Proxy Connect Profile	None					
	FTP Profile	None -					
	RTSP Profile	None -					
	SSL Profile (Client)	Selected Available Cennessou centestale cientestal cientestale sou cientestale sou splitsacoura default - lientestal sou splitsacoura default - lientestal					
	SSL Profile (Server)	Selected Analasia serversal serversal spituscion defaulti serversal we defaulti serversal					
	SMTPS Profile	None -					
	Client LDAP Profile	None -					
	Server LDAP Profile	Nona T					
	VLAN and Tunnel Traffic	All VLANs and Tunnels -					
	Source Address Translation	Rato Map 🖻					
	Content Rewrite	Content Rewrite					
	Rewrite Profile +	None S					
	HTML Profile	None _					
	Acceleration	h					
	Rate Class	None J					
	OneConnect Profile	None -					
	NTLM Conn Pool	None -					
	HTTP Compression Profile	None I					
	Web Acceleration Profile	None 3					
	HTTP/2 Profile	None J					
	Update Delete						

From the Super-NetOps terminal. Invoke terraform output and copy the value for the primary Big-IP's Elastic IP. Let's test the http profile and clientssl profile are working. Open a browser tab and HTTPS (different than before, when we accessed our example application via HTTP) to this Elastic IP.



2.4.3 Test Failover

From the Super-NetOps terminal, run the handy lab-info utility. Confirm that "MCPD is up, System Ready" for all three of your instances.

lab-info

From the HTTPS Configuration Utility (Web UI) of the active Big-IPX device: Device Management => Devices. [Force Offline]. Click [OK] to confirm.

Activities 😆 Firefox Web B	rowser -		Mon 19:25				
EC2 Management Corr X	PIG-IP® - in-10-0-101 - X	BIG-IP® - ip-10-0-1	101-93.ec2.internal (10.0.101	93) - Mozilla Firefox	Y G ES yi ab	v ±	×
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Hostname: ip-10-0-101-93.ec2.internal D IP Address: 10.0.101.93 T	Date: Jul 10, 2018 User: admi Time: 2:25 AM (UTC) Role: Admi	in inistrator				Partition: Common	- Log out
Main Help About	Device Management >> Devic	es » lp-10-0-101-93.ec2.internal					
Statistics	🔅 🗸 Properties Con	ntgSync Fallover Network Mirroring					
IApps							
信册 Local Traffic	General Properties	ip-10-0-101-93.ec2.internal Change Device Name					
Acceleration	Description						
Device Management	Location						
Device Management	Contact						
Devices	Comment						
Device Groups 🔶	Hostname	ip-10-0-101-93.ec2.internal					
Device Trust	Serial Number	251b22ec-20de-a789-tc54c52118b1					
Traffic Groups (+)	MAC Address	0a:b1:92:0e:1a:8c					
Network	Time Zone Time Delta (sec)	0					
	Platform ID	Z100					
	Platform Name	BIG-IP Virtual Edition					
	Status	BIG-IP V13.1.0.2 (Build 0.0.6)					
	Active Modules	MSP_LTM+ PL25 Mops (USYONG-OMFWETO) eRats Stapping eAPA_LImited Sol, VE eSol, VE eMsp_LOTENTAL eMsp_LOTENTAL eMsp_LOTENTAL eMsp_LOTENTAL eMsp_LOTENTAL eMsp_LOTENTAL eMsp_LOTENTAL eSource VTML Keptoend eAPA_M Web Application e Mounter out certificate Checks emsets					1000201
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From the Super-NetOps terminal, run the lab-info utility. Notice how the Elastic IP previously associated with Big-IP1 has now "floated over" and is associated with Big-IP2.

lab-info



HTTPS to the Elastic IP. We simulated a failover event and our sample application is still up. Because only the Big-IP has failed, not the whole Availability Zone, and the client is configured for persistence, the application is still served up from the same Availability Zone.



Now we'll simulate an Availability Zone outage. From the https Configuration Utility (Web UI) of the active Big-IPX device: Local Traffic => Pools => Members => Select the pool member in Availability Zone #1 (almost always the first pool member) and [Force Offline].

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HTTPS to the Elastic IP. Hit refresh [F5] a few times to refresh the cache. Notice we are not connecting to the application on AZ#2.



Note: Traditional HA failover relies on Layer 2 connectivity and a heartbeat to trigger a fail-over event and move a 'floating IP' to a new active unit. There is no Layer 2 connectivity in the cloud across availability zones. The Big-IP will detect an availability zone outage or trouble with a Big-IP VE and the elastic IP will 'float' over to the new active device as you just saw.



2.5 Logging to CloudWatch

F5 Virtual Editions support comprehensive request and security logging for compliance and troubleshooting using two AWS native features: S3 Buckets and CloudWatch. In this lab we'll configure logging to CloudWatch.

2.5.1 LTM Request Logging to CloudWatch

From the Super-NetOps terminal, run the handy lab-info utility. Confirm that "MCPD is up, System Ready" for all three of your instances.

lab-info

From the AWS management console, navigate to Services => Management Tools => CloudWatch => Log Groups. In the search filter enter your username (i.e. user55). Terraform created a Log Group for you.

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Click on your log group. Click on your log stream named "log-stream". Notice the Message column has no messages.



Right-click and copy your log group name (i.e. user55labcom). Save in notepad or your preferred text editor / note taking method for later use.



For convenience working through the next few steps, split your screen into two halves: Super-NetOps terminal on the left and the Firefox or Chrome browser on the right. On a standard Windows US/English Windows keyboard you can split the screen with <Windows Key + left arrow> and <Windows Key + right arrow>.

