

Setting up Site-to-Site VPN between Cisco ASA and Microsoft Azure Virtual Network using a Static Routing VPN Gateway

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Introduction:

With a CISCO ASA we can establish a site-to-site VPN between an on premises network and a Microsoft Azure Virtual Network. In this blog we'll provide step-by-step procedure to establish site-to-site VPN (with Static Routing VPN Gateway) between Cisco ASA and Microsoft Azure Virtual Network.

Prerequisites:

Before we move on to configure site-to-site VPN, let's make sure we have the minimum prerequisites to establish site-to-site VPN.

ASA Prerequisites:

1) We recommend ASA version 9.1 or above and the version can be verified with CLI "Show Version".

2) AES Encryption License should be enabled. Make sure AES license is enabled on ASA, which can be verified using "Show version" or "Show version | include Encryption-3DES-AES" CLI on ASA.

Topology:

Use the below topology as a reference for site-to-site VPN configuration.



Azure virtual network address space:
192.168.10.0/24

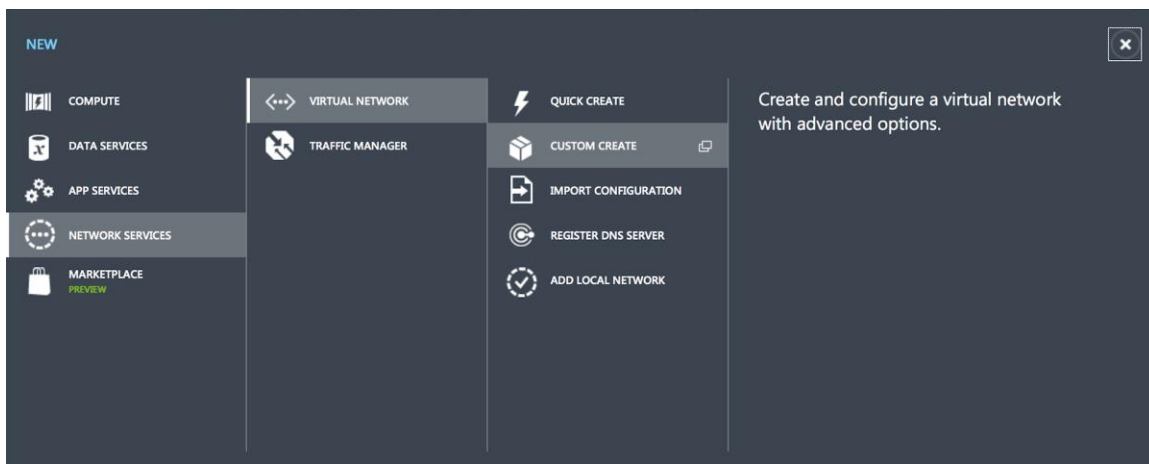
ASA side network:
On-premises network inside network 10.10.10.0/24

Creating the Azure VPN

In this section, we'll be creating a virtual network in the Azure portal.

Step 1: Create the virtual network:

After login to Azure portal, Click Network -> Click NEW -> CUSTOM CREATE



Step 2: Create new virtual network

Page 1: Virtual network details

In this first page fill in the name of virtual network and the location of your on premises network.

e.g. Name: My_First_Azure_Virtual_NW
Location: East US 2

Click Next ->

Virtual Network Details

NAME

My_First_Azure_Virtual_NW

LOCATION

East US 2

NETWORK PREVIEW

 My_First_Azure_Virtu...

2 3

Page 2: DNS Server and VPN Connectivity

At this point the DNS server detail is optional. Select check box "Configure a site-to-site VPN" and click Next ->

DNS Servers and VPN Connectivity

DNS SERVERS ?

ENTER NAME

IP ADDRESS

POINT-TO-SITE CONNECTIVITY ?

☐ Configure a point-to-site VPN


SITE-TO-SITE CONNECTIVITY ?

☒ Configure a site-to-site VPN☐ Use ExpressRoute

LOCAL NETWORK


Specify a New Local Network

NETWORK PREVIEW

 My_First_Azure_Virtu...

GATEWAY

VPN

 New Local Network

3 4

Page 3: Site-to-site Connectivity

In this page, fill in the name for on-premises and detail such as the ASA Outside (Public IP address) and Inside Network.

In our example:

Name: My_ASA (User defined name for the on-premises network)

VPN Device IP Address: 128.X.X.X (ASA outside interface IP (Public IP address))

Address: 10.10.10.1/24 (Your on-premises local network. Specify starting IP address of your network.)

