

# Azure Point-to-Site (P2S) VPN Gateway – Proof of Concept (POC)

## 1.1 Purpose of this Document

This document explains the step-by-step implementation of an **Azure Point-to-Site (P2S) VPN Gateway** using **two authentication methods: Certificate-based authentication and Microsoft Entra ID authentication**. Each step includes **what configuration was done and why it was required**, making this document suitable for freshers and interview discussions.

## 1.2 Scope of the POC

- Configure Azure infrastructure required for P2S VPN
- Enable secure remote user connectivity
- Implement and test two authentication mechanisms
- Understand security and design considerations

## 2. Overview of Point-to-Site VPN

A Point-to-Site VPN allows individual client devices to securely connect to an Azure Virtual Network over the internet. This is commonly used for:

- Remote employees
- Developers and administrators
- Temporary or mobile access scenarios

Unlike Site-to-Site VPN, P2S does not require on-premises VPN devices.

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## 3. Architecture Overview

### Components Used:

- Resource Group
- Azure Virtual Network (VNet)
- Gateway Subnet
- Azure VPN Gateway
- Point-to-Site Configuration

- Certificate Authority (Root & Client Certificates)
- Microsoft Entra ID

The VPN Gateway acts as the secure entry point into the Azure Virtual Network.

## 4. Step-by-Step Implementation

### Step 1: Create Resource Group

**What was done:** A new resource group was created to hold all VPN-related resources.

#### Why this is required:

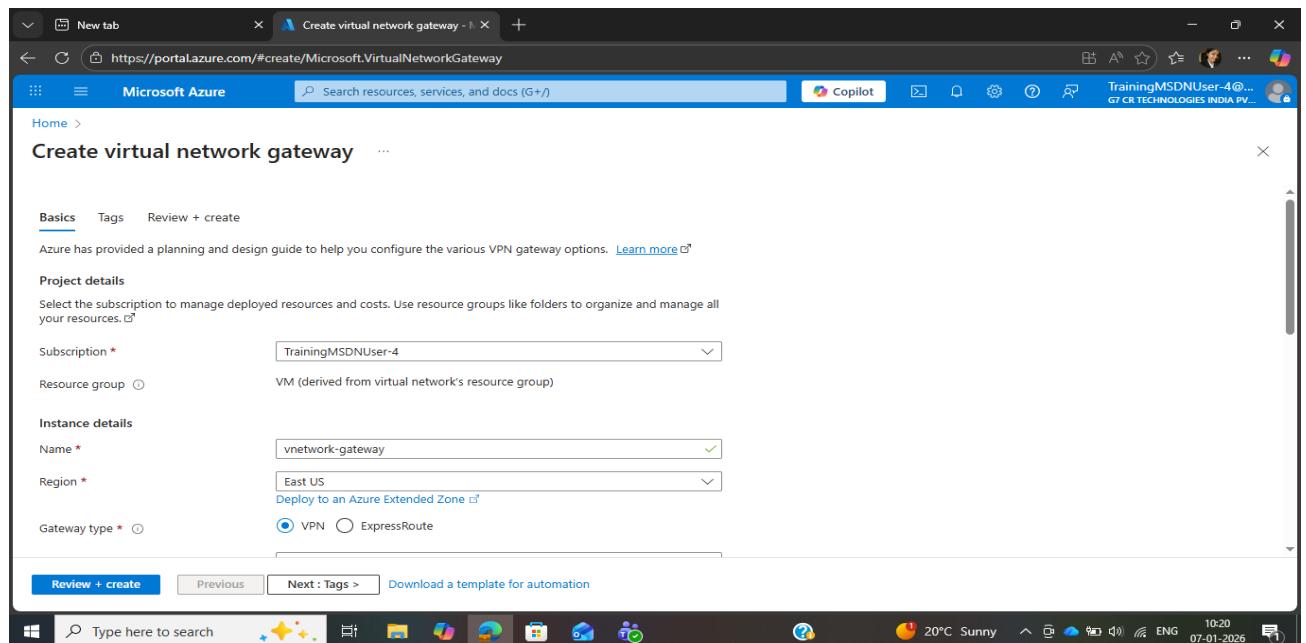
- Provides logical grouping of resources
- Simplifies management, monitoring, and deletion
- Helps with cost tracking and governance

### Step 2: Create Virtual Network (VNet)

**What was done:** A virtual network with a private IP address range was created.

#### Why this is required:

- VNet provides isolated private networking in Azure
- VPN users need a network to connect to
- Enables secure communication with Azure resources



New tab Create virtual network gateway - Microsoft Azure https://portal.azure.com/#create/Microsoft.VirtualNetworkGateway

Microsoft Azure Search resources, services, and docs (G+/) Copilot Home > Create virtual network gateway

Gateway type  VPN  ExpressRoute

SKU \*

Generation

Enable Advanced Connectivity  Enabled  Disabled

Virtual network \*  Create virtual network

Subnet

Only virtual networks in the currently selected subscription and region are listed.

Public IP address

Public IP address \*  Create new  Use existing

Public IP address name \*

Public IP address SKU Standard

**Review + create** Previous Next : Tags > Download a template for automation

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New tab Create virtual network gateway - Microsoft Azure https://portal.azure.com/#create/Microsoft.VirtualNetworkGateway

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Enable active-active mode \*  Enabled  Disabled

SECOND PUBLIC IP ADDRESS

SECOND PUBLIC IP ADDRESS \*  Create new  Use existing

Public IP address name \*

Public IP address SKU Standard

Configure BGP \*  Enabled  Disabled

Autonomous system number (ASN) \*

Custom Azure APIPA BGP IP address

Peer Address

Second Custom Azure APIPA BGP IP address

Peer Address

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https://portal.azure.com/#create/Microsoft.VirtualNetworkGateway

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Home > Create virtual network gateway ...

Public IP address SKU Standard  
 Enabled  Disabled

Configure BGP \*  Enabled  Disabled

Autonomous system number (ASN) \*  65515

Custom Azure APIPA BGP IP address

Peer Address

Second Custom Azure APIPA BGP IP address

Peer Address

Authentication Information (Preview)  
Enable Key Vault Access  Enabled  Disabled

Azure recommends using a validated VPN device with your virtual network gateway. To view a list of validated devices and instructions for configuration, refer to Azure's [documentation](#) regarding validated VPN devices.

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New tab Create virtual network gateway - l +

https://portal.azure.com/#create/Microsoft.VirtualNetworkGateway

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Home > Create virtual network gateway ...

**Basics**

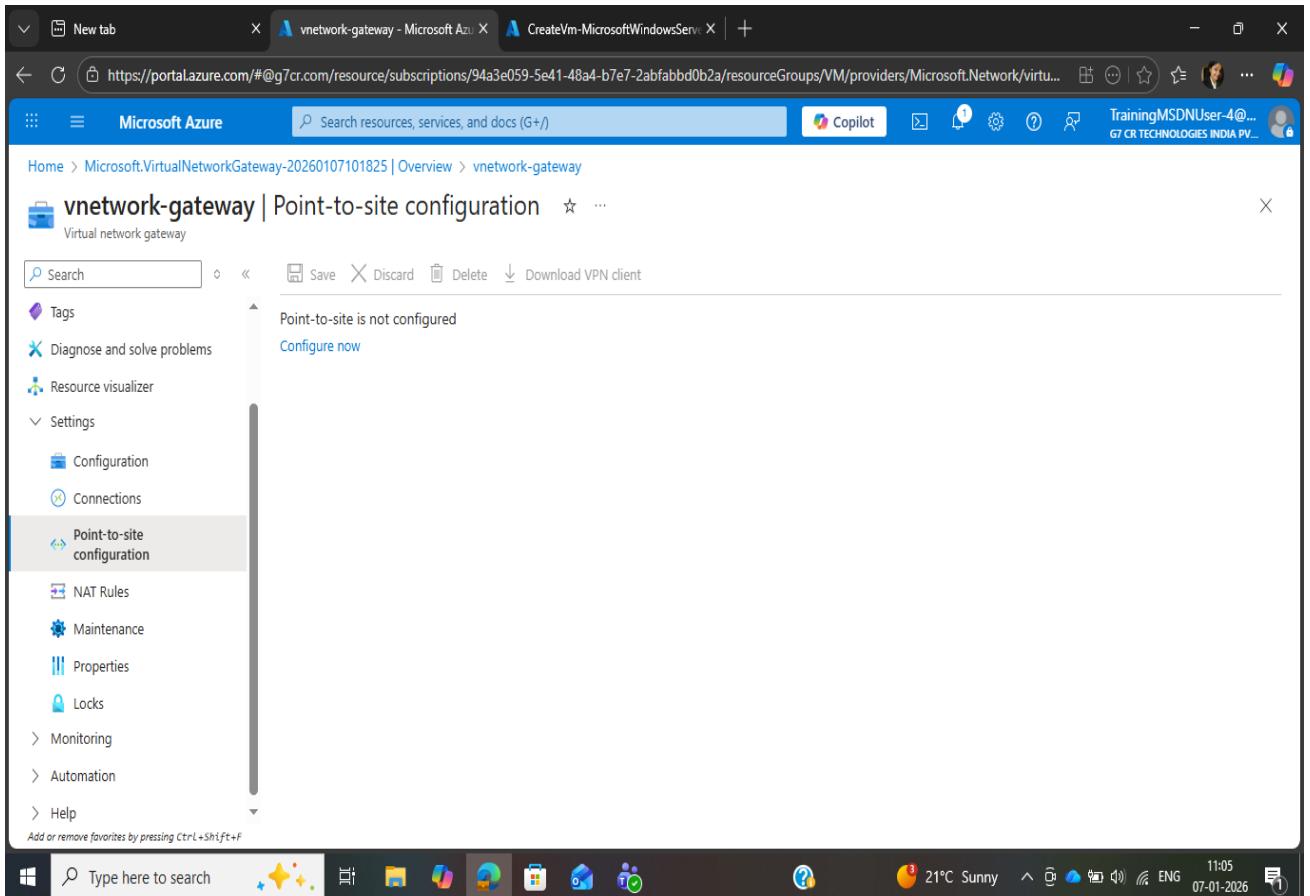
Subscription	TrainingMSDNUser-4
Resource group	VM
Name	vnetwork-gateway
Region	East US
SKU	VpnGw2AZ
Generation	Generation2
Virtual network	VMpt-vnet
Subnet	GatewaySubnet (10.0.1.0/24)
Gateway type	Vpn
VPN type	RouteBased
Enable active-active mode	Disabled
Enable Advanced Connectivity	Disabled
Configure BGP	Disabled
Public IP address	public-ip

