

# Branch Application To Cloud Application Connectivity

## Overview

This quickstart guide will provide all the steps to create a secure service between a branch application and/or user and an application hosted in Azure Cloud using NetFoundry Overlay Fabric (NFOF).

### Important

Assumption is that the NF Fabric is already up.

## Through NF Web Console UI

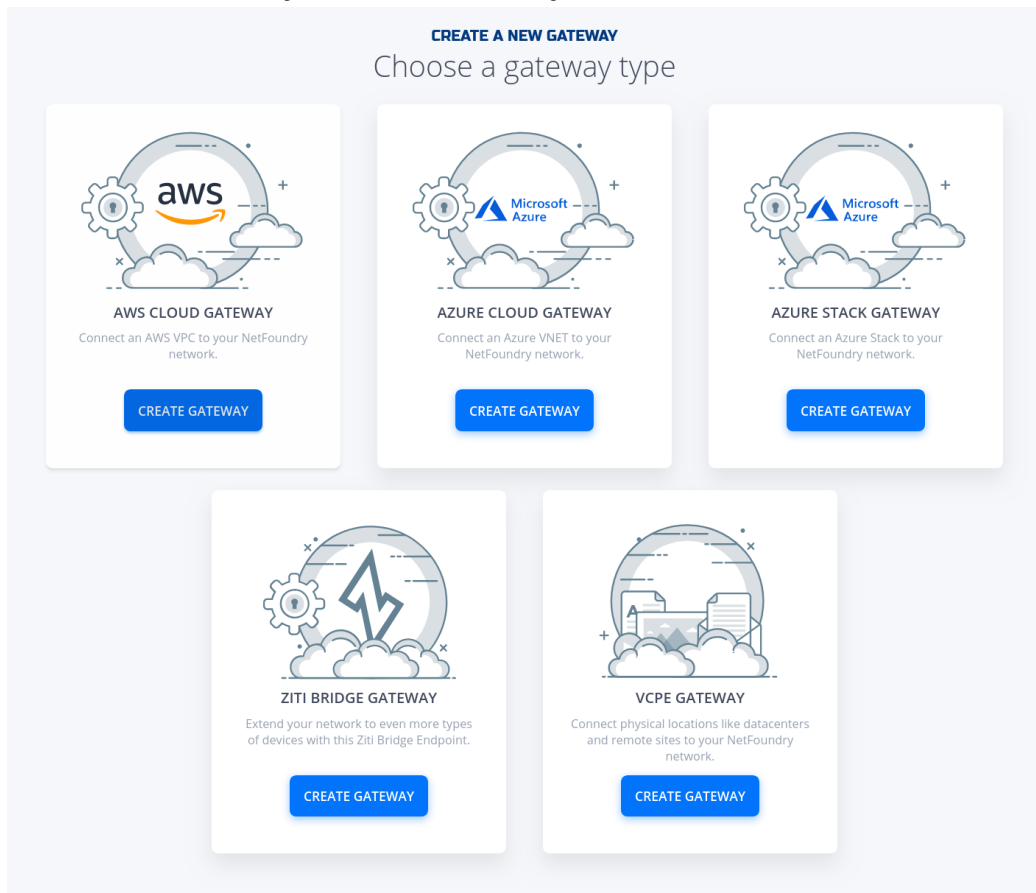
### **Create and Deploy NF Gateway in Branch Datacenter**

This section will guide a user through the steps on how to create a NF Manage Gateway in the NF Console UI and install it in the Branch Datacenter.

1. Navigate to Manage Gateways Page
2. Click on + sign in the top right corner.



3. Click on "Create Gateway" on the VCPE Gateway Card



4. Fill in the required information and click on "Create"

### CREATE A NEW GATEWAY

## Enter your Gateway attributes

GATEWAY NAME

REQUIRED

YourBranchGatewayName

CLOUD REGION

REQUIRED

US East

ENABLE HIGH AVAILABILITY

ENABLE TO EDIT DETAILS

HA

ENABLE HIGH AVAILABILITY  
FOR ULTIMATE REDUNDANCY

OFF


DISABLED

CREATE

5. Copy the Client Registration Key

### CONGRATULATIONS

## Your Gateway has been created

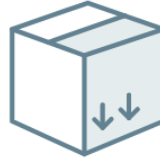


YOURBRANCHGATEWAYNAME REGISTRATION KEY

CLICK TO COPY

FB18C6EBEAD65B723E9C86B6882A3298ED77DBBF


## Download and install instructions



### DOWNLOAD INSTALL PACKAGE

vCPE Gateway to connect to private networks, branches, & data centers using this customer-managed virtual gateway.