From your Super-NetOps terminal, there are multiple ways to see your AWS access keys. You can echo the environment variables:

```
echo $AWS_ACCESS_KEY_ID
echo $AWS_SECRET_ACCESS_KEY
```

... or you can cat the hidden ~/.aws/config file:

cat ~/.aws/config

Copy your AWS_ACCESS_KEY_ID and AWS_SECRET_ACCESS_KEY values. Save in notepad or your preferred text editor / note taking method for later use.

Create a new cloud_logger iApp. HTTPS to the Configuration Utility (Web UI) of Big-IP1 (assuming that is the ACTIVE device and not STANDBY).

iApps => Application Services => Name: cloudwatch. Template: f5.cloud_logger.v1.0.0. Click [Finished].



Question	value
Name	cloudwatch
Template	f5.cloud_logger.v1.0.0
Which AWS region is the provider located in?	us-east-1
What is the access key you want to use for the API calls?	value of \$AWS_ACCESS_KEY_ID
What is the secret key you want to use for the API calls?	value of \$AWS_SECRET_ACCESS_KEY
What is the AWS CloudWatch Logs group name?	log group name i.e. user55labcom
What is the AWS CloudWatch Logs group's stream name?	log-stream
Do you want to enable LTM Request logging?	Enable LTM request logging



Click [Finished].



The logging components have been created!



HTTPS to the Configuration Utility (Web UI) of Big-IP2 (if that is the standby). Look in the upper left-hand corner. Confirm you are on the STANDBY. All of the iApp changes are kept in sync between active and standby devices.



HTTPS to the Configuration Utility (Web UI) of Big-IP1 (assuming that is the ACTIVE device and not STANDBY).

iApps => Application Services => virtual_server1.

Attention: Before completing the next few steps, DISABLE STRICT UPDATES for the f5.tcp.v1.0.0rc2 iApp named virtual_server1 in our example.

Local Traffic => Virtual Servers => virtual_server1_vs.10.0.1.x.

- Choose "Advanced" from the dropdown.
- Select SSL Profile(Client): clientssl
- Change HTTP Profile to "http"
- Request Logging Profile: cloudwatch_remote_logging

Click [Update].



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aws_secret_access_key = rnfXAdYyWb4MCNooFJkzHL+TJ+ZBRBkpRq2iPtPx	Monitors (+)	Availability	Available (Enabled) - The virtual server is available
region = us-east-1	Traffic Class 🔶	Syncookie Status	or
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		FTP Profile	None
		RTSP Profile	None
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		Client LDAP Profile	None
		Server LDAP Profile	None
		VLAN and Tunnel Traffic	All VLANs and Tunnels I
		Source Address Translation	Auto Map 🗹
		Content Rewrite	
		Rewrite Profile +	None
		HTML Profile	None Y
		Acceleration	
		Rate Class	None -
		OneConnect Profile	None



Do the same for the second virtual server. Local Traffic => Virtual Servers => virtual_server1_vs.10.0.1.x.

- Choose "Advanced" from the dropdown.
- Select SSL Profile(Client): clientssl
- Change HTTP Profile to "http"
- Request Logging Profile: cloudwatch_remote_logging

Click [Update].



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aws_secret_access_key = rnfXAdYyWb4MCNooFJkzHL+TJ+ZBRBkpRq2iPtPx										
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Run the lab-info command. Note the Elastic IP.

lab-info					
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aws_secret_access_key = rnfXAdYyWb4MCNooFJkzHL+TJ+ZBRBkpRq2iPtPx region = us-east-1	Hostname: lp-10-0-102-111.ec2.inte	rnal Date: Jul 10, 2018 User: admin		Partition: Common	V Log out
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[root@f5-super-netops] [~/marfil-f5-terraform] \$ lab-info AWS Console	Main Help Abs	Local Traffic » Virtual Servers : Virtual Serve	r List		
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URL: https://waf-user55f5labcom-3256385.us-east-1.elb.amazonaws.com		•	Search		
web-azl.0: user55f5labcom	Local Traffic	Status - Name	Description Application	Destination	Service Port Type Re
PRIVATE IP: 10.0.1.190	Network Map	cloudwatch_cred_vs	cloudwatch	255.255.255.254	41003 Standard Edi
	Virtual Servers	cloudwatch_format_vs	cloudwatch	255.255.255.254	41001 Standard Edi
Big-IP1: ha-user55f5labcom-vpc-7252a108	Policies	cloudwatch_send_vs	cloudwatch	255.255.255.254	41002 Standard Edi
STATUS: MCPD is up, System Ready	Profiles	virtual_server1_vs_10.0.1.150	virtual_server1	10.0.1.150	443 (HTTPS) Standard Edi
MGMT URL: https://18.208.30.193 SSH: ssh -o UserKnownHostsFile=/dev/null -o StrictHostKevChecking=no -o ConnectTimeout=3 -i M	Cipners	Virtual_server1_vs_10.0.2.58	virtual_server1	10.0.2.58	443 (HTTPS) Standard Edi
yKeyPair-user55@f5lab.com.pem admin@18.208.30.193	Daala	Enable Disable Delete			
VIP IP: 10.0.1.150	Pools				
umb and 0. usasEE(E)absam	Monitore	0			
PRIVATE IP: 10.0.2.118	Traffic Class	0			
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BIG-IP Autoscale Instance: waf-user55f5labcom					
STATUS: MCPD is up, System Ready	Acceleration				
MGMT URL: https://54.172.188.81:8443 SSH: ssh -o UserKnownHostsFile=/dev/null -o StrictHostKevChecking=no -o ConnectTimeout=3 -i M	Device Management				
yKeyPair-user55@f5lab.com.pem admin@54.172.188.81	Alabaark				
	Hermork				
Big-IP2: ha-user55f5labcom-vpc-7252a108 MGMT IP: 35.170.139.232	System				
STATUS: MCPD is up, System Ready					
SSH: ssh -o UserKnownHostsFile=/dev/null -o StrictHostKeyChecking=no -o ConnectTimeout=3 -i M					
yKeyPair-user55@f5lab.com.pem_admin@35.170.139.232					
Elastic IP: 18.209.138.124					
					_
<pre>[root@f5-super-netops] [~/marfil-f5-terraform] \$</pre>	and the second second second second				and the second se