**Tags**

Create Previous Next Download a template for automation

Type here to search

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### Step 3: Create Gateway Subnet

**What was done:** A subnet named **GatewaySubnet** was created within the VNet.

#### Why this is required:

- Azure VPN Gateway must reside in a subnet named GatewaySubnet
- This subnet is reserved for VPN infrastructure
- Separates gateway components from application workloads

### Step 4: Create Azure VPN Gateway

**What was done:** A route-based VPN Gateway was created with a public IP address.

#### Why this is required:

- VPN Gateway is the core component that enables VPN connectivity
- Route-based gateways support Point-to-Site connections

- Public IP allows secure connections over the internet

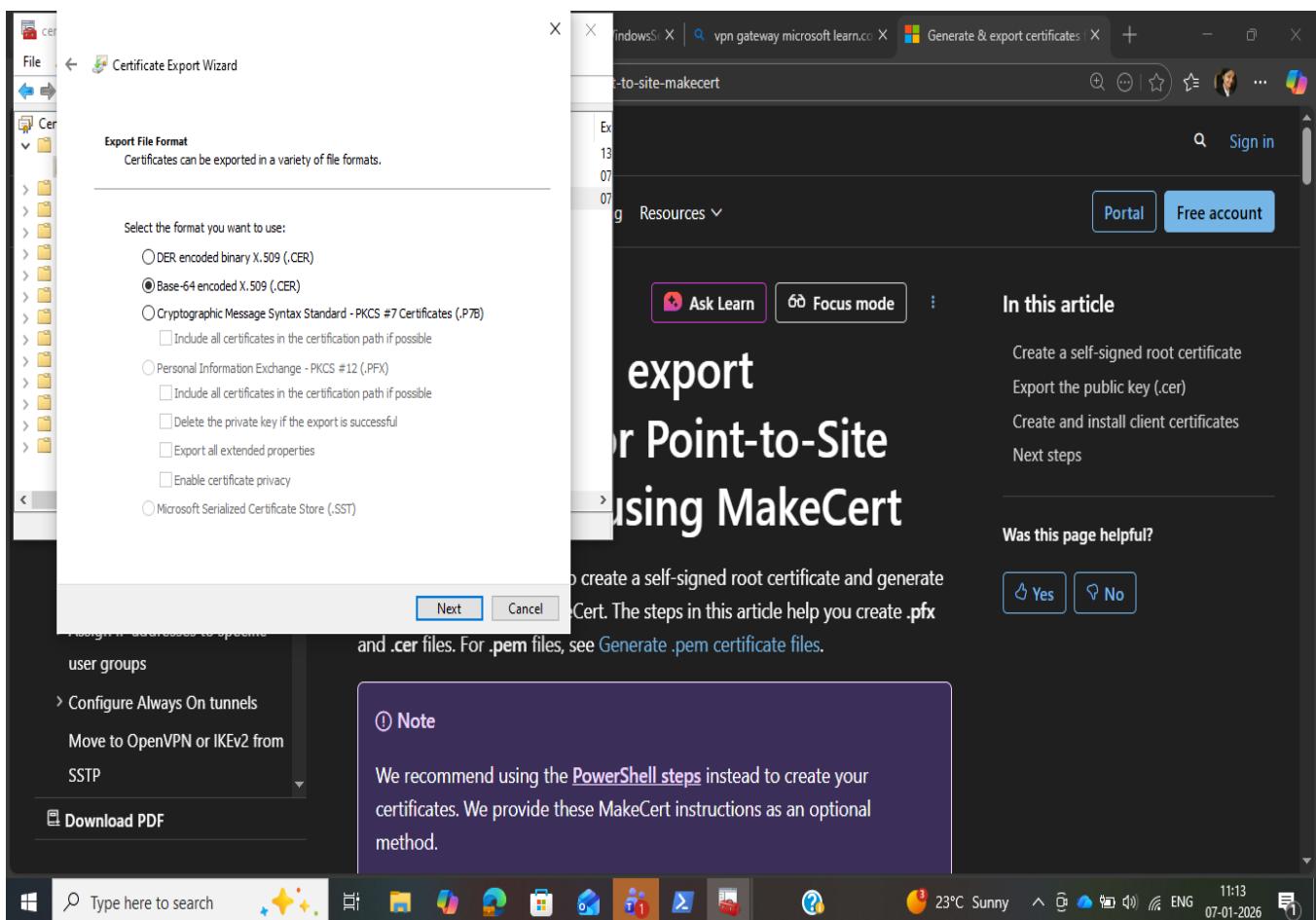
## 5. Authentication Method 1: Certificate-Based Authentication

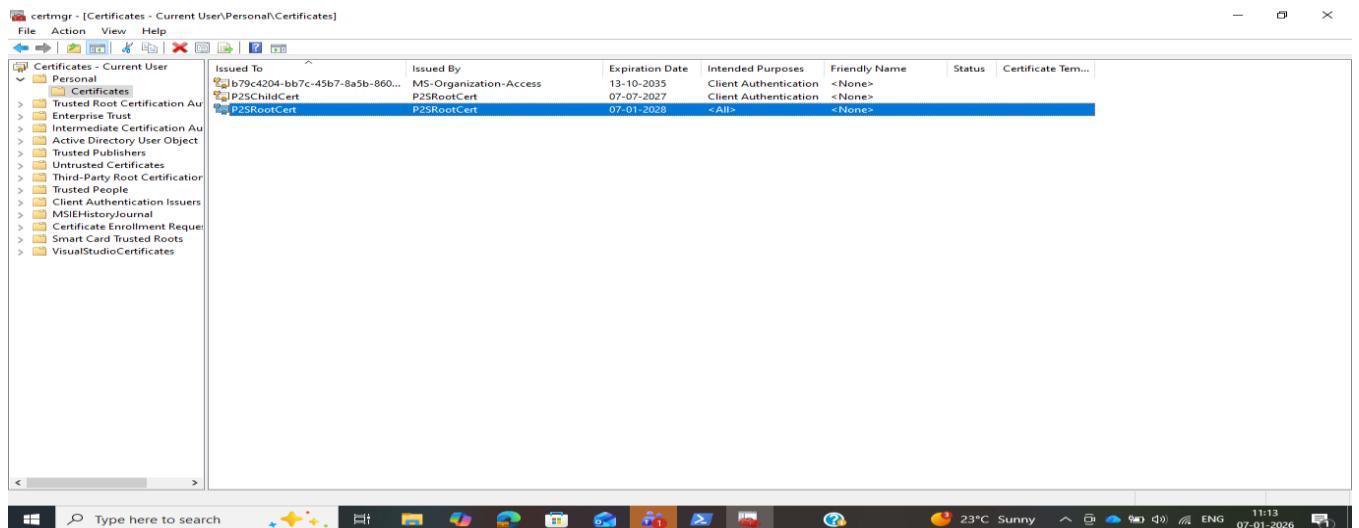
### Step 5: Generate Root and Client Certificates

**What was done:** Root and client certificates were generated using a trusted certificate authority.

#### Why this is required:

- Root certificate establishes trust with Azure
- Client certificate verifies user or device identity
- Enables secure authentication without password

