



University of Wales
Trinity Saint David
BIRMINGHAM

MODULE: Network and Operating System and Services

ASSIGNMENT: Component 2 Configure and manage the Virtualised Enterprise network.

CODE: ACCA5023

STUDENT: Joaquin Alexander

SURNAME: Canales Garcia

ID: 2427434

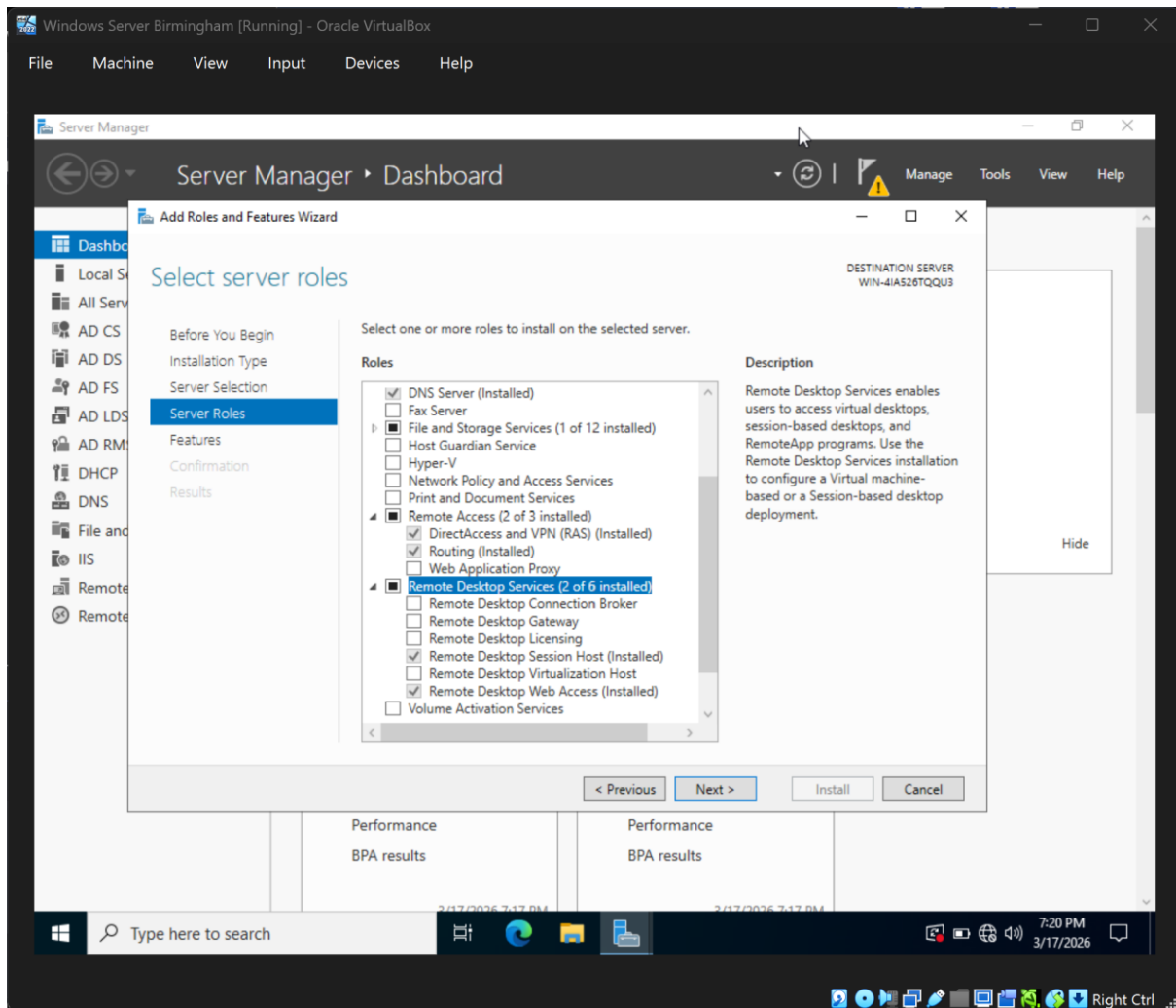
LECTURER: Md Abrar Jahin Almazi Bipon

SUBMISSION: 18/03/2026

Contents

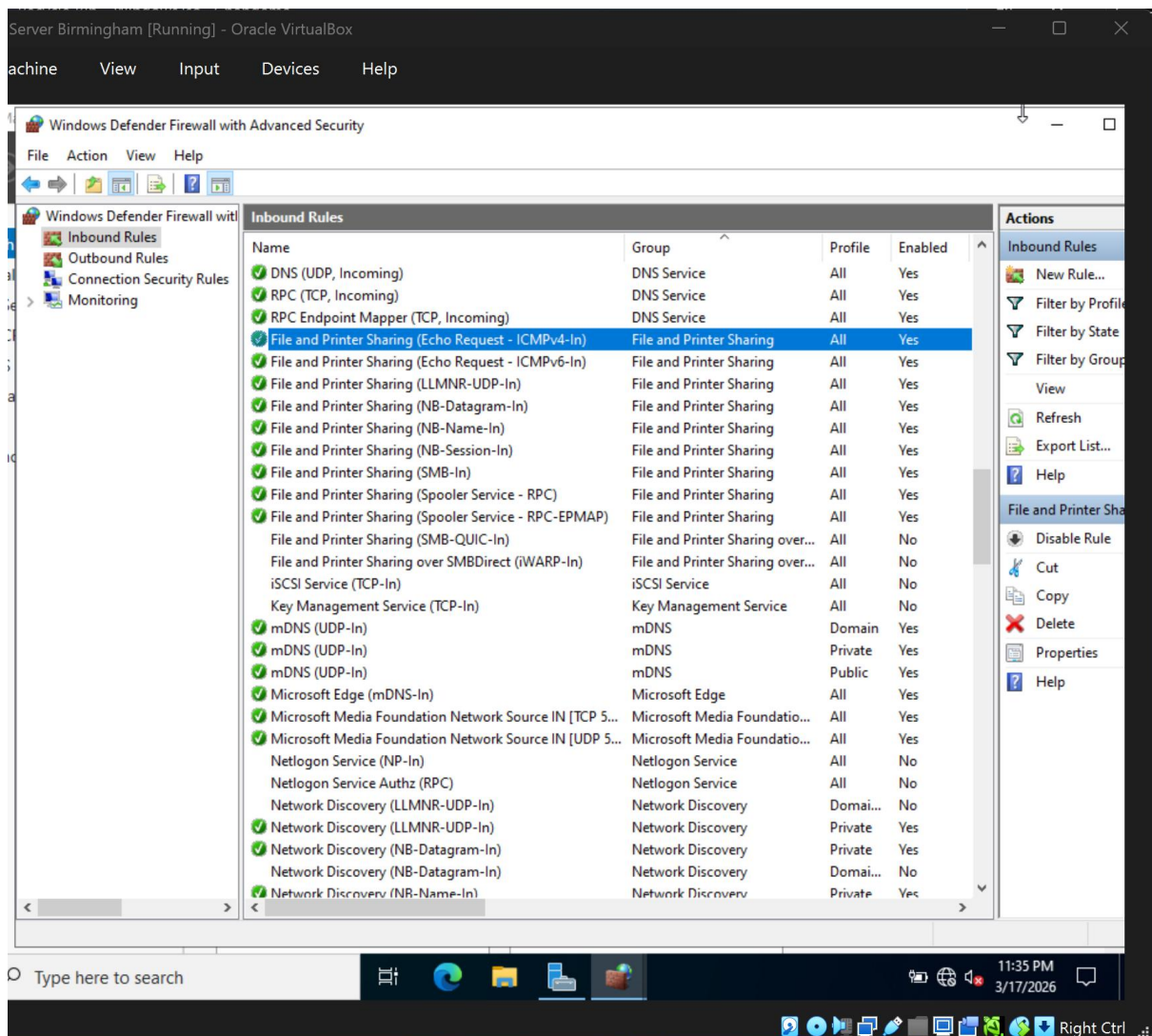
1. Routing.....	3
2 Domain Server	9
3 Encrypted Connection	13
4 Users Create user accounts for alex.acca domain	19
5 Domain Membership	24
6 DHCP SERVER	31
7 Test and Troubleshoot.....	36
8 Disk Drive	39
9 IIS Server	42
10 Remote Desktop Services	47

1. Routing



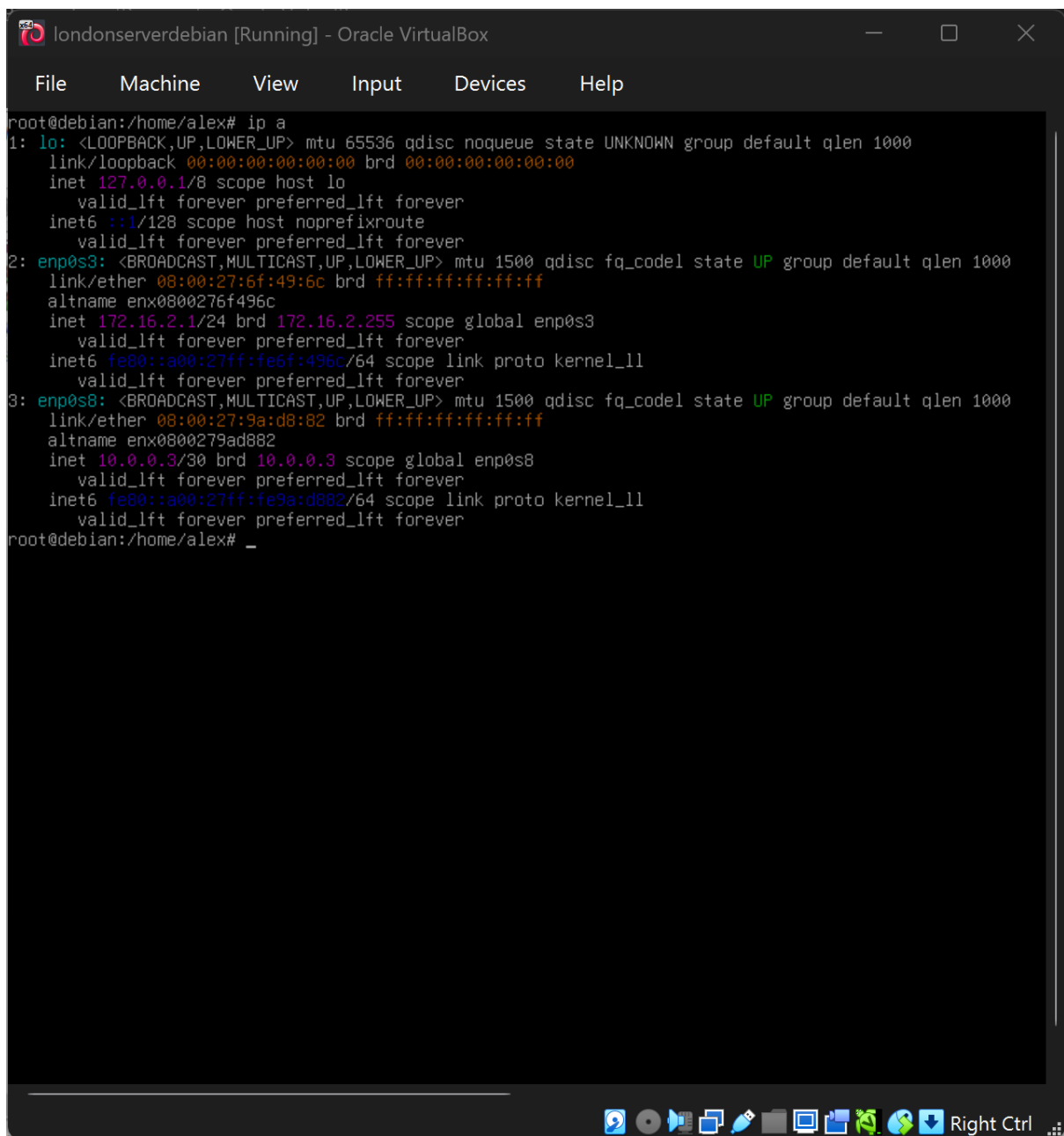
Routing Birmingham Network

We install remote access service selecting routing on manage add roles and features select server roles click on remote access and tick routing and direct access and vpn next and install.



Modify firewall rules to allow ICMP traffic

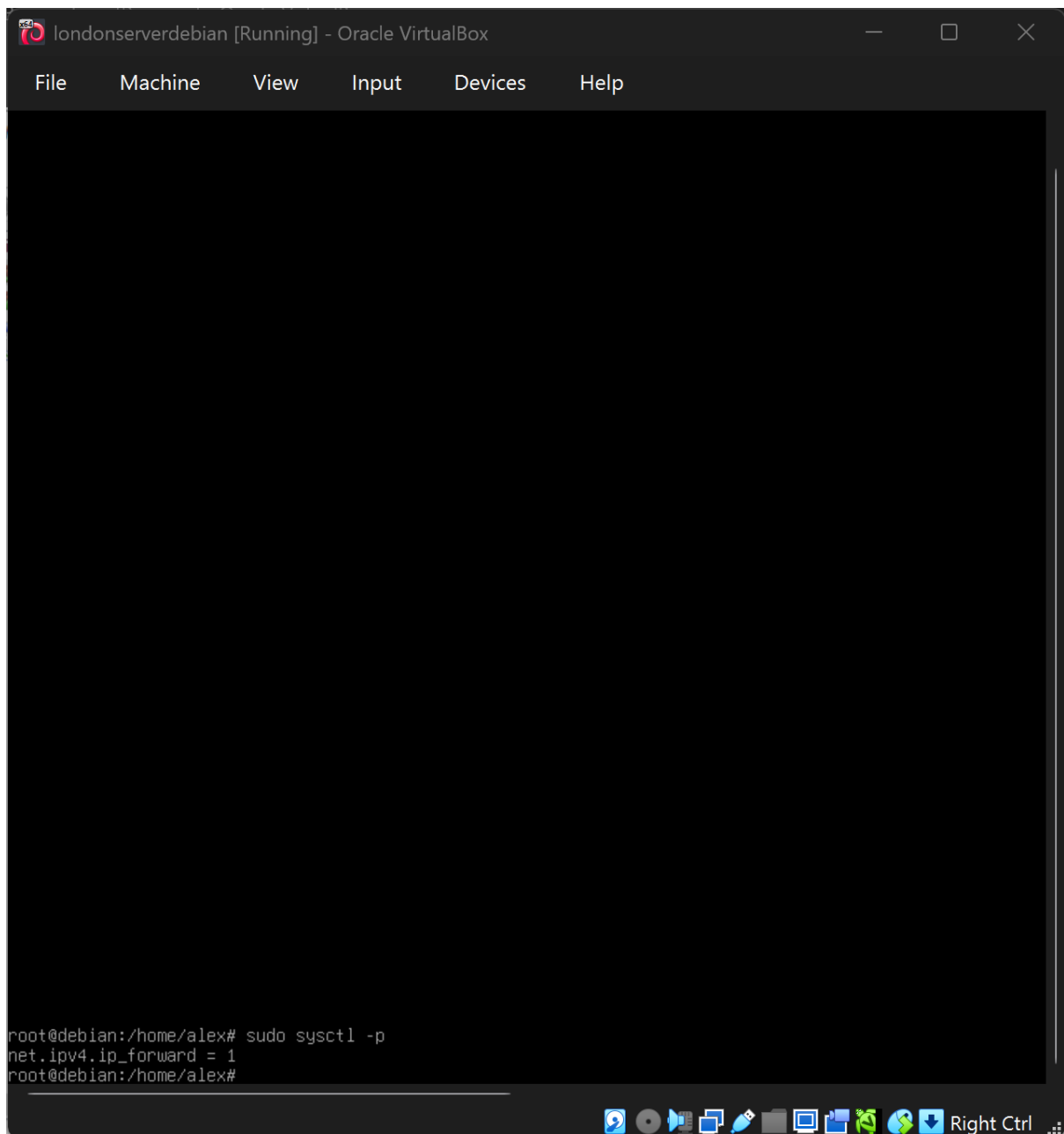
1.2 routing London Network



```
londonserverdebian [Running] - Oracle VirtualBox
File Machine View Input Devices Help

root@debian:/home/alex# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:00:27:6f:49:6c brd ff:ff:ff:ff:ff:ff
    altname enx0800276f496c
    inet 172.16.2.1/24 brd 172.16.2.255 scope global enp0s3
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe6f:496c/64 scope link proto kernel_ll
        valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:00:27:9a:d8:82 brd ff:ff:ff:ff:ff:ff
    altname enx0800279ad882
    inet 10.0.0.3/30 brd 10.0.0.3 scope global enp0s8
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe9a:d882/64 scope link proto kernel_ll
        valid_lft forever preferred_lft forever
root@debian:/home/alex# _
```

showing both interfaces with correct ips

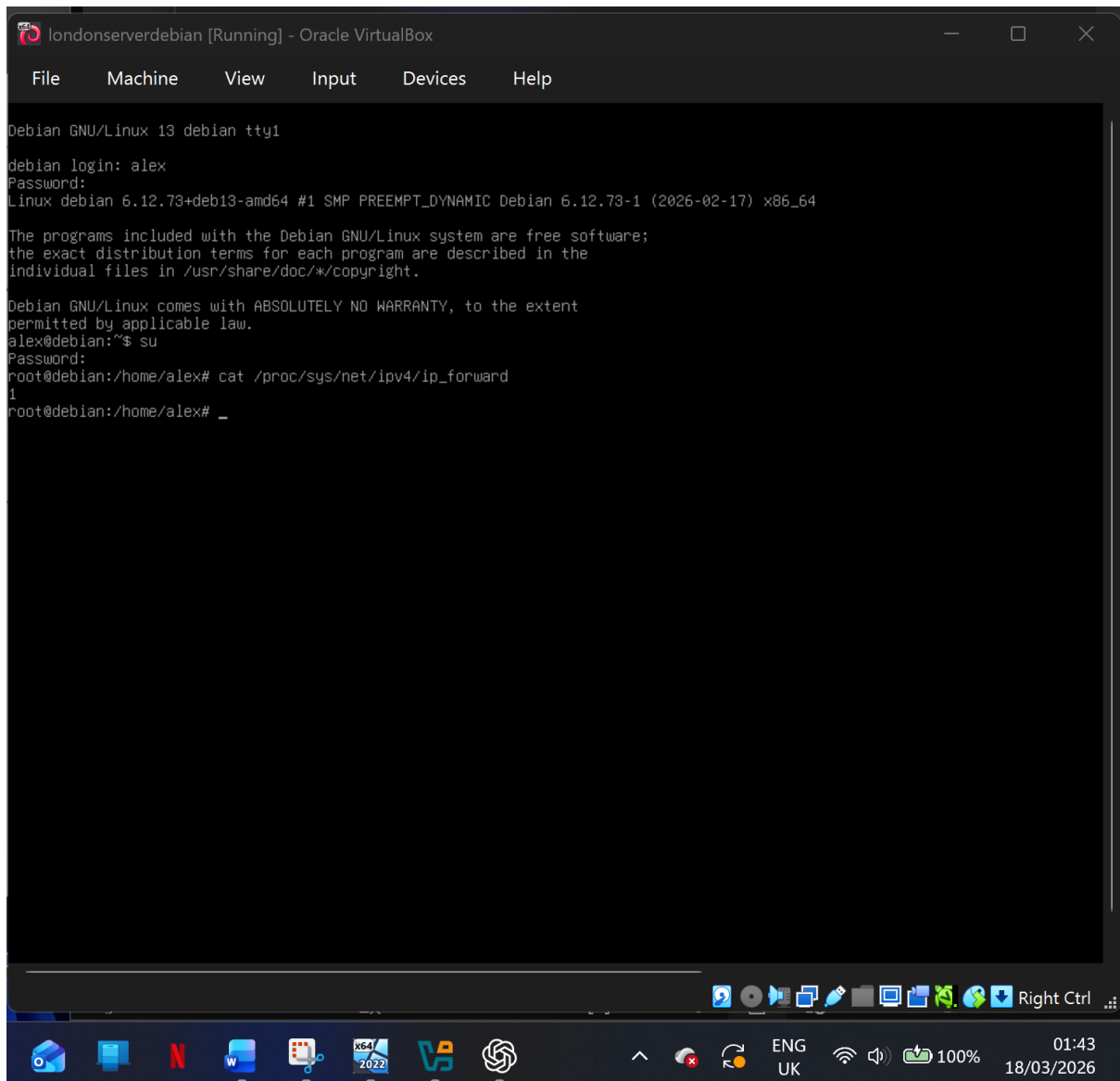


/etc/sysctl.conf showing net.ipv4.ip_forward=1

This proves persistent IP forwarding is configured



Checking firewall because debian is offline I can not install UFW or IPTABLES the correct firewall system is nftables which I already built in with this command `sudo nft list ruleset` it proves that I checked the firewall and proves that nftables is active and document the London firewall configuration.



```
londonserverdebian [Running] - Oracle VirtualBox
File Machine View Input Devices Help

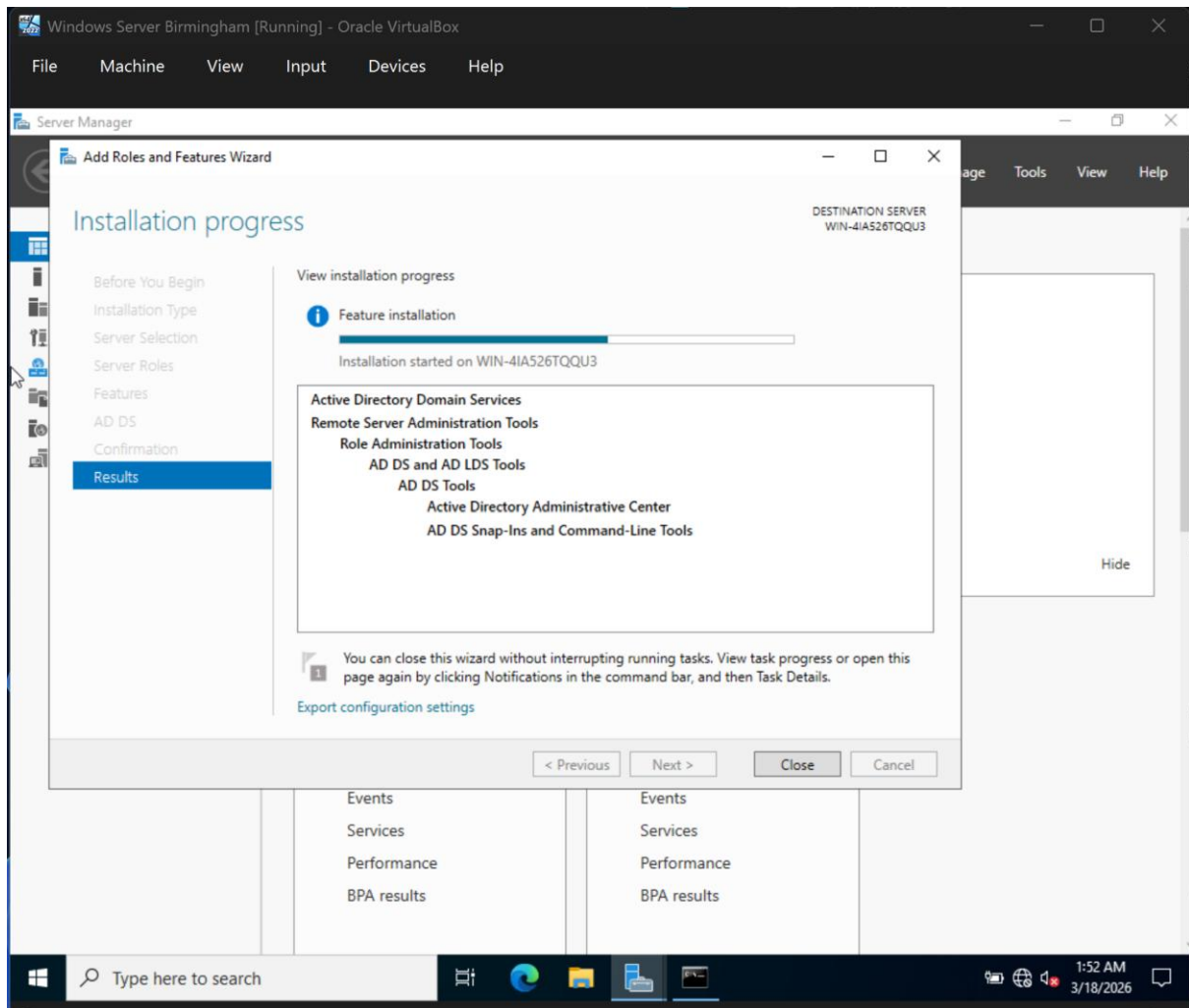
Debian GNU/Linux 13 debian tty1
debian login: alex
Password:
Linux debian 6.12.73+deb13-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.12.73-1 (2026-02-17) x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
alex@debian:~$ su
Password:
root@debian:/home/alex# cat /proc/sys/net/ipv4/ip_forward
1
root@debian:/home/alex# _
```

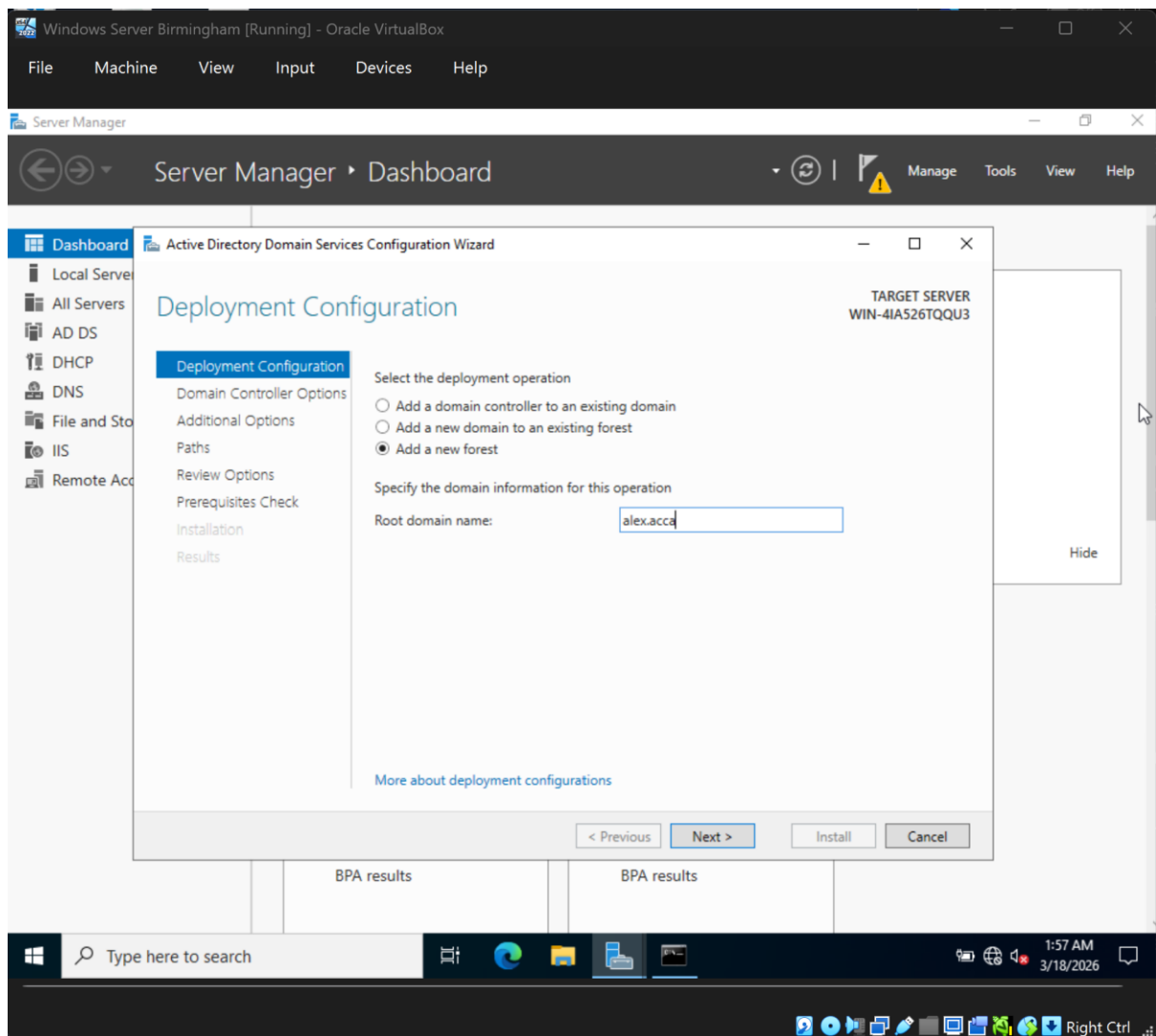
Persistent IP forwarding was configured on the London Debian server to enable packet routing between multiple networks. This allows the server to function as a router by forwarding traffic automatically even after system reboot.

2 Domain Server



Installing active directory Domain Services

Server manager, manage, add roles and features, installation type role based or feature based installation next server selection select birmingham server next, server roles active directory domain services popup appears click in add features also ensure DN Server is auto selected next next next install.

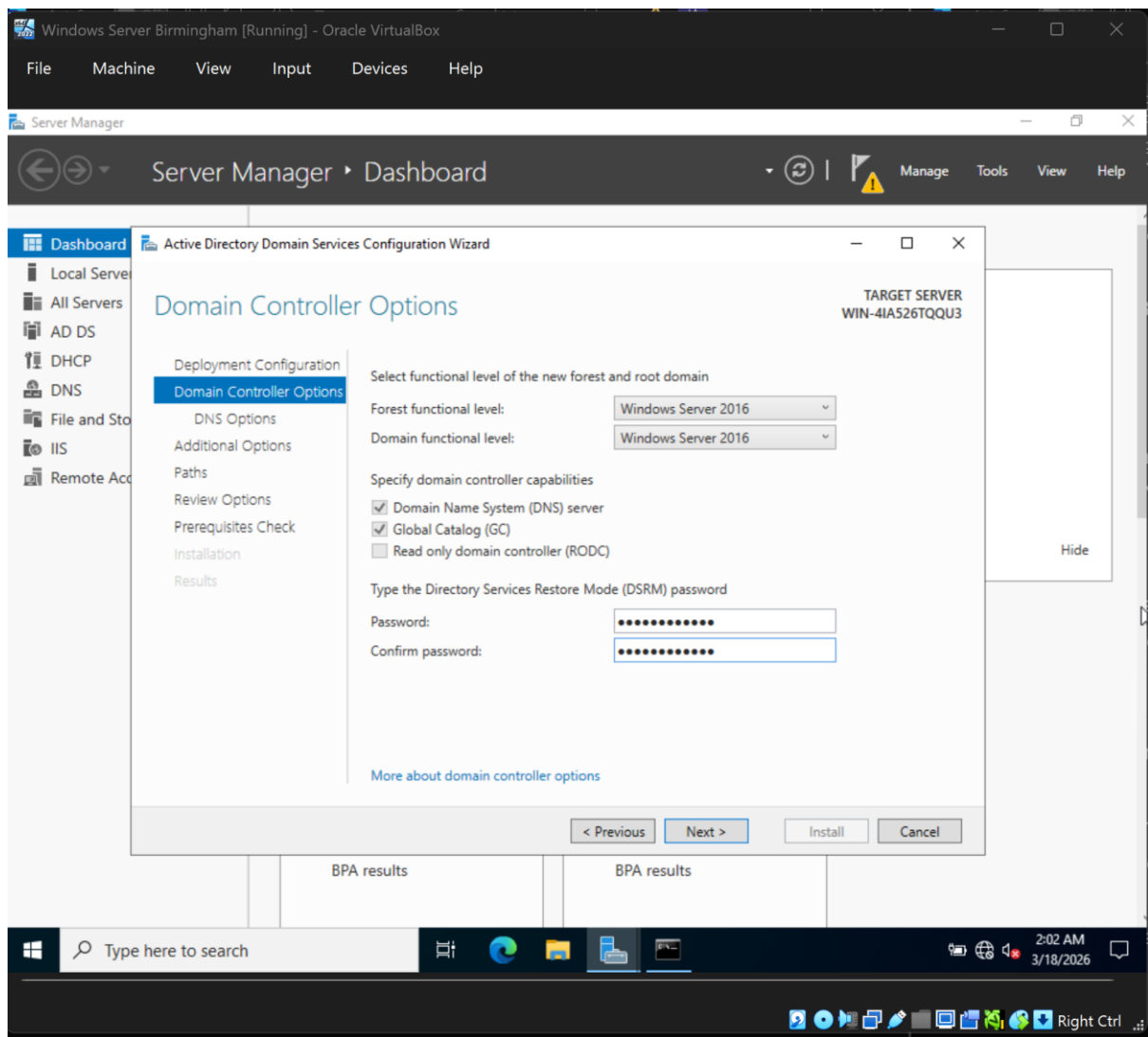


Promote Server to Domain Controller

Creating a new forrest After installation finishes you will see a yellow flag in Server Manager. Click Promote this server to a domain controller

Deployment Configuration

Add a new forest, Root Domain Name, Type: alex.acca



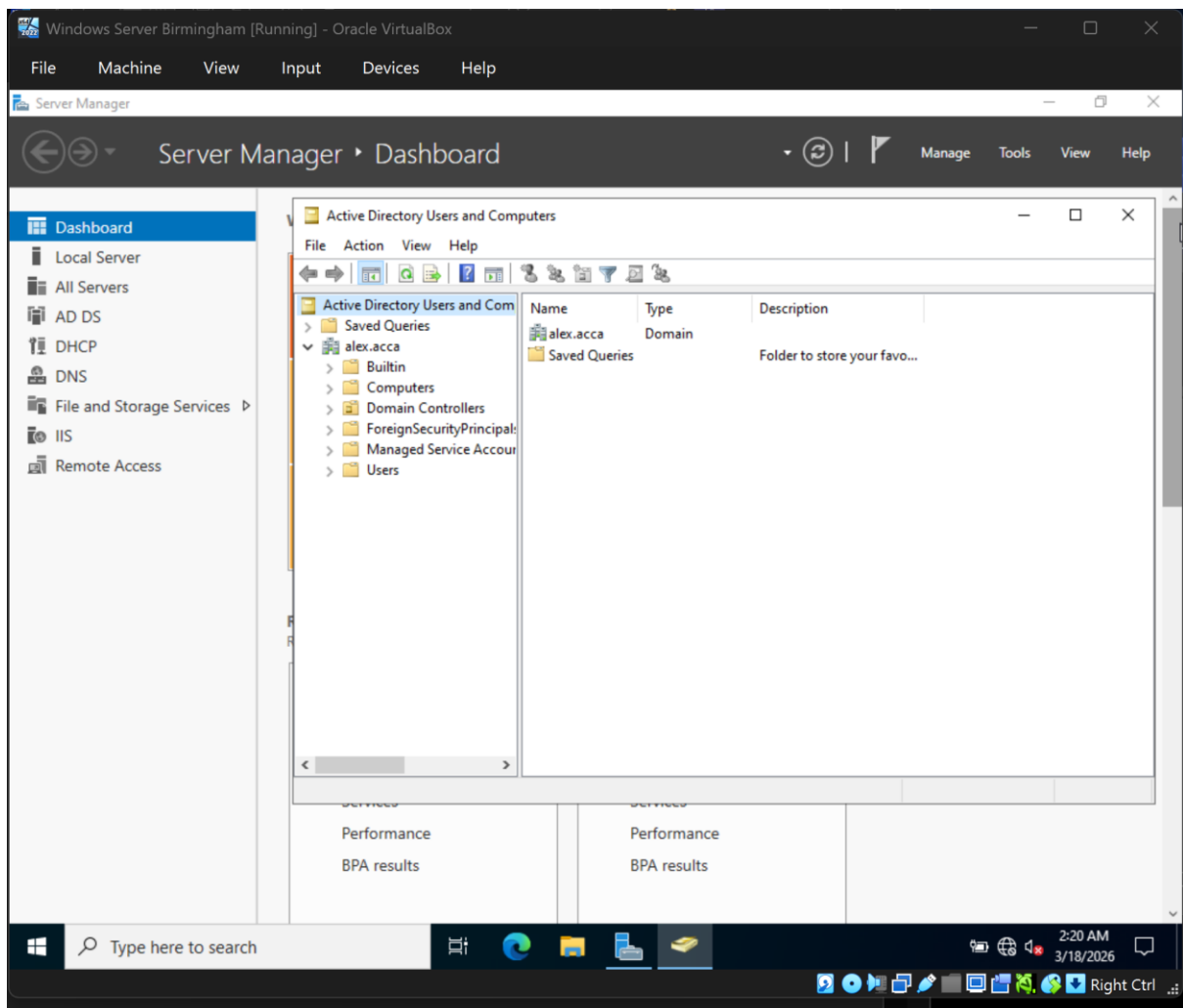
Domain controller options

Domain name system DNS server, Global Catalog

Set DSRM Password: Notebook@123

DNS Option Ignore warning Click Next

