# Deploying VM Series with Direct Attachments to a Transit Gateway

http://www.paloaltonetworks.com

# Table of Contents

# Version History

| Version number | Comments |
|---|---|
| **1.0** | Initial GitHub check-in |
| **2.0** | Fixed issue with lambda files |

# 1. About

This document will explain how to deploy an AWS Transit Gateway with the VM-Series on AWS. A Transit Gateway uses a hub and spoke architecture that allows security teams to centralize secure connectivity for VPC-to-VPC, VPC to corporate and VPC to the internet communications.

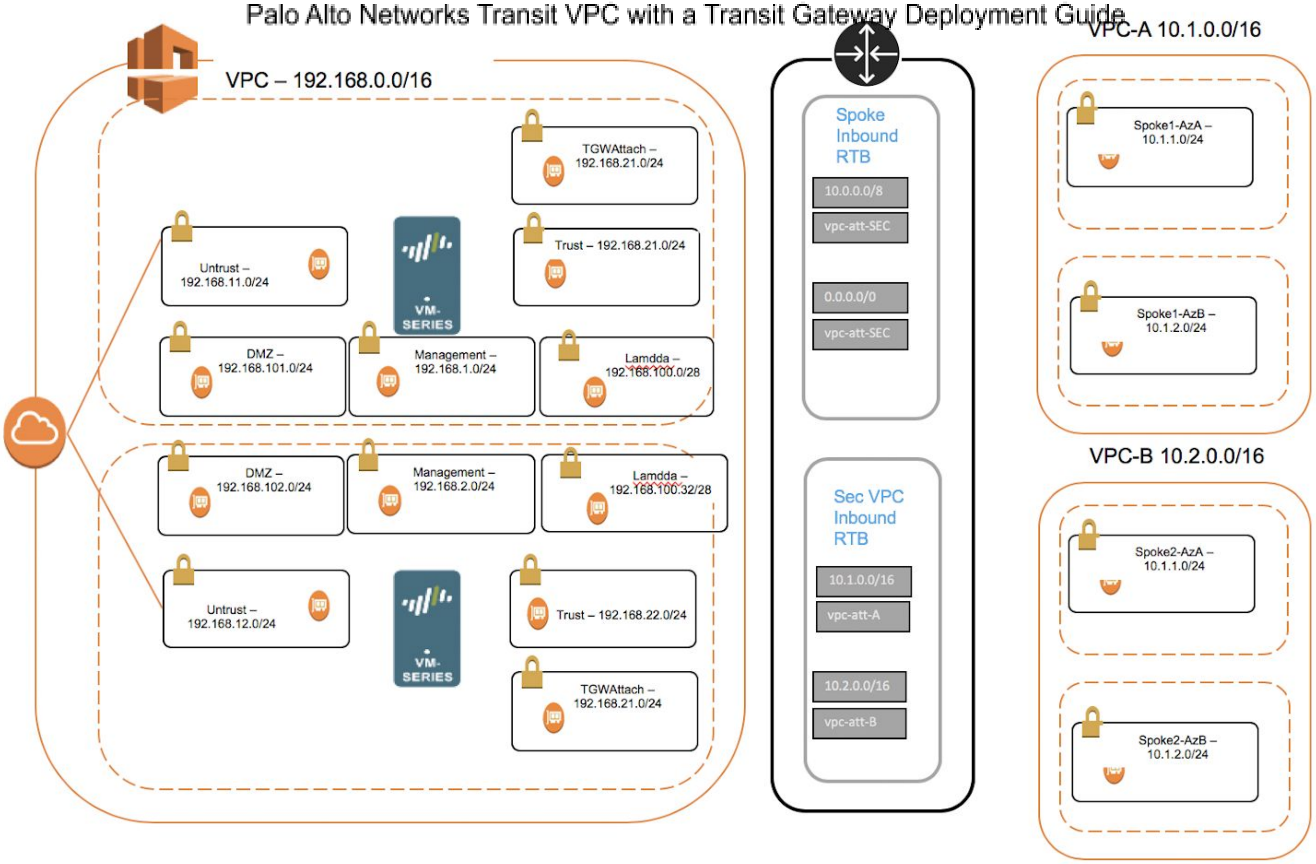
AWS Transit Gateway is a service that enables customers to connect their Amazon Virtual Private Clouds (VPCs) and their on-premises networks to a single gateway. As you grow the number of workloads running on AWS, you need to be able to scale your networks across multiple accounts and Amazon VPCs to keep up with the growth. Today, you can connect pairs of Amazon VPCs using peering. However, managing point-to-point connectivity across many Amazon VPCs, without the ability to centrally manage the connectivity policies, can be operationally costly and cumbersome. For on-premises connectivity, you need to attach your AWS VPN to each individual Amazon VPC. This solution can be time consuming to build and hard to manage when the number of VPCs grows into the hundreds.

With an AWS Transit Gateway, you only have to create and manage a single connection from the central gateway in to each VPC, on-premises data center, or remote office across your network. Transit Gateway acts as a hub that controls how traffic is routed among all the connected networks which act like spokes. This hub and spoke model simplifies management and reduces operational costs because each network only connects to the Transit Gateway and not to every other network. Any new VPC is simply connected to the Transit Gateway and is then automatically available to every other network that is connected to the Transit Gateway. This ease of connectivity makes it easy to scale your network as you grow.

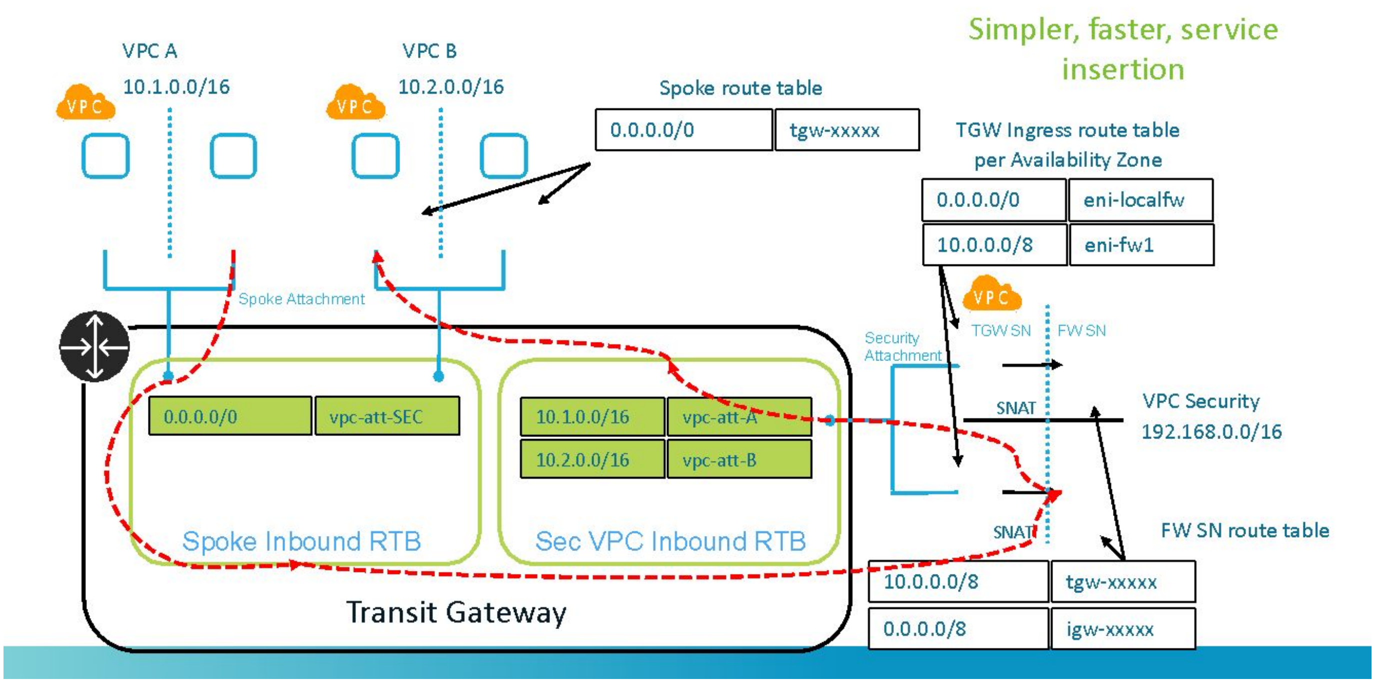
More information on the AWS Transit Gateway can be found here:
https://aws.amazon.com/transit-gateway/

# 2. Topology

The topology below displays the VPCs and subnets that will be deployed. The Security or Firewall hub will provide security inspection and connectivity while the Transit Gateway will facilitate communications for the application VPCs. This topology is deployed in a single account:



## VPC INSERTION



**Stateful Interface method**

Simpler, faster, service insertion

Spoke route table

| | |
|---|---|
| 0.0.0.0/0 | tgw-xxxxx |

TGW Ingress route table per Availability Zone

| | |
|---|---|
| 0.0.0.0/0 | eni-localfw |
| 10.0.0.0/8 | eni-fw1 |

Spoke Inbound RTB

| | |
|---|---|
| 0.0.0.0/0 | vpc-att-SEC |

Sec VPC Inbound RTB

| | |
|---|---|
| 10.1.0.0/16 | vpc-att-A |
| 10.2.0.0/16 | vpc-att-B |

FW SN route table

| | |
|---|---|
| 10.0.0.0/8 | tgw-xxxxx |
| 0.0.0.0/8 | igw-xxxxx |

# 3. Support Policy

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

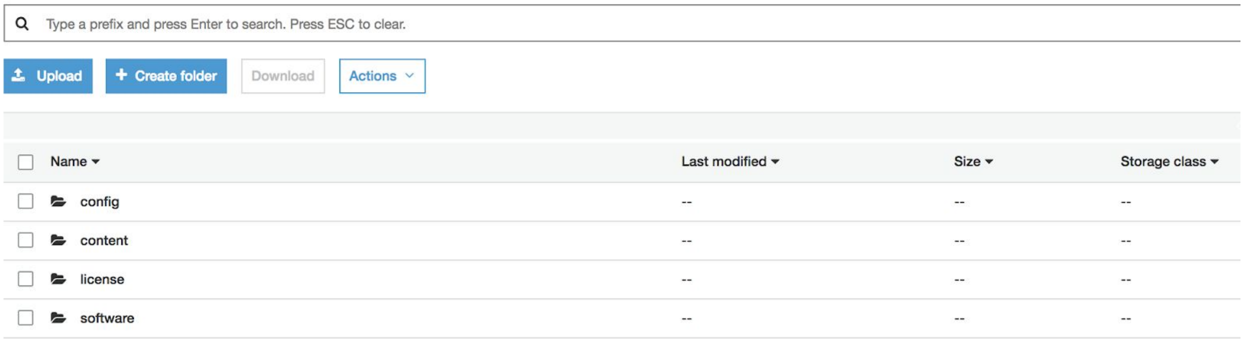
# 4. Prerequisites

Here are the prerequisites required to successfully launch this template:

1. AWS account
2. Clone or download the files from the following GitHub repository on to your local machine: https://github.com/jharris10/transitgateway

# 5. Create S3 Buckets for Security VPC

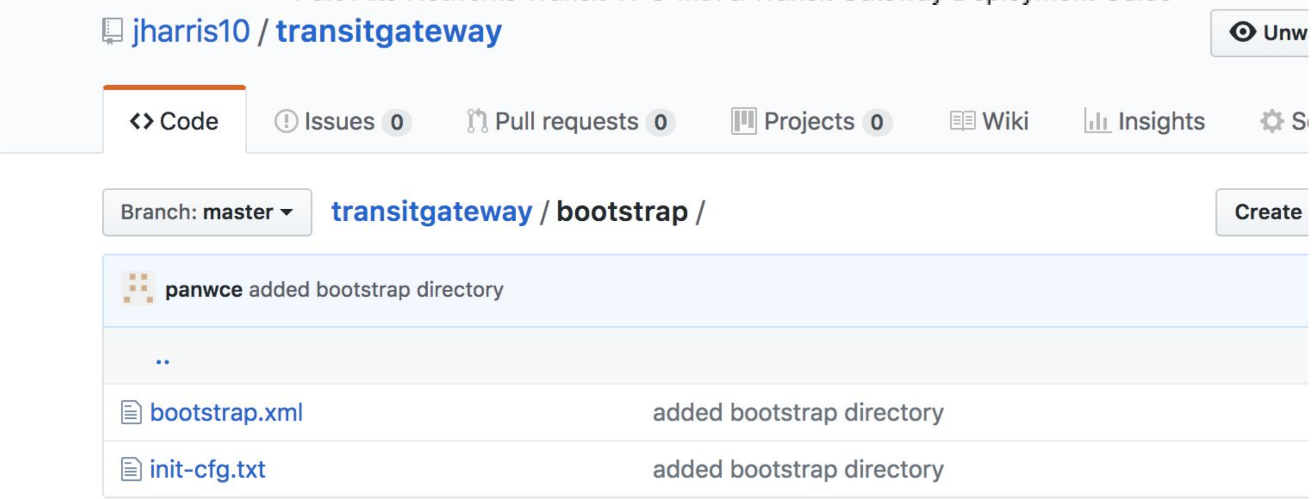
In the AWS S3 console, create an S3 bucket with config, content, license and software folders.



Type a prefix and press Enter to search. Press ESC to clear.
Upload
+ Create folder
Download
Actions

| □ Name | Last modified | Size | Storage class |
|---|---|---|---|
| □ config | -- | -- | -- |
| □ content | -- | -- | -- |
| □ license | -- | -- | -- |
| □ software | -- | -- | -- |

In the config folder add the VM-Series  bootstrap.xml and init-cfg.txt files from the cloned repositories /bootstrap folder



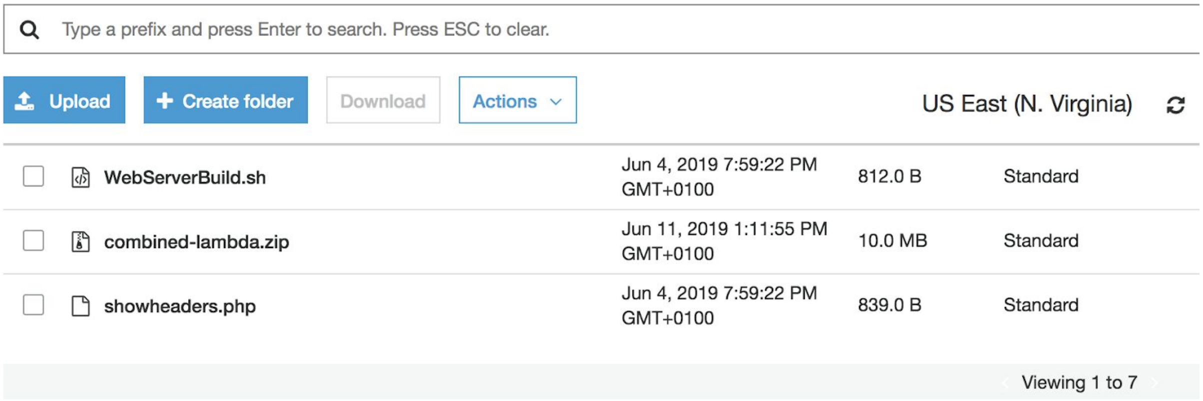
transitgateway / bootstrap /

panwce added bootstrap directory

..

| | |
|---|---|
| bootstrap.xml | added bootstrap directory |
| init-cfg.txt | added bootstrap directory |

Either create another S3 bucket or use the existing bucket and add the combined-lambda.zip, layers.zip, showheaders.php and WebServerBuld.sh from the Lambda directory in the cloned repository into this bucket.


Type a prefix and press Enter to search. Press ESC to clear.
Upload
Create folder
Download
Actions
US East (N. Virginia)

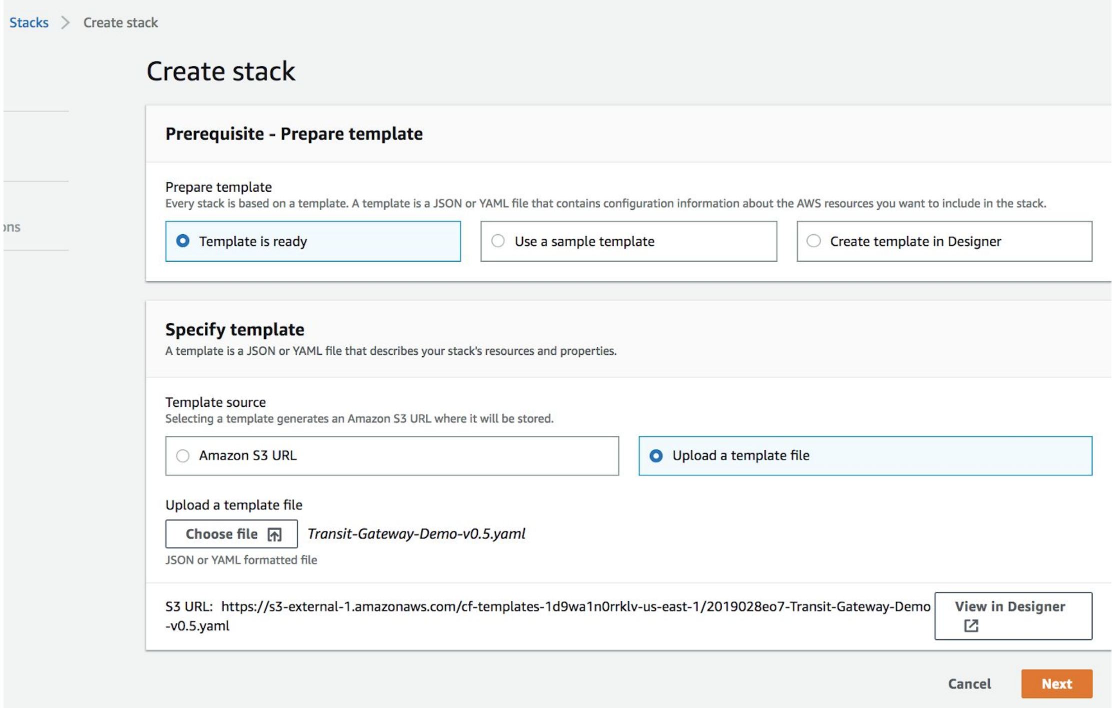
| | | | | |
|---|---|---|---|---|
| □ | WebServerBuild.sh | Jun 4, 2019 7:59:22 PM GMT+0100 | 812.0 B | Standard |
| □ | combined-lambda.zip | Jun 11, 2019 1:11:55 PM GMT+0100 | 10.0 MB | Standard |
| □ | showheaders.php | Jun 4, 2019 7:59:22 PM GMT+0100 | 839.0 B | Standard |

Viewing 1 to 7

**Note: The buckets need to be in the same region in which you will deploy the Transit Gateway template.**

# 6. Deploy the Transit Gateway Direct Attach Stack

In the AWS CloudFormation console create a new stack and select the Transit-Gateway-Demo-v2.yaml template and fill in the parameters



Stacks > Create stack

Create stack

**Prerequisite - Prepare template**

Prepare template
Every stack is based on a template. A template is a JSON or YAML file that contains configuration information about the AWS resources you want to include in the stack.