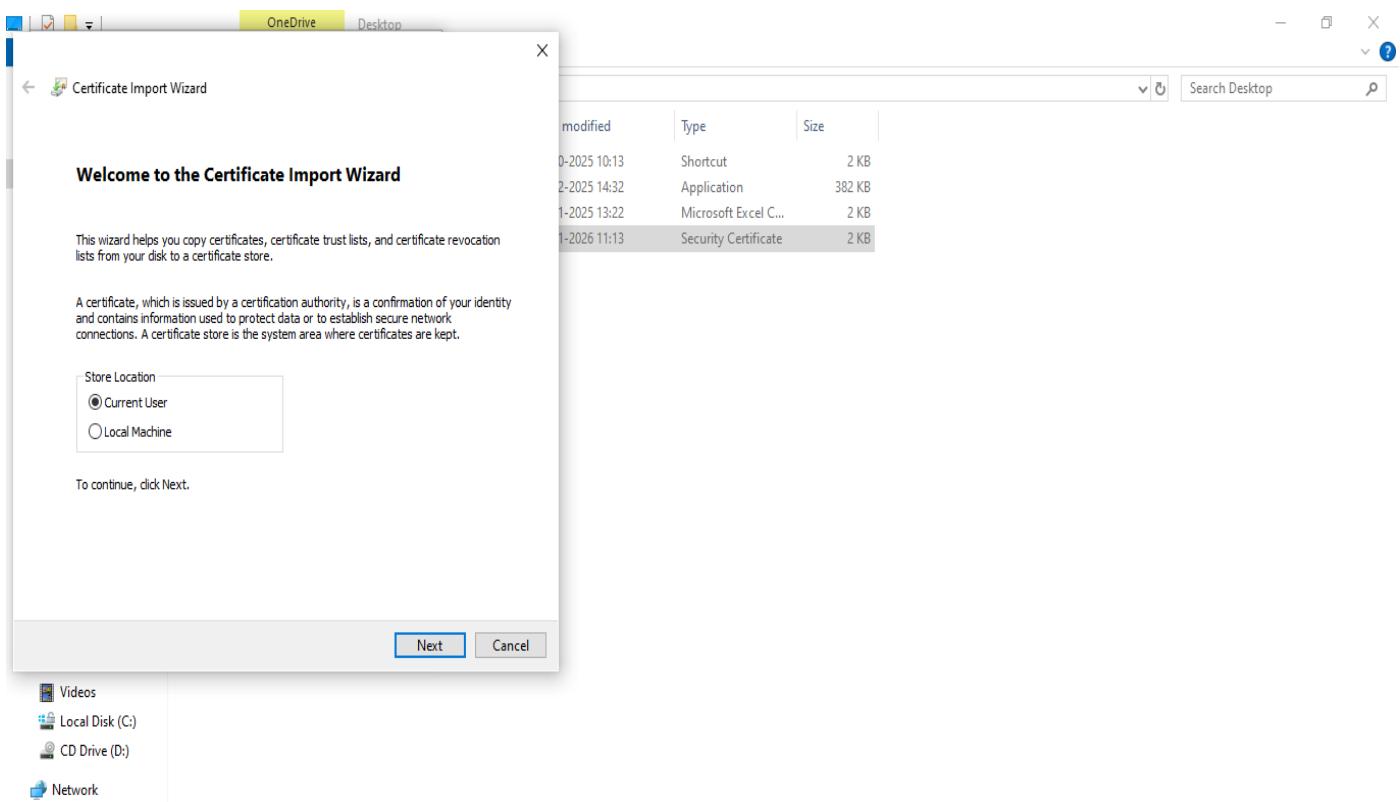
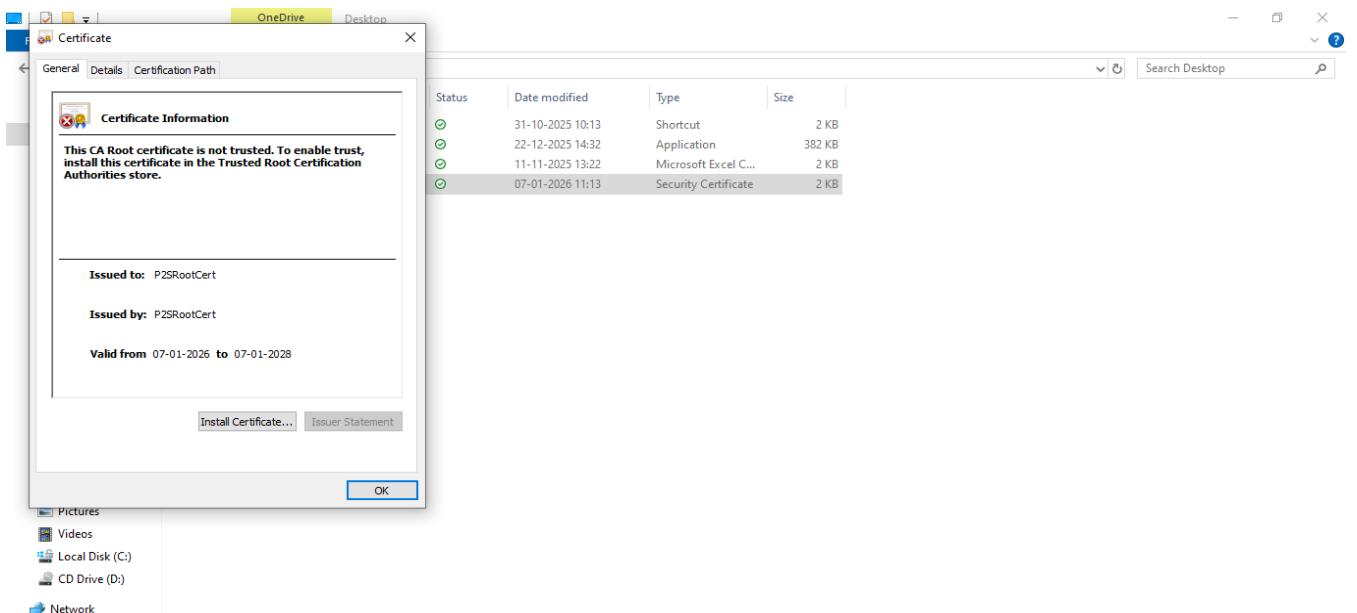


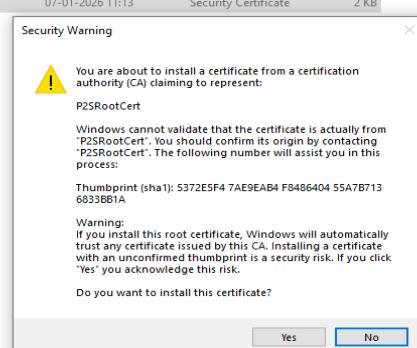
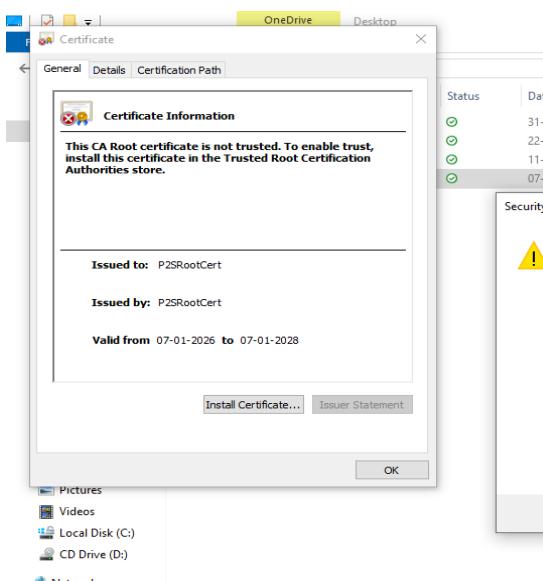
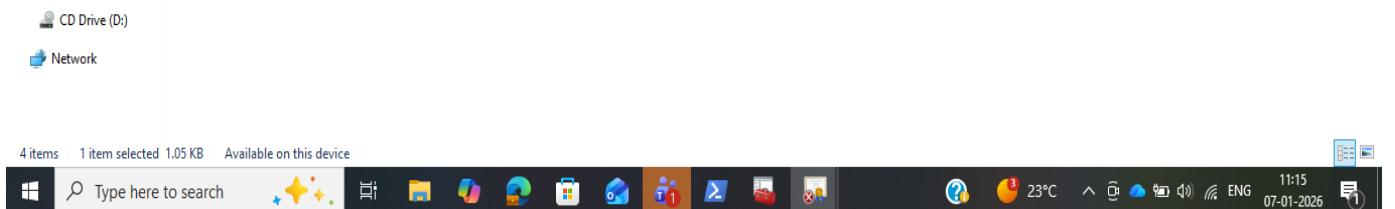
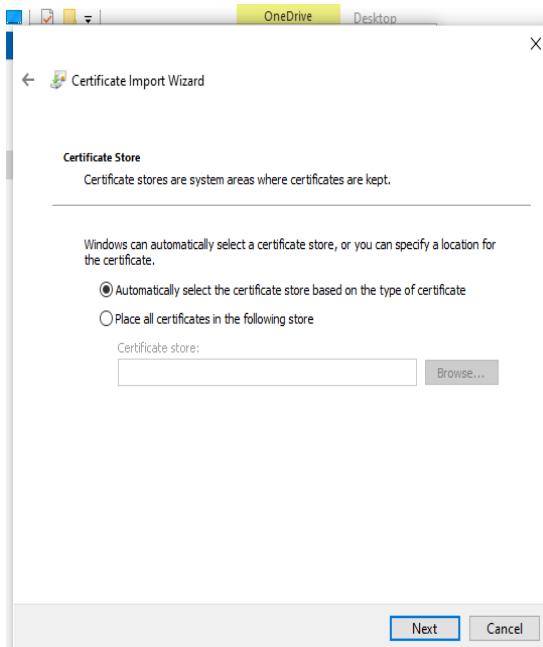


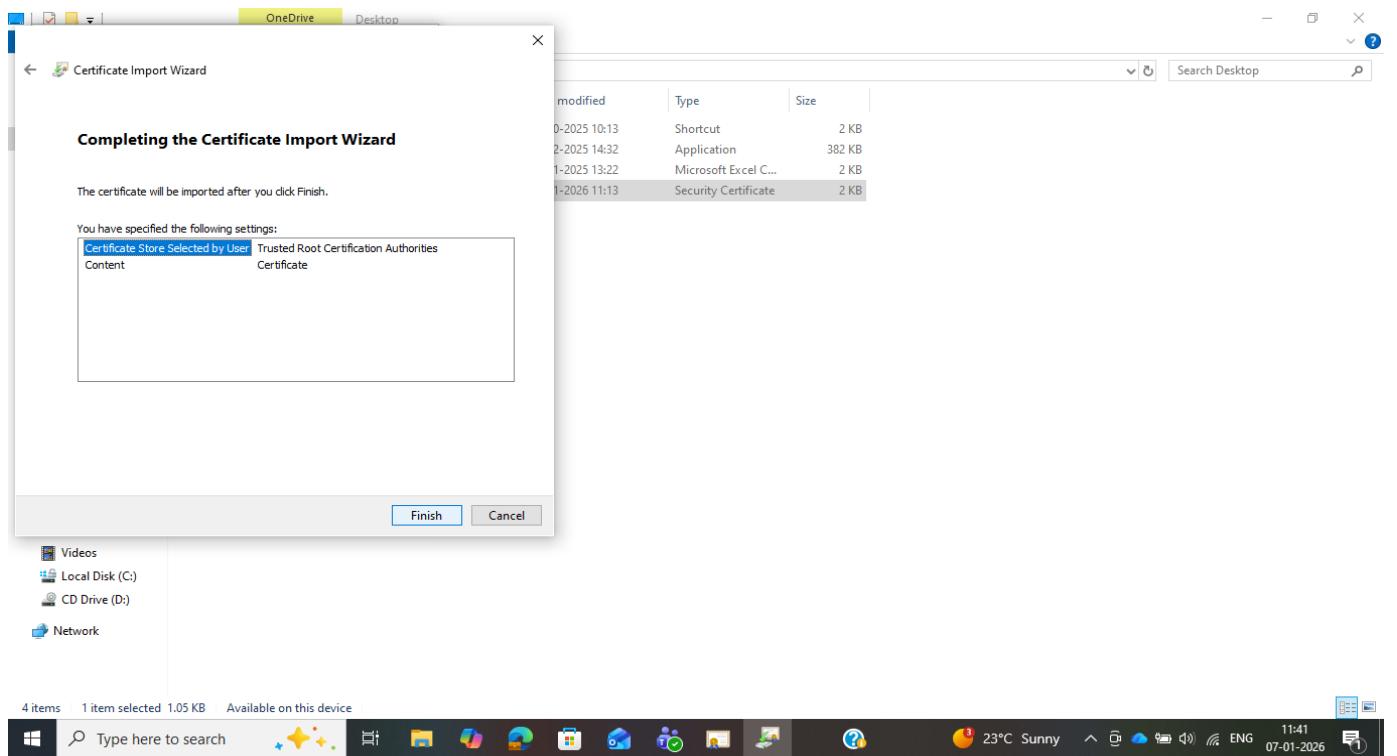
The screenshot shows a Microsoft Edge browser window with multiple tabs open. In the background, a PowerShell session is running in a terminal window. The PowerShell session is executing commands to generate self-signed certificates for Azure services.

```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

PS C:\Users\SAMEEKSHA YS> $params = @{
>>>     Type = 'Custom'
>>>     Subject = 'CN=P2SRootCert'
>>>     KeySpec = 'Signature'
>>>     KeyExportPolicy = 'Exportable'
>>>     KeyUsage = 'CertSign'
>>>     KeyUsageProperty = 'Sign'
>>>     KeyLength = 2048
>>>     HashAlgorithm = 'sha256'
>>>     NotAfter = (Get-Date).AddMonths(24)
>>>     CertStoreLocation = 'Cert:\CurrentUser\My'
>> }
PS C:\Users\SAMEEKSHA YS> $cert = New-SelfSignedCertificate @params
PS C:\Users\SAMEEKSHA YS> $params = @{
>>>     Type = 'Custom'
>>>     Subject = 'CN=P2SChildCert'
>>>     DnsName = 'P2SChildCert'
>>>     KeySpec = 'Signature'
>>>     KeyExportPolicy = 'Exportable'
>>>     KeyLength = 2048
>>>     HashAlgorithm = 'sha256'
>>>     NotAfter = (Get-Date).AddMonths(18)
>>>     CertStoreLocation = 'Cert:\CurrentUser\My'
>>>     Signer = $cert
>>>     TextExtension = @(
>>>         '2.5.29.37={text}1.3.6.1.5.5.7.3.2')
>>>     }
PS C:\Users\SAMEEKSHA YS>     New-SelfSignedCertificate @params
PS ParentPath: Microsoft.PowerShell.Security\Certificate::CurrentUser\My
> ConfigThumbprint                                         Subject
-----                                            -----
Move t1B2CDC13A5D89DC91D48109FAB7CA5C850829E08  CN=P2SChildCert
SSTP
PS C:\Users\SAMEEKSHA YS> -
```







