

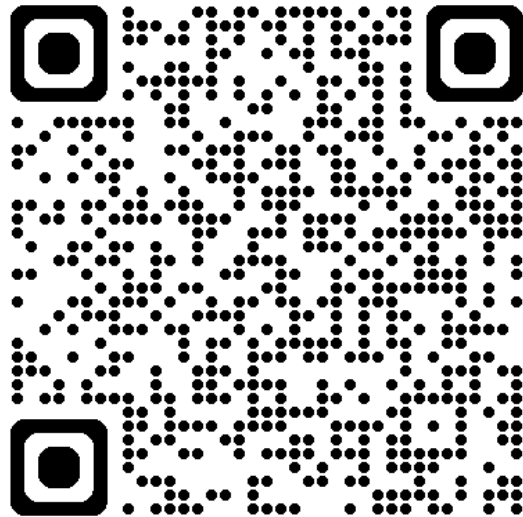


# An Introduction to Azure Virtual WAN

Jake Walsh

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*Please note – the views/opinions in this presentation are entirely my own.  
If in any doubt, please check latest documentation and MS Links for updated info!*



# Hello!

**Jake Walsh**

Senior Solution Architect @ CDW UK

@jakewalsh90  
jakewalsh.co.uk

*Please note – the views/opinions in this presentation are entirely my own.  
If in any doubt, please check latest documentation and MS Links for updated info!*

# Agenda

- Overview
- Use Cases & Core Components
- Why use Azure Virtual WAN?
- Security
- Expansion
- Getting Started
- Demo Environment (Time Permitting!)
- Resources to help – to be shared in slides afterwards.

# What is Azure Virtual WAN?

- Azure Virtual WAN is a **Networking Service** that brings various elements together in a single operational interface.
- Key Features Include:
  - Automated large-scale branch connectivity
  - Unified network and policy management
  - Optimised routing thanks to the Microsoft Global Network

**Azure Virtual WAN now generally available**

**Published date:** September 24, 2018

# What is Azure Virtual WAN?

Azure Virtual WAN is a **Networking Service** that brings various aspects together in a single Azure Service:

Hub / Spoke –  
replaced with Virtual  
WAN Hub and VNET  
Peering to Spokes

Routing and Route  
Tables – Automated

VPNs/ExpressRoute  
– Centralised  
Management

Firewalling – Azure  
native options and  
3<sup>rd</sup> Party NVAs



# Always improving...

[Learn](#) / [Azure](#) / [Networking](#) / [Virtual WAN](#) / 

Ask Learn

## What's new in Azure Virtual WAN?

Article • 04/21/2025 • 13 contributors 

Feedback

In this article

Recent releases

Preview

Known issues

Next steps

Azure Virtual WAN is updated regularly. Stay up to date with the latest announcements. This article provides you with information about:

- Recent releases
- Previews underway with known limitations (if applicable)
- Known issues
- Deprecated functionality (if applicable)

You can also find the latest Azure Virtual WAN updates and subscribe to the RSS feed [here](#).



Routing 

Expand table

Type	Area	Name	Description	Date added	Limitations
Feature	Routing	Route-maps	General Availability of Route-maps. Route-maps is a feature that gives you the ability to control route advertisements and routing for Virtual WAN virtual hubs.	April 2025	<a href="#">Known limitations</a>
Metric	Routing	<a href="#">New Virtual hub metrics</a>	There are now two new Virtual WAN hub metrics that display the virtual hub's capacity and spoke Virtual Machine (VM) utilization: <b>Routing Infrastructure Units</b> and <b>Spoke VM Utilization</b> .	August 2024	The <b>Spoke VM Utilization</b> metric represents an approximate number of deployed spoke VMs as a percentage of the total number of spoke VMs that the hub's routing infrastructure units can support.

<https://learn.microsoft.com/en-us/azure/virtual-wan/whats-new>

## Where is Virtual WAN available?

Geopolitical region	Azure regions
Australia Government	Australia Central, Australia Central 2
Europe	France Central, France South, Germany North, Germany West Central, North Europe, Norway East, Switzerland North, Switzerland West, West Europe, UK West, UK South
North America	East US, West US, East US 2, West US 2, Central US, South Central US, North Central US, West Central US, Canada Central, Canada East
Asia	East Asia, Southeast Asia
India	India West, India Central, India South
Japan	Japan West, Japan East
Oceania	Australia Southeast, Australia East
South Africa	South Africa North, South Africa West
South America	Brazil South
South Korea	Korea Central, Korea South
UAE	UAE North, UAE Central

- Most Azure Public Regions – some limitations around Reserved Access
- US Government and Azure China also available
- Availability Zones – key consideration

Geopolitical region	Azure regions
US Government cloud	US Gov Arizona, US Gov Iowa, US Gov Texas, US Gov Virginia, US DoD Central, US DoD East
China East	China East2
China North	China North2

<https://learn.microsoft.com/en-us/azure/virtual-wan/virtual-wan-locations-partners>

<https://azure.microsoft.com/en-us/explore/global-infrastructure/products-by-region/table>



# Use Cases

- The key aspect – **Bringing together** core networking features:
- Branch connectivity – route your branch to branch traffic via Microsoft's Network.
- Site-to-site VPN connectivity.
- Remote user VPN connectivity (point-to-site).
- Private connectivity (ExpressRoute).
- Intra-cloud connectivity (transitive connectivity for virtual networks).
- VPN ExpressRoute inter-connectivity.
- Routing Configuration – Route Tables, Custom Routing etc.
- Azure Firewall & Firewall Manager integration
- Transit & Internal Connectivity – Hub/Hub/Spoke/Spoke



# Virtual WAN is like a buffet...



Virtual WAN provides many services – you can choose which you want to use.

Some organisations will use many, others will use only a few.

Some will go back for a second helping!

# Two SKUs

Virtual WAN type	Hub type	Available configurations
Basic	Basic	Site-to-site VPN only
Standard	Standard	ExpressRoute User VPN (P2S) VPN (site-to-site) Inter-hub and VNet-to-VNet transiting through the virtual hub Azure Firewall NVA in a virtual WAN

## ⓘ Note

You can upgrade from Basic to Standard, but can't revert from Standard back to Basic.

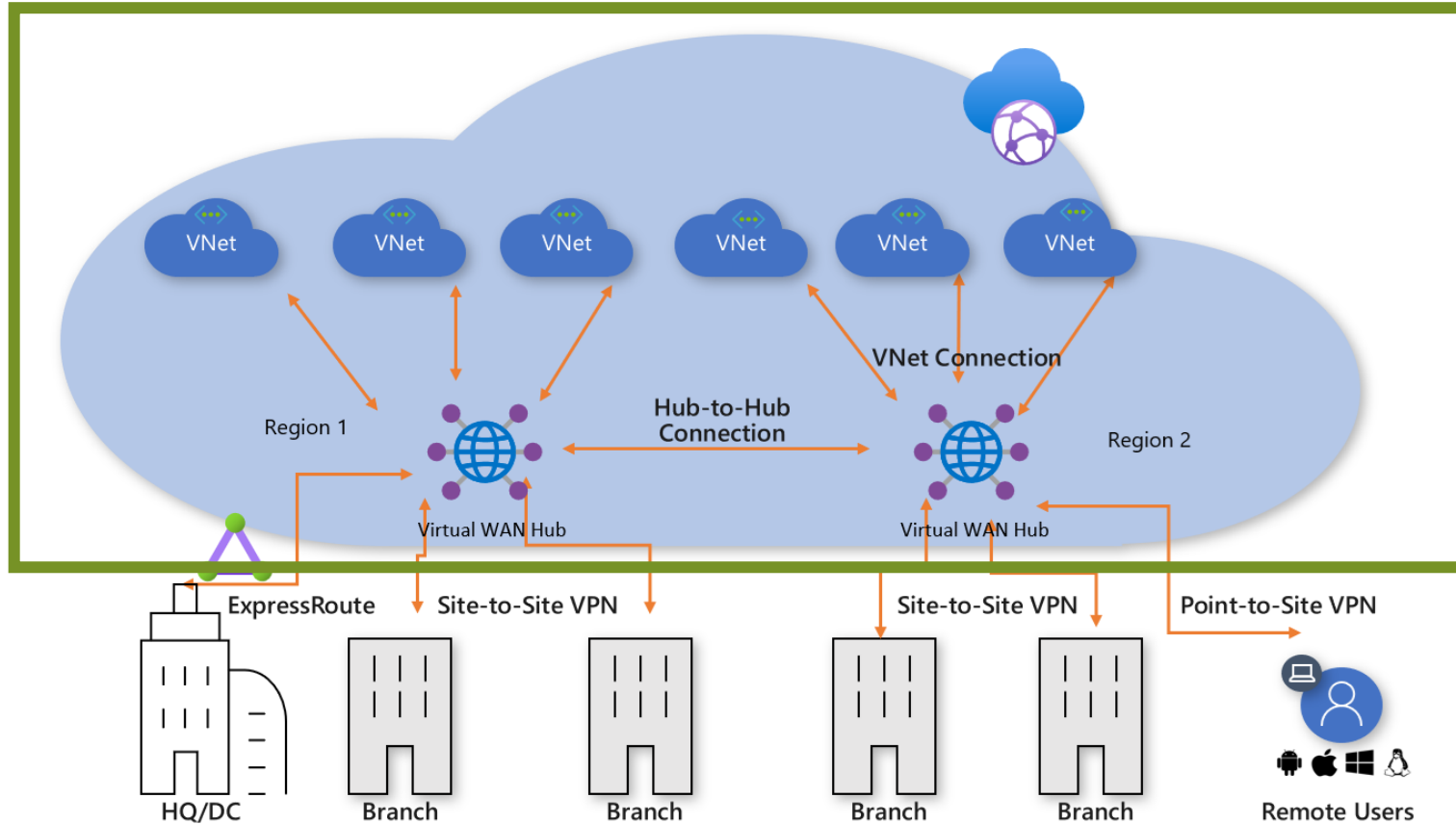
<https://learn.microsoft.com/en-us/azure/virtual-wan/virtual-wan-about>



# Core Components

- 5 Key Virtual WAN components you will likely use in all deployments that span **more than 1 Azure Region**:
  - Virtual WAN
  - Hub
  - **Hub to Hub Connection**
  - Hub Virtual Network Connection
  - Hub Route Table