HTTPS to the Elastic IP to test request logging. Refresh with [F5] key for 15 seconds to generate a modest amount of traffic.



Attention: Some lab testers reported an incompatibility issue with Mozilla Firefox on Linux and the AWS CloudWatch console. If Firefox doesn't render the CloudWatch console, switch to Google Chrome for this part of the lab.

From the AWS Console, Services => Management Tools => CloudWatch => Log Groups. Select your log group and log-stream.

Activities 🛛 🎯 Chromi	ium Web Browser 👻	Mon 19:58	
	c	loudWatch Management Console - Chromium	×
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aws serv	ices 🗸 Resource Groups 🗸 🛠	۵	user55@45lab.com @ f5agility2018 • N. Virginia • Support •
CloudWatch Dashboards ALARM ALARM Belling Events Rules Events Events Events Faulos Events Favorites	CloudWatch > Log Groups > Streams for user5558labcom Search Log Groups Create Log Stream Delete Log Stream Filter: Log Streams Anne Prefix x Dog streams Degete arg.	- Last Event Time	Lanzaj zazona (r zajaj voli s ⁻ i k vigita s ⁻ zajo s ⁻ (< < Log Streams 1-1 >
			н 📼
https://console.aws.ama	zon.com/cloudwatch/home?region=us-east-1#logEventV	© 2008 - 2018, Amazon Web Servi	ices, Inc. or its affiliates. All rights reserved. Privacy Policy Terms of Use

You will see the http request logs.

Activities	Chromium V	Veb Browser 🔻	Mon 20:00				-	• ● ● •
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← → C ■	Secure https:/	//console.aws.amazon.com	v/cloudwatch/home?region=us-east-1#logEventViewer:group=user55f5labcom;stream=log-stream					☆ :
aws	Services	🗸 Resource Groups 🗸	۲ user55@f5lab.com	@ f5agility201	8 - 1	I. Virginia	Sup	port 🛩
CloudWatch		CloudWatch > Log Groups	> user55[5]abcom > loo-stream					
Dashboards								
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OK	4	Time (UTC +00:00)	Message					
Billing		2018-07-10						
Events			No older events found at the moment. Retry.					
Rules		 02:59:53 	["time":"Tue, 10 Jul 2018 02:59:53 GMT","host":"ip-10-0-102-111.ec2.internal","logSource":"BIGIP","bigipVersion":"13.1.0","EVENT_SOURCE":"request_logging","BIGIP_HOSTNAME":	ip-10-0-102	-111.ec2.	internal","	CLIENT	_IP":"129.213.
Event Buses		 02:59:54 	[("time":"Tue, 10 Jul 2018 02:59:54 GMT","host":"ip-10-0-102-111.ec2.internal","logSource":"BIGIP","bigipVersion":"13.1.0","EVENT_SOURCE":"request_logging","BIGIP_HOSTNAME":	ip-10-0-102	-111.ec2.	internal","	CLIENT_	_IP":"129.213.
Logs		 02:59:54 	[["time"."Tue, 10 Jul 2018 02:59:54 GMT", host:"ip-10-0-102-111.ec2.internal", logSource"."BIGIP", "bigipVersion"."13.1.0", EVENT_SOURCE"."request_logging", BIGIP_HOSTNAME".	ip-10-0-102	-111.ec2.	internal","	CLIENT_	_IP":"129.213.
Metrics		 03:00:01 03:00:02 	[Time**10e, 10 Jul 2016 03:00:01 GMT*, nost: TIP-10-102-111.ec2.internar, togSource**BiGIP*, togDyersion**13.1.0*, EVENT_SOURCE**request_logging, *BiGIP+HOSINAME** [Time**10e, 10 Jul 2016 02:00:02 CMT**hoef**ii 10.0.012111.ec2.internar, togSource**BiGIP*/TigDyersion**13.1.0*	ip-10-0-102	-111.ec2.	internal","	CLIENT_	IP 129.213.
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		03:00:02	Timme": Tue, 10 Jul 2018 03:00:02 GMT", "host": "ip-10-0-102-111.ec2.internal", "logSource": "BIGIP", "bigipVersion": "13.1.0", "EVENT SOURCE": "request logging", "BIGIP HOSTNAME";	ip-10-0-102	-111.ec2.	internal","	CLIENT	IP":"129.213.
			No newer events found at the moment. Retry.					
								in w
Feedback	G English (L	us)	© 2008 - 2018 Amazon Web Senders Inc. or its affiliat	s. All rights re	served	Privacy P	olicy T	erms of Lise

Expand a log entry to see more detail.