## Step 6: Configure P2S VPN with Certificate Authentication

**What was done:** The root certificate was uploaded to the VPN Gateway and a P2S address pool was configured.

### Why this is required:

- Address pool assigns private IPs to VPN users
- Root certificate allows Azure to trust client certificates
- Ensures encrypted and authenticated connections

The screenshot shows the Microsoft Azure portal interface. The URL in the address bar is <https://portal.azure.com/#@g7cr.com/resource/subscriptions/94a3e059-5e41-48a4-b7e7-2abfabbd0b2a/resourceGroups/VM/providers/Microsoft.Network/virtualNetworkGateways/vnetwork-gateway>. The page title is "vnetwork-gateway | Point-to-site configuration". The left sidebar menu is expanded, showing "Point-to-site configuration" selected under "Settings". The main content area displays the message "Point-to-site is not configured" and a "Configure now" button. The top right corner shows the user's name "TrainingMSDNUser-4@..." and the date "07-01-2026". The bottom taskbar includes the Start button, a search bar, and various pinned application icons.

This screenshot shows the same Microsoft Azure portal interface as the previous one, but with more detailed configuration options visible. The "Point-to-site configuration" section is fully loaded. It includes fields for "Authentication type" (set to "Azure certificate"), "Root certificates" (with a "Name" field containing "root" and a "Public certificate data" field containing a long string of characters), and "Revoked certificates" (an empty table). There are also sections for "Additional routes to advertise" and "Locks". The rest of the interface is identical to the first screenshot, including the sidebar, top bar with user info, and taskbar.

The screenshot shows the Microsoft Azure portal with the URL <https://portal.azure.com/#@g7cr.com/resource/subscriptions/94a3e059-5e41-48a4-b7e7-2abfabbd0b2a/resourceGroups/VM/providers/Microsoft.Network/virtualNetworkGateways/vnetwork-gateway>. The left sidebar shows the navigation path: Home > vnetwork-gateway. The main content area is titled "vnetwork-gateway | Point-to-site configuration". It includes sections for Authentication type (set to "Azure certificate"), Root certificates (listing "root" with public certificate data), Revoked certificates, Additional routes to advertise, and NAT Rules. The "Save" button at the top right is highlighted in blue. The status bar at the bottom shows the URL [https://portal.azure.com/#blade/Microsoft\\_Azure\\_ActivityLog/ActivityLogBlade/queryInputs/%7B%22user%22%3A%2240me%27D](https://portal.azure.com/#blade/Microsoft_Azure_ActivityLog/ActivityLogBlade/queryInputs/%7B%22user%22%3A%2240me%27D).

You need to save it after entering the details otherwise u will get the above error

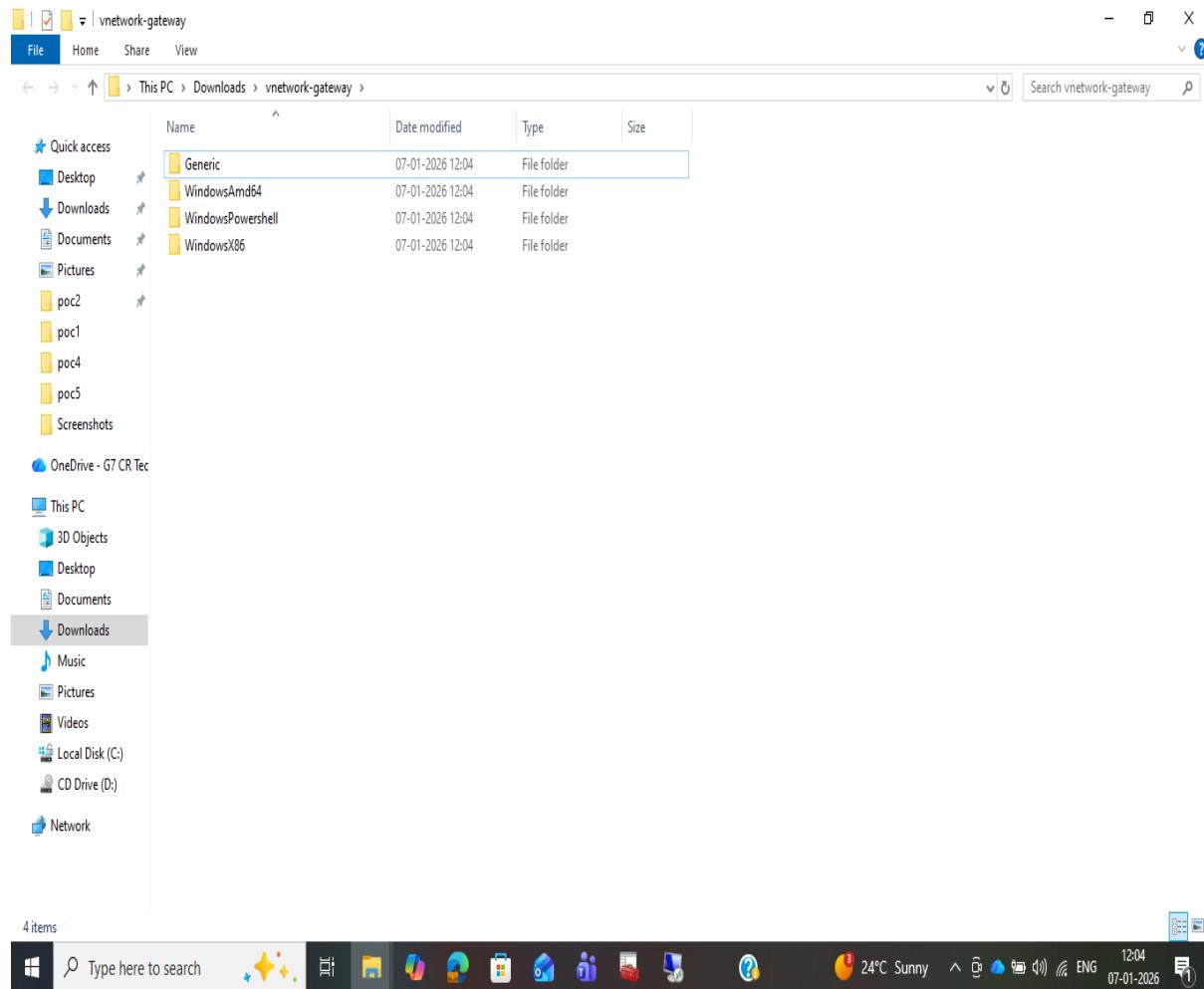
The screenshot shows the Microsoft Azure portal with the URL <https://portal.azure.com/#@g7cr.com/resource/subscriptions/94a3e059-5e41-48a4-b7e7-2abfabbd0b2a/resourceGroups/VM/providers/Microsoft.Network/virtualNetworkGateways/vnetwork-gateway>. The left sidebar shows the navigation path: Home > vnetwork-gateway. The main content area is titled "vnetwork-gateway | Point-to-site configuration". It includes sections for Address pool (set to "172.0.0.0/16"), Tunnel type (set to "IKEv2"), IPsec / IKE policy (set to "Default"), Authentication type (set to "Azure certificate"), Root certificates (listing "root" with public certificate data), and NAT Rules. The "Save" button at the top right has been clicked, and a success notification in the Notifications panel states "Saved virtual network gateway". The status bar at the bottom shows the URL [https://portal.azure.com/#blade/Microsoft\\_Azure\\_ActivityLog/ActivityLogBlade/queryInputs/%7B%22user%22%3A%2240me%27D](https://portal.azure.com/#blade/Microsoft_Azure_ActivityLog/ActivityLogBlade/queryInputs/%7B%22user%22%3A%2240me%27D).