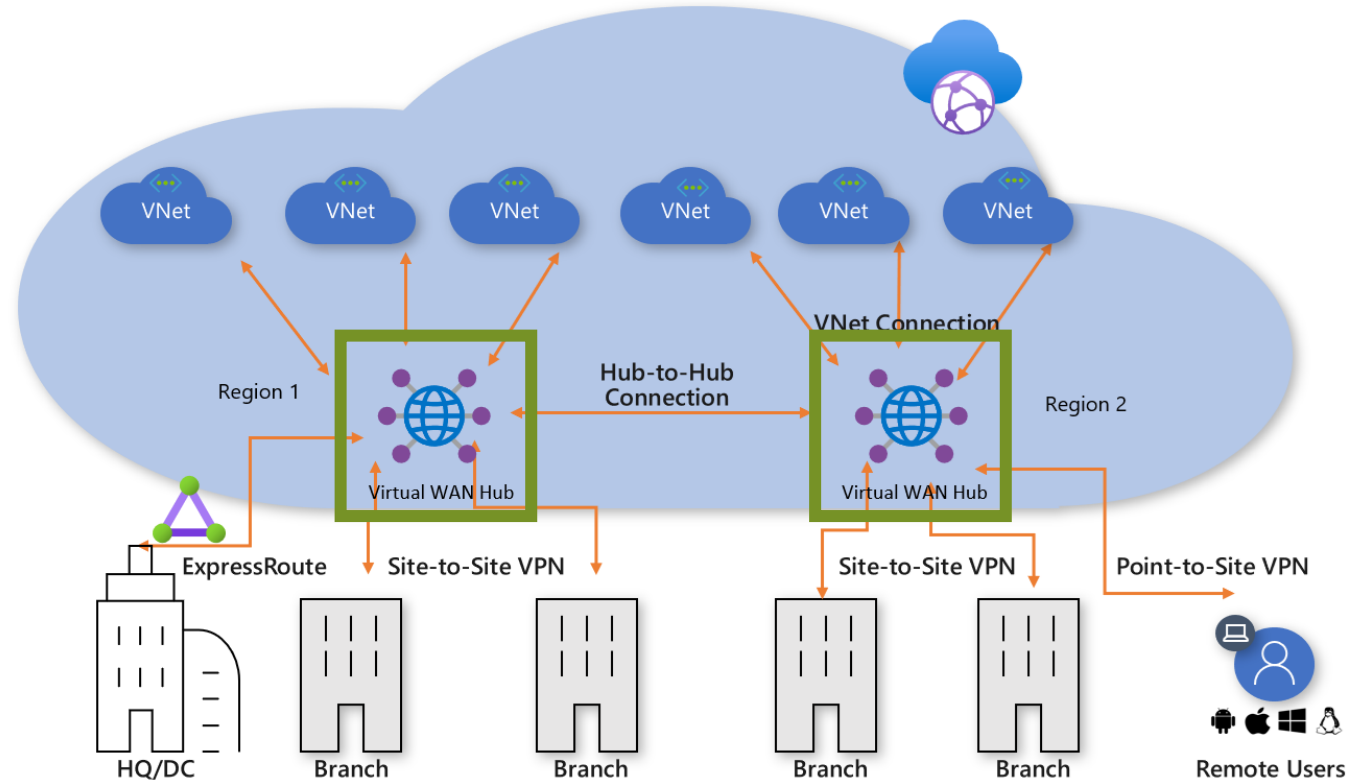
# Virtual WAN



- Virtual overlay of your Azure Networking
- A collection of multiple Resources
- Contains all Virtual WAN components within your topology
- The point of administration for your Virtual WAN deployment.

# Hub

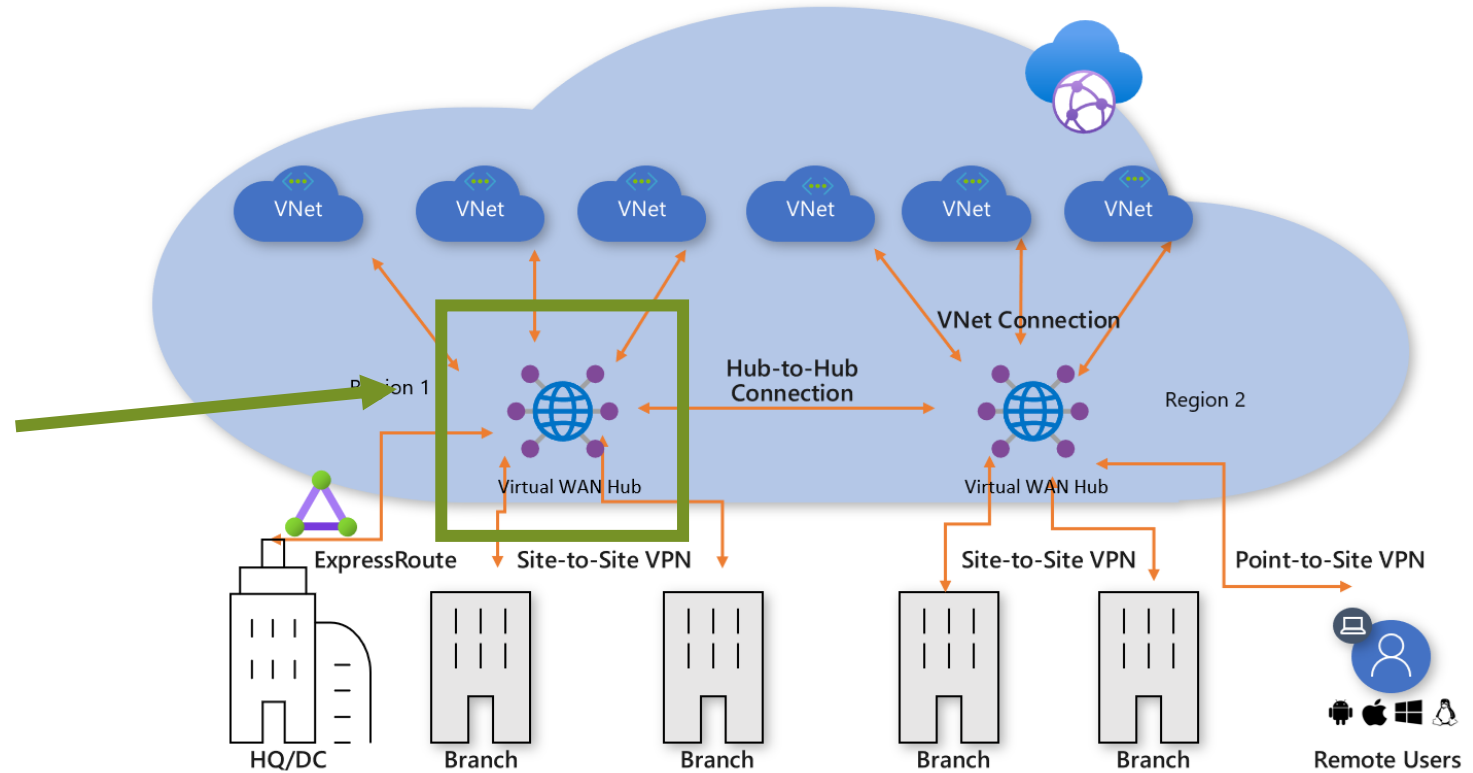
- The Virtual Hub is a Microsoft Managed Virtual Network, containing various service endpoints.
- The Hub is the Core of the Virtual WAN network in an Azure Region. Typically 1 Hub per Region but can be more.
- Gateways for VPN/ExpressRoute deployed within Hubs.
- Firewalls / NVAs deployed into Hubs.
- Note – consider routing units!



# What's in the Hub?

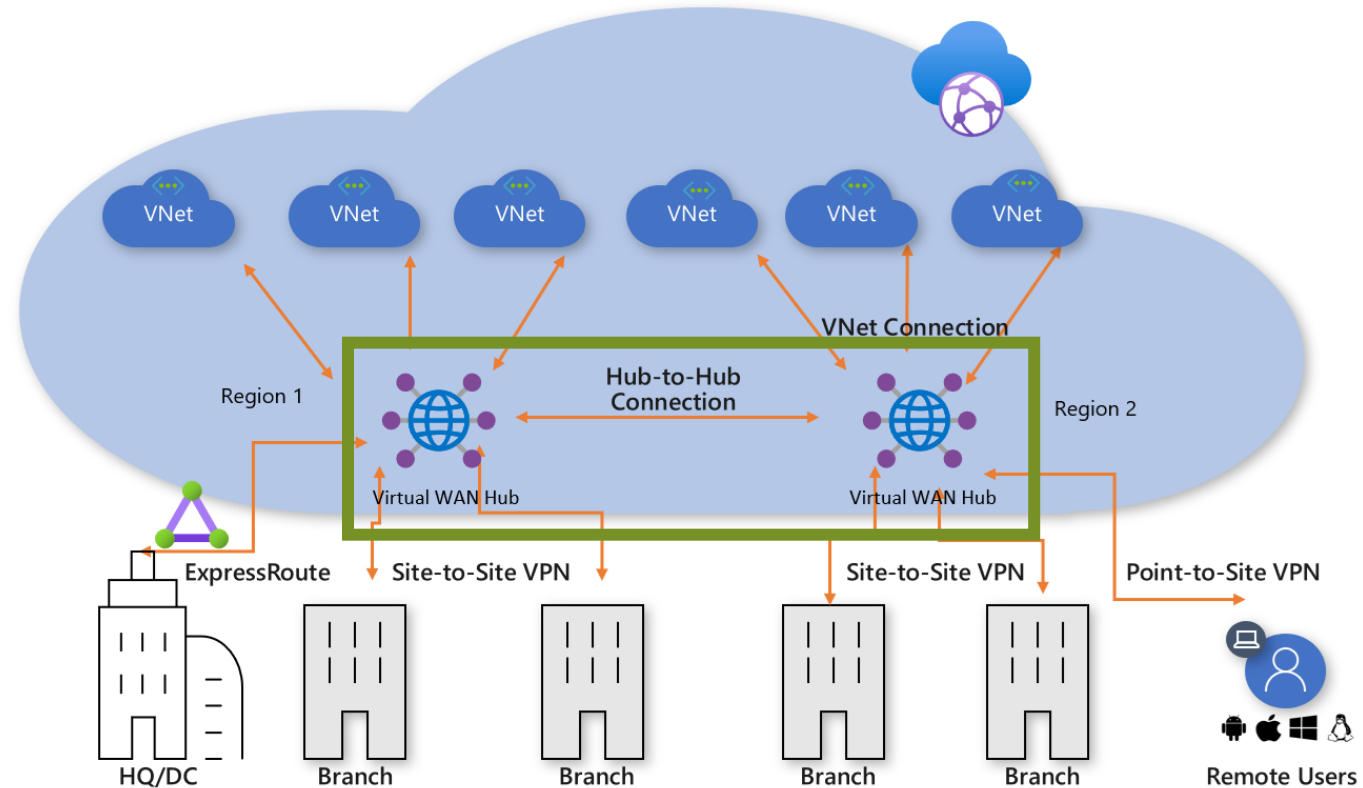
Items we can deploy into a Hub:

- Virtual Network Gateway
- ExpressRoute Gateway
- P2S Gateway
- Azure Firewall or NVA
- Route Tables
- Hub to Hub Connection