● Template is ready ○ Use a sample template ○ Create template in Designer

**Specify template**
A template is a JSON or YAML file that describes your stack's resources and properties.

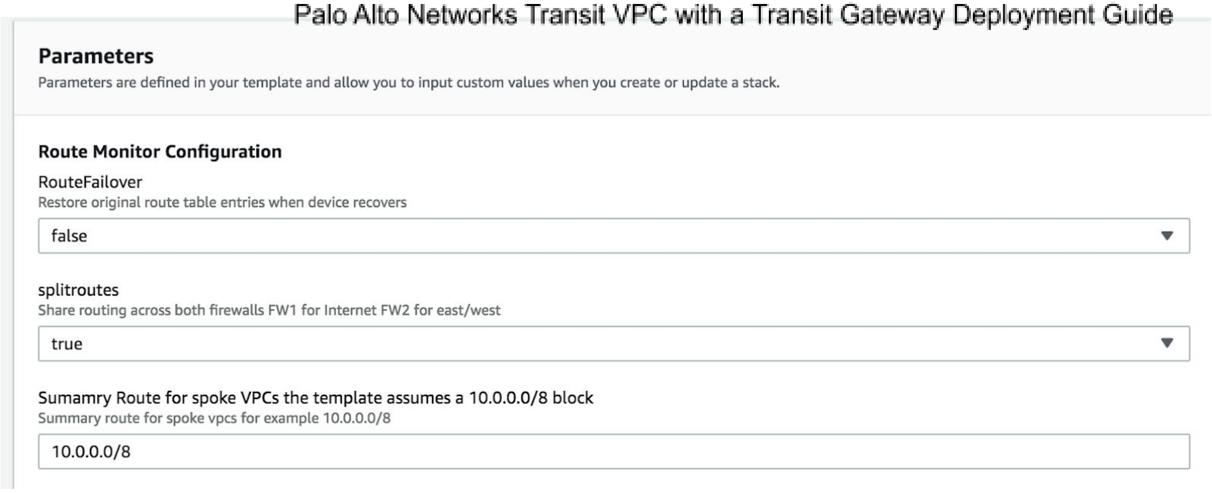
Template source
Selecting a template generates an Amazon S3 URL where it will be stored.

○ Amazon S3 URL ● Upload a template file

Upload a template file
Choose file *Transit-Gateway-Demo-v0.5.yaml*
JSON or YAML formatted file

S3 URL: https://s3-external-1.amazonaws.com/cf-templates-1d9wa1n0rrklv-us-east-1/2019028eo7-Transit-Gateway-Demo-v0.5.yaml

1. Route Monitor Configuration
    a. The first section configures the behaviour of the route failover Lambda function.
    b. RouteFailover – Setting this to true will return the route table to the original configuration where firewall 1 is used for internet connections and firewall 2 is used for east/west connections.
    c. SplitRoutes – Setting this value to false will result in a single firewall handling both internet connections and east/west connections



**Parameters**

Parameters are defined in your template and allow you to input custom values when you create or update a stack.

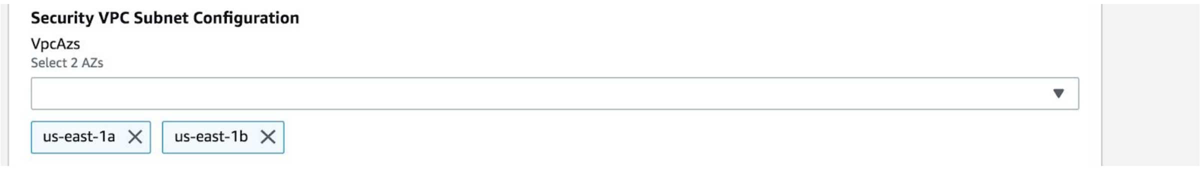
**Route Monitor Configuration**

RouteFailover
Restore original route table entries when device recovers
false ▼

splitroutes
Share routing across both firewalls FW1 for Internet FW2 for east/west
true ▼

Sumamry Route for spoke VPCs the template assumes a 10.0.0.0/8 block
Summary route for spoke vpcs for example 10.0.0.0/8
10.0.0.0/8

1. Security VPC Subnet Configuration
   The template assumes that the default subnet values are used. It may be necessary to modify the existing bootstrap.xml file in the bootstrap folder if the network configuration changes.

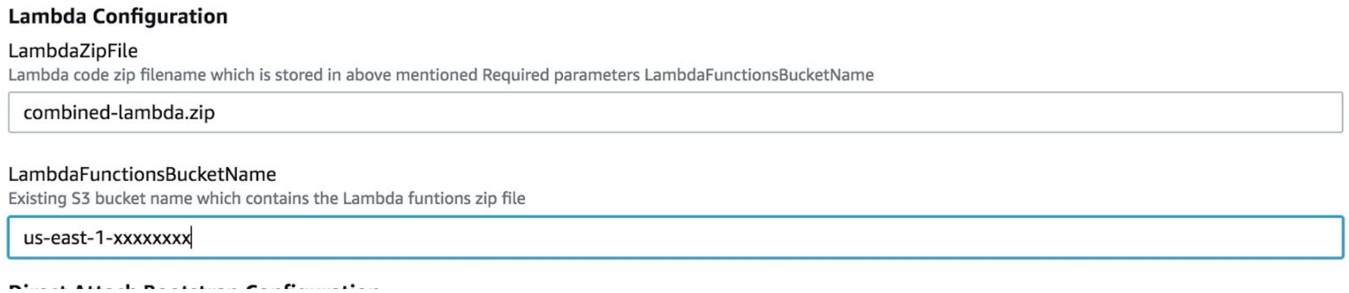


**Security VPC Subnet Configuration**

VpcAzs
Select 2 AZs
▼

us-east-1a ✕ us-east-1b ✕

2. Lambda Configuration
   Enter the name of the Lambda zip files you uploaded previously and the name of the S3 bucket they are stored in. Note: The S3 bucket must be in the same region as the stack deployment.



**Lambda Configuration**

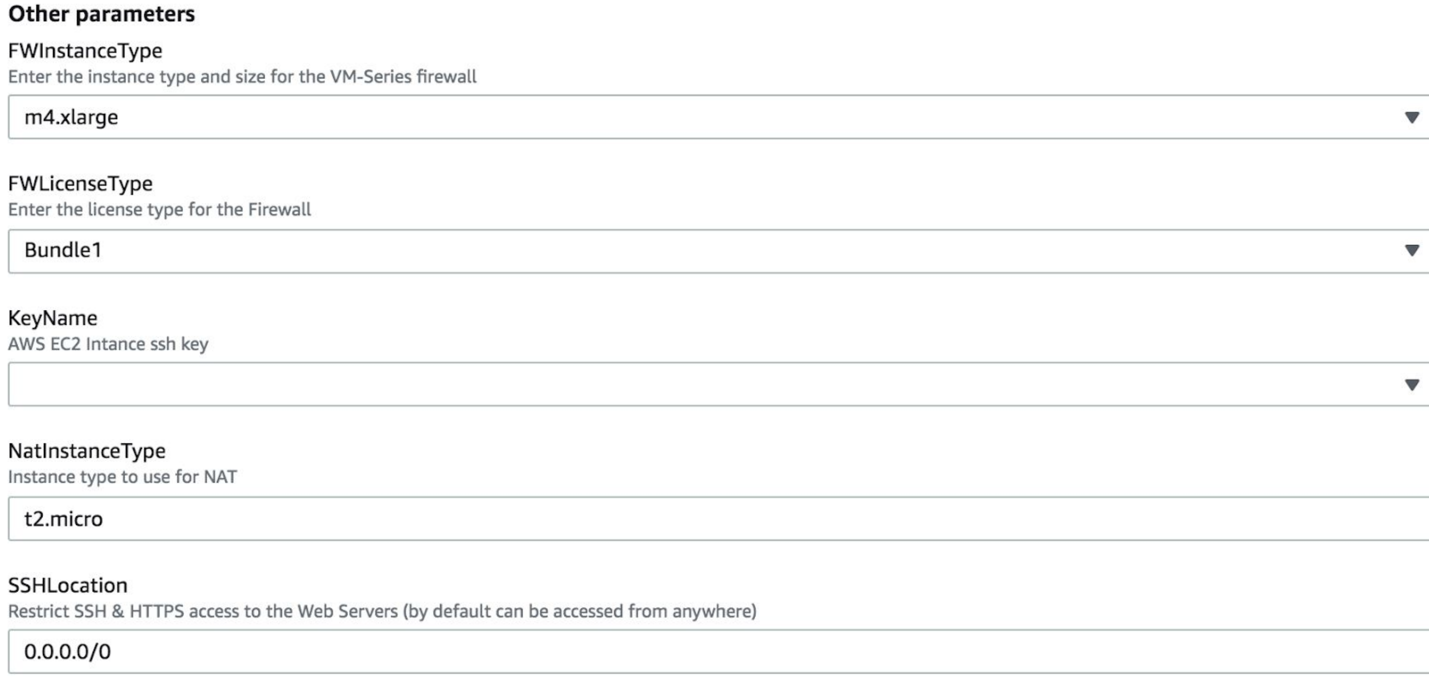
LambdaZipFile
Lambda code zip filename which is stored in above mentioned Required parameters LambdaFunctionsBucketName