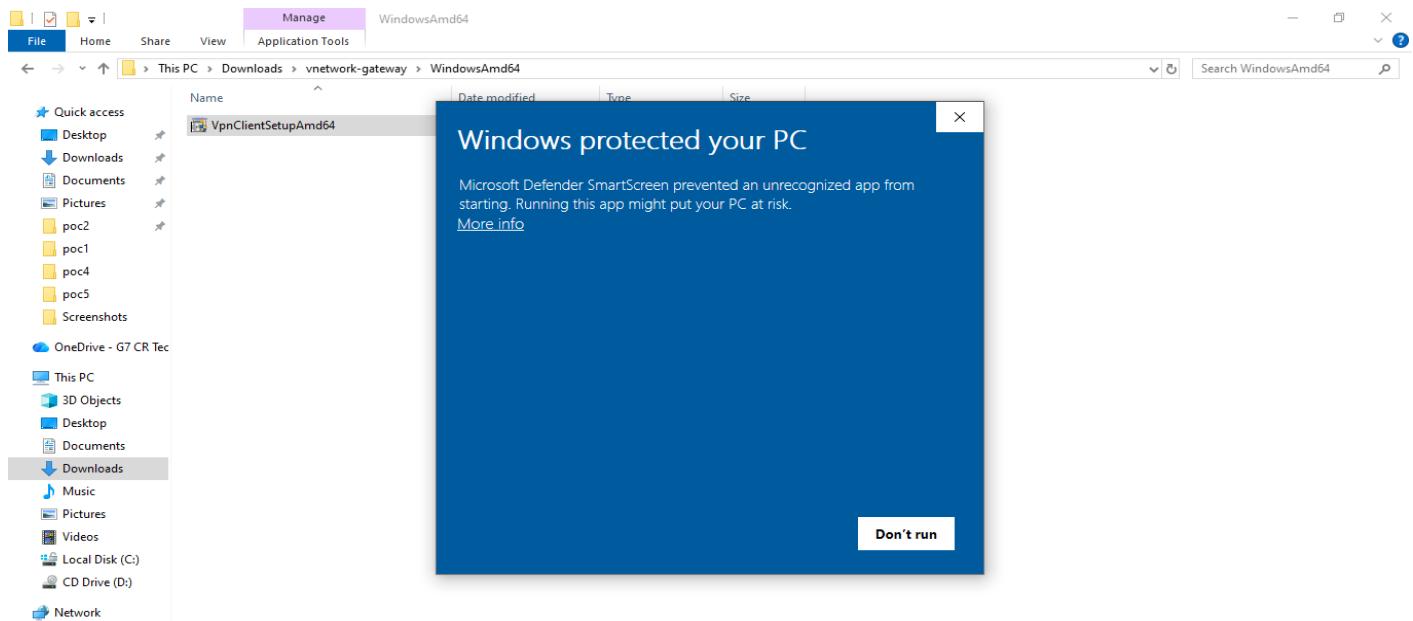
## Step 7: Install and Test VPN Client

**What was done:** The VPN client package was downloaded and installed on the user machine.

### Why this is required:

- VPN client establishes the tunnel between user and Azure
- Client certificate enables authentication
- Confirms end-to-end connectivity





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Type here to search

Settings

Home

Find a setting

Network & Internet

- Status
- Wi-Fi
- Ethernet
- Dial-up
- VPN**
- Airplane mode
- Mobile hotspot
- Proxy

VPN

Add a VPN connection

VMpt-vnet

Connect Advanced options Remove

Related settings

Change adapter options

Change advanced sharing options

Network and Sharing Center

Windows Firewall

Help from the web

Setting up a secure VPN connection

Setting up a VPN

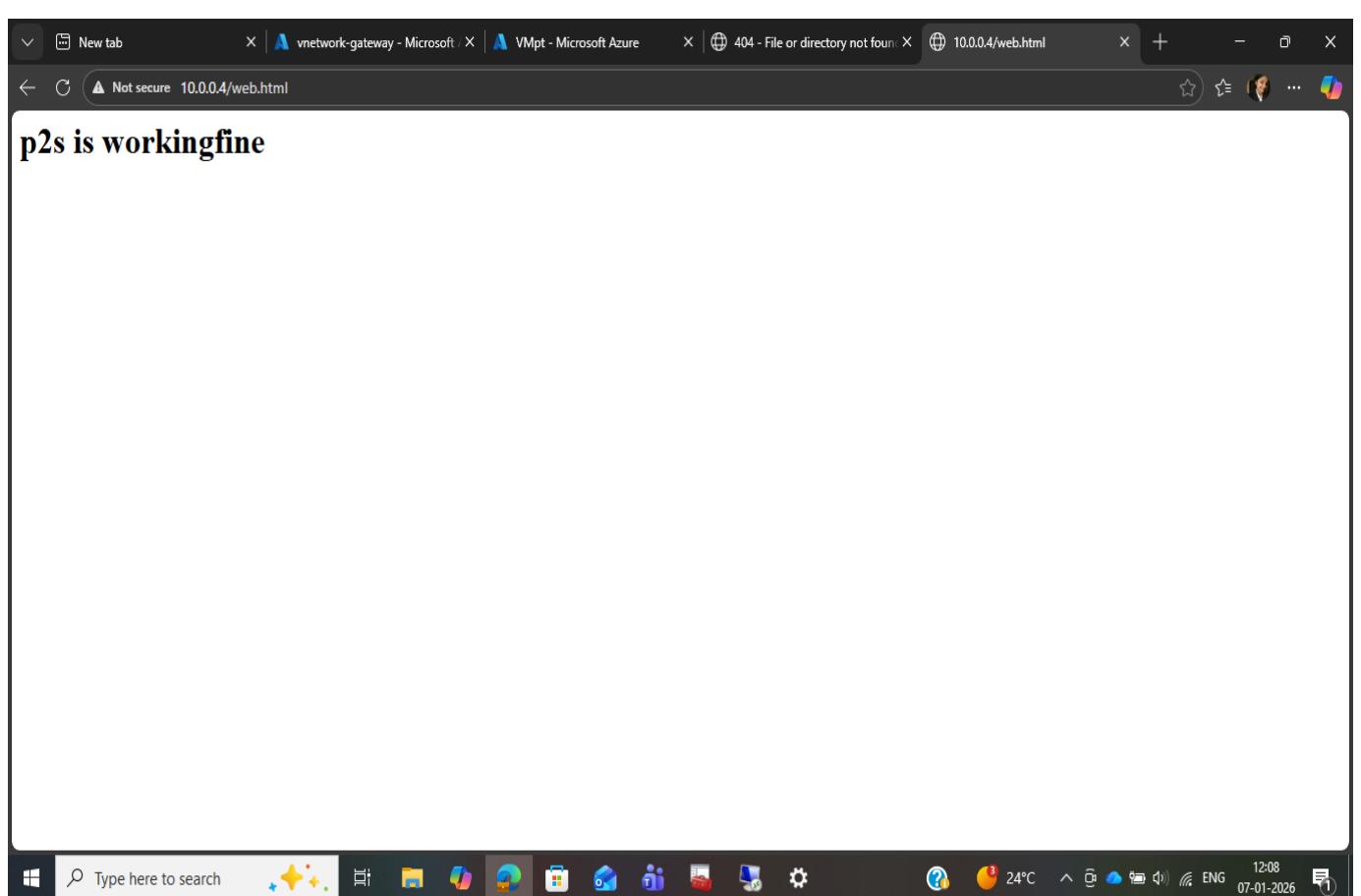
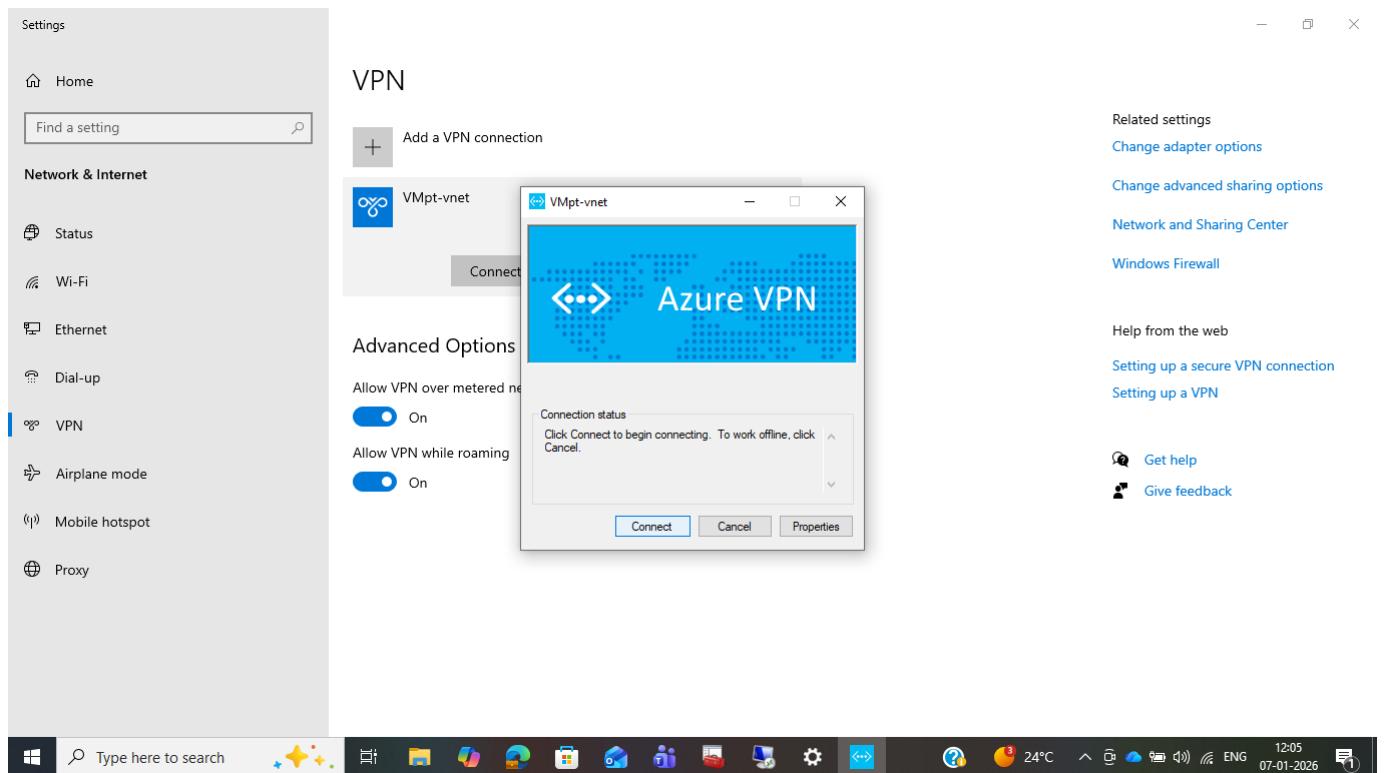
Get help