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← → C 🔒 Secure http	ps://console.aws.amazon.com	/cloudwatch/home?region=us-east-1#logEventVlewer:group=user55f5labcom;stream=log-stream	☆ :
aws Service	es 🗸 Resource Groups 🗸	*	🕽 user55@45lab.com @ 15agility2018 👻 N. Virginia 👻 Support 👻
Alves Service CloudWatch Dashboards Alarms Alarms MesuPricent OK Billing Eventis Rules Event Buess I Logs Metrics Favorites	<pre>s Resource Groups CoutWhatch > Log Groups CoutWhatch > Co</pre>	<pre> werd5558abcom > bg-stream Message No odder events found at p Access statistics, performance graphs, and in ("time"-Tue, 10 Jul 2018 02:59:53 GMT", host":p=10-0.102:111 ec2.internal", logSource:"BIGIP", biggVersion":13.1.0", EVENT_SOURCE:"request_logging", ul 2018 02:59:53 GMT", control to a statistic control to statistic conternal to a statistic control</pre>	Bigge Jost Kover (* Expland all • Row) Text C • • • • • • • • • • • • • • • • • • •
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Copy the CLIENT_IP of a request and use this CLIENT_IP in the "Filter events" search filter. In production you would filter search results by attributes such as CLIENT-IP to home in on relevant logs.

Activities 🛛 💿 Cl	hromium 1	Web Browser 🕶	Mon 20202 🚓 🚸 🕐 CloudWatch Management Console - Chromium
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← → C ■ Sec	ure https:	://console.aws.amazon.com/	rcloudwatch/home?region=us-east-1#logEventViewer:group=user55f5labcom;stream=log-stream
aws	Services	✓ Resource Groups ✓	★ يدونځو(#Stab.com @ Staglity2018 → N. Vriginia → Support →
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OK	4	Time (UTO (00:00)	
Billing		2018-07-10	message
Rules			No odder events found auf ACCESS Statistics, performance graphs, and links to helpful tools. [Pime: "Tue, 10 Jul 2018 02:59:53 GMT; "host" "ip-10-0-102:111 ec2.internal", "Odgource" ("Biol"), "Biol", Biol, "Biol", Biol, "Biol", "Biol", Biol, "Biol", Biol, "Biol", Biol, "Biol", Biol, "Biol", Biol, "Biol", Biol", Biol, "Biol", Biol", Biol", Biol", Biol", Biol, "Biol", Biol", Biol", Biol", Biol", Biol, Biol, "Biol", Biol, "Biol", Biol, "Biol", Biol, "Biol", Biol, "Biol", Biol, "Biol", Biol", Biol, "Biol", Biol, "Biol", Biol, "Biol", Biol, "Biol", Biol", Biol, "Biol", Biol", Biol, "Biol", Biol", Biol", Biol", Biol, "Biol", Biol", Biol
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2.5.2 WAF HTTP Request and Security Logging to CloudWatch

HTTPS to the Configuration Utility (Web UI) of the BIG-IP Autoscale Instance: waf. . .

iApps => Application Services => waf=userxxf5labcom.

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🌣 Most Visited 🐞 Getting	tarted 🖨 Amazon Web Servic 🏟 F5 Networks · GitHub 隆 F5 Cloud Docs					
Hostname: lip-10-0-2-149.ec2.internal IP Address: 10.0.2.149	Dale: Jul 10, 2018 User: admin Time: 308 AM (UTC) Role: Administrator		Parttion:	Common 🗸 🗸	Log ou	
CONLINE (ACTIVE) Standalone	Receiving configuration data from your device.					
Main Help About	Apps Application Services : Applications					
Statistics	o + Application Service List					
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同司 Local Traffic	watuset55iaboom	f5.http.v1.2.0rc7		Common/waf-user55	5labcom.app	
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Properties => UNCHECK "Strict Updates". [Update].

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Hostname: Ip-10-0-2-149.ec2.internal IP Address: 10.0.2.149	Date: Jul 10, 2018 User: a Time: 3:09 AM (UTC) Role: A	admin Administrator					Common 🗸		og out
ONLINE (ACTIVE) Standalone									
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AND	Description	E Me ut 0 0m7							
Local Traffic	Strict Updates	(recommended)							
Acceleration	Update Delete	- Areas and a							
Device Management									
Security									
Retwork									
II System									

Create a new cloud_logger iApp. iApps => Application Services => Name: *cloudwatch*. Template: *f5.cloud_logger.v1.0.0*. Click [Finished].

Question	value
Name	cloudwatch
Template	f5.cloud_logger.v1.0.0
Which AWS region is the provider located in?	us-east-1
What is the access key you want to use for the API calls?	value of \$AWS_ACCESS_KEY_ID
What is the secret key you want to use for the API calls?	value of \$AWS_SECRET_ACCESS_KEY
What is the AWS CloudWatch Logs group name?	log group name i.e. user55labcom
What is the AWS CloudWatrch Logs group's stream name?	log-stream
Do you want to enable ASM logging?	Enable ASM logging
What ASM requests do you want to log?	Log all requests (verbose)
Do you want to include ASM DOS logging?	Include DOS protection logging
Do you want to enable LTM Request logging?	Enable LTM request logging
What Request parameters do you want to send in the log?	leave defaults

Click [Finished].