combined-lambda.zip

LambdaFunctionsBucketName
Existing S3 bucket name which contains the Lambda funtions zip file

us-east-1-xxxxxxxx

3. Other Parameters
   Complete the remaining fields and Click through to kick of stack creation



**Other parameters**

FWInstanceType
Enter the instance type and size for the VM-Series firewall

m4.xlarge

FWLicenseType
Enter the license type for the Firewall

Bundle1

KeyName
AWS EC2 Intance ssh key

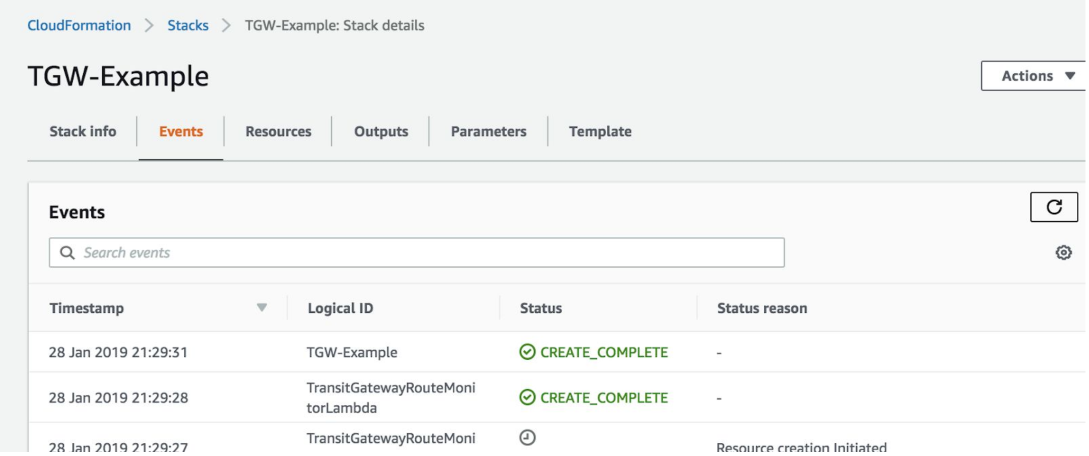
NatInstanceType
Instance type to use for NAT

t2.micro

SSHLocation
Restrict SSH & HTTPS access to the Web Servers (by default can be accessed from anywhere)

0.0.0.0/0

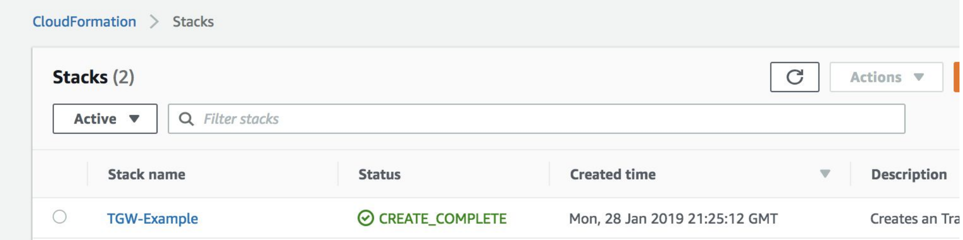
Click through to kick of stack creation.
You should see a stack create complete when the transit VPC account has been successfully initialized.



TGW-Example

Events

| Timestamp | Logical ID | Status | Status reason |
|---|---|---|---|
| 28 Jan 2019 21:29:31 | TGW-Example | ✓ CREATE_COMPLETE | - |
| 28 Jan 2019 21:29:28 | TransitGatewayRouteMonitorLambda | ✓ CREATE_COMPLETE | - |
| 28 Jan 2019 21:29:27 | TransitGatewayRouteMoni |  | Resource creation Initiated |

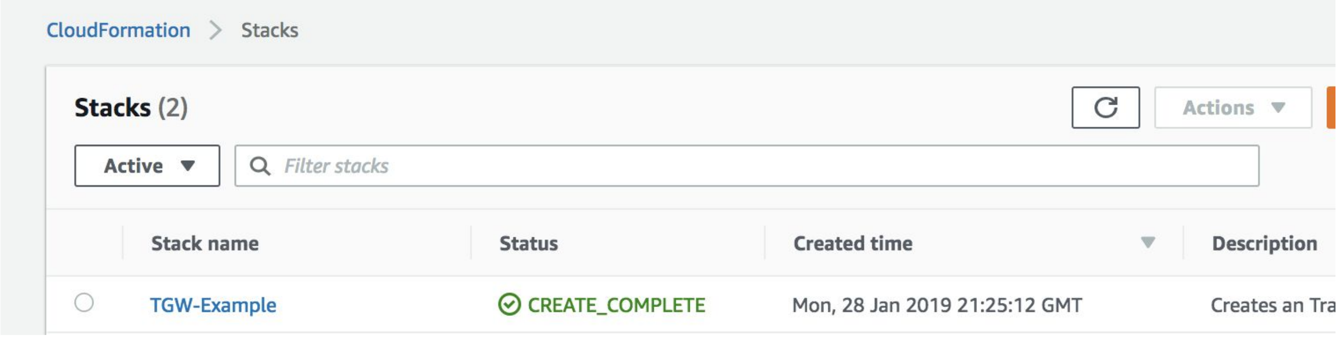


Stacks (2)

|  | Stack name | Status | Created time | Description |
|---|---|---|---|---|
| ○ | TGW-Example | ✓ CREATE_COMPLETE | Mon, 28 Jan 2019 21:25:12 GMT | Creates an Tra |

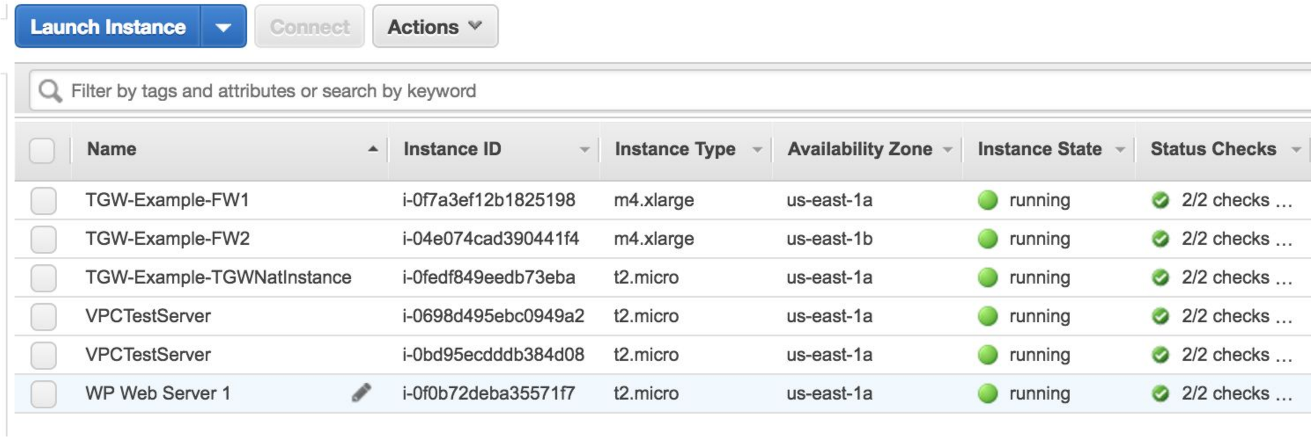
# 9. When everything works

.You should see a “create_complete” status if the template had deployed correctly



| | Stack name | Status | Created time | Description |
|---|---|---|---|---|
| ○ | TGW-Example | CREATE_COMPLETE | Mon, 28 Jan 2019 21:25:12 GMT | Creates an Tra |

In the screenshot below, you can see a pair of VM-Series firewalls, depicted as TGW-Example FW1 and FW2:

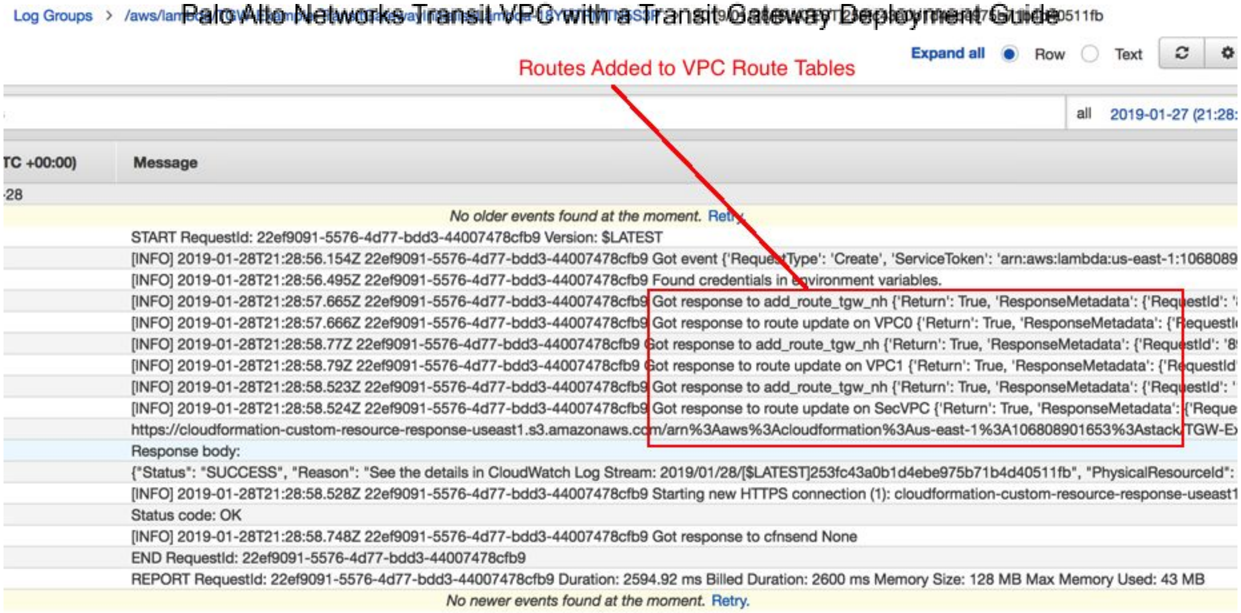


| | Name | Instance ID | Instance Type | Availability Zone | Instance State | Status Checks |
|---|---|---|---|---|---|---|
| □ | TGW-Example-FW1 | i-0f7a3ef12b1825198 | m4.xlarge | us-east-1a | running | 2/2 checks ... |
| □ | TGW-Example-FW2 | i-04e074cad390441f4 | m4.xlarge | us-east-1b | running | 2/2 checks ... |
| □ | TGW-Example-TGWNatInstance | i-0fedf849eedb73eba | t2.micro | us-east-1a | running | 2/2 checks ... |
| □ | VPCTestServer | i-0698d495ebc0949a2 | t2.micro | us-east-1a | running | 2/2 checks ... |
| □ | VPCTestServer | i-0bd95ecdddb384d08 | t2.micro | us-east-1a | running | 2/2 checks ... |
| □ | WP Web Server 1 | i-0f0b72deba35571f7 | t2.micro | us-east-1a | running | 2/2 checks ... |

## Verify the Setup

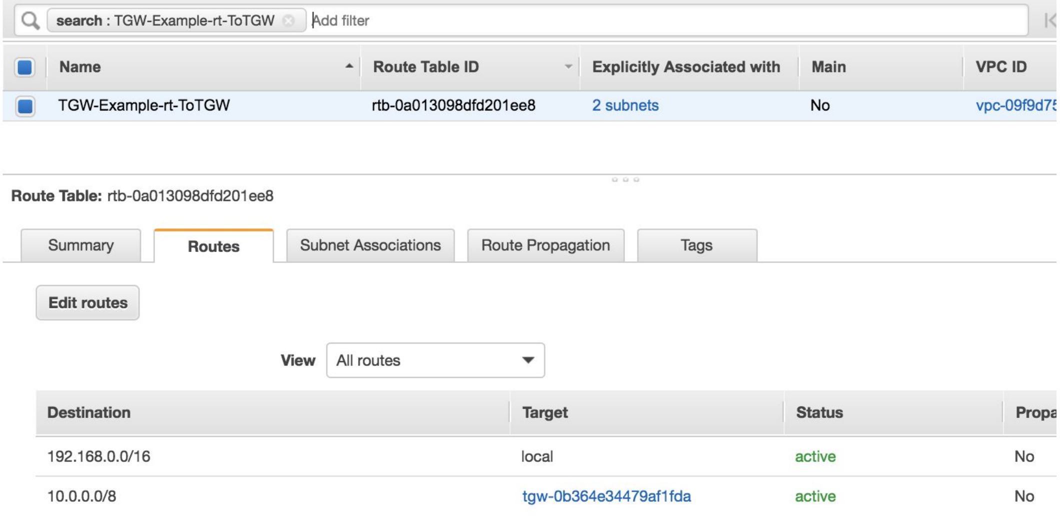
### Lambda Functions

The TransitGatewayInitialiseLambda function updates the VPC subnet route tables with the next hop of the transit gateway. We use Lambda to create these routes as at this time we cannot accomplish this with the CloudFormation Template. The function also starts a lambda step function that runs some post deployment configuration tasks on the firewalls. In this case its sets a static route for the spoke VPCs and updates and address object with the firewalls untrust IP assigned by AWS.



```
No older events found at the moment. Retry.
START RequestId: 22ef9091-5576-4d77-bdd3-44007478cfb9 Version: $LATEST
[INFO] 2019-01-28T21:28:56.154Z 22ef9091-5576-4d77-bdd3-44007478cfb9 Got event {'RequestType': 'Create', 'ServiceToken': 'arn:aws:lambda:us-east-1:1068089
[INFO] 2019-01-28T21:28:56.495Z 22ef9091-5576-4d77-bdd3-44007478cfb9 Found credentials in environment variables.
[INFO] 2019-01-28T21:28:57.665Z 22ef9091-5576-4d77-bdd3-44007478cfb9 Got response to add_route_tgw_nh {'Return': True, 'ResponseMetadata': {'RequestId': '
[INFO] 2019-01-28T21:28:57.666Z 22ef9091-5576-4d77-bdd3-44007478cfb9 Got response to route update on VPC0 {'Return': True, 'ResponseMetadata': {'RequestI
[INFO] 2019-01-28T21:28:58.77Z 22ef9091-5576-4d77-bdd3-44007478cfb9 Got response to add_route_tgw_nh {'Return': True, 'ResponseMetadata': {'RequestId': '8
[INFO] 2019-01-28T21:28:58.79Z 22ef9091-5576-4d77-bdd3-44007478cfb9 Got response to route update on VPC1 {'Return': True, 'ResponseMetadata': {'RequestId'
[INFO] 2019-01-28T21:28:58.523Z 22ef9091-5576-4d77-bdd3-44007478cfb9 Got response to add_route_tgw_nh {'Return': True, 'ResponseMetadata': {'RequestId': '
[INFO] 2019-01-28T21:28:58.524Z 22ef9091-5576-4d77-bdd3-44007478cfb9 Got response to route update on SecVPC {'Return': True, 'ResponseMetadata': {'Reque
https://cloudformation-custom-resource-response-useast1.s3.amazonaws.com/arn%3Aaws%3Acloudformation%3Aus-east-1%3A106808901653%3Astack/TGW-Ex
Response body:
{"Status": "SUCCESS", "Reason": "See the details in CloudWatch Log Stream: 2019/01/28/[$LATEST]253fc43a0b1d4ebe975b71b4d40511fb", "PhysicalResourceId":
[INFO] 2019-01-28T21:28:58.528Z 22ef9091-5576-4d77-bdd3-44007478cfb9 Starting new HTTPS connection (1): cloudformation-custom-resource-response-useast1
Status code: OK
[INFO] 2019-01-28T21:28:58.748Z 22ef9091-5576-4d77-bdd3-44007478cfb9 Got response to cfnsend None
END RequestId: 22ef9091-5576-4d77-bdd3-44007478cfb9
REPORT RequestId: 22ef9091-5576-4d77-bdd3-44007478cfb9 Duration: 2594.92 ms Billed Duration: 2600 ms Memory Size: 128 MB Max Memory Used: 43 MB
No newer events found at the moment. Retry.
```

*Figure 1 Routes Added to VPC Route Tables*



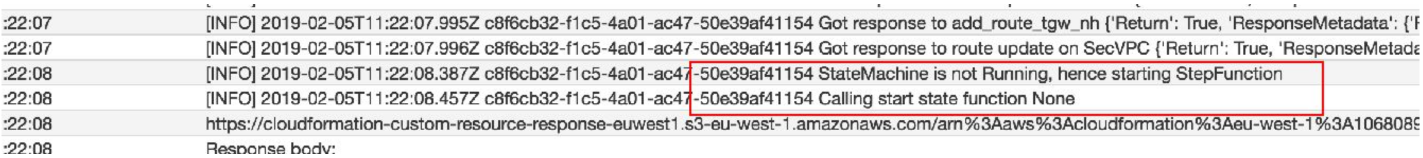
| Name | Route Table ID | Explicitly Associated with | Main | VPC ID |
|---|---|---|---|---|
| TGW-Example-rt-ToTGW | rtb-0a013098dfd201ee8 | 2 subnets | No | vpc-09f9d75 |