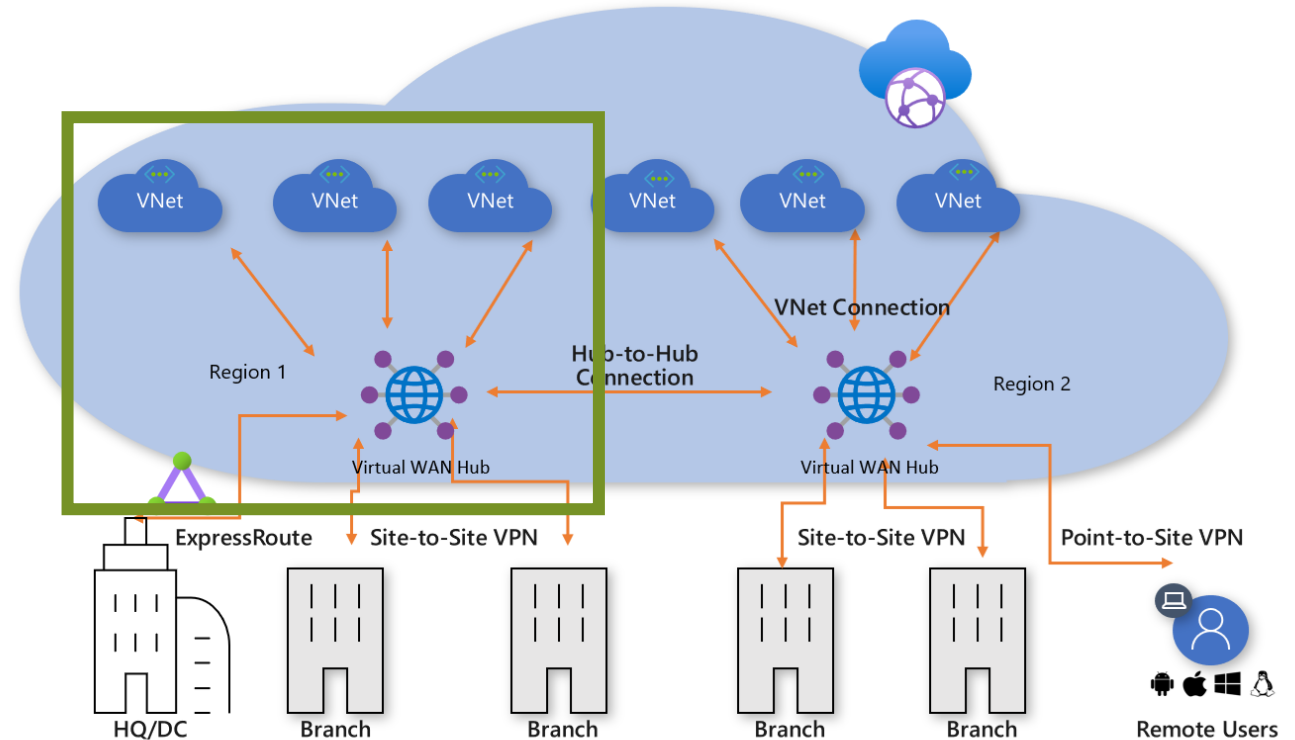
# Hub to Hub Connection

- Virtual WAN Hubs are connected within a Virtual WAN.
- Hubs can communicate freely and routing is propagated.
- Inter-Region connectivity is established using Virtual WAN Hubs.
- Connectivity can be controlled using a Firewall or NVA.



# Hub Virtual Network Connection

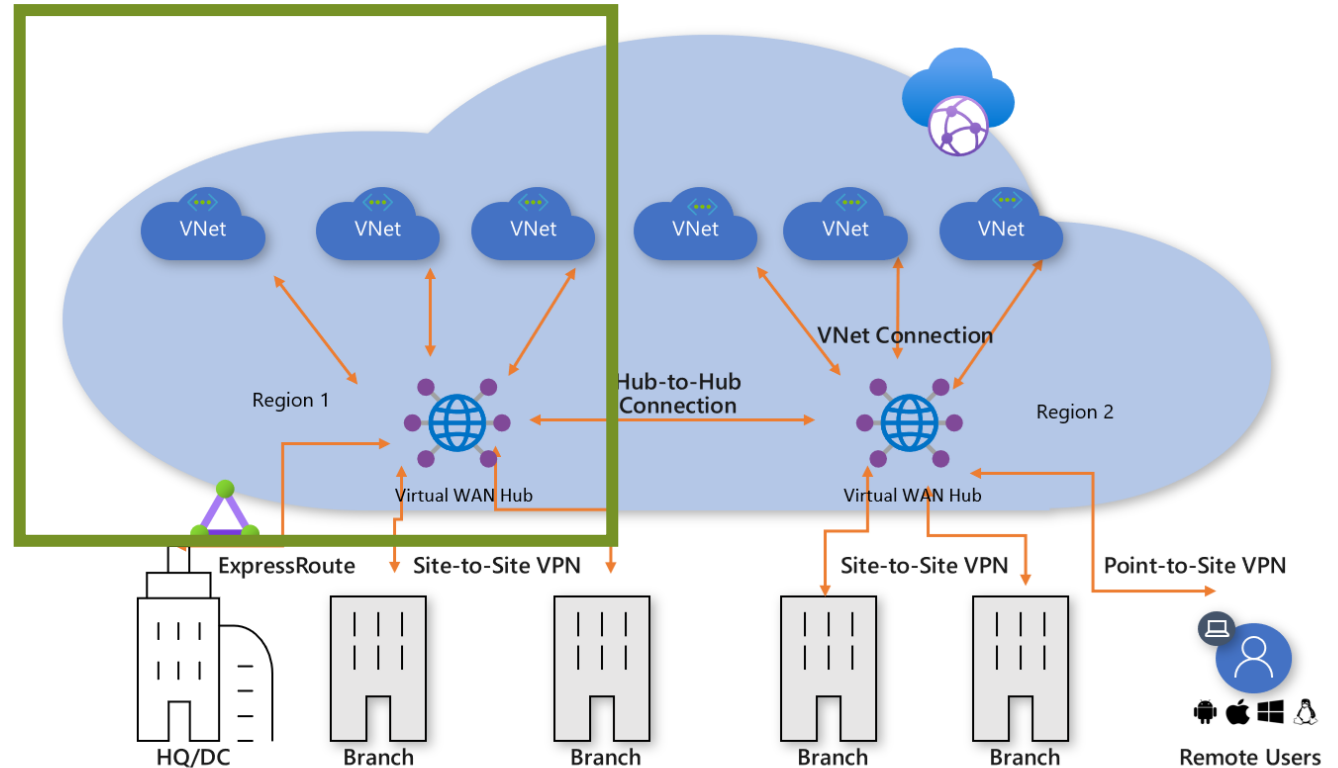
- A Hub Virtual Network connection joins a spoke network to a Virtual WAN Hub.
- A Virtual Network can be connected to a single Virtual WAN hub.
- Traffic is enabled between the Virtual WAN Hub and Spoke Virtual Network.
- Azure Firewall or an NVA is used in many cases to control this traffic.





# Hub Route Table

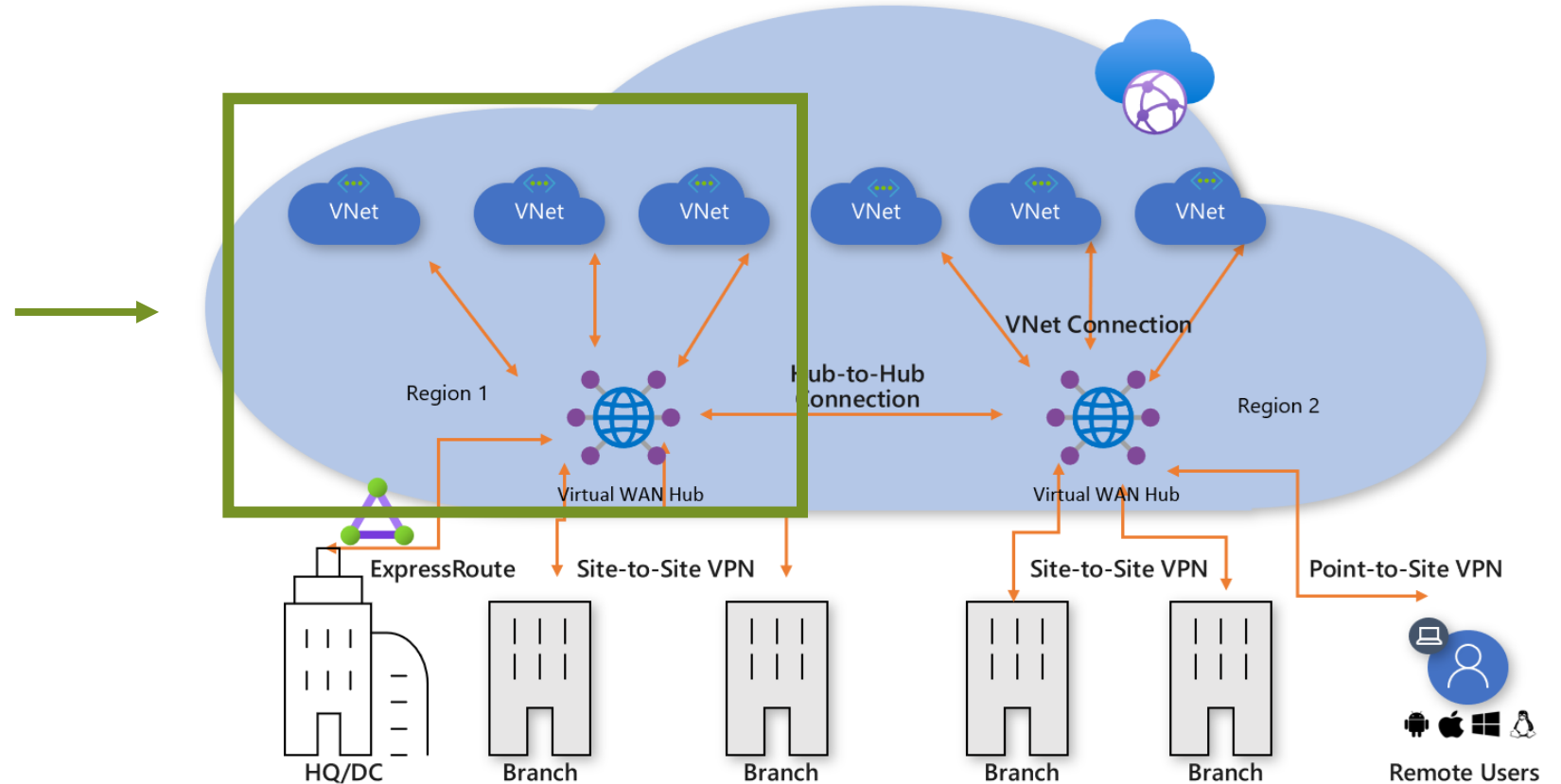
- Each Hub has its own default route table. This can be edited to add static routes if required.
- Static routes take precedence over dynamic routes.
- Associated with a Hub and it's connected Virtual Networks.
- Connections, e.g. VPN, ExpressRoute or PS2 will also have a routing configuration that propagates to a route table.
- Labels can be used to logically group route tables.



<https://learn.microsoft.com/en-us/azure/virtual-wan/about-virtual-hub-routing#considerations>

# What about Hub and Spoke?

- Virtual WAN replaces an existing Hub Spoke architecture with Spoke VNets peered into a Virtual WAN Hub.
- Hubs become fully managed by Virtual WAN.
- Central management of all Hubs in the topology.
- All Spokes peer into a Virtual WAN Hub, with connectivity and inter-region traffic routed via the Hub.





## Why Virtual WAN? Core Benefits:

- **An Integrated Solution** – All core networking aspects in a single control Resource. Site to Site and Connectivity options are easily accessed and managed. **Simple administration!**
- **An Automated Solution** – Connect Virtual Networks to the Hubs easily, and also bring additional services into Virtual WAN with ease – again, centralised, simplified and automated is the key.
- **Troubleshooting** – End to End visibility, allowing rapid diagnosis of issues and simple troubleshooting.
- **Centralised Control** – A centralised service that brings core networking together, removing the need to configure and manage multiple separate resources.
- **Firewalling** – Integrations to Azure Firewall, Azure Firewall Manager, and NVA options.
- **Rapid Expansion** – Simple expansion to other Regions, with automated routing and simplified connectivity via the Global Transit Architecture.