10 10 <td< th=""><th>Activities 🖸 Firefox Web Browser -</th><th></th><th></th><th>Mon</th><th>20:12</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></td<>	Activities 🖸 Firefox Web Browser -			Mon	20:12							
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	<pre>[root@f5-super-netops] [~/marfil-f5-terraf AKTAJBBLT3DJETPMYI30</pre>	orm] \$ echo \$AWS_ACCESS_	KEY_ID		A Most Visited 💧 Gettin	ng Started 🖨 Ama	zon Web Sen	vic Q F5	Networks · G	tHub 🕼 F5 C	loud Docs	
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	[root@f5-super-netops] [~/marfil-f5-terraf					using?		AMC Claud	Matabia an availab	-		into to il comulene o
	[default] aws_secret_access_key = rnfXAdYyWb4MCNooFJ region = us-east-1	kzHL+TJ+ZBRBkpRq2iPtPx						synchronous from two diff some of ther	flow of events. This erent devices or if th h will be lost.	means that if trying ere are a large num	to send to the same ber of logs being ser	CloudWatch Logs Street tin a short time frame
What is the access any source What is the AVE ClockWath	[root@f5-super-netops] [~/marfil-f5-terraf					Which AWS located in?	region is the provid	us-east-1	۲.			
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Weak Add you with you with you with Boys Add Doys Add Doys Add Doys and the Request for the COS protection togging Doys watch Request for the Request for the Sector Cost Sector						Do you want enable ASM logging?	Enable ASM I	ogging		J		
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West frequent parameters do you water or parameters do you water or parameters do you water or parameters do you water or parameters do you water or parameters or para						Do you want enable LTM Request logging?	Enable LTM n	equest logging		3		
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Local Traffic => Virtual Server => waf-userXXf5labcom_vs.

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Hostname: Ip-10-0-2-149.ec2.internal I IP Address: 10.0.2.149		3 User: admin TC) Role: Administrator										on: Comm	on v	Log out
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Network Map		cloudwatch_cred_vs						cloudwatch	255.255.255.254	41003	Standard 8	Edit	Common/cloudwa	tch.app
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Change Request Logging Profile to *cloudwatch_remote_logging*.

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	Traffic Class	X X							
	Connection Limit	0							
	Eviction Policy	None							
	Connection Rate Limit	0							
	Connection Rate Limit Mode	Per Virtual Server							
	Address Translation	C Enabled							
	Port Translation	✓ Enabled							
	Source Port	Preserve							
	Clone Pool (Client)	None							
	Clone Pool (Server)	None							
	Auto Last Hop	Defaut r							
	Last Hop Pool	None							
	NAT64	Enabled							
	Request Logging Profile	None							
	VS Score	None							
	Immediate Action On Service Down	/Common							
	Content Rewrite	/Common/cloudwatch.app							
	Rewrite Profile +	cloudwatch_remote_logging							1
	HTML Profile	None ¥							
	Acceleration								
	Rate Class	None y							1
	OneConnect Profile	waf-user55f5labcom_oneconnect							
	NTLM Conn Pool	waf-user55f5labcom_nim							
	HTTP Compression Profile	waf-user55f5labcom_wan-optimized-compression							
	Web Acceleration Profile	waf-user55lf5labcom_optimized-caching							
	HTTP/2 Profile	None						ш	
	Update Detete								

Click [Update].

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	Traffic Class					
	Connection Limit	0				
	Eviction Policy	None y				
	Connection Rate Limit	0				
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	Address Translation	C Enabled				
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	Source Port	Presarve				
	Clone Pool (Client)	None I				
	Clone Pool (Server)	None ¥				
	Auto Last Hop	Default 3				
	Last Hop Pool	None I				
	NAT64	Enabled				
	Request Logging Profile	cloudwalth remote Jogging				
	VS Score	0				
	Immediate Action On Service Down	None d				
	Content Rewrite					
	Rewrite Profile +	None d				
	HTML Profile	None				
	Acceleration					
	Rate Class	None -				
	OneConnect Profile	waf-usef55f5labcom_oneconnect =				
	NTLM Conn Pool	waf-user55f5labcom_ntim =				
	HTTP Compression Profile	wal-user55l5labcom_wan-optimized-compression				
	Web Acceleration Profile	waf-user55f5labcom_optimized-eaching				
	HTTP/2 Profile	None				١
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Local Traffic => Virtual Server => waf-userXXf5labcom_vs => Security => Policies.

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Hostname: Ip-10-0-2-149.ec2.internal Da IP Address: 10.0.2.149 Tir	ate: Jul 10, 2018 User: admin me: 3:09 AM (UTC) Role: Admini				Common		Log out	
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Network Map	Application	waf-user55f5labcom						- 11
Virtual Servers >	Partition / Path	Common/waf-user55/5iabcom.app						
Policies >	Description							
Profiles	Туре	Standard						
Ciphers >	Source Address	0.0.0.0						
iRules >	Destination Address/Mask	0.0.0.0						
Pools >	Service Port	80 HTTP -						
Nodes >	Notity Status to Virtual Address							
Monitors 🕞	Availability	Available (Enabled) - The virtual server is available						
Traffic Class 💮	Syncookie Status	Of						
Address Translation >	State	Enabled I						
Acceleration	Configuration: Advanced							
	Protocol	TCP						
Device Management	Protocol Profile (Client)	waf-user55f5labcom_t5-lcp-wan						
Security	Protocol Profile (Server)	waf-user55f5labcom_15-tcp-lan						
Network	HTTP Profile	waf-user55f5labcom_http						
	HTTP Proxy Connect Profile	None V						
System	FTP Profile	None -						
	RTSP Profile	Nma +						
	SOCKS Profile	Norm w					-	
	SUURS FILING						-	몍
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Log Profile. Select *cloudwatch_remote_logging*. Click [Update].