DOWNLOAD





### VIEW INSTALL INSTRUCTIONS

Connect public or private IP space inside your vCPE using a customer-managed cloud gateway.

VIEW

## 6. Click on "Download" button on the Installation Package Card


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**OVA for VMWare ESXi 5.0 or greater**


This is a V-CPE Gateway to connect to private networks, branches, & datacenters using this customer-managed virtual gateway. Not sure how to install it? [Click Here](#) to read our simple install instructions.

[DOWNLOAD](#)




**Microsoft Hyper-V VHD Image**

This is a V-CPE Gateway to connect to private networks, branches, & datacenters using this customer-managed virtual gateway. Not sure how to install it? [Click Here](#) to read our simple install instructions.



**KVM QCOW2 Image**

This is a V-CPE Gateway to connect to private networks, branches, & datacenters using this customer-managed virtual gateway. Not sure how to install it? [Click Here](#) to read our simple install instructions.



**OVA for Virtual Box**

This is a V-CPE Gateway to connect to private networks, branches, & datacenters using this customer-managed virtual gateway. Not sure how to install it? [Click Here](#) to read our simple install instructions.

## 7. Download the correct image for the desired Hypervisor.

## 8. Follow the installation procedure linked in the description of each image type (i.e. "Click Here").



## 9. Once installed, login into it locally with ssh and register it using the key copied in the previous step. Run the following command `sudo nfnreg "reg key"`

```
infadmin@yourBranchGatewayName ~]$ sudo nfnreg 36BFD32C7F09883BA4C0C3D991D3BB013D89EA87
Created symlink from /etc/systemd/system/multi-user.target.wants/dvn-driver.service to /usr/lib/systemd/system/dvn-driver.service.
Created symlink from /etc/systemd/system/multi-user.target.wants/dvn.service to /usr/lib/systemd/system/dvn.service.
Registration complete
infadmin@yourBranchGatewayName ~]$
```

## 10. Once registered, one should see the gateway status turn to green in NF Console UI

### MANAGE GATEWAYS

[Manage Gateways](#) [Manage Clients](#) [Manage Azure Virtual WAN Sites](#) [Manage Endpoint Groups](#)

| Type to Filter  |   |   |          |
|--|---|---|----------|
| <input type="radio"/> Gateway Label  | <input checked="" type="radio"/> Status | Type  | Location |
| <input type="radio"/> YourBranchGatewayName  | <span>Online</span>                     |  V-CPE Gateway | US East  |

## 11. Done

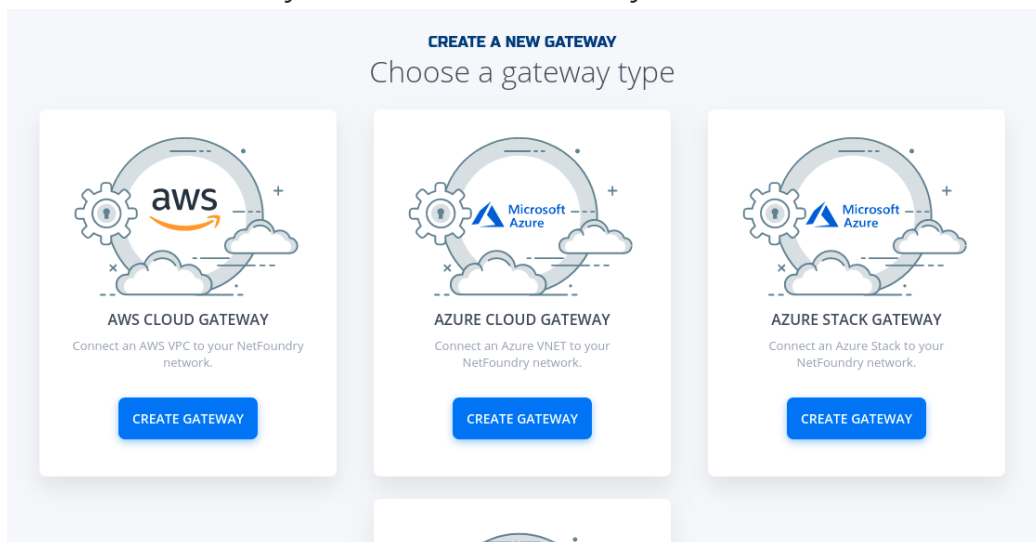
## **Create and Deploy NF Azure Gateway**

This section will guide a user through the steps on how to create a NF Manage Gateway in the NF Console UI and install it in the Azure vNet.