**An Integrated Solution** – All core networking aspects in a single control Resource. Site to Site and Connectivity options are easily accessed and managed. **Simple administration!**

Home > All resources >

virtual-wan-demo-01

Virtual WAN

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Resource visualizer

Settings

- Configuration
- Properties
- Locks

Connectivity

Monitor

Automation

Help

Delete

Refresh

Essentials

JSON View

Resource group : [rg-uksouth-Virtual-WAN-Demo](#)

Location : UK South

Subscription : [dev.jakewalsh.co.uk - MVP Credit](#)

Subscription ID :

Tags ([edit](#)) : Environment : jakewalsh90-virtual-wan-DemoLab

Status : ✔ Succeeded

Branch-to-branch : Enabled

Virtual hubs : 2

Topology : [View Topology](#)

World map


Virtual hubs

[Clear all filters](#)

+ Add filter

Hub	Hub status	Address Space	Region	VPN sites	Azure Firewall	Point-to-site	ExpressRoute circuits	Virtual network conn...
<a href="#">uksouth-virtual-wan-hu</a>	<span>✔ Succeeded</span>	10.10.0.0/21	UK South	No VPN gateway	<span>✔ Deployed</span>	No P2S gateway	No ExpressRoute gate...	<span>✔ All connected</span> ...
<a href="#">eastus-virtual-wan-hub</a>	<span>✔ Succeeded</span>	10.20.0.0/21	East US	No VPN gateway	<span>✔ Deployed</span>	No P2S gateway	No ExpressRoute gate...	<span>✔ All connected</span> ...

**An Integrated Solution** – All core networking aspects in a single control Resource. Site to Site and Connectivity options are easily accessed and managed. **Simple administration!**

 **virtual-wan-demo-01**  
Virtual WAN

◊ « 🗑️ Delete 🔄 Refresh

Overview

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Settings

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Resource group : [rg-uksouth-Virtual-WAN-Demo](#)

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Subscription ID :

Tags [\(edit\)](#) : Environment : jakewalsh90-virtual-wan-DemoLab

Status : ✅ Succeeded

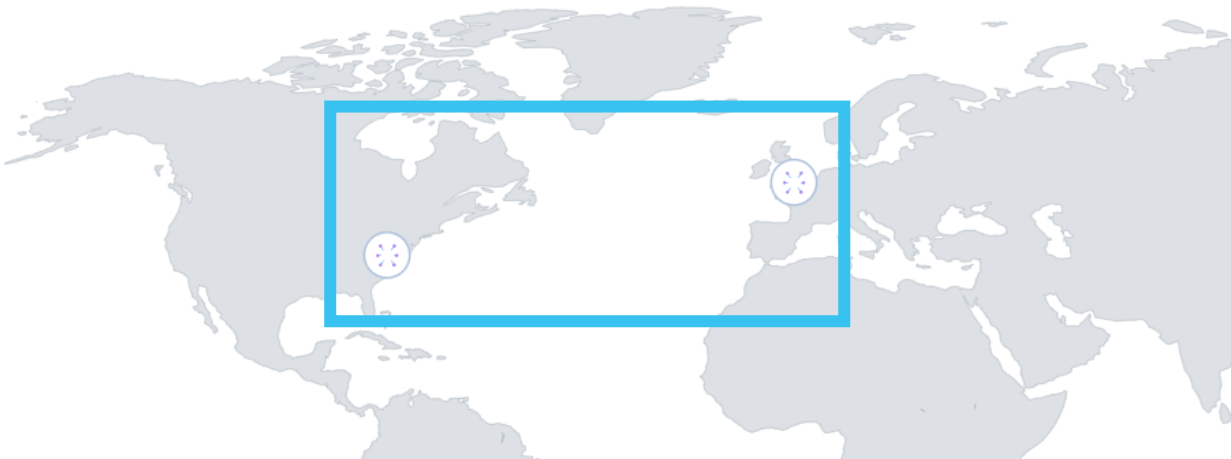
Branch-to-branch : Enabled

Virtual hubs : 2




Topology : [View Topology](#)



World map






Virtual hubs





**An Automated Solution** – Connect Virtual Networks to the Hubs easily, and also bring additional services into Virtual WAN with ease – again, centralised, simplified and automated is the key.


 **uksouth-virtual-wan-hub-01**    
Virtual HUB


 


 Edit virtual hub  Delete  Refresh  Reset router  Reset Hub


 Overview


 Connectivity

 Routing

 Security

 Third party providers


 Monitor

 Manage security provider and route settings for this Secured virtual hub in Azure Firewall Manager →

### Essentials

Name : [uksouth-virtual-wan-hub-01](#)

Resource group : [rg-uksouth-Virtual-WAN-Demo](#)


Hub status :  Succeeded

Private address space : 10.10.0.0/21

Location : UK South


Tags [\(edit\)](#) : Environment : jakewalsh90-virtual-wan-DemoLab



Router version : Latest



Routing status :  Provisioned



Hub routing preference : ExpressRoute



Metrics : [View in Azure Monitor](#)



**Virtual network connections**  
Connect virtual networks to a virtual hub.  
vNet connections: 1

**VPN (Site to site)**  
Connect a VPN Site to a virtual hub VPN Gateway.  
 No gateway [\(Create\)](#)

**User VPN (Point to site)**  
Connect a User VPN Configuration to a virtual hub User VPN Gateway.  
 No gateway [\(Create\)](#)

**ExpressRoute**  
Connect an ExpressRoute circuit to a virtual hub ExpressRoute Gateway.  
 No gateway [\(Create\)](#)

**Azure Firewall**  
Secure your virtual hub by installing Azure Firewall.  
 Secured  
Security Partner Provider: --

**Network Virtual Appliance**  
Deploy third-party appliances in your virtual hub for connectivity or firewall purposes.  
 No gateway [\(Create\)](#)

## Troubleshooting – End to End visibility, logging, and rapid diagnosis of issues and simple troubleshooting.



### uksouth-virtual-wan-hub-01 | Activity Log

Virtual HUB

Search

Overview

Connectivity

VPN (Site to site)

ExpressRoute

User VPN (Point to site)

Routing

Route Maps

Routing Intent and Routing Policies

BGP Peers

Route Tables

Effective Routes

Security

Azure Firewall and Firewall Manager

Third party providers

Network Virtual Appliance

SaaS Solutions

Monitor

Activity Log

Activity Edit columns Refresh Export Activity Logs Download as CSV Insights Feedback Pin current filters Reset filters

Looking for Log Analytics? In Log Analytics you can search for performance, diagnostics, health logs, and more. [Visit Log Analytics](#)

Search

Quick Insights

Management Group : None

Subscription : dev.jakewalsh.co.uk - MVP Credit

Event severity : All

Timespan : Last 6 hours

Resource group : rg-uksouth-Virtual

Resource : uksouth-virtual-wan-hub-01 Add Filter

10 items.

Operation name	Status	Time	Time stamp	Subscription
Create or update a HubVirtualNetworkConnection	Succeeded	35 minutes ...	Mon Jun 02 2025 09:46...	dev.jakewalsh.co.uk - MVP Credit
Create or update a Virtual Hub	Started	59 minutes ...	Mon Jun 02 2025 09:22...	dev.jakewalsh.co.uk - MVP Credit
Create or update a Virtual Hub	Accepted	59 minutes ...	Mon Jun 02 2025 09:22...	dev.jakewalsh.co.uk - MVP Credit
Get a Virtual Hub	Running	57 minutes ...	Mon Jun 02 2025 09:24...	dev.jakewalsh.co.uk - MVP Credit
Get a Virtual Hub	Running	55 minutes ...	Mon Jun 02 2025 09:26...	dev.jakewalsh.co.uk - MVP Credit
Get a Virtual Hub	Running	55 minutes ...	Mon Jun 02 2025 09:26...	dev.jakewalsh.co.uk - MVP Credit
Get a Virtual Hub	Running	54 minutes ...	Mon Jun 02 2025 09:27...	dev.jakewalsh.co.uk - MVP Credit
Create or update a Virtual Hub	Succeeded	54 minutes ...	Mon Jun 02 2025 09:27...	dev.jakewalsh.co.uk - MVP Credit
Create or update a HubVirtualNetworkConnection	Started	38 minutes ...	Mon Jun 02 2025 09:43...	dev.jakewalsh.co.uk - MVP Credit
Create or update a HubVirtualNetworkConnection	Accepted	38 minutes ...	Mon Jun 02 2025 09:43...	dev.jakewalsh.co.uk - MVP Credit

**Troubleshooting** – End to End visibility, logging, and rapid diagnosis of issues and simple troubleshooting.





## Network Insights VirtualWANs Minified



Network Insights VirtualWANs Minified



 Workbooks  Edit      ? Help  Auto refresh: Off

Virtual WAN: virtual-wan-demo-01 

Time Range: Last 24 hours 

### Virtual WAN Hub Capacities

 Search

Virtual Hub	↑↓	VPN Gateway Scale Units	↑↓	P2S Gateway Scale Units	↑↓	ER Gateway Scale Units
 eastus-virtual-wan-hub-02	-		-		-	
 uksouth-virtual-wan-hub-01	-		-		-	



## Troubleshooting – End to End visibility, logging, and rapid diagnosis of issues and simple troubleshooting.



### Metrics



Network Insights VirtualWANs

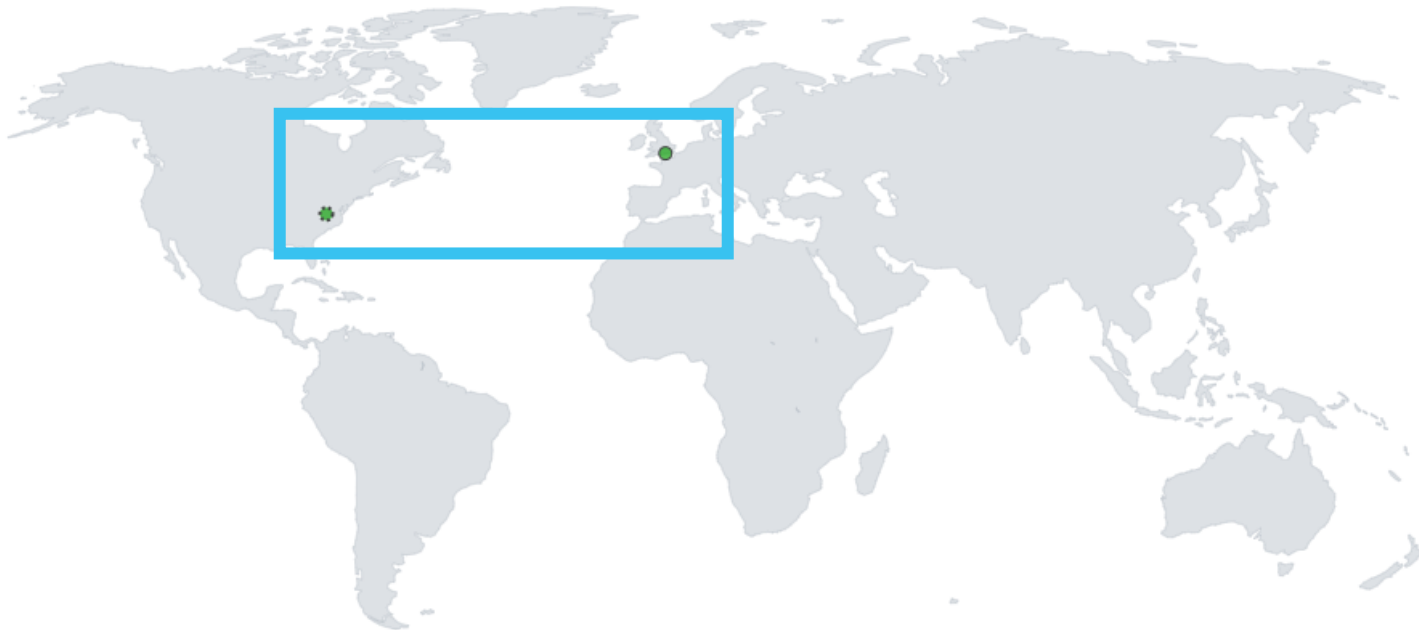
Workbooks Edit Help Auto refresh: Off

Virtual WAN: virtual-wan-demo-01 ▾

Time Range: Last 24 hours ▾

#### Virtual WAN Regional Hub Status and Hub Capacities (Gbps)

**Geographical Hub Location Map** displays the Virtual WAN hubs that are deployed in various Azure regions. **Virtual WAN Hubs Status** is indicated by Green or Red color - Green indicates that one or more of the gateways are in a failed state. **Virtual WAN Hub Capacity** is the total capacity in Gbps of each hub displayed below the map. The hub capacity is derived by # of gateway scale units \* bandwidth of each scale unit in Gbps)








**Centralised Control** – A centralised service that brings core networking together, removing the need to configure and manage multiple separate resources.