Route Table: rtb-0a013098dfd201ee8

| Destination | Target | Status | Propa |
|---|---|---|---|
| 192.168.0.0/16 | local | active | No |
| 10.0.0.0/8 | tgw-0b364e34479af1fda | active | No |

*Figure 2 Routes added to the VPC route table*

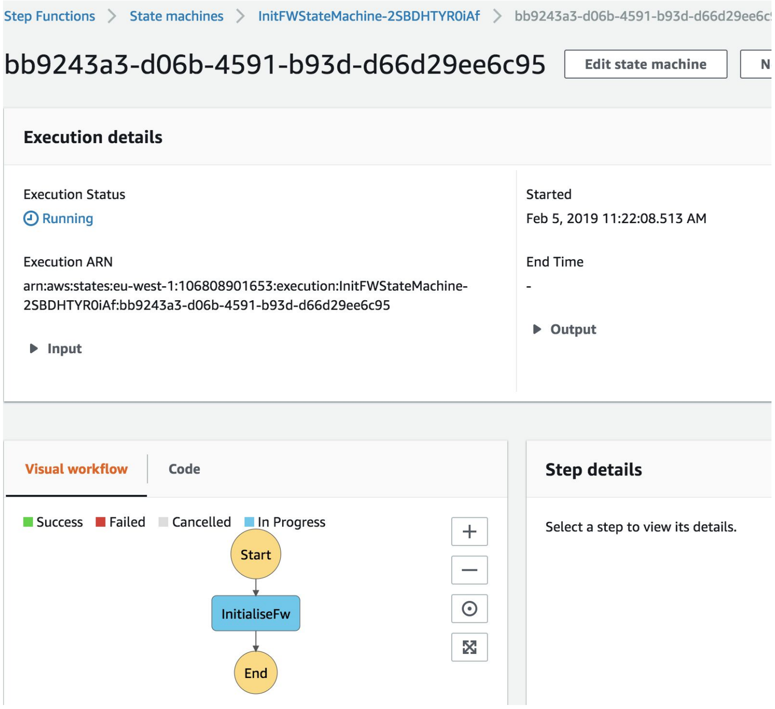
You can view this step function event in the CloudWatch logs associated with the lambda script



```
:22:07   [INFO] 2019-02-05T11:22:07.995Z c8f6cb32-f1c5-4a01-ac47-50e39af41154 Got response to add_route_tgw_nh {'Return': True, 'ResponseMetadata': {'F
:22:07   [INFO] 2019-02-05T11:22:07.996Z c8f6cb32-f1c5-4a01-ac47-50e39af41154 Got response to route update on SecVPC {'Return': True, 'ResponseMetada
:22:08   [INFO] 2019-02-05T11:22:08.387Z c8f6cb32-f1c5-4a01-ac47-50e39af41154 StateMachine is not Running, hence starting StepFunction
:22:08   [INFO] 2019-02-05T11:22:08.457Z c8f6cb32-f1c5-4a01-ac47-50e39af41154 Calling start state function None
:22:08   https://cloudformation-custom-resource-response-euwest1.s3-eu-west-1.amazonaws.com/arn%3Aaws%3Acloudformation%3Aeu-west-1%3A1068089
:22:08   Response body:
```

*Figure 3 TGWInitialiseLambda Starting Step Function*

The step function runs the InitialiseFWLambda function



Step Functions > State machines > InitFWStateMachine-2SBDHTYR0iAf > bb9243a3-d06b-4591-b93d-d66d29ee6c

bb9243a3-d06b-4591-b93d-d66d29ee6c95

**Execution details**

Execution Status
Running

Execution ARN
arn:aws:states:eu-west-1:106808901653:execution:InitFWStateMachine-2SBDHTYR0iAf:bb9243a3-d06b-4591-b93d-d66d29ee6c95

Started
Feb 5, 2019 11:22:08.513 AM

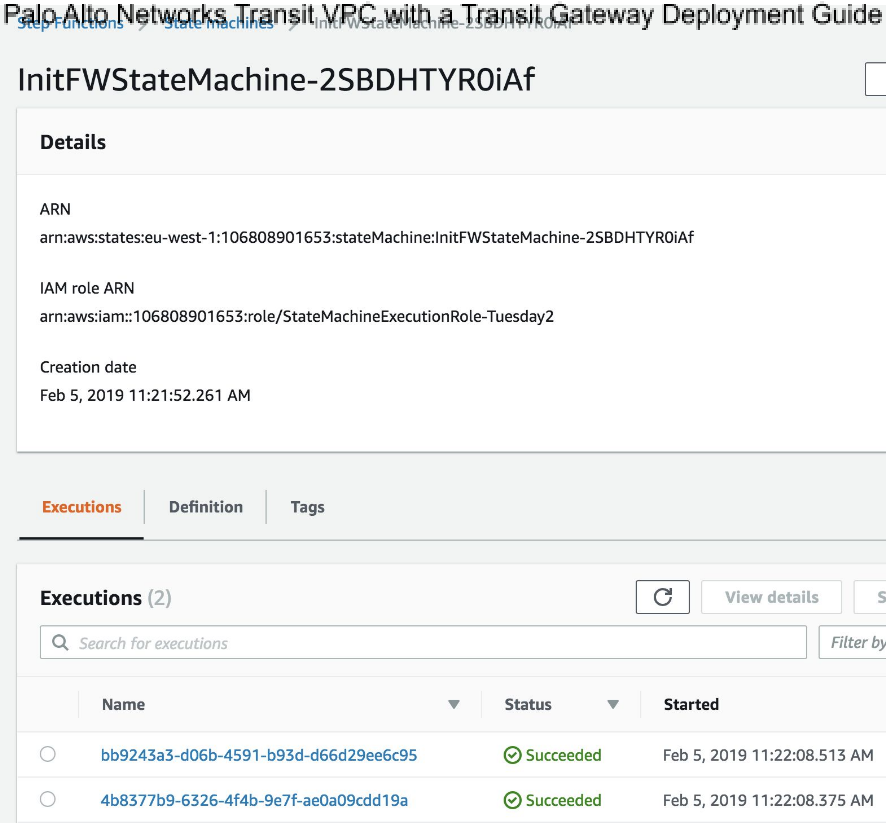
End Time
-

**Step details**

Select a step to view its details.

*Figure 4 Step Function Status*

When the step function completes you will see the status update



Step Functions > State machines > InitFWStateMachine-2SBDHTYR0iAf

InitFWStateMachine-2SBDHTYR0iAf

**Details**

ARN
arn:aws:states:eu-west-1:106808901653:stateMachine:InitFWStateMachine-2SBDHTYR0iAf

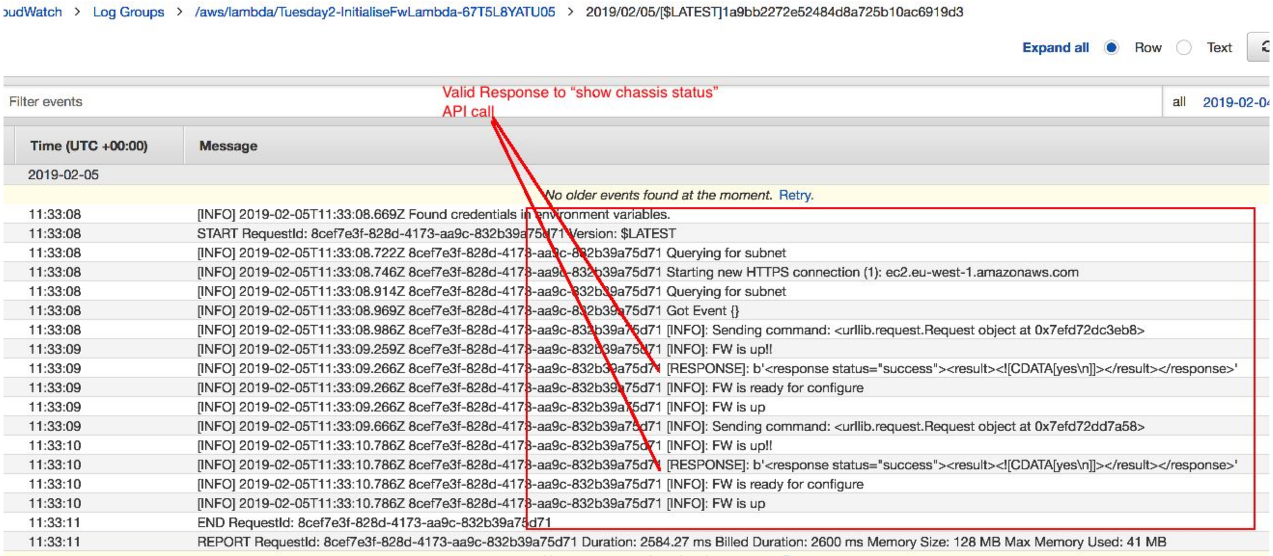
IAM role ARN
arn:aws:iam::106808901653:role/StateMachineExecutionRole-Tuesday2

Creation date
Feb 5, 2019 11:21:52.261 AM

**Executions** (2)

| | Name | Status | Started |
|---|---|---|---|
| ○ | bb9243a3-d06b-4591-b93d-d66d29ee6c95 | ✓ Succeeded | Feb 5, 2019 11:22:08.513 AM |
| ○ | 4b8377b9-6326-4f4b-9e7f-ae0a09cdd19a | ✓ Succeeded | Feb 5, 2019 11:22:08.375 AM |