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RPR Level Traffic	Policy Settings	0.0.0.000					
Local frame	Service	HTTP					
Network Map	Application Security Policy	Enabled. V Policy: linux-low					
Policies	Service Policy	None					
Profiles	IP Intelligence	Disabled -					
Ciphers	DoS Protection Profile	Disabled I					
IRules >		Enabled					
Pools >		Selected Available	-				
Nodes >	Log Profile	Log all requests					
Monitors (*)		cloudwatch_remote_logging >> local-dos					
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Acceleration							
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From the Super-NetOps terminal, run the lab-info utility.

lab-info

HTTPS to the WAF ELB URL. Refresh the browser with <CTRL+F5> for 15 seconds to generate a modest amount of traffic.



Back in the CloudWatch console. Use the search term waf to see logs coming from your F5 WAF.

Activities 🏼 🎯 Chromiu	ım Web Browser -	Mon 20:13	. •() () -
CloudWatch Management Console - Chromium x			
CloudWatch Mani x			
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	03:12:45	[["time":"Tue, 10 Jul 2018 03:12:45 GMT", "host":"ip-10-0-2-149.ec2.internal", "logSource":"BIGIP", "bigipVersion":"13.1.0", "EVENT SOURCE":"request logging", "BIGIP HOSTNAME":"ip-10-0-2-149.ec2.internal", "logSource":"BIGIP HOSTNAME":"ip-10-0-2-149.ec2.internal", "logSource":"Ip-10-0-2-149.ec2.internal", "logSource"	al","CLIENT IP":"10.0.2.214
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	 03:12:48 	[["time":"Tue, 10 Jul 2018 03:12:48 GMT", "host":"ip-10-0-2-149.ec2.internal", "logSource":"BIGIP", "bigipVersion":"13.1.0", "EVENT_SOURCE":"request_logging", "BIGIP_HOSTNAME":"ip-10-0-2-149.ec2.internal	al","CLIENT_IP":"10.0.2.214
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	 03:12:58 	[["time":"Tue, 10 Jul 2018 03:12:58 GMT","host":"ip-10-0-2-149.ec2.internal","logSource":"BIGIP","bigipVersion":"13.1.0","EVENT_SOURCE":"request_logging","BIGIP_HOSTNAME":"ip-10-0-2-149.ec2.internal","logSource":"BIGIP","bigipVersion":"13.1.0","EVENT_SOURCE":"request_logging","BIGIP_HOSTNAME":"ip-10-0-2-149.ec2.internal","logSource":"BIGIP","bigipVersion":"13.1.0","EVENT_SOURCE":"request_logging","BIGIP_HOSTNAME":"ip-10-0-2-149.ec2.internal","logSource":"BIGIP","bigipVersion":"13.1.0","EVENT_SOURCE":"request_logging","BIGIP_HOSTNAME":"ip-10-0-2-149.ec2.internal","logSource":"BIGIP","bigipVersion":"13.1.0","EVENT_SOURCE":"request_logging","BIGIP_HOSTNAME":"ip-10-0-2-149.ec2.internal","logSource":"BIGIP","bigipVersion":"13.1.0","EVENT_SOURCE":"request_logging","BIGIP_HOSTNAME":"ip-10-0-2-149.ec2.internal","logSource":"BIGIP","bigipVersion":"13.1.0","EVENT_SOURCE":"request_logging","BIGIP_HOSTNAME":"ip-10-0-2-149.ec2.internal","logSource":"BIGIP","bigipVersion":"13.1.0","EVENT_SOURCE":"request_logging","BIGIP_HOSTNAME":"ip-10-0-2-149.ec2.internal","logSource":"BIGIP","bigipVersion":"13.1.0","EVENT_SOURCE":"request_logging","BIGIP_HOSTNAME":"ip-10-0-2-149.ec2.internal","logSource":"BIGIP","bigipVersion":"13.1.0","EVENT_SOURCE":"request_logging","BIGIP_HOSTNAME":"ip-10-0-2-149.ec2.internal","bigipVersion":"14.1.0","EVENT_SOURCE":"Ip-10-0-2-149.ec2.internal","bigipVersion","bigipVersi	al","CLIENT_IP":"10.0.1.167
🔵 Feedback 😪 Engl	ish (US)	© 2008 - 2018, Amazon Web Services, Inc. or its affiliates. All rights reserved.	Privacy Policy Terms of Use

2.6 Autoscale WAF

Automatically scale out your Web Application Firewall to service a surge and scale in when surge subsides.

2.6.1 Autoscale WAF

HTTPS to the WAF ELB URL.



F5 vLab Demos -

ip-10-0-1-131

Public Cloud Lab: AZ #2 F5 vLab

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From the AWS console, navigate to Services => AUTO SCALING => Auto Scaling Groups. Filter on your username and select your waf-userxx... auto scaling group.