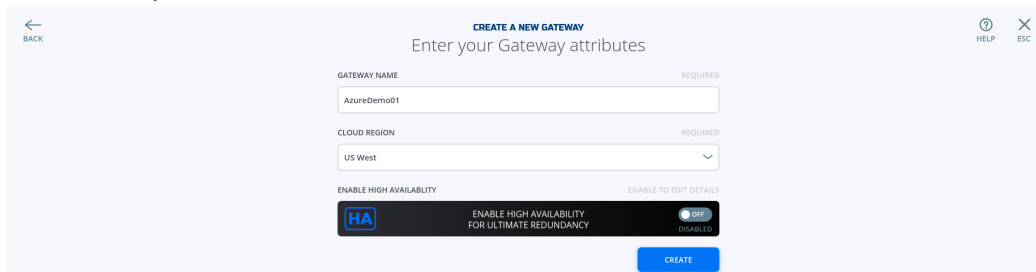
1. Navigate to Manage Gateways Page
2. Click on + sign in the top right corner.



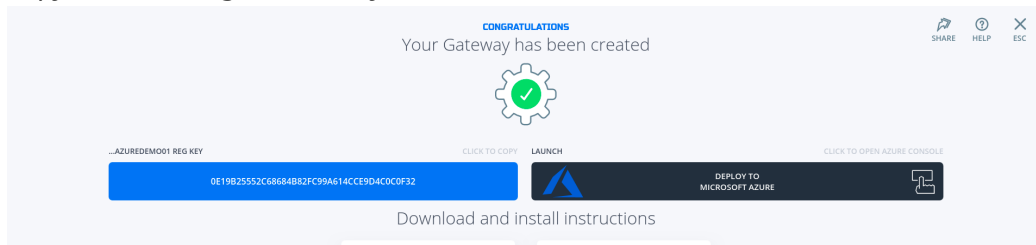
3. Click on "Create Gateway" on the Azure Cloud Gateway Card



4. Fill in the required information and click on "Create"



5. Copy the Client Registration Key



6. Click on "Deploy to Microsoft Azure". It will take you to the Azure Portal and ask you for your login credentials.

7. You will be presented with the template that needs to be filled. The first section is the Basics regarding your Subscription and Resource Group this gateway will be deployed in.

#### BASICS

|                  |                            |   |
|------------------|----------------------------|---|
| Subscription *   | NetFoundry Non-Prod        | ▼ |
| Resource group * | nf-sandbox                 | ▼ |
|                  | <a href="#">Create new</a> |   |
| Location *       | (US) East US               | ▼ |

8. The second section related to resources associated with this gateway. e.g. vm name, ip address space, security groups, etc. you will paste the registration key copied in step 5. You will also need the public ssh key to use for access to this gateway remotely.

#### SETTINGS

|                        |   |
|------------------------|---|
| Location               | westus  |
| Network Interface Name | azuredemo01-if  |
| Security Group Name    | azuredemo01-sg  |
| Virtual Network Name   | azuredemo01-vnet  |
| Address Prefix         | 10.0.8.0/24   |
| Subnet Name            | default   |
| Subnet Prefix          | 10.0.8.0/24   |
| Public Ip Address Name | azuredemo01-ip  |
| Public Ip Address Type | Dynamic   |
| Public Ip Address Sku  | Basic   |
| Virtual Machine Name   | azuredemo01 ✓   |
| Virtual Machine RG     | nf-sandbox  |
| Os Disk Type           | Premium_LRS   |
| Virtual Machine Size   | Standard_B1ms   |
| Nfreg Key * ⓘ          | ..... ✓   |
| Admin Username ⓘ       | nfadmin   |
| Ssh Key Data * ⓘ       | ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQACjga67wcoISXaD1bswknLrejRYtZ... ✓ |

9. You will need to agree to Azure Marketplace Terms and Conditions and click to "Purchase" to continue.

#### TERMS AND CONDITIONS

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By clicking "Purchase," I (a) agree to the applicable legal terms associated with the offering; (b) authorize Microsoft to charge or bill my current payment method for the fees associated the offering(s), including applicable taxes, with the same billing frequency as my Azure subscription, until I discontinue use of the offering(s); and (c) agree that, if the deployment involves 3rd party offerings, Microsoft may share my contact information and other details of such deployment with the publisher of that offering.

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10. If the NF Gateway was deployed successfully. Here is the view of the Resource Group and NF Console UI.