*Figure 5 Successful Step Function*



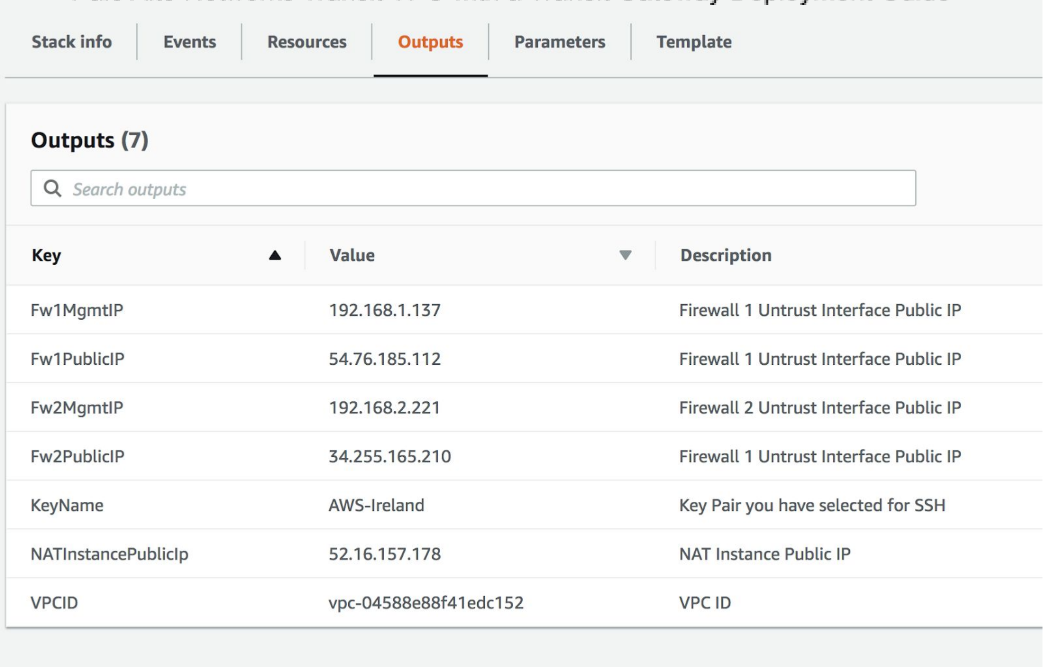
oudWatch > Log Groups > /aws/lambda/Tuesday2-InitialiseFwLambda-67T5L8YATU05 > 2019/02/05/[$LATEST]1a9bb2272e52484d8a725b10ac6919d3

Valid Response to "show chassis status" API call

```
Time (UTC +00:00)   Message
2019-02-05
                    No older events found at the moment. Retry.
11:33:08            [INFO] 2019-02-05T11:33:08.669Z Found credentials in environment variables.
11:33:08            START RequestId: 8cef7e3f-828d-4173-aa9c-832b39a75d71 Version: $LATEST
11:33:08            [INFO] 2019-02-05T11:33:08.722Z 8cef7e3f-828d-4173-aa9c-832b39a75d71 Querying for subnet
11:33:08            [INFO] 2019-02-05T11:33:08.746Z 8cef7e3f-828d-4173-aa9c-832b39a75d71 Starting new HTTPS connection (1): ec2.eu-west-1.amazonaws.com
11:33:08            [INFO] 2019-02-05T11:33:08.914Z 8cef7e3f-828d-4173-aa9c-832b39a75d71 Querying for subnet
11:33:08            [INFO] 2019-02-05T11:33:08.969Z 8cef7e3f-828d-4173-aa9c-832b39a75d71 Got Event {}
11:33:08            [INFO] 2019-02-05T11:33:08.986Z 8cef7e3f-828d-4173-aa9c-832b39a75d71 [INFO]: Sending command: <urllib.request.Request object at 0x7efd72dc3eb8>
11:33:09            [INFO] 2019-02-05T11:33:09.259Z 8cef7e3f-828d-4173-aa9c-832b39a75d71 [INFO]: FW is up!!
11:33:09            [INFO] 2019-02-05T11:33:09.266Z 8cef7e3f-828d-4173-aa9c-832b39a75d71 [RESPONSE]: b'<response status="success"><result><![CDATA[yes\n]]></result></response>'
11:33:09            [INFO] 2019-02-05T11:33:09.266Z 8cef7e3f-828d-4173-aa9c-832b39a75d71 [INFO]: FW is ready for configure
11:33:09            [INFO] 2019-02-05T11:33:09.266Z 8cef7e3f-828d-4173-aa9c-832b39a75d71 [INFO]: FW is up
11:33:09            [INFO] 2019-02-05T11:33:09.666Z 8cef7e3f-828d-4173-aa9c-832b39a75d71 [INFO]: Sending command: <urllib.request.Request object at 0x7efd72dd7a58>
11:33:10            [INFO] 2019-02-05T11:33:10.786Z 8cef7e3f-828d-4173-aa9c-832b39a75d71 [INFO]: FW is up!!
11:33:10            [INFO] 2019-02-05T11:33:10.786Z 8cef7e3f-828d-4173-aa9c-832b39a75d71 [RESPONSE]: b'<response status="success"><result><![CDATA[yes\n]]></result></response>'
11:33:10            [INFO] 2019-02-05T11:33:10.786Z 8cef7e3f-828d-4173-aa9c-832b39a75d71 [INFO]: FW is ready for configure
11:33:10            [INFO] 2019-02-05T11:33:10.786Z 8cef7e3f-828d-4173-aa9c-832b39a75d71 [INFO]: FW is up
11:33:11            END RequestId: 8cef7e3f-828d-4173-aa9c-832b39a75d71
11:33:11            REPORT RequestId: 8cef7e3f-828d-4173-aa9c-832b39a75d71 Duration: 2584.27 ms Billed Duration: 2600 ms Memory Size: 128 MB Max Memory Used: 41 MB
```

*Figure 6 Output from InitialiseFwLambda function*

Once the stack build has completed go to the output tab where you will find relevant information regarding IP address allocations



Outputs (7)

| Key | Value | Description |
|---|---|---|
| Fw1MgmtIP | 192.168.1.137 | Firewall 1 Untrust Interface Public IP |
| Fw1PublicIP | 54.76.185.112 | Firewall 1 Untrust Interface Public IP |
| Fw2MgmtIP | 192.168.2.221 | Firewall 2 Untrust Interface Public IP |
| Fw2PublicIP | 34.255.165.210 | Firewall 1 Untrust Interface Public IP |
| KeyName | AWS-Ireland | Key Pair you have selected for SSH |
| NATInstancePublicIp | 52.16.157.178 | NAT Instance Public IP |
| VPCID | vpc-04588e88f41edc152 | VPC ID |

*Figure 7 Stack Output with IP Address Allocation*

# 10. Accessing the Firewall

In order to access the firewall's web UI or the CLI, it is recommended that you use the NAT instance that has been deployed in the Transit VPC. In order to do that you will need to setup an SSH tunnel from your localhost to the remote NAT instance.

For Web UI:

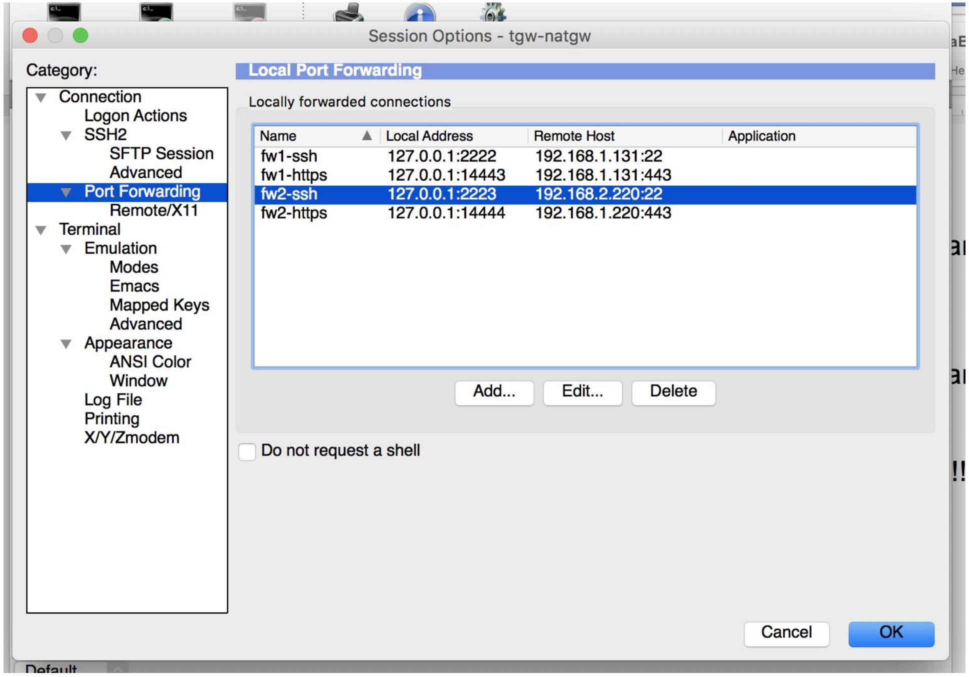
$ssh -i <AWS SSH key> -l ec2-user <public IP address of NAT instance> -L 4000:<private IP address of fw eth0>:443 -nNtv

You can then point your browser to https://localhost:4000 For CLI:
$ssh -i <AWS SSH key> -l ec2-user <public IP address of NAT instance> -L 4000:<private IP address of fw eth0>:22 -nNtv

You can now ssh to localhost:4001 using the panadmin/Pal0Alt0123! credentials.