CREATE A VIRTUAL NETWORK

Site-to-Site Connectivity

NAME:

VPN DEVICE IP ADDRESS:

ADDRESS SPACE

ADDRESS SPACE	STARTING IP	CIDR (ADDRESS COUNT)	USABLE ADDRESS RANGE
10.10.10.1/24	10.10.10.1	/24 (256)	10.10.10.0 - 10.10.10.255

[add address space](#)

NETWORK PREVIEW

My_First_Azure_Virtu... GATEWAY VPN My_ASA.

1 2 4

Click Next ->

Page 4: Virtual Network Address Spaces

In this page you have to allocate IP address that will be used for Azure Virtual Network. In our e.g. 192.168.10.0/24 is used

Starting IP: 192.168.10.1 (Starting IP address of your Virtual Network)

CIDR: 24 (Subnet Mask for the IP range)

Subnets:

Subnet-1: 192.168.10.1 / 27 (This Network will be used for Virtual Host in Azure Virtual Network)

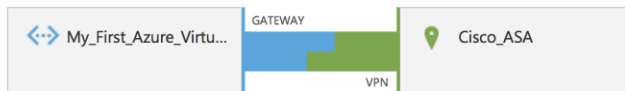
Gateway: 192.168.10.32 / 29 (This Network will be used for Virtual Azure Gateway)

Virtual Network Address Spaces

ADDRESS SPACE	STARTING IP	CIDR (ADDRESS COUNT)	USABLE ADDRESS RANGE
192.168.10.1/24	192.168.10.1	/24 (256)	192.168.10.0 - 192.168.10.255
SUBNETS			
Subnet-1	192.168.10.1	/27 (32)	192.168.10.0 - 192.168.10.31
Gateway	192.168.10.32	/29 (8)	192.168.10.32 - 192.168.10.39
add subnet		add gateway subnet	

add address space

NETWORK PREVIEW



Once done click complete.

It takes couple of minutes to create Virtual Network. Once created you'll see created Virtual Network under Network.

VIRTUAL NETWORKS LOCAL NETWORKS DNS SERVERS

NAME	STATUS	SUBSCRIPTION	LOCATION	
My_First_Azure_Virtual_NW	→ ✓ Created	Free Trial	East US 2	

Creating Gateway:

Once Virtual Network is created, we should create Gateway. Click on the newly created Virtual Network. e.g. Click "My_First_Azure_Virtual_NW".

Click "Create GATEWAY" which is available in the bottom of the screen and choose Static Routing and click "YES". It will take couple of minutes to create the gateway.

my_first_azure_virtual_nw

DASHBOARD CONFIGURE CERTIFICATES

virtual network

My_First_Azure_Virtu...
 THE GATEWAY WAS NOT CREATED.

GATEWAY

VPN

My_ASA

resources

NAME	ROLE	IP ADDRESS	SUBNET NAME
------	------	------------	-------------

quick glance

Download VPN Device Script

STATUS
Created

SUBSCRIPTION ID

VIRTUAL NETWORK ID

LOCATION

Static Routing

Dynamic Routing

CREATE GATEWAY

EXPORT

DELETE

Once the gateway is created, the gateway IP address will be displayed in the dashboard.

my_first_azure_virtual_nw

DASHBOARD CONFIGURE CERTIFICATES

virtual network

My_First_Azure_Virtu...

GATEWAY

VPN

My_ASA

DATA IN
0B

DATA OUT
0B

GATEWAY IP ADDRESS
104.x.x.x

resources

NAME	ROLE	IP ADDRESS	SUBNET NAME
------	------	------------	-------------

Configuring Cisco ASA:

In this section we'll configure site-to-site VPN on ASA 8.4 & 9.x and above.

Step 1: Access-list

Step 1a:

Create two object-group one with Azure Virtual Network subnet another object-group for On-Premises network, e.g.

```
object-group network azure-networks
description Azure-Virtual-Network
network-object 192.168.10.0 255.255.255.0
exit
object-group network onprem-networks
description On-premises Network
network-object 10.10.10.0 255.255.255.0
exit
```

Step 1b: Creating the access-list with the above object-group for identifying interesting traffic for the VPN.

```
access-list azure-vpn-acl extended permit ip object-group onprem-networks object-group azure-networks
```

Step 2: Creating Identity NAT

With same object-group create identity NAT for this VPN traffic

```
Nat (inside,outside) 1 source static onprem-networks onprem-networks destination static azure-networks
azure-networks
```

Step 3: Configuring IKEv1 Internet Key Exchange

Creating IKEv1 policy parameters for phase I.

```
crypto ikev1 policy 5
authentication pre-share
encryption aes-256
hash sha
group 2
lifetime 28800
```

```
crypto ikev1 enable outside (Outside is the interface name if)
```

Step 4: Configuring IPSec

Configuring IPSec parameters for Phase II.