## uksouth-virtual-wan-hub-01


Virtual HUB

 Search  


 Edit virtual hub  Delete  Refresh  Reset router  Reset Hub


### Overview

- > Connectivity
- > Routing
- > Security
- > Third party providers
- > Monitor

 Manage security provider and route settings for this Secured virtual hub in Azure Firewall Manager →

#### ^ Essentials

Name : [uksouth-virtual-wan-hub-01](#)  
Resource group : [rg-uksouth-Virtual-WAN-Demo](#)  
Hub status :  Succeeded  
Private address space : 10.10.0.0/21  
Location : UK South  
Tags ([edit](#)) : Environment : iakewalsh90-virtual-wan-DemoLab

Router version : Latest  
Routing status :  Provisioned  
Hub routing preference : ExpressRoute  
Metrics : [View in Azure Monitor](#)

JSC

#### Virtual network connections

Connect virtual networks to a virtual hub.

vNet connections: 1

#### VPN (Site to site)

Connect a VPN Site to a virtual hub VPN Gateway.

 No gateway ([Create](#))

#### User VPN (Point to site)

Connect a User VPN Configuration to a virtual hub User VPN Gateway.

 No gateway ([Create](#))

#### ExpressRoute

Connect an ExpressRoute circuit to a virtual hub ExpressRoute Gateway.

 No gateway ([Create](#))

#### Azure Firewall


Secure your virtual hub by installing Azure Firewall.

 Secured

Security Partner Provider: --

#### Network Virtual Appliance

Deploy third-party appliances in your virtual hub for connectivity or firewall purposes.

 No gateway ([Create](#))

## Firewalling – Integrations to Azure Firewall, Azure Firewall Manager, and NVA options.



### uksouth-virtual-wan-hub-01 | Azure Firewall and Firewall Manager

Search

+ Create new secured virtual hub Refresh Manage security

Overview

Connectivity

VPN (Site to site)

ExpressRoute

User VPN (Point to site)

Routing

Route Maps

Routing Intent and Routing Policies

BGP Peers

Route Tables

Effective Routes

Security

Azure Firewall and Firewall Manager

Third party providers

Search for hubs by name

Clear all filters

subscription : dev.jakewalsh.co.uk - MVP Credit

	Name	Azure firewall policy	Firewall name	Resource group	Location	Security parti
<input type="checkbox"/>	uksouth-virtual-wan-hub-01	fw-pol01	uksouth-fw01	rg-uksouth-virtual-wan-demo	uksouth	

**Rapid Expansion** – Simple expansion to other Regions, with automated routing and simplified connectivity.

virtual-wan-demo-01 | Hubs

Virtual WAN

Search

+ New Hub

Refresh

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Resource visualizer

Settings

Configuration

Properties

Locks

Connectivity

Hubs





VPN sites

User VPN configurations

Search for hubs by name

Clear all filters

Add filter

Hub	Hub status	Region	VPN sites	Address Space	Point-to-site
 <a href="#">uksouth-virtual-wan-hub-01</a>	 Succeeded	UK South	-	10.10.0.0/21	-
 <a href="#">eastus-virtual-wan-hub-02</a>	 Succeeded	East US	-	10.20.0.0/21	-


# Security Options

- There are numerous security aspects within Azure Virtual WAN – I'll cover a few key aspects today (there is **far** too much to cover on security in just this session!):
  - Azure Firewall, NVA, SaaS Options
  - Monitoring
  - Administration
  - Azure Security Baseline for Virtual WAN

## Azure Firewall, SaaS, and NVA Options


- Virtual WAN supports Azure Firewall, SaaS, and NVA options via supported vendors
- NVAs = Deployment Process
- Azure Firewall – convert Standard to Secured Hub

- BGP Peers
- Route Tables
- Effective Routes
- ✓ Security
  - Azure Firewall and Firewall Manager
- ✓ Third party providers
  - Network Virtual Appliance
  - SaaS Solutions
- ✓ Monitor
  - Activity Log

 **Virtual network connections**


Connect virtual networks to a virtual hub.

vNet connections: 1

 **VPN (Site to site)**


Connect a VPN Site to a virtual hub VPN Gateway.

● No gateway ([Create](#))

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Connect a User VPN Configuration to a virtual hub User VPN Gateway.


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Secure your virtual hub by installing Azure Firewall.

✓ Secured

Security Partner Provider: --

 **Network Virtual Appliance**

Deploy third-party appliances in your virtual hub for connectivity or firewall purposes.


● No gateway ([Create](#))

### Network Virtual Appliance

Choose the network virtual appliance you would like to deploy to this virtual hub

Network Virtual Appliance

arubaedgeconnectenterprise



arubaedgeconnectenterprise

barracuda sdwan release

barracudasdwanrelease

checkpoint

cisco-tdv-vwan-nva

ciscosdwan

fortinet-ngfw

fortinet-sdwan-and-ngfw

fortinet

versanetworks

vmware sdwan in vwan

vmwaresdwaninvwan

SAAS Offering: <https://learn.microsoft.com/en-us/azure/virtual-wan/how-to-palo-alto-cloud-ngfw>



# Azure Firewall and NVA Options

- **Pre-defined and pre-tested selection of infrastructure choices (NVA Infrastructure Units)**
- **Built-in availability and resiliency**
- **No-hassle provisioning and boot-strapping**
- **Simplified routing**
- **Integrated support**
- **Optional platform-provided lifecycle management**
- **Integrated with platform features**

# Azure Firewall and NVA Options

The following SD-WAN connectivity Network Virtual Appliances can be deployed in the Virtual WAN hub.

Expand table

Partners	Virtual WAN NVA Vendor Identifier	Configuration/How-to/Deployment guide	Dedicated support model
Barracuda Networks <a href="#">↗</a>	barracudasdwanrelease	Barracuda SecureEdge for Virtual WAN Deployment Guide <a href="#">↗</a>	Yes
Cisco SD-WAN <a href="#">↗</a>	ciscosdwan	The integration of the Cisco SD-WAN solution with Azure virtual WAN enhances Cloud OnRamp for Multi-Cloud deployments and enables configuring Cisco Catalyst 8000V Edge Software (Cisco Catalyst 8000V) as a network virtual appliance (NVA) in Azure Virtual WAN hubs. View <a href="#">Cisco SD-WAN Cloud OnRamp, Cisco IOS XE Release 17.x configuration guide</a> <a href="#">↗</a>	Yes
VMware SD-WAN <a href="#">↗</a>	vmwaresdwaninwvan	VMware SD-WAN in Virtual WAN hub deployment guide <a href="#">↗</a> . The managed application for deployment can be found at this <a href="#">Azure Marketplace link</a> <a href="#">↗</a> .	Yes
Versa Networks <a href="#">↗</a>	versanetworks	If you're an existing Versa Networks customer, log on to your Versa account and access the deployment guide using the following link <a href="#">Versa Deployment Guide</a> <a href="#">↗</a> . If you're a new Versa customer, sign-up using the <a href="#">Versa preview sign-up link</a> <a href="#">↗</a> .	Yes
Aruba EdgeConnect <a href="#">↗</a>	arubaedgeconnectenterprise	Aruba EdgeConnect SD-WAN deployment guide <a href="#">↗</a> . <b>Currently in Preview.</b> <a href="#">Azure Marketplace link</a> <a href="#">↗</a>	No

Partners	Virtual WAN NVA Vendor	Configuration/How-to/Deployment guide	Dedicated support model
Check Point CloudGuard Network Security for Azure Virtual WAN <a href="#">↗</a>	checkpoint	<a href="#">Check Point Network Security for Virtual WAN</a> <a href="#">↗</a> deployment guide	No
Fortinet Next-Generation Firewall (NGFW) <a href="#">↗</a>	fortinet-ngfw	<a href="#">Fortinet NGFW</a> <a href="#">↗</a> deployment guide. Fortinet NGFW supports up to 80 scale units and isn't recommended to be used for SD-WAN tunnel termination. For Fortigate SD-WAN tunnel termination, see <a href="#">Fortinet SD-WAN and NGFW documentation</a> <a href="#">↗</a> .	No
Cisco Secure Firewall Threat Defense for Azure Virtual WAN <a href="#">↗</a>	cisco-tdv-vwan-nva	<a href="#">Cisco Secure Firewall Threat Defense for Azure Virtual WAN</a> <a href="#">↗</a> deployment guide	No

The following dual-role SD-WAN connectivity and security (Next-Generation Firewall) Network Virtual Appliances can be deployed in the Virtual WAN hub. These Virtual Appliances can be used to inspect all North-South, East-West, and Internet-bound traffic.

Expand table

Partners	Virtual WAN NVA Vendor	Configuration/How-to/Deployment guide	Dedicated support model
Fortinet Next-Generation Firewall (NGFW) <a href="#">↗</a>	fortinet-sdwan-and-ngfw	<a href="#">Fortinet SD-WAN and NGFW NVA</a> <a href="#">↗</a> deployment guide. Fortinet SD-WAN and NGFW NVA support up to 20 scale units and supports both SD-WAN tunnel termination and Next-Generation Firewall capabilities.	No

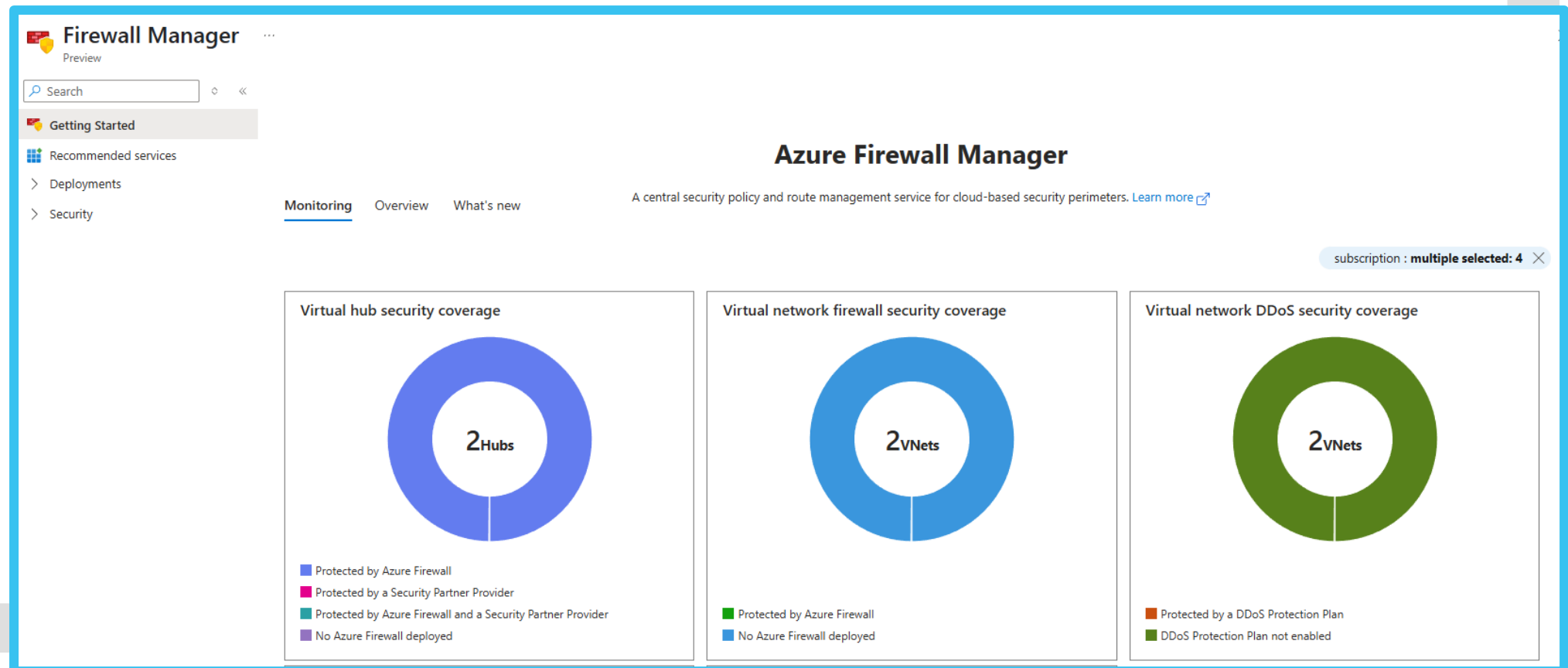
<https://learn.microsoft.com/en-us/azure/virtual-wan/about-nva-hub#partners>