$ssh admin@localhost -p 4001

NOTE: You can use any port of you choosing other than 4000



Local Port Forwarding

Locally forwarded connections

| Name | Local Address | Remote Host | Application |
|---|---|---|---|
| fw1-ssh | 127.0.0.1:2222 | 192.168.1.131:22 | |
| fw1-https | 127.0.0.1:14443 | 192.168.1.131:443 | |
| fw2-ssh | 127.0.0.1:2223 | 192.168.2.220:22 | |
| fw2-https | 127.0.0.1:14444 | 192.168.1.220:443 | |

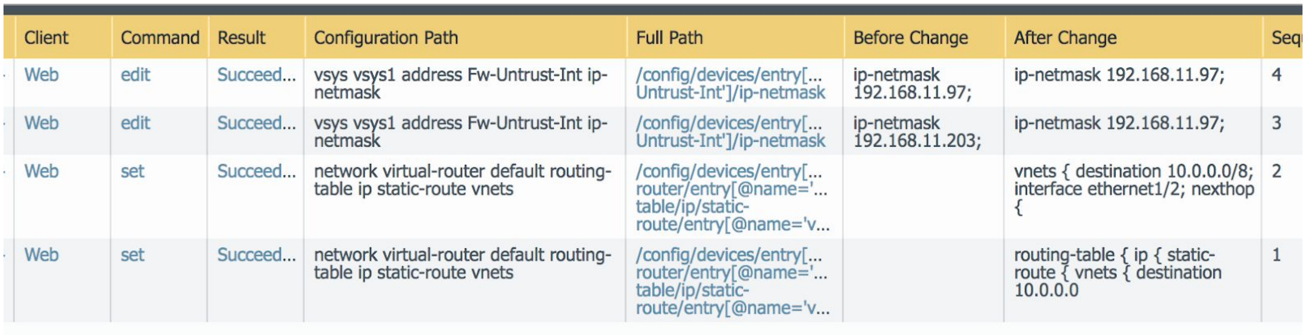
☐ Do not request a shell

*Figure 8 SecureCRT with Port Forwarding*

# 11. Testing the Deployment

1) Login to the firewalls via a browser.

Verify that the Lambda function has updated the firewall with a route to the spoke VPCs and updated the untrust interface address object.



| Client | Command | Result | Configuration Path | Full Path | Before Change | After Change | Seq |
|---|---|---|---|---|---|---|---|
| Web | edit | Succeed... | vsys vsys1 address Fw-Untrust-Int ip-netmask | /config/devices/entry[... Untrust-Int']/ip-netmask | ip-netmask 192.168.11.97; | ip-netmask 192.168.11.97; | 4 |
| Web | edit | Succeed... | vsys vsys1 address Fw-Untrust-Int ip-netmask | /config/devices/entry[... Untrust-Int']/ip-netmask | ip-netmask 192.168.11.203; | ip-netmask 192.168.11.97; | 3 |
| Web | set | Succeed... | network virtual-router default routing-table ip static-route vnets | /config/devices/entry[... router/entry[@name='... table/ip/static-route/entry[@name='v... | | vnets { destination 10.0.0.0/8; interface ethernet1/2; nexthop { | 2 |
| Web | set | Succeed... | network virtual-router default routing-table ip static-route vnets | /config/devices/entry[... router/entry[@name='... table/ip/static-route/entry[@name='v... | | routing-table { ip { static-route { vnets { destination 10.0.0.0 | 1 |

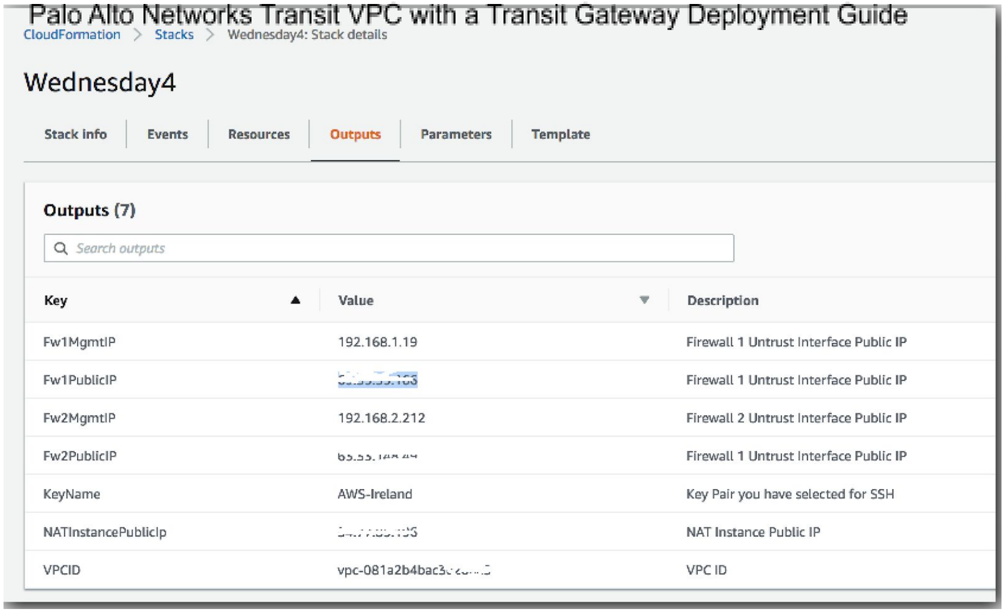
*Figure 9 Configuration log showing firewall updates from Lambda*

*Figure 10 Firewall Changes From Lambda API calls*

2) Test Connectivity
The firewall is configured with a NAT rule for ssh access to the server and Web Access to the test server on nonstandard ports.

The test url is http://<fwpublicip>/index.php

The firewall public ip can be obtained from the stack output

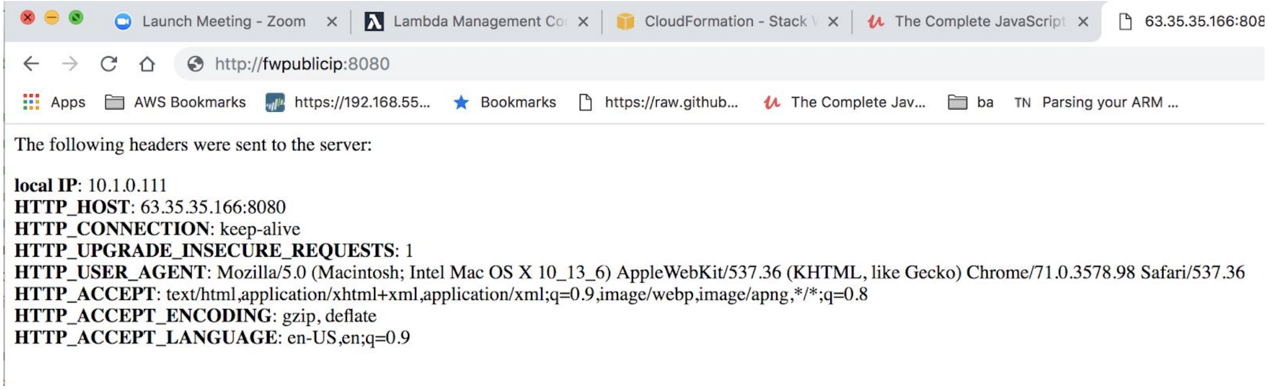


Wednesday4

Outputs (7)

| Key | Value | Description |
|---|---|---|
| Fw1MgmtIP | 192.168.1.19 | Firewall 1 Untrust Interface Public IP |
| Fw1PublicIP | [redacted] | Firewall 1 Untrust Interface Public IP |
| Fw2MgmtIP | 192.168.2.212 | Firewall 2 Untrust Interface Public IP |
| Fw2PublicIP | [redacted] | Firewall 1 Untrust Interface Public IP |
| KeyName | AWS-Ireland | Key Pair you have selected for SSH |
| NATInstancePublicIp | [redacted] | NAT Instance Public IP |
| VPCID | vpc-081a2b4bac3[redacted] | VPC ID |

*Figure 11 Stack output*



The following headers were sent to the server:

**local IP**: 10.1.0.111
**HTTP_HOST**: 63.35.35.166:8080
**HTTP_CONNECTION**: keep-alive
**HTTP_UPGRADE_INSECURE_REQUESTS**: 1
**HTTP_USER_AGENT**: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_13_6) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/71.0.3578.98 Safari/537.36
**HTTP_ACCEPT**: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,image/apng,*/*;q=0.8
**HTTP_ACCEPT_ENCODING**: gzip, deflate
**HTTP_ACCEPT_LANGUAGE**: en-US,en;q=0.9

*Figure 12 Server test page*

# 12. Cleanup

You can clean up the setup by deleting the stack deployed. You may have to manually delete some resources that were created by Lambda functions.