In the below e.g. 104.x.x.x IP should be replaced by Gateway IP address, which is available under Network -> Virtual Network -> Click (Newly created Virtual Network) Under dashboard you'll get "GATEWAY IP ADDRESS" <Pre-Share-Key> should be replaced by Managed Share Key, which is available on same dashboard, click "Manage Key" available at bottom of the screen, copy "managed shared key" and replace "Pre-shared-key"

my_first_azure_virtual_nw

[DASHBOARD](#) [CONFIGURE](#) [CERTIFICATES](#)

virtual network

LAST GATEWAY EVENT The connectivity state for the local network site 'My_ASA' changed from Initializing to Connecting. 10/23/2015 4:57:41 PM



DATA IN

0B

DATA OUT

0B

GATEWAY IP ADDRESS

104.x.x.x

resources

NAME	ROLE	IP ADDRESS	SUBNET NAME
------	------	------------	-------------

quick glance

[Download VPN Device Script](#)

STATUS
Created

SUBSCRIPTION ID

[DELETE GATEWAY](#) [CONNECT](#) [EXPORT](#) [MANAGE KEY](#) [DELETE](#)

1 1

```
crypto ipsec ikev1 transform-set azure-ipsec-proposal-set esp-aes-256 esp-sha-hmac
crypto ipsec security-association lifetime seconds 3600
crypto ipsec security-association lifetime kilobytes 102400000
```

```
tunnel-group 104.x.x.x type ipsec-l2l
tunnel-group 104.x.x.x ipsec-attribute
ikev1 pre-shared-key <Pre-Shared-Key>
```

Step 5: Creating Crypto Map

Configure crypto map using below configuration, if your ASA already has existing crypto map use the same name with different priority number. Using “show run crypto map” CLI you can verify If ASA has existing crypto map, if it existing use same name instead of “azure-crypto-map”

```
crypto map azure-crypto-map 1 match address azure-vpn-acl
crypto map azure-crypto-map 1 set peer 104.x.x.x
crypto map azure-crypto-map 1 set ikev1 transform-set azure-ipsec-proposal-set

crypto map azure-crypto-map interface outside
```

Step 6: Adjusting TCPMMS value

To avoid fragmentation set TCPMMS value to 1350, use below CLI

```
“sysopt connection tcpmss 1350”
```


Step 7: Allow re-establishment of the L2L VPN Tunnel

To avoid tunnel drops use below CLI

“sysopt connection preserve-vpn-flows”

ASA configuration is now complete!

Verifying ASA configuration:

Once above configuration is completed, you can verify it

Verifying Object-group and Access-list:

Using “show run object-group” and “show run access-list” to verify object-group and Access-list.

My-ASA(config)# **show run object-group**

object-group network azure-networks

network-object 192.168.10.0 255.255.255.0

object-group network onprem-networks

network-object 10.10.10.0 255.255.255.0

My-ASA(config)# **show run access-list**

access-list azure-vpn-acl extended permit ip object-group onprem-networks object-group azure-networks

Verifying Crypto configuration:

To verify all crypto configuration, use “show run crypto” to verify configured crypto CLI.

My-ASA(Config)#**Show run crypto**

crypto ipsec ikev1 transform-set azure-ipsec-proposal-set esp-aes-256 esp-sha-hmac

crypto ipsec security-association lifetime seconds 3600

crypto ipsec security-association lifetime kilobytes 102400000

crypto map azure-crypto-map 1 match address azure-vpn-acl

crypto map azure-crypto-map 1 set peer 104.X.X.X

crypto map azure-crypto-map 1 set ikev1 transform-set azure-ipsec-proposal-set

crypto map azure-crypto-map interface outside

crypto ikev1 enable outside

crypto ikev1 policy 1

authentication pre-share

encryption aes-256

hash sha

group 2

lifetime 28800

Verify Tunnel group:


To verify tunnel group configuration, use CLI “Show run tunnel-group”

```
My-ASA(config)# show run tunnel-group
tunnel-group 104.210.13.15 type ipsec-l2l
tunnel-group 104.210.13.15 ipsec-attributes
ikev1 pre-shared-key *****
My-ASA(config)#
```

Establishing VPN:

Once the virtual network is created on Azure portal and the ASA is configured, its time to establish the VPN. You can establish/start VPN by clicking “Connect” under the Virtual Network Dashboard.


my_first_azure_virtual_nw

 DASHBOARD


CONFIGURE

CERTIFICATES


virtual network


 My_First_Azure_Virtu...