Select the 'Instances' tab below, and select your Instance ID (there should be only one). If your instance is "Protected from... Scale in" then it will always stay up regardless of scale up/down thresholds configured. It's common to keep a single minimum WAF instance running at all times and scale the 2nd, 3rd, Nth WAF during surges.
🎁 Services 🗸 R	esource Groups 🗸 🗽 🏠 user02@f5.io @ f5agility2017 👻 N. Virginia 👻 Support	•
EC2 Dashboard Events	Create Auto Scaling group Actions 🗸 🔶 🔶	Ø
Tags Reports	Filter: Q, Filter Auto Scaling groups 🗙	\geq
Limits	Name A Launch Configuration - Instances - Desired - Min - Max - Availability Zones - Default Cooldown - Health Check Gravity	(*
 INSTANCES Instances 	waf-user0256io-spc-b7b1c7ce-BigipAutoscaleGroup-8GKCW912H14M vaf-user0215io-spc-b7b 2 2 1 2 us-east-ta_us-east-tb 1.500 1.500	
Spot Requests		
Reserved Instances Scheduled Instances Dedicated Hosts	Auto Scaling Group: waf-user02f5io-vpc-b7b1c7ce-BigipAutoscaleGroup-8GKCW91ZHJ4M	10
 IMAGES AMIs Bundle Tasks 	Actions ~	9
ELASTIC BLOCK STORE	Filter: Any Health Status 🗸 Any Lifecycle State 👻 🔍 Filter Instances 🗙	
Volumes Snapshots	Instance ID · Lifecycle · Launch Configuration Name · Availability Zone · Health Status · Protected from	÷
NETWORK & SECURITY	🛟 i-015f46cebfb0749b1 Pending wafuser02f5lo-type-b7b1c7ceBiglpLaunchConfig STC2T92TTBHC us-east-1a Healthy	
Security Groups Elastic IPs Placement Groups Key Pairs	I-096736e827Cbf02cd InService wal-user02f5io-vpc-b7b1c7ce-BigipLaunchConfig/STC2T92TTBHC us-east-1b Healthy Scale In	

Select the Scaling Polices tab. These policies were deployed via the CloudFormation template and can be changed via the CloudFormation template.



Login to the active BIG-IP Autoscale Instance MGMT IP on port 8443 configuration utility (web ui).

lab-info

In the Big-IP Configuration utility (Web UI) navigate to Security -> Application Security -> Security Policies -> Active Polices. A "linux-low" policy was deployed via CloudFormation template and is in Enforcement Mode: Blocking.

\leftarrow	C A Not secure	د.//52.207.200.169:8443/xui/					🛧 🚺 🖬 🛡 🗄
Hostna IP Add	ame: ip-10-0-2-54.ec2.internal	Date: Jul 29, 2017 User: admin Time: 10-11 PM (UTC) Role: Administrator					Partition: Common 🔻 Log out
ſ	ONLINE (ACTIVE) Standalone ASM Signature Update A						
Mai	in Help About	Security » Application Security : Security Policies : Active Policies					
1 🐴 s	tatistics	Active Policies Inactive Policies Policy Groups Policies Summary Policy Diff					
	lops	Active Security Policies					Create Import
Liga		Security Policy Name	Virtual Servers	Enforcement Mode	Version	Partition / Path	
5 D	NS	Iinux-high	waf-uo_vs	Blocking	2017-07-29 20:43:03	/Common	
010 L	ocal Traffic	Export Save as Template Merge Deactivate					Total Entries: 1
(A	cceleration						
📄 D	evice Management						
🌍 s	ecurity						
	Overview	>					
	Application Security	>					
	Protocol Security	•					
	Network Firewall	•					
	DoS Protection	▶					
	Event Logs						
	Reporting	•					
	Security Updates	Þ.					
	Options	>					
<u></u> N	etwork						
s es	ystem						

From the f5-super-netops container, let's launch some traffic against the application behind our WAF and watch it autoscale to service the surge! Replace the https://waf-userxx... in the command below with the one in the output of lab-info and don't miss that critical forward slash / at the end!

```
base64 /dev/urandom | head -c 3000 > payload
ab -t 120 -c 200 -c 5 -T 'multipart/form-data; boundary=1234567890' -p payload https:/
→/waf-user11f5democom-xxxxxxx.us-east-1.elb.amazonaws.com/
```

Services => Compute => EC2 => INSTANCES => Instances. Filter on your username and after 60 seconds (the lowest configurable time threshold) hit refresh to see your 2nd autoscale WAF instance starting.

🧊 Services 🗸 Re	source Groups 🗸 🕆	⚠ user02@f5.io @ f5agility2017 ▼ N. Virginia ▼ Support ▼
EC2 Dashboard Events	Launch Instance Connect Actions *	· · · • •
Tags	Q search: user02 S search: running Add filter	② < < 1 to 7 of 7 > >
Reports Limits	Name v Instance ID v Instance Type v Availability Zone v Instance State A Status Checks v	Alarm Status Public DNS (IPv4) - 1
INSTANCES	web-az1.0: user02f5io i-00c8155c0bf785319 t2.micro us-east-1a Orunning 2/2 checks	None tec2-54-162-147-14.compute-1.amazonaws.com
Instances	🔳 BIG-IP Autoscale Instance: waf-user02/5io i-015/46ceb/b0749b1 m4.xlarge us-east-1a 🥥 running 🔀 Initializing	None to ec2-34-228-31-190.compute-1.amazonaws.com
Spot Requests	Big-IP1: ha-user02f5io-vpc-b7b1c7ce i-020c3d956c56a8e3a t2.medium us-east-1a Image: Transition of the second secon	None tec2-34-232-9-141.compute-1.amazonaws.com
Reserved Instances	web-az2.0: user02f5io i-0517af574a65a6ae1 t2.micro us-east-1b I running I v2/2 checks	None tec2-54-173-59-162.compute-1.amazonaws.com
Scheduled Instances	BIG-IP Autoscale Instance: waf-user02f5io i-096736e827cbf02cd m4.xlarge us-east-1b Image 2/2 checks	None tec2-52-207-200-169.compute-1.amazonaws.com
Dedicated Hosts	Big-IP2: ha-user02f5io-vpc-b7b1c7ce i-0f5/8fd96f1832eba t2.medium us-east-1b ● running ≥ 2/2 checks	None tec2-34-195-89-147.compute-1.amazonaws.com
IMAGES	BIG-IP Autoscale Instance: waf-user02f5io i-0828/63/7482cab6d m4.xlarge us-east-1a 🥥 terminated	None 🍃 -
AMIS Bundle Tasks		
STORE		
Volumes		
Snapshots		

2.7 Clean Up Environment

The exciting promise of public cloud is not only to stand up application environments quickly, consistently and with minimum capex, but also the inverse: to tear down application environments quickly, cleanly and completely.