# Azure Firewall!





- Azure Firewall provides an Azure Native Firewall option that can be controlled and Managed using Azure Firewall Manager










# Azure Firewall


- Central Hub Management and Policy control:


**Firewall Manager | Virtual Hubs**  


Preview


Search    Create new secured virtual hub  Refresh  Manage security 


 Getting Started


 Recommended services



 Deployments







 Virtual Networks

 **Virtual Hubs**

 Application Delivery Platforms

 Security

Search for hubs by name  Clear all filters subscription : **multiple selected: 4** 

	Name	↑↓	Azure firewall policy	↑↓	Firewall name	↑↓	Resource group	↑↓	Location	↑↓
<input type="checkbox"/>	 eastus-virtual-wan-hub-02		 fw-pol01		 eastus-fw01		rg-eastus-virtual-wan-demo		eastus	
<input type="checkbox"/>	 uksouth-virtual-wan-hub-01		 fw-pol01		 uksouth-fw01		rg-uksouth-virtual-wan-demo		uksouth	

<https://learn.microsoft.com/en-us/azure/virtual-wan/howto-firewall>

# Monitoring – the importance of Metrics!

- Like many Azure Services – Virtual WAN has a huge range of Metrics you can monitor.
- The Azure Virtual WAN monitoring data reference is the guide to these metrics.

## Azure Virtual WAN monitoring data reference

Article • 11/01/2024 • 8 contributors

[Feedback](#)

### In this article

[Metrics](#)  
[Metric dimensions](#)  
[Resource logs](#)  
[Azure Monitor Logs tables](#)  
[Show 2 more](#)

This article contains all the monitoring reference information for this service.

See [Monitor Azure Virtual WAN](#) for details on the data you can collect for Virtual WAN and how to use it.

## Metrics

This section lists all the automatically collected platform metrics for this service. These metrics are also part of the global list of [all platform metrics supported in Azure Monitor](#).

For information on metric retention, see [Azure Monitor Metrics overview](#).

### Supported metrics for Microsoft.Network/virtualhubs

The following table lists the metrics available for the Microsoft.Network/virtualhubs resource type.

- All columns might not be present in every table.
- Some columns might be beyond the viewing area of the page. Select **Expand table** to view all available columns.

## Category: Traffic

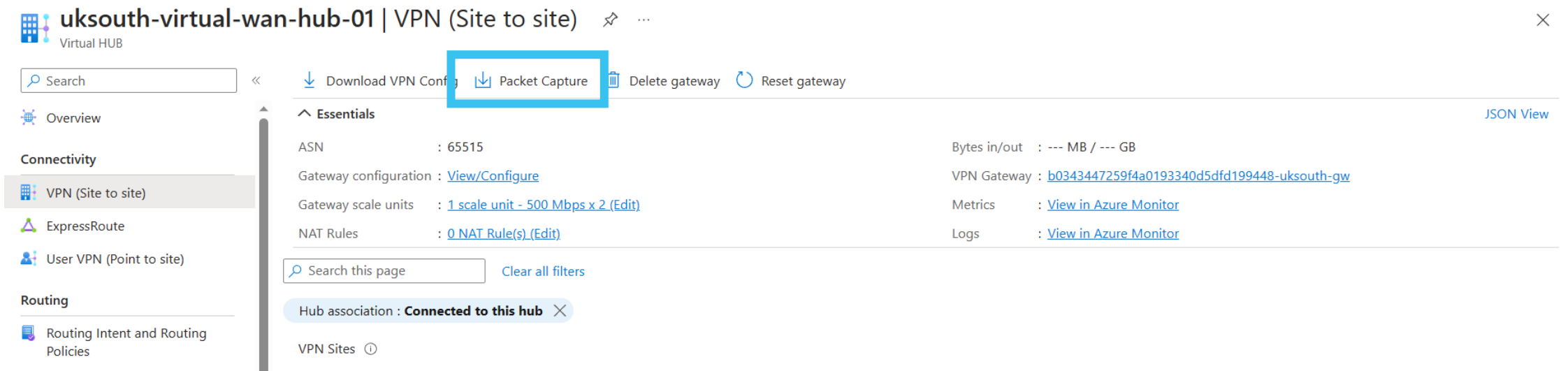
[Expand table](#)

Metric	Name in REST API	Unit	Aggregation	Dimensions	Time Grains	DS Export
Gateway S2S Bandwidth	<code>AverageBandwidth</code>	BytesPerSecond	Average	<code>Instance</code>	PT5M, PT15M, PT30M, PT1H, PT6H, PT12H, P1D	Yes
Site-to-site bandwidth of a gateway in bytes per second						
Gateway Inbound Flows	<code>InboundFlowsCount</code>	Count	Maximum, Minimum	<code>Instance</code>	PT5M, PT15M, PT30M, PT1H, PT6H, PT12H, P1D	Yes
Number of 5-tuple flows entering into a VPN gateway						
Gateway Outbound Flows	<code>OutboundFlowsCount</code>	Count	Maximum, Minimum	<code>Instance</code>	PT5M, PT15M, PT30M, PT1H, PT6H, PT12H, P1D	Yes
Number of 5-tuple flows exiting a VPN gateway						
Tunnel Bandwidth	<code>TunnelAverageBandwidth</code>	BytesPerSecond	Average	<code>ConnectionName</code> , <code>RemoteIP</code> , <code>Instance</code>	PT5M, PT15M, PT30M, PT1H, PT6H, PT12H, P1D	Yes
Average bandwidth of a tunnel in bytes per second						
Tunnel Egress Bytes	<code>TunnelEgressBytes</code>	Bytes	Total (Sum)	<code>ConnectionName</code> , <code>RemoteIP</code> , <code>Instance</code>	PT5M, PT15M, PT30M,	Yes

<https://learn.microsoft.com/en-us/azure/virtual-wan/monitor-virtual-wan-reference#metrics>

## Packet Capture – available for S2S VPNs

- Requires a Virtual WAN and Hub, with a S2S VPN Gateway deployed.
- Logs captures to a Storage Account Container
- Supports optional filters, e.g. TCPFlags or MaxFileSize



**uksouth-virtual-wan-hub-01 | VPN (Site to site)** Virtual HUB

Search

Download VPN Config Packet Capture Delete gateway Reset gateway

**Essentials** JSON View

ASN : 65515 Bytes in/out : --- MB / --- GB

Gateway configuration : [View/Configure](#) VPN Gateway : [b0343447259f4a0193340d5dfd199448-uksouth-gw](#)

Gateway scale units : [1 scale unit - 500 Mbps x 2 \(Edit\)](#) Metrics : [View in Azure Monitor](#)

NAT Rules : [0 NAT Rule\(s\) \(Edit\)](#) Logs : [View in Azure Monitor](#)

Search this page Clear all filters

Hub association : **Connected to this hub**

VPN Sites ⓘ

<https://learn.microsoft.com/en-us/azure/virtual-wan/packet-capture-site-to-site-portal>

# Packet Capture – available for S2S VPNs

[Home](#) > [Virtual WANs](#) > [virtual-wan-demo-01](#) > [uksouth-virtual-wan-hub-01 | VPN \(Site to site\)](#) >

## Packet Capture ...

[▶ Start](#) [□ Stop](#) [⌂ Abort](#) [🔄 Refresh](#)

This operation captures all packets on the Site to Site VPN Gateway that match the filter criteria specified. This includes

A valid SAS (or Shared Access Signature) Uri with read/write access is required to complete a packet capture. When

## Start Packet Capture



[▶ Start](#) [✕ Discard](#)

### Filters

Max Capture File Size ⓘ

100

Max Packet Buffer Size ⓘ

120

Packets to capture

2 selected

Source Subnet ⓘ

0.0.0.0/0

Source Port ⓘ

0

Destination Subnet ⓘ

0.0.0.0/0

Destination Port ⓘ

0

TCP Flags

5 selected

Protocol ⓘ

16

Capture Single Direction Traffic Only

☐


## Administration – obvious, but relevant...

- Centralised Cloud Network - use Entra ID credentials for Administration
- Entra ID means PIM / MFA etc.
- No need for a jump host or Bastion to administrate network appliances or systems.
- Management via ARM / Azure Portal
- DevOps Integration – Networking Configuration as Code

## Azure Security Baseline – a worthwhile read!

### Azure security baseline for Virtual WAN

Article • 02/25/2025 • 1 contributor

 Feedback

#### In this article

- Security profile
- Identity management
- Data protection
- Asset management
- Show 2 more

This security baseline applies guidance from the [Microsoft cloud security benchmark version 1.0](#) to Virtual WAN. The Microsoft cloud security benchmark provides recommendations on how you can secure your cloud solutions on Azure. The content is grouped by the security controls defined by the Microsoft cloud security benchmark and the related guidance applicable to Virtual WAN.

You can monitor this security baseline and its recommendations using Microsoft Defender for Cloud. Azure Policy definitions will be listed in the Regulatory Compliance section of the Microsoft Defender for Cloud portal page.

When a feature has relevant Azure Policy Definitions, they are listed in this baseline to help you measure compliance with the Microsoft cloud security benchmark controls and recommendations. Some recommendations may require a paid Microsoft Defender plan to enable certain security scenarios.

<https://learn.microsoft.com/en-us/security/benchmark/azure/baselines/virtual-wan-security-baseline>


## Azure Security Baseline – a worthwhile read!

### DP-6: Use a secure key management process

#### Features

#### Key Management in Azure Key Vault

**Description:** The service supports Azure Key Vault integration for any customer keys, secrets, or certificates. [Learn more.](#)

 Expand table

Supported	Enabled By Default	Configuration Responsibility
True	False	Shared

**Configuration Guidance:** Use Azure Key Vault to create and control the life cycle of your encryption keys. Site-to-site VPN in Virtual WAN uses pre-shared keys (PSK) which are discovered, created and managed by the customer in their Azure Key Vault. Implement Credential Scanner to identify credentials within code. Credential Scanner will also encourage moving discovered credentials to more secure locations such as Azure Key Vault.