Give feedback

24°C 12:04 07-01-2026

Type here to search

12:05 24°C ENG 07-01-2026



## 6. Authentication Method 2: Microsoft Entra ID Authentication

### Step 8: Register Azure VPN Application

**What was done:** An application was registered in Microsoft Entra ID for VPN authentication.

#### Why this is required:

- Enables identity-based authentication
- Integrates VPN with Azure AD users and groups
- Supports enterprise security features like MFA

The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with navigation links: Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Resource visualizer, Settings, Configuration, Connections, Point-to-site configuration (which is selected and highlighted in grey), NAT Rules, Maintenance, Properties, and Logs. The main content area is titled "vnetwork-gateway | Point-to-site configuration". It displays settings for an "Address pool" (172.0.0.0/16), "Tunnel type" (OpenVPN (SSL) is selected), and "Audience" (41b23e61-6c1e-4545-b367-cd054...). Below these are fields for "Issuer" (https://sts.windows.net/380a88f6-...) and "Grant administrator consent for Azure VPN client application". At the top of the main area, there are buttons for Save, Discard, Delete, and Download VPN client. A search bar at the top says "Search resources, services, and docs (G+)". On the right side of the screen, a modal window titled "Save your password?" is open. It contains fields for "Username" (172.0.0.0/16) and "Password" (represented by a series of dots). There are "Save" and "Not now" buttons, and a note stating "Your password will autofill the next time and will be saved to your Microsoft account". Below this modal, there are several notification cards: "File download error" (Failed to dynamically fetch target download uri), "File download error" (Failed to dynamically fetch target download uri), and "₹4,770.95 credit remaining" (Subscription 'TrainingMSDNUser-4' has a remaining credit of ₹4,770.95). The bottom of the screen shows the Windows taskbar with various pinned icons and system status indicators.

The screenshot shows the Microsoft Azure portal interface. The main page title is "vnetwork-gateway | Point-to-site configuration". On the left sidebar, under the "Point-to-site configuration" section, the "Address pool" is set to "172.0.0.0/16" and the "Tunnel type" is "OpenVPN (SSL)". Under "Azure Active Directory", the "Tenant" is set to "https://login.microsoftonline.com/...". The "Grant administrator consent for Azure VPN client application" button is visible at the bottom. On the right side, there is a "Notifications" panel listing several events: "Saved virtual network gateway" (successful save), "File download error" (failed to dynamically fetch target download uri), and three more "File download error" entries from different times. The system tray at the bottom shows the date as 07-01-2026 and the time as 12:33.

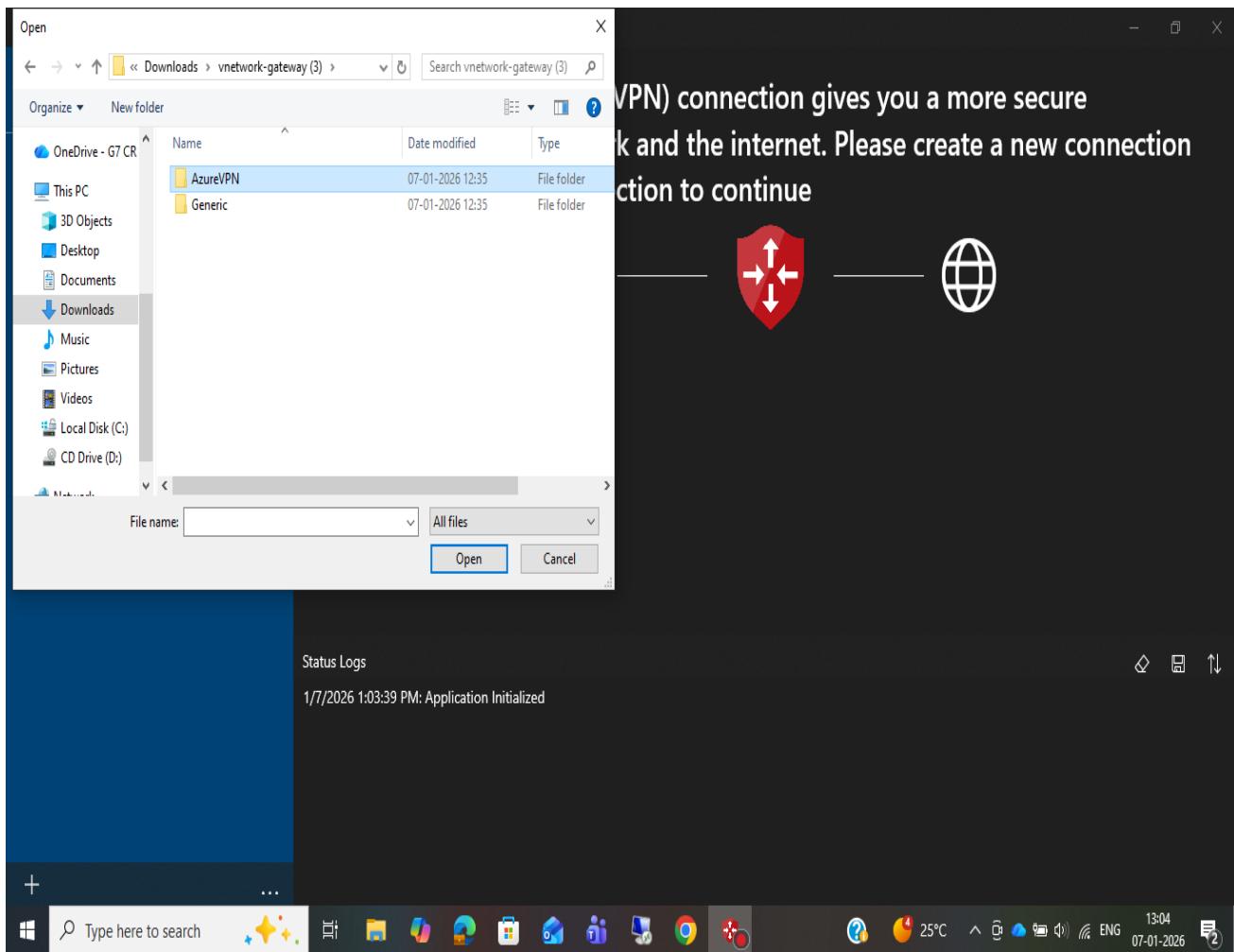
The screenshot shows a Microsoft Learn article titled "Configure the Azure VPN gateway". The left sidebar lists various configuration options: "ID authentication", "P2S gateway configuration" (selected), "Configure P2S - manually registered", "Change from manually registered to Microsoft-registered VPN client", "Create or modify custom audience app ID", "Configure access based on users and groups", "Configure multifactor authentication (MFA)", "VPN client configuration", "Configure P2S - RADIUS", and "Download PDF". The main content area shows a "Configuring" step with an "Important" note: "The Azure portal will verify the password for P2SChildCert (4 seconds)...". A modal window titled "VMpt-vnet" is open, showing the "Enterprise Applications" blade with a search bar and a table of applications. The right sidebar contains sections for "In this article" (Prerequisites, Create Microsoft Entra tenant users, Authorize the Azure VPN application, Configure the VPN gateway, Download the Azure VPN Client profile configuration package) and "Next steps". At the bottom, there is a "Was this page helpful?" poll with "Yes" and "No" buttons.