2.7.1 Clean up the lab environment

From the Super-NetOps terminal, clean up, then destroy the environment.

```
lab-cleanup
terraform destroy --force
```

Attention: You might need to run *terraform destroy –force* a second time. Watch the console output. Nothing serious: sometimes the Internet gateways take longer to delete than the time we have configured for terraform to timeout.

Activities 🕞 Terminal 🗸	Mon 20:25		
	student@docker: ~		×
File Edit View Search Terminal Tabs Help	~	Terminal	
<pre>Irootdfs-super-netoms! 1-/marfit-Fs terraform] 5 lab-cleanum recovery procressfromSchlern [1:406/05376064ee465:] releting on unersSfilabork ny [:2222109:sbuckter.jphy711ydes deleting with userSfilabork ny [:2222109:sbuckter.jphy711ydes [rootdf5-super-netoms] [-/marfit-Fs-terraform] 5 terraform destruy force splied to load ferraform configuration or plan: gene force: no such file or direct [rootdf5-super-netoms] [-/marfit-Fs-terraform] 5 terraform destruy force mag.upc.terraform-yes: Befreshing state (ID: yes-7522108) mag_mag_upc.terraform=] [-/marfit-Fs-terraform] 5 terraform destruy -force mag_upc.terraform-yes: Befreshing state (ID: xes-7522108) mag_mag_upc.terraform=] [-/marfit-Fs-terraform] 5 terraform destruy -force mag_upc.terraform-yes: Befreshing state (ID: xg-ter222108) mag_mag_upc.terraform=] [-/marfit-Fs-terraform] 5 terraform destruy -force mag_upc.terraform=] [-/marfit-Fs-terraform] 5 terraform=] 5 terraform] 5 terraform] 5 terraform=] 5 terraform=</pre>	u) I n:mxs:cloudformation:us-east-1:4571128/c54(ssoc-1d78b763) ormation:us-east-1:4571128/cb49ffd0-83e2-11e8-b73 cloudformation:us-east-1:4571128/c54c5c60-f d78b763)	c9c60-83e2-11e8-aa65-500c28b236fd) 1e8-b711-5044763dbb7b) 11-5044763dbb7b) 83e2-11e8-aa65-560c28b236fd)	
<pre>ams_scinity_group.rs_management: verificient complete ms_cloubant[.og_group.rs_status ws_msirrows_log_roup.rs_data: Destruction complete ms_msirrows_cloble_amscription.association-subnet Destruction complete ms_rows_tatus.rsite.rsite.complete.complete.complete ms_rows_tatus.rsite.complete.compl</pre>			11 📼
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<pre>ams_cloudformation_stack.f3-mutoscale-waf: Still destroying (D: gar:ams:cloudformation_stack.f3-mutoscale-waf: Still destroying (D: gar-sc377d4, Ma08 elepsed) ams_cloufformation_stack.f3-mutoscale-waf: Destruction complete ams_cloufformation_stack.f3-mutoscale-waf: Destruction ams_cloufformation_stack.f3-mutoscale-waf. (D: s0-f64237b3) ams_scales.function_stack.f3-mutoscale-waf.ams/f3-f3-f3-mutoscale-waf.ams/f3-f3-f3-mutoscale-waf.ams/f3-f3-f3-mutoscale-waf.ams/f3-f3-f3-mutoscale-waf.ams/f3-f3-mutoscale-waf.ams/f3-f3-mutoscale-waf.ams/f3-f3-mutoscale-waf.ams/f3-f3-mutoscale-waf.ams/f3-f3-mutoscale-waf.ams/f3-f3-mutoscale-waf.ams/f3-f3-mutoscale-waf.ams/f3-f3-mutoscale-waf.ams/f3-f3-mutoscale-waf.ams/f3-f3-f3-mutoscale-waf.ams/f3-f3-f3-mutoscale-waf.ams/f3-f3-f3-mutoscale-waf.ams/f3-f3-f3-mutoscale-waf.ams/f3-f3-f3-f3-f3-f3-f3-f3-f3-f3-f3-f3-f3-f</pre>	ormation:us-east-1:4571128/cb45ffd0-83e2-1: U, 10s elapsed) I	le8-b711-5044763dbb76, 3m56s elapsed)	
<pre>1 error(s) occurred: * aws_internet_gateway.gw (destroy): 1 error(s) accurred: * aws_internet_gateway.gw: Error vaiting for internet gateway (igw-ac577fd4) to de Terraform does not automatically rollback in the face of errors. Instead, your Terraform State file has been partially updated with any resources that successfully_completedPlease address the error above and apply again to incrementally_change your infrastructure. Trootdf5-super-netops] [-/marfil-f5-terraform] 5 terraform destroyforce magnetic partowp.pw: Terraform_internet_content internet_gateway.gw: Destroying (10: igw-ac377fd4) mag_internet_gateway.gw: Destroying (10: igw-ac377fd4) mag_internet_gateway.gw: EllI destroying (10: igw-ac377fd4)</pre>			











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