<https://learn.microsoft.com/en-us/security/benchmark/azure/baselines/virtual-wan-security-baseline>

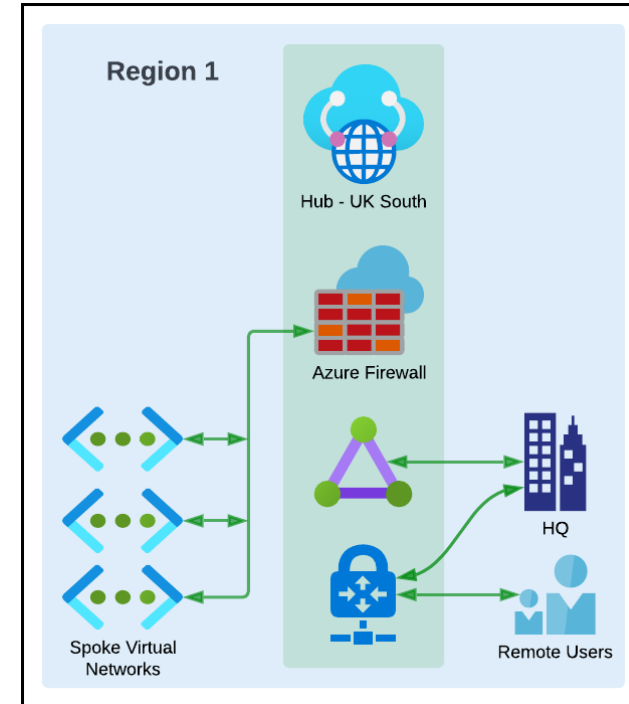


# Expansion Options

Expansion is easy with Virtual WAN:

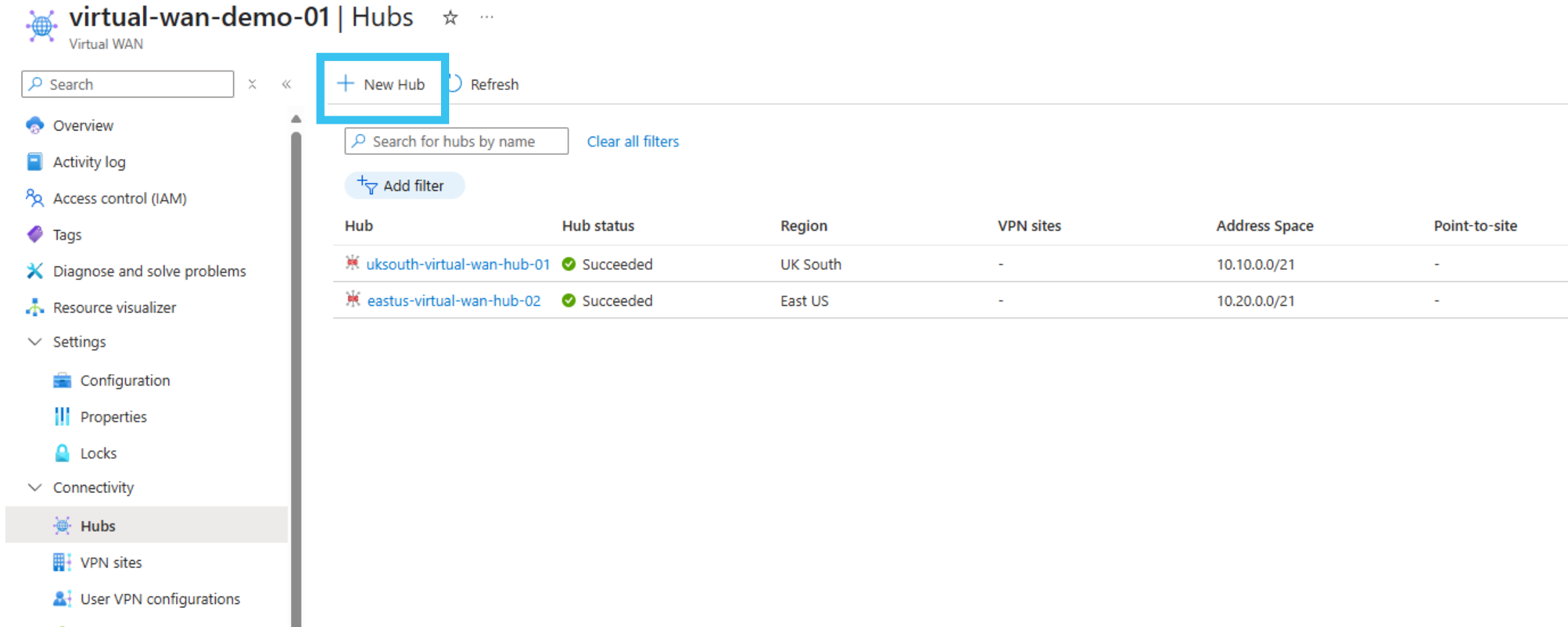
- Our start – Single Virtual WAN hub, ExpressRoute and a VPN Gateway for IPsec or P2S Users.
- Spoke Virtual Networks peered into Virtual WAN hub.
- All Traffic via Single Azure Firewall instance.

**How do we expand to other Regions?**



# Expansion Options

- ✓ Regional Expansion is simple – and done by adding Hubs
- ✓ Hubs are fully-meshed by default, enabling communication



**virtual-wan-demo-01 | Hubs** ☆ ...



Virtual WAN

Search

+ New Hub Refresh

Search for hubs by name Clear all filters

+ Add filter

Hub	Hub status	Region	VPN sites	Address Space	Point-to-site
 uksouth-virtual-wan-hub-01	✓ Succeeded	UK South	-	10.10.0.0/21	-
 eastus-virtual-wan-hub-02	✓ Succeeded	East US	-	10.20.0.0/21	-