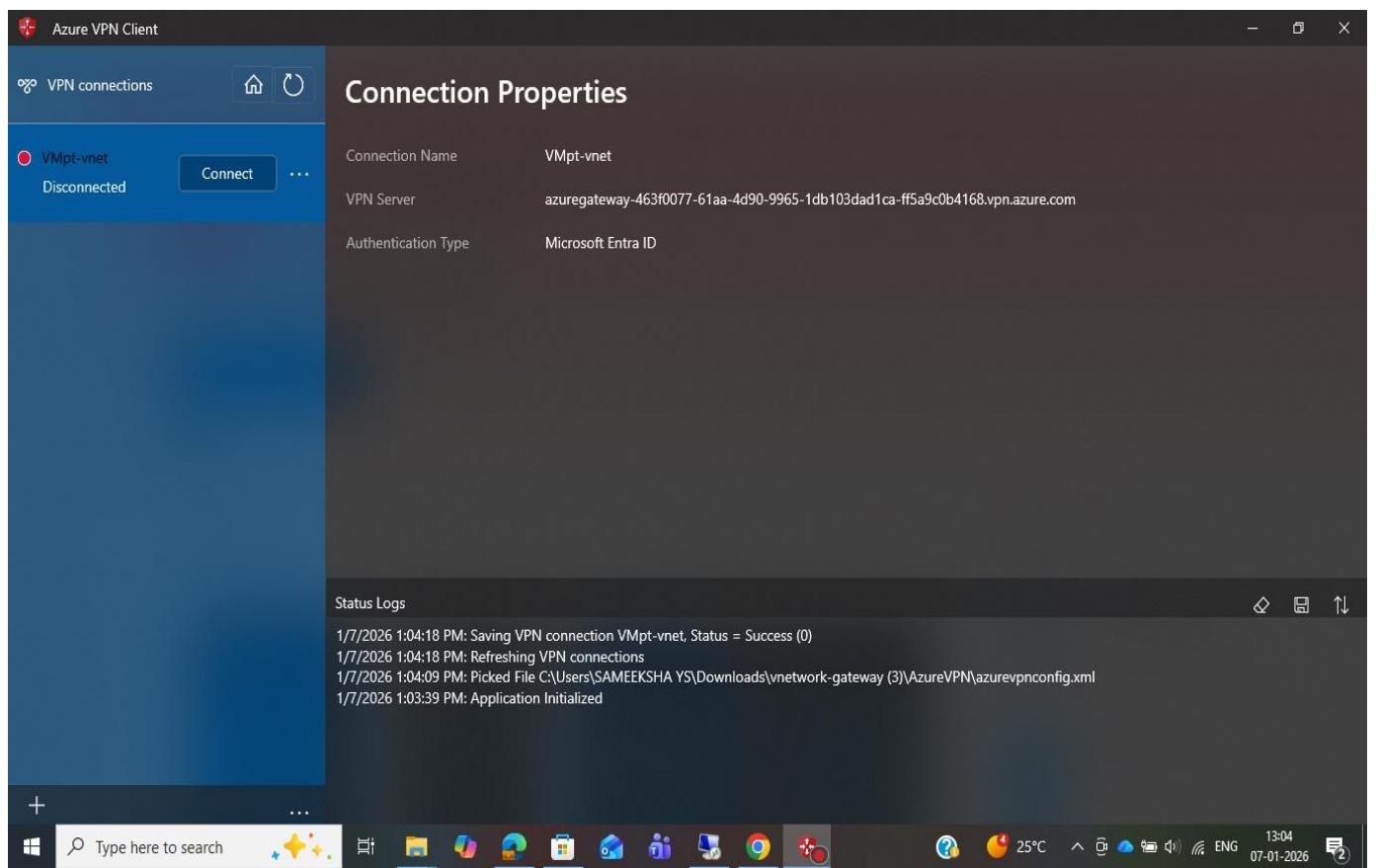
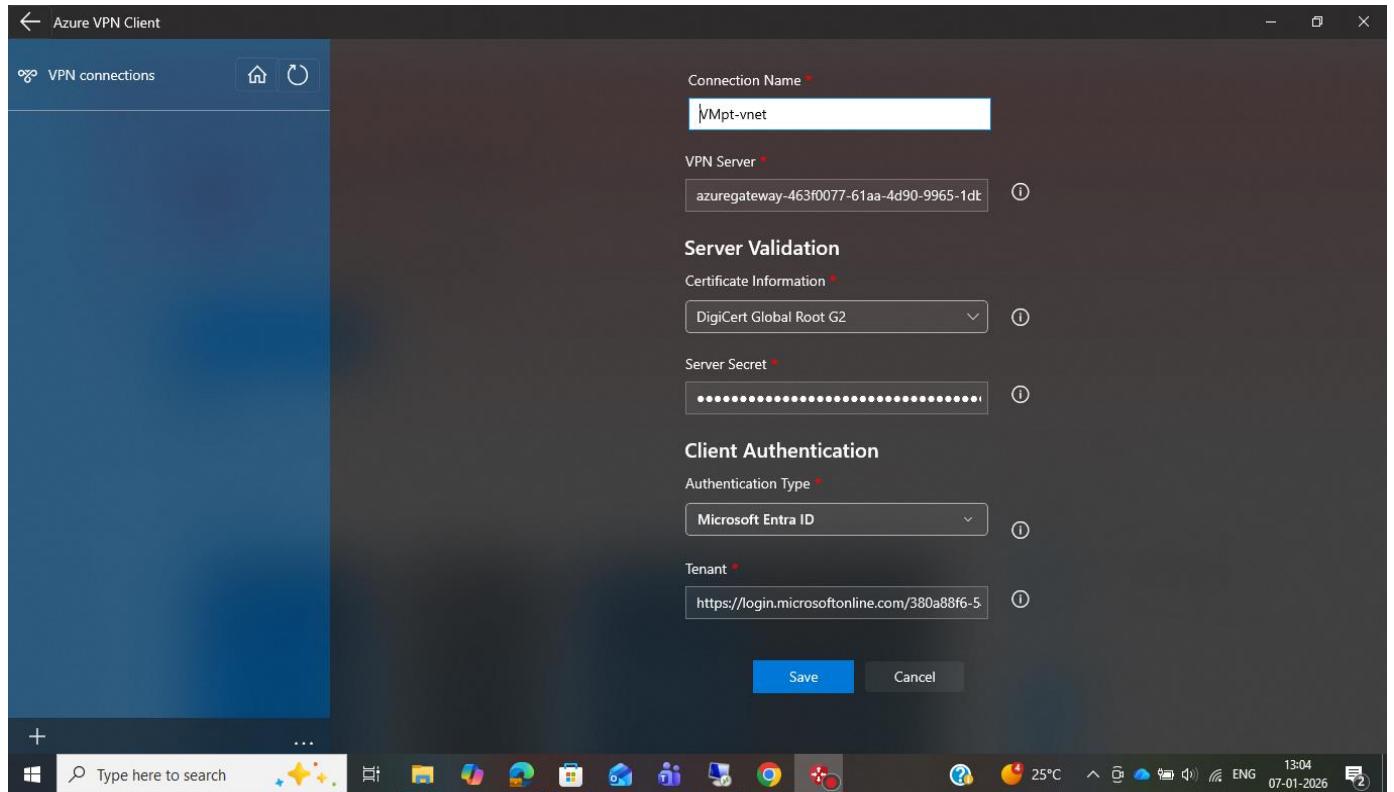
## Step 9: Configure VPN Gateway for Entra ID

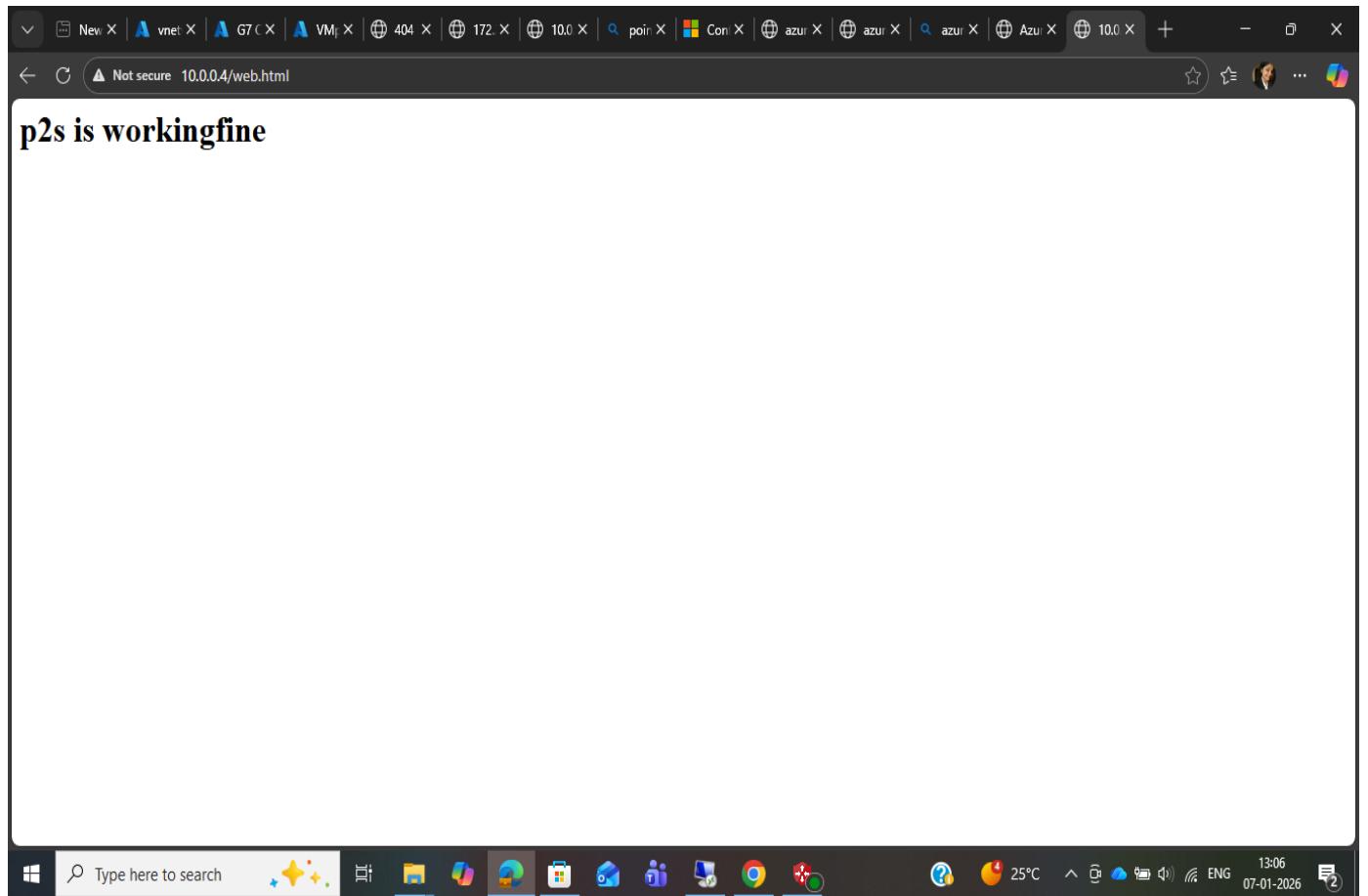
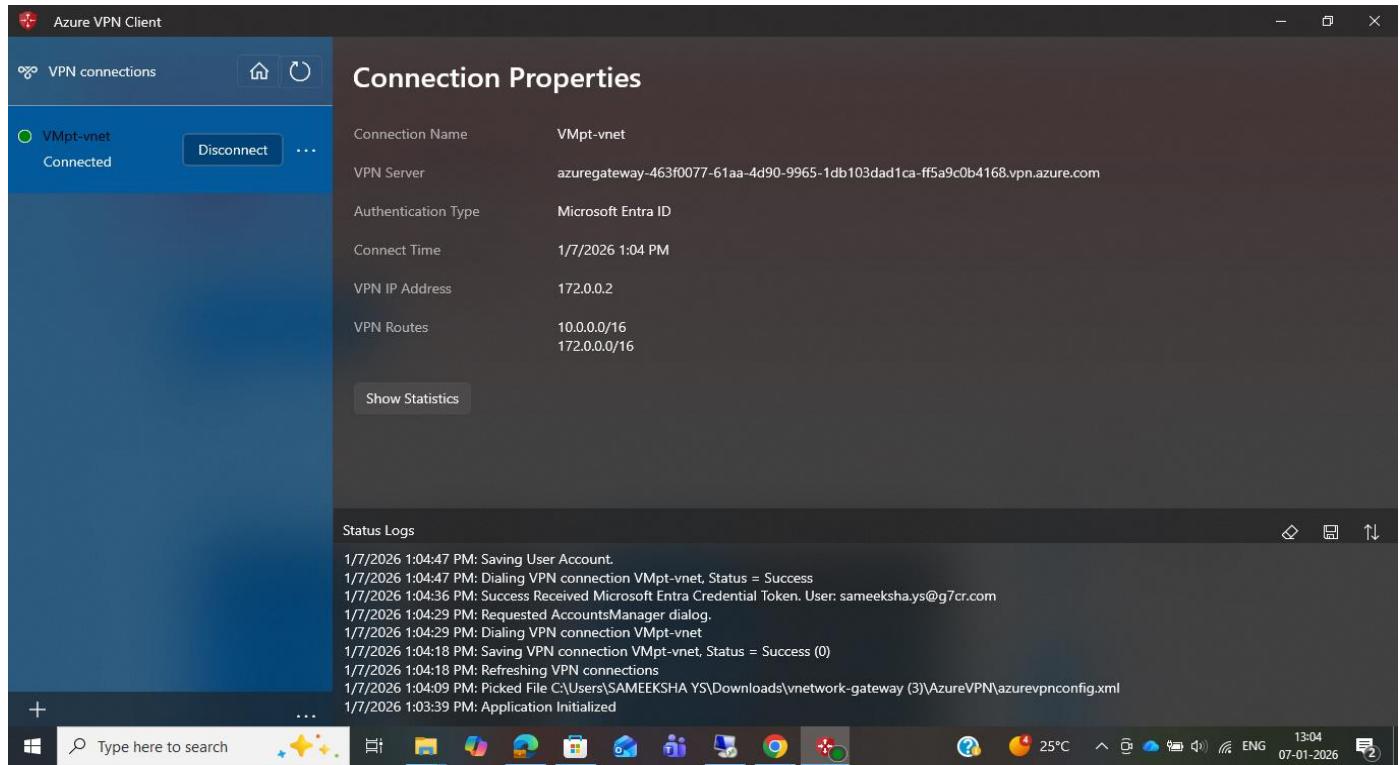
**What was done:** The VPN Gateway was updated with Entra ID tenant, issuer, and audience details.

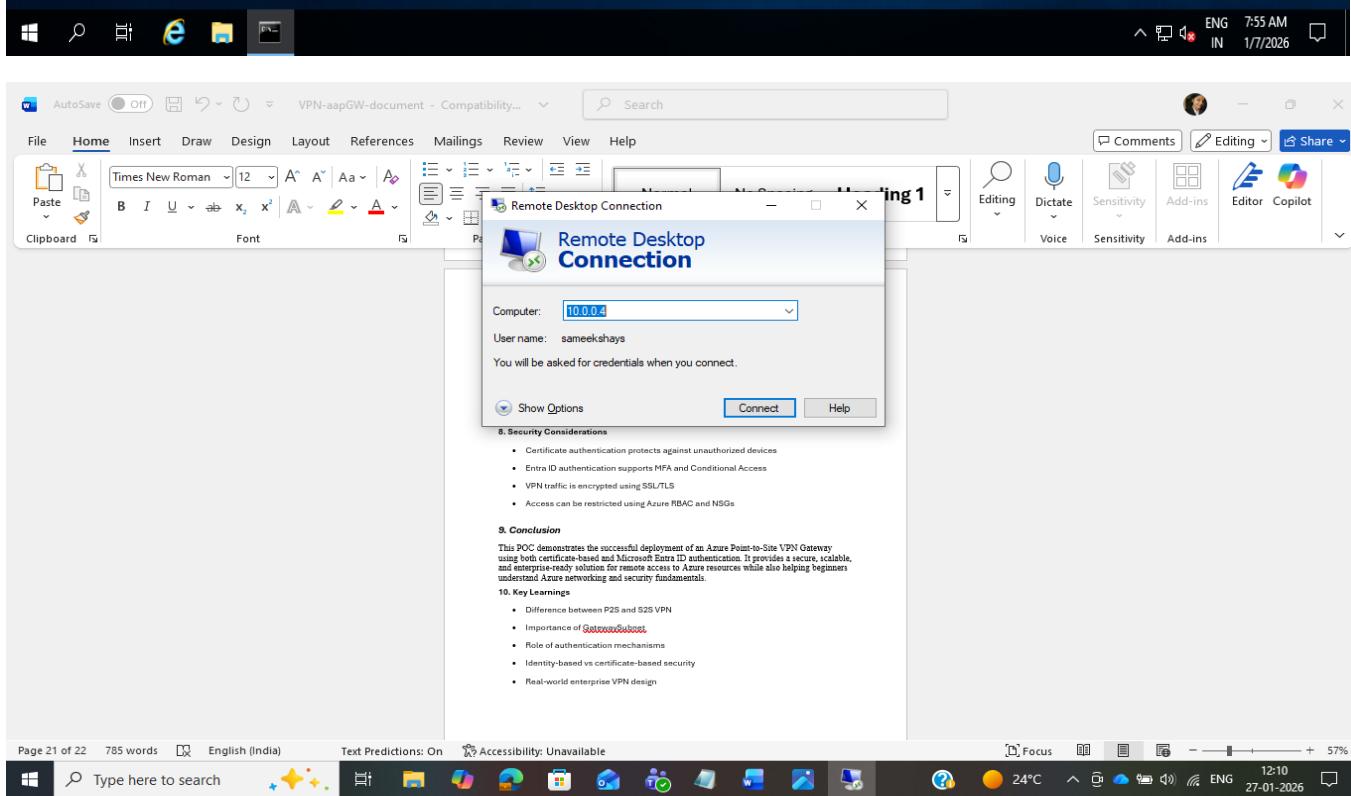
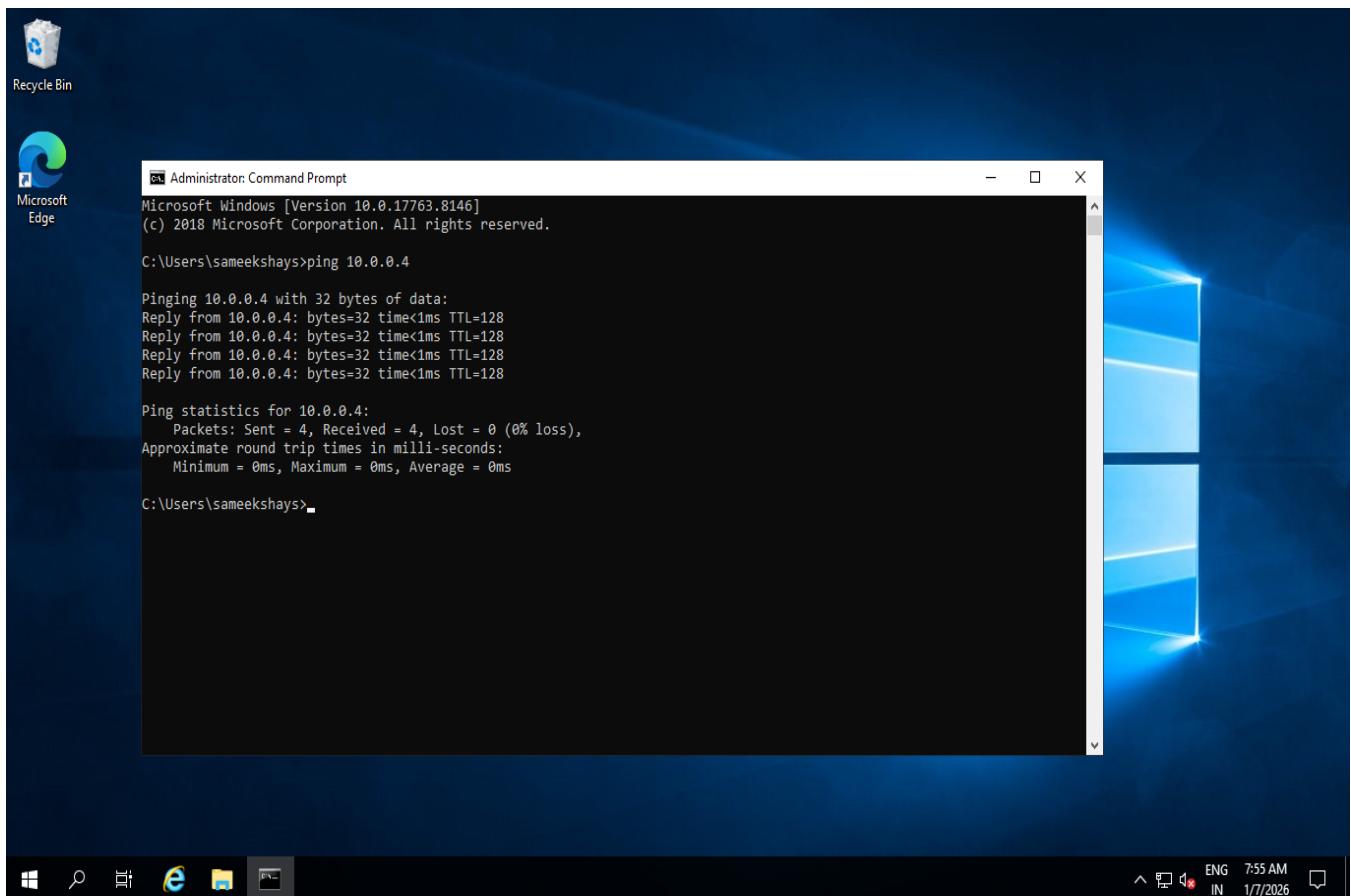
**Why this is required:**

- Links VPN authentication to Entra ID
- Ensures only authorized users can connect
- Enables centralized identity management









## **Step 10: Assign Users to VPN Application**

**What was done:** Users or groups were assigned access to the VPN enterprise application.

**Why this is required:**

- Controls who can access the VPN
- Follows principle of least privilege
- Improves security and compliance

## **7. Validation and Testing**

**Validation Performed:**

- Connected using certificate-based authentication
- Connected using Entra ID credentials
- Verified IP allocation from P2S pool
- Confirmed access to Azure resources

**Purpose:** To ensure the VPN setup works securely and as expected.

## **8. Security Considerations**

- Certificate authentication protects against unauthorized devices
- Entra ID authentication supports MFA and Conditional Access
- VPN traffic is encrypted using SSL/TLS
- Access can be restricted using Azure RBAC and NSGs

## **9. Conclusion**

This POC demonstrates the successful deployment of an Azure Point-to-Site VPN Gateway using both certificate-based and Microsoft Entra ID authentication. It provides a secure, scalable, and enterprise-ready solution for remote access to Azure resources while also helping beginners understand Azure networking and security fundamentals.

## **10. Key Learnings**

- Difference between P2S and S2S VPN
- Importance of GatewaySubnet
- Role of authentication mechanisms

- Identity-based vs certificate-based security
- Real-world enterprise VPN design