The screenshot displays the Azure portal interface. On the left, the 'nf-sandbox' resource group is selected, showing a list of resources including 'azuredemo01-if', 'azuredemo01-ip', 'azuredemo01-sg', and 'azuredemo01-vnet'. The main area shows the 'MANAGE GATEWAYS' console for 'DariuszDemo01'. The console includes a search bar, a table with columns for Gateway Label, Status, Type, Location, and Cloud Provider, and a list of gateways. A notification on the right indicates a successful deployment of 'Microsoft.Template' to the resource group 'nf-sandbox'.

| Gateway Label | Status | Type                  | Location | Cloud Provider |
|---------------|--------|-----------------------|----------|----------------|
| AzureDemo01   | Online | Azure Private Gateway | Oregon   | Azure          |

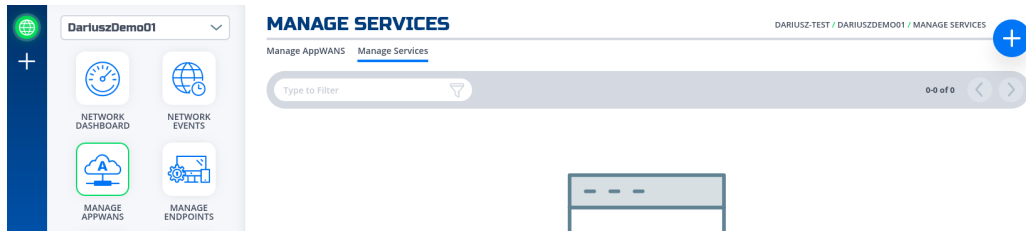
11. Done

## Create IP Host Service

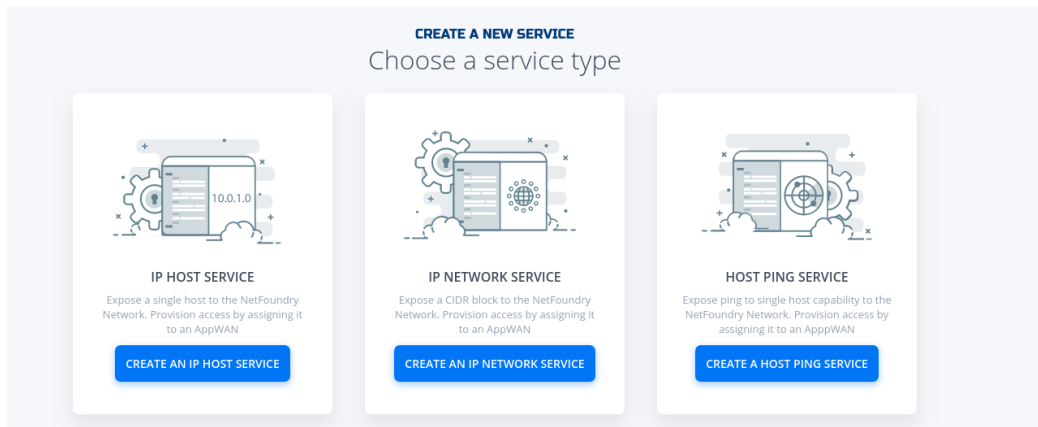
This section will guide a user through the steps on how to create a NF Service.



1. Navigate to Manage Services Page under Manage Appwans
2. Click on + sign in the top right corner.



3. Click on "Create an IP Host Service"



4. Fill in the required information for SSH and click on "Create"

**CREATE A NEW IP HOST SERVICE**

Enter your service attributes

SERVICE NAME REQUIRED

DemoServiceSsh

GATEWAY REQUIRED

AzureDemo01

IP ADDRESS REQUIRED PORT/RANGE REQUIRED

10.0.8.5 22

INTERCEPT IP ADDRESS INTERCEPT PORT/RANGE

10.0.8.5 22

PROTOCOL TYPE REQUIRED

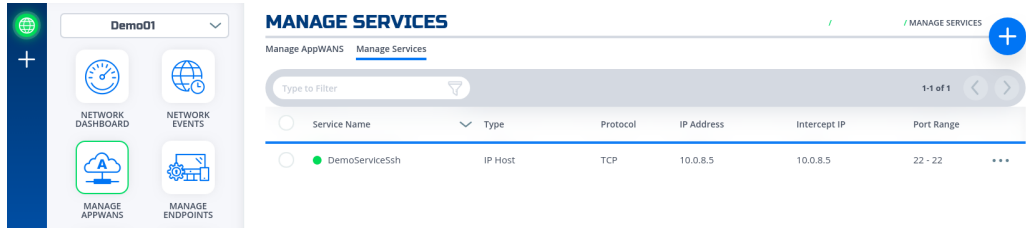
TCP

ADVANCED OPTIONS OPEN TO EDIT DETAILS

ADVANCED OPTIONS

CREATE

5. If successfully, the service is green.



The screenshot shows the 'MANAGE SERVICES' interface. On the left is a sidebar with a '+', a 'Demo01' dropdown, and four icons: NETWORK DASHBOARD, NETWORK EVENTS, MANAGE APPWANS, and MANAGE ENDPOINTS. The main area has a 'MANAGE SERVICES' header with a green status indicator and a '+ MANAGE SERVICES' button. Below the header is a search bar 'Type to Filter' and a table. The table has columns: Service Name, Type, Protocol, IP Address, Intercept IP, and Port Range. It shows one service, 'DemoServiceSsh', which is green. The table is paginated '1-1 of 1'.

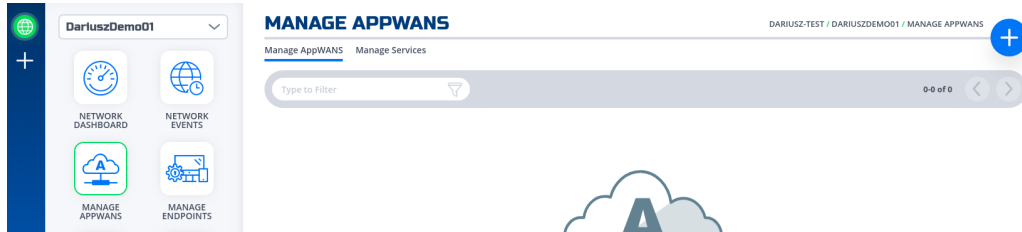
| Service Name   | Type    | Protocol | IP Address | Intercept IP | Port Range |
|----------------|---------|----------|------------|--------------|------------|
| DemoServiceSsh | IP Host | TCP      | 10.0.8.5   | 10.0.8.5     | 22 - 22    |

6. Done

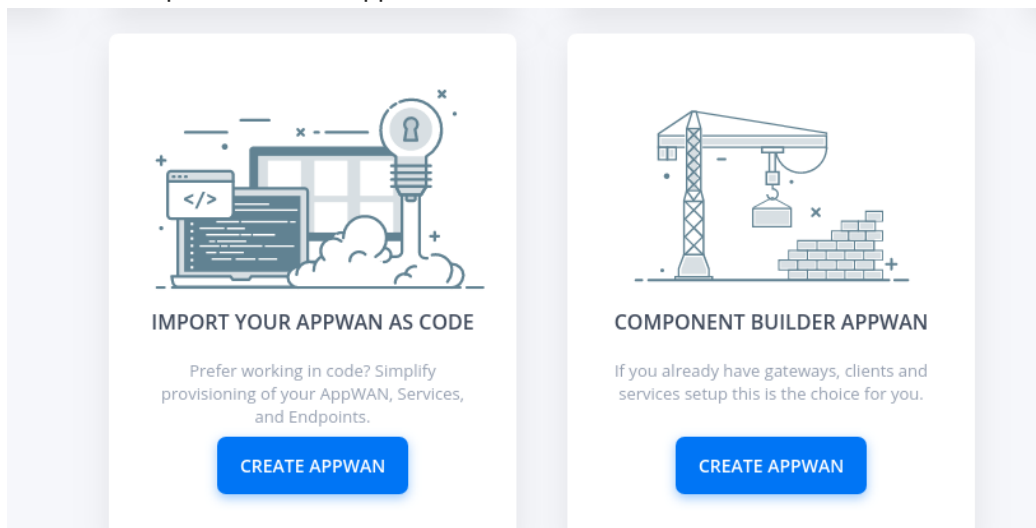
## Create AppWan

This section will guide a user through the steps on how to enable service connectivity to users by creating an appwan.

1. Navigate to Manage AppWANS Page under Manage Appwans
2. Click on + sign in the top right corner.



3. Click on "Component Builder Appwan"



4. Move the desired gateway (e.g. DemoGateway01) from "Available" Gateways to "Selected" Endpoints. Move the desired service (e.g. DemoServiceSsh) from "Available" to

"Selected" Services.

CREATE A NEW APPWAN

Choose from existing components, or add new ones

1 APPWAN NAME

REQUIRED

DemoAppWan

2 ADD CLIENTS, GATEWAYS, OR ENDPOINT GROUPS

Search for Endpoints

AVAILABLE GROUPS

ADD NEW +

AVAILABLE CLIENTS

ADD NEW +

AVAILABLE GATEWAYS

ADD NEW +

AzureDemo01

SELECTED ENDPOINTS

YourBranchGatewayName

3 ADD SERVICES

Search for a Service

AVAILABLE SERVICES

ADD NEW +

SELECTED SERVICES

DemoServiceSsh

CREATE

5. Click on "Create".

**YOUR APPWAN SUMMARY**

Your AppWAN has been created! A network summary is below.

What's next? Finish connecting your network by registering new clients and gateways.

**HINT** NEW CLIENTS  
Share Client Registration Info

**HINT** NEW GATEWAYS  
Tap to Launch and Register

1 APPWAN NAME  
DemoAppWan

2 ENDPOINTS  
CLIENTS SHARE NEW CLIENTS  
GATEWAYS REGISTER NEW GATEWAYS  
● YOURBRANCHGATEWAYNAME

3 SERVICES  
SERVICE DEFINITIONS  
● DemoServiceSsh

4 ENDPOINT GROUPS  
GROUPS

6. Done

## Test Connectivity to Application Server

### Route to vNet

The private IP of NF Gateway (e.g. YourBranchGatewayName) needs to be the next hop to reach the vNet in Azure (e.g. 10.0.8.0/24). Thus, a static route will need to be configured in one of the branch routers. NF Gateway can support dynamic routing if needed (e.g.bgp, ospf)

## Steps

1. Log in to a Client App Host in Branch DataCenter
2. Run `ssh username@privateIpOfServerAppHostInAzure`

```
nfadmin@azuredemoapp:~  
PS C:\>  
PS C:\>  
PS C:\> ssh nfadmin@10.0.8.5  
[nfadmin@azuredemoapp ~]$  
[nfadmin@azuredemoapp ~]$ ls  
[nfadmin@azuredemoapp ~]$ pwd  
/home/nfadmin  
[nfadmin@azuredemoapp ~]$  
[nfadmin@azuredemoapp ~]$
```

## Programmatically

### via Python and Terraform

#### Python Modules

For the code clarity, we have broken down the code into multiple Python modules

1. NF REST CRUD (Create,Read, Update and Delete) operations
2. Get MOP Session Token
3. Create NF Network
4. Create NF Gateway(s)
5. Create NF Service(s)
6. Create NF AppWan(s)
7. Wrapper Script to Create NF Resources based on Resource yaml file

## Environment Setup Requirements

1. `~/env` to store NF Credentials in (e.g. `clientId`, `clientSecret` ) to obtain a session token for NF API
2. Export Azure Credentials (e.g, `export ARM_TENANT_ID, ARM_CLIENT_ID, ARM_CLIENT_SECRET, ARM_SUBSCRIPTION_ID` ) to enable resource gateway creation in Azure Resource Group via Terraform.
3. Terraform and Python3 installed in path.

### Additional Information:

1. The new Resource Group in Azure is created based on then name provided in `Resource.yaml`, if one does not exists already in the same region (e.g. `centralus`). The action delete gateway will delete the RG as well even if it was an existing RG. If one does not want to delete the RG, the command `terraform state rm "{tf resource name for RG}"` needs to be run before running the gateway delete step. This will ensure that the RG is not deleted.
2. A new vNet will be created and NF Gateway will be placed in it.
3. Environment means the NF Console Environment used (e.g. `production`), not Azure.

## Steps

1. Clone this repo (git clone <https://github.com/netfoundry/mop.git>)
2. Update Resource yaml file with the desired options to feed into the wrapper script as described in the following code snippet. All Resource.yml Options
3. Run this from the root folder to create GW in NF Console UI and Azure.

```
python3 quickstarts/docs/python/nf_resources.py --file quickstarts/docs/python/nf_resources.yml
```

### Required Configuration Parameters for Gateway Creation

```
environment: production
network_action: get
network_name: DemoNet01
gateway_list:
- action: create
  cloud: azure
  count: 1
  names: []
  region: westus
  regionalCidr: [10.20.10.0/24]
  regkeys: []
  resourceGroup:
    name: demoPythonTerraform01
    region: centralus
  tag: TerraformDemo
terraform:
  bin: terraform
  output: 'no'
  source: ./quickstarts/docs/terraform
  work_dir: .
```

4. After the script is run successfully, one can see that the gateway name and registration key were saved in Resource.yml file. The name is created automatically based on region and gateway type joined with x and gateway count (AZCPEGW means an azure type gateway in NF console). One can create more than one gateway in the same region by increasing the count to more than 1.

```
environment: production
gateway_list:
- action: create
  cloud: azure
  count: 1
  names:
  - AZCPEGWx0xWESTUS
  region: westus
  regionalCidr:
  - 10.20.10.0/24
  regkeys:
  - 21DB86724EC3F31C11C1C9D68CE5ECD6A06F057E
  resourceGroup:
```



```

name: demoPythonTerraform01
region: centralus
tag: TerraformDemo
network_action: get
network_name: DemoNet01
terraform:
  bin: terraform
  output: 'no'
  source: ./quickstarts/docs/terraform
  work_dir: .

```

## 5. Create a test server vm on the same vNet if not already present.

## 6. Update the Resoure.yaml file to include the Service option to create the NF service on the gateway create in the previous step. Don't forget to change the action on the gateway to "get".

```

environment: production
gateway_list:
- action: get
  cloud: azure
  count: 1
  names:
  - AZCPEGWx0xWESTUS
  region: westus
  regionalCidr:
  - 10.20.10.0/24
  regkeys:
  - 21DB86724EC3F31C11C1C9D68CE5ECD6A06F057E
  resourceGroup:

```

```

name: demoPythonTerraform01
region: centralus
tag: TerraformDemo
network_action: get
network_name: DemoNet01
terraform:
  bin: terraform
  output: 'no'
  source: ./quickstarts/docs/terraform
  work_dir: .
services:
- action: create
  gateway: AZCPEGWx0xWESTUS
  ip: 10.20.10.5
  port: 22
  name:
  type: host

```

7. After the script run again successfully, the service section should have been populated with the service name as so.

```

services:
- action: create
  gateway: AZCPEGWx0xWESTUS
  ip: 10.20.10.5
  name: AZCPEGWx0xWESTUS--10.20.10.5--22
  port: 22
  type: host

```

**MANAGE SERVICES** / MANAGE SERVICES +

Manage AppWANS Manage Services

Type to Filter 1-1 of 1 < >

| Service Name  | Type    | Protocol | IP Address | Intercept IP | Port Range |
|---|---------|----------|------------|--------------|------------|
| <input type="radio"/> AZCPEGWx0xWESTUS--10.20.10.5-22 | IP Host | TCP      | 10.20.10.5 | 10.20.10.5   | 22 - 22    |

8. Create a gateway in the branch as the steps in the UI section indicated. We will provide code snippets for private hypervisors deployment through python in later releases (e.g. vSphere)

## MANAGE GATEWAYS

Manage Gateways Manage Clients Manage Azure Virtual WAN Sites Manage Endpoint Groups

Type to Filter 1-1 of 1 < >

| Gateway Label                               | Status | Type                         | Location |
|---|--------|------------------------------|----------|
| <input type="radio"/> YourBranchGatewayName | Online | <span>S</span> V-CPE Gateway | US East  |

9. Update the Resoure.yaml file to include the AppWan option to create the NF AppWan tying the gateway, client and service created in the previous steps. Don't forget to change the action on the service option to "get".

```

environment: production
gateway_list:
- action: get
  cloud: azure

```

```
count: 1
names:
- AZCPEGWx0xWESTUS
region: westus
regionalCidr:
- 10.20.10.0/24
regkeys:
- 21DB86724EC3F31C11C1C9D68CE5ECD6A06F057E
resourceGroup:
  name: demoPythonTerraform01
  region: centralus
tag: TerraformDemo
network_action: get
network_name: DemoNet01
services:
- action: get
  gateway: AZCPEGWx0xWESTUS
  ip: 10.20.10.5
  name: AZCPEGWx0xWESTUS--10.20.10.5--22
  port: 22
  type: host
terraform:
  bin: terraform
  output: 'no'
  source: ./quickstarts/docs/terraform
  work_dir: .
appwans:
- action: create
  endpoints:
  - BranchGatewayName
  - ClientName
  name: appwan-ssh-22
  services:
  - AZCPEGWx0xWESTUS--10.20.10.5--22
```

10. After the script ran again successfully, the connectivity should have been up.

**YOUR APPWAN SUMMARY**

Your AppWAN's details are below. Looking to make some changes?  
Follow the hints below to edit your AppWAN, Endpoints, and or Services.

**HINT** EDIT YOUR APPWAN  
Tap the Edit icon to make changes


**HINT** ENDPOINTS & SERVICES  
Tap to Edit Advanced Options

1 APPWAN NAME  
appwan-ssh-22


2 ENDPOINTS  
CLIENTS  
ClientName  
GATEWAYS  
BRANCHGATEWAYNAME

3 SERVICES  
SERVICE DEFINITIONS  
AZCPEGWx0xWESTUS--10.20.10.5-22

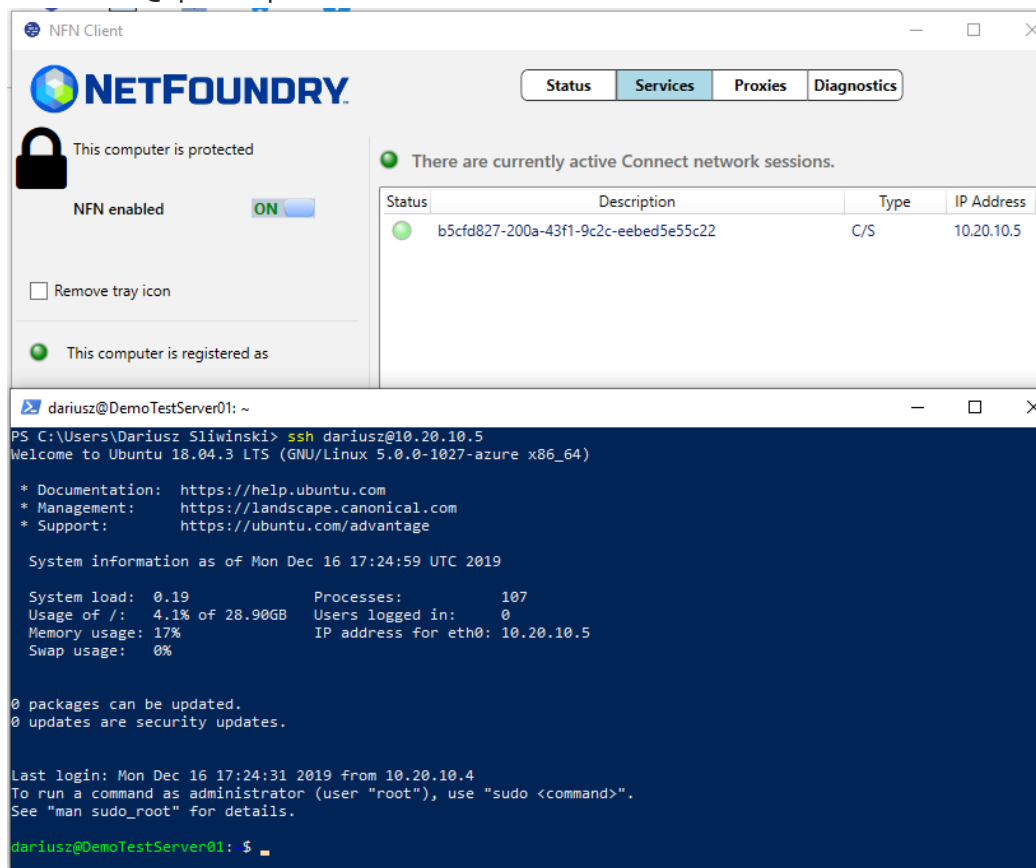
4 ENDPOINT GROUPS  
GROUPS

 Want to add another environment  
with the same services or endpoints?

TAP TO CLONE



11. To test connectivity, log in to the Remote Client or Branch App Server and run ssh "username"@ "privatelp"



12. To delete resources created, just follow the reverse order. Change the action to delete for AppWans first, then other resources as indicated in the code snippets.

```
appwans:
- action: delete
  endpoints:
  - BranchGatewayName
  - ClientName
  name: null
  services:
  - AZCPEGWx0xWESTUS--10.20.10.5--22
```

13. Services

```
services:
- action: delete
  gateway: AZCPEGWx0xWESTUS
  ip: 10.20.10.5
  name: null
  port: 22
  type: host
```

#### 14. Endpoints - will delete all resources in Azure as well.

- a. `terraform state rm "{tf resource name for RG}" // run this before the python script if`  
Resource Group needs to be preserved 1.

```
gateway_list:
- action: delete
  cloud: azure
  count: 1
  names: []
  region: westus
  regionalCidr:
  - 10.20.10.0/24
  regkeys: []
  resourceGroup:
    name: demoPythonTerraform01
    region: centralus
  tag: TerraformDemo
```


#### 15. Network

```
environment: production
network_action: delete
network_name: DemoNet01
```

#### 16. Done

### via Jenkins

In this section, we will use Resource yaml along with Jenkinsfile to show how to automate the steps further by creating the Jenkins Job

 **Coming Soon**