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Resource visualizer

Settings

Configuration

Properties

Locks

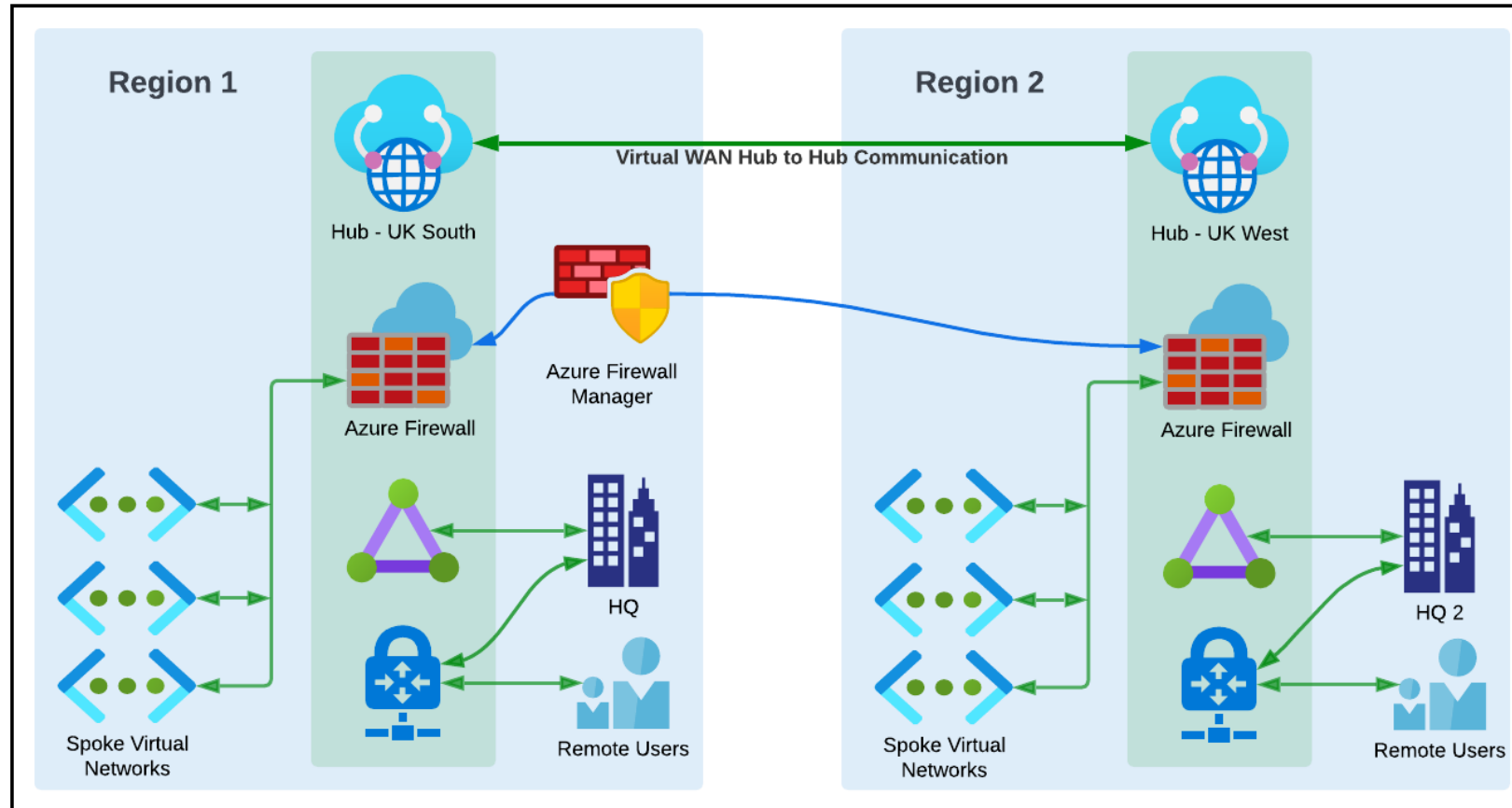
Connectivity

**Hubs**

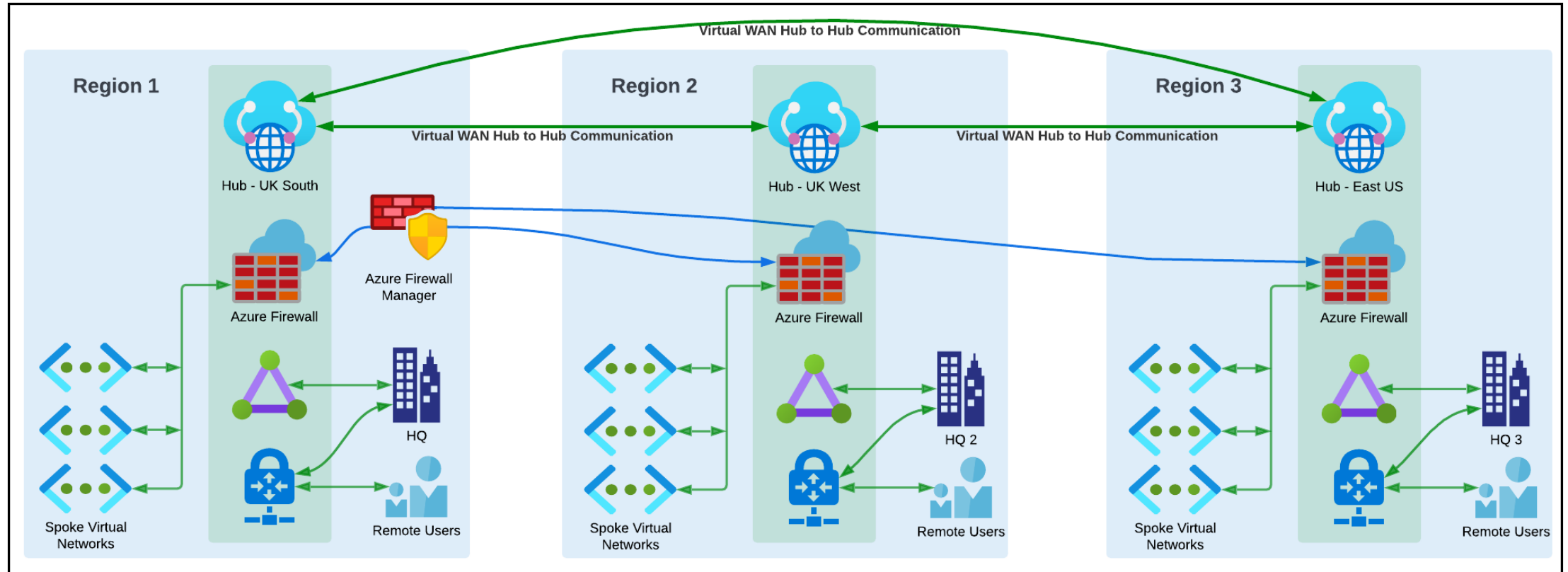
VPN sites

User VPN configurations

# Expansion Options... +1 Region



# Expansion Options... +2 Regions



## Expansion Options & Benefits

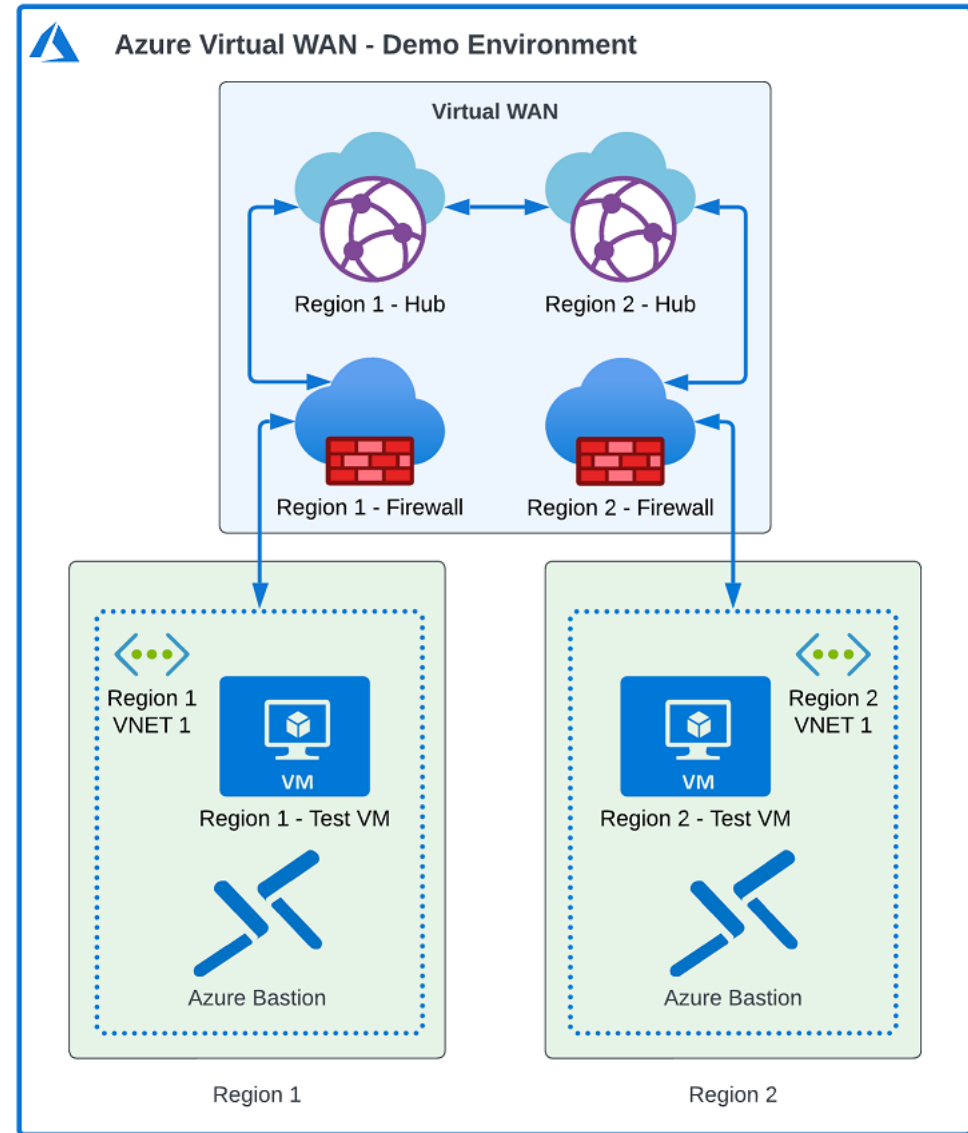


- ✓ Regional Expansion – **add a Hub, and then other services.**
- ✓ Firewalling options – Scale up to Premium
- ✓ Hub Routing Intent – Cross Region & Internet traffic all via NVAs/AzFWs/SaaS
- ✓ Centralised Firewall Rulesets and Management
- ✓ ExpressRoute and VPN Gateway Support (S2S and P2S)
- ✓ Full Mesh Topology – enabling communication via the MS Global Network
- ✓ Spokes can communicate freely (via Firewalling if required).
- ✓ Automated Route Table Management & Provisioning ★
- ✓ Single Control of Cloud Networking via Virtual WAN
- ✓ Scale in routing units up to 50Gbps (VNet to VNet) and 50,000 VMs per Hub

# Where do we begin?

- **Recommendation** – Get familiar with the basics and concepts using a lab. My Terraform Environment can help here!
- Consider **upskilling and training** – AZ-700 and AZ-305 exams are helpful.
- **Have a plan!** Consider the Cloud Adoption Framework guidance and understand drivers/goals/objectives.
- Organisational deployment - **Start with a Single Hub** and expand from there.
- Consult **Guidance** – MS docs for migrating from Hub/Spoke - <https://learn.microsoft.com/en-us/azure/virtual-wan/migrate-from-hub-spoke-topology>
- **Engage a Partner** – Design/Implementation/Support etc.

# Demo Lab





# Demo Lab – Costs

Service category	Service type	Region	Description	Estimated monthly cost
Networking	Virtual WAN	East US	730 Deployment hours, 0 Routing infrastructure units, 10 GB of data processed, Azure firewall integrated (standard tier) with 0 GB of data processed, Site to site VPN connection for 0 scale units, 0 deployed for 730 Hours, User VPN connection for 0 scale units for 730 Hours and 0 scale units for 730 Hours, ExpressRoute connections for 0 scale units, 0 deployed for 730 Hours	\$912.70
Networking	Virtual WAN	UK South	730 Deployment hours, 0 Routing infrastructure units, 10 GB of data processed, Azure firewall integrated (standard tier) with 0 GB of data processed, Site to site VPN connection for 0 scale units, 0 deployed for 730 Hours, User VPN connection for 0 scale units for 730 Hours and 0 scale units for 730 Hours, ExpressRoute connections for 0 scale units, 0 deployed for 730 Hours	\$912.70
Networking	Azure Bastion	East US	Basic Tier, 730 Hours, 5 GB Outbound Data Transfer	\$138.70
Networking	Azure Bastion	UK South	Basic Tier, 730 Hours, 5 GB Outbound Data Transfer	\$138.70
Compute	Virtual Machines	East US	1 B4ms (4 Cores, 16 GB RAM) x 730 Hours (Pay as you go), Windows (Licence included), OS Only; 1 managed disk – S10; Inter Region transfer type, 5 GB outbound data transfer from East US to East Asia	\$138.75
Compute	Virtual Machines	UK South	1 B4ms (4 Cores, 16 GB RAM) x 730 Hours (Pay as you go), Windows (Licence included), OS Only; 1 managed disk – S10; Inter Region transfer type, 5 GB outbound data transfer from UK South to East Asia	\$156.13
Networking	IP Addresses	East US	Standard (ARM), 20 Static IP Addresses X 730 Hours, 0 Public IP Prefixes X 730 Hours	\$73.00
Total				\$2,470.68



# Demo / Lab Environment - Terraform

```
1  # virtual-wan Resources
2  # virtual-wan
3  resource "azurerm_virtual_wan" "virtual-wan1" {
4      name                = "${var.lab-name}-virtual-wan-01"
5      resource_group_name = azurerm_resource_group.region1-rg1.name
6      location             = var.region1
7
8      # Configuration
9      office365_local_breakout_category = "OptimizeAndAllow"
10
11     tags = {
12         Environment = var.environment_tag
13     }
14 }
15 # virtual-wan Hub 1
16 resource "azurerm_virtual_hub" "region1-vhub1" {
17     name                = "${var.region1}-virtual-wan-hub-01"
18     resource_group_name = azurerm_resource_group.region1-rg1.name
19     location             = var.region1
20     virtual_wan_id       = azurerm_virtual_wan.virtual-wan1.id
21     address_prefix       = var.virtual-wan-region1-hub1-prefix1
22
23     tags = {
24         Environment = var.environment_tag
25     }
26 }
```

<https://github.com/jakewalsh90/Terraform-Azure/tree/main/Virtual-WAN-Demo>

# Demo / Lab Environment – Bicep

```
Code Blame 313 lines (274 loc) · 11.1 KB

1  @minLength(4)
2  @maxLength(80)
3  param vWANName string = 'vWAN'
4
5  @description('Region for the Azure Virtual WAN')
6  param vWANLocation string = resourceGroup().location
7
8  @description('Name of the FIRST virtual hub')
9  @minLength(4)
10 @maxLength(80)
11 param hub1Name string = 'Hub1'
12
13 @description('Region for the FIRST virtual hub')
14 param hub1Location string = resourceGroup().location
15
16 @description('Address space for the FIRST virtual hub')
17 param hub1AddressSpace string = '10.1.0.0/23'
18
19 @description('Address space for the first VNet (spoke1) connected to the FIRST virtual hub')
20 param hub1Spoke1AddressSpace string = '10.1.2.0/24'
21
22 @description('Address space for the second VNet (spoke2) connected to the FIRST virtual hub')
23 param hub1Spoke2AddressSpace string = '10.1.4.0/24'
24
25 @description('Name of the SECOND virtual hub')
26 @minLength(4)
27 @maxLength(80)
28 param hub2Name string = 'Hub2'
29
```

[azure-quickstart-templates/quickstarts/microsoft.network/virtual-wan-routing-intent at master · Azure/azure-quickstart-templates · GitHub](https://github.com/Azure/azure-quickstart-templates/tree/master/quickstarts/microsoft.network/virtual-wan-routing-intent)



# Useful Links

- <https://learn.microsoft.com/en-us/azure/virtual-wan/>
- **John Savill** - <https://www.youtube.com/watch?v=f-GyAURZWzg>
- **Global Transit Architecture:** <https://learn.microsoft.com/en-us/azure/virtual-wan/virtual-wan-global-transit-network-architecture>
- <https://jakewalsh.co.uk/deploying-azure-virtual-wan-using-terraform/>
- <https://github.com/jakewalsh90/Terraform-Azure/tree/main/vWAN-DemoLab>
- <https://github.com/jakewalsh90/Terraform-Modules-Azure/tree/main/azure-quick-virtualwan>
- Exams – Az-700 and Az-305
- NVA Options: <https://learn.microsoft.com/en-us/azure/virtual-wan/about-nva-hub>
- <https://learn.microsoft.com/en-us/azure/virtual-wan/about-nva-hub#partners>

# Q & A





# Thank You!

## An Introduction to Azure Virtual WAN

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Jake Walsh

*Please note – the views/opinions in this presentation are entirely my own.  
If in any doubt, please check latest documentation and MS Links for updated info!*