GATEWAY



VPN

 My_ASA

 DISCONNECTED

DATA IN

680B

DATA OUT


216B


GATEWAY IP ADDRESS


104.x.x.x


resources


NAME	ROLE	IP ADDRESS	SUBNET NAME	
------	------	------------	-------------	--

 DELETE GATEWAY

 CONNECT

 EXPORT

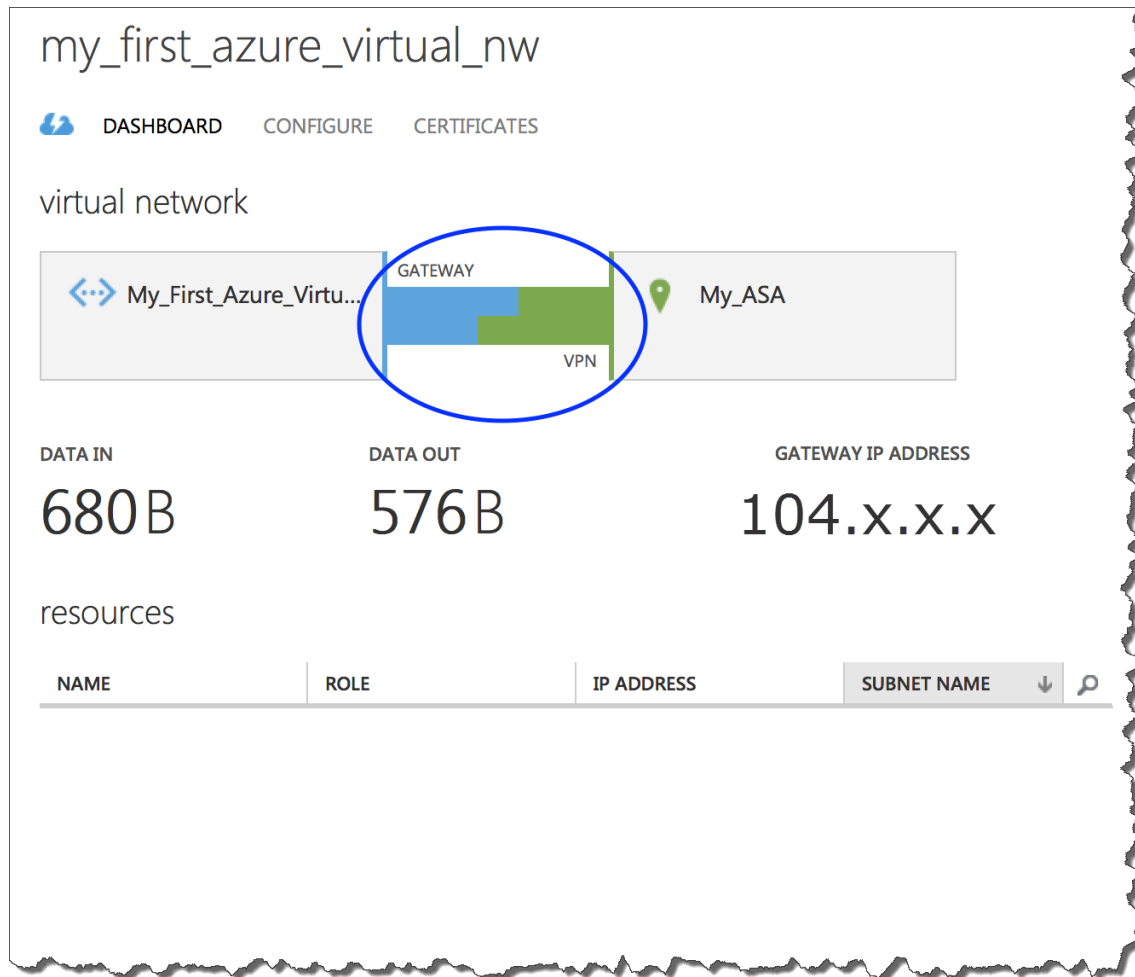
 MANAGE KEY

 DELETE

Verification:

Verification on Azure Portal:

Once the VPN is established, Virtual Network Dashboard would appear as below.



Verification on Cisco ASA:

On ASA you can verify use CLI "Show Crypto isakmp"
The output should show "MM_ACTIVE"

IKE Peer: 104.X.X.X

Type : L2L Role : responder
Rekey : no State : MM_ACTIVE

Also additionally you can verify using "Debug ICMP trace". Once you enable this Debug, we can see ICMP echo request packet coming from Azure Virtual Network

" ICMP echo request from outside:192.168.10.0 to inside:10.10.10.0 ID=1 seq=427 len=4 "

To Turn off Debug CLI "undebg all"

Testing with Traffic:

In order to test VPN with traffic, create a Virtual Host in Azure network using the created Virtual Network address space. Virtual Host will get an on IP from Subnet-1 192.168.10.4 – 30 range.

After turning off the firewall on the Virtual Host, you should be able to ping or RDP to the virtual host from host in on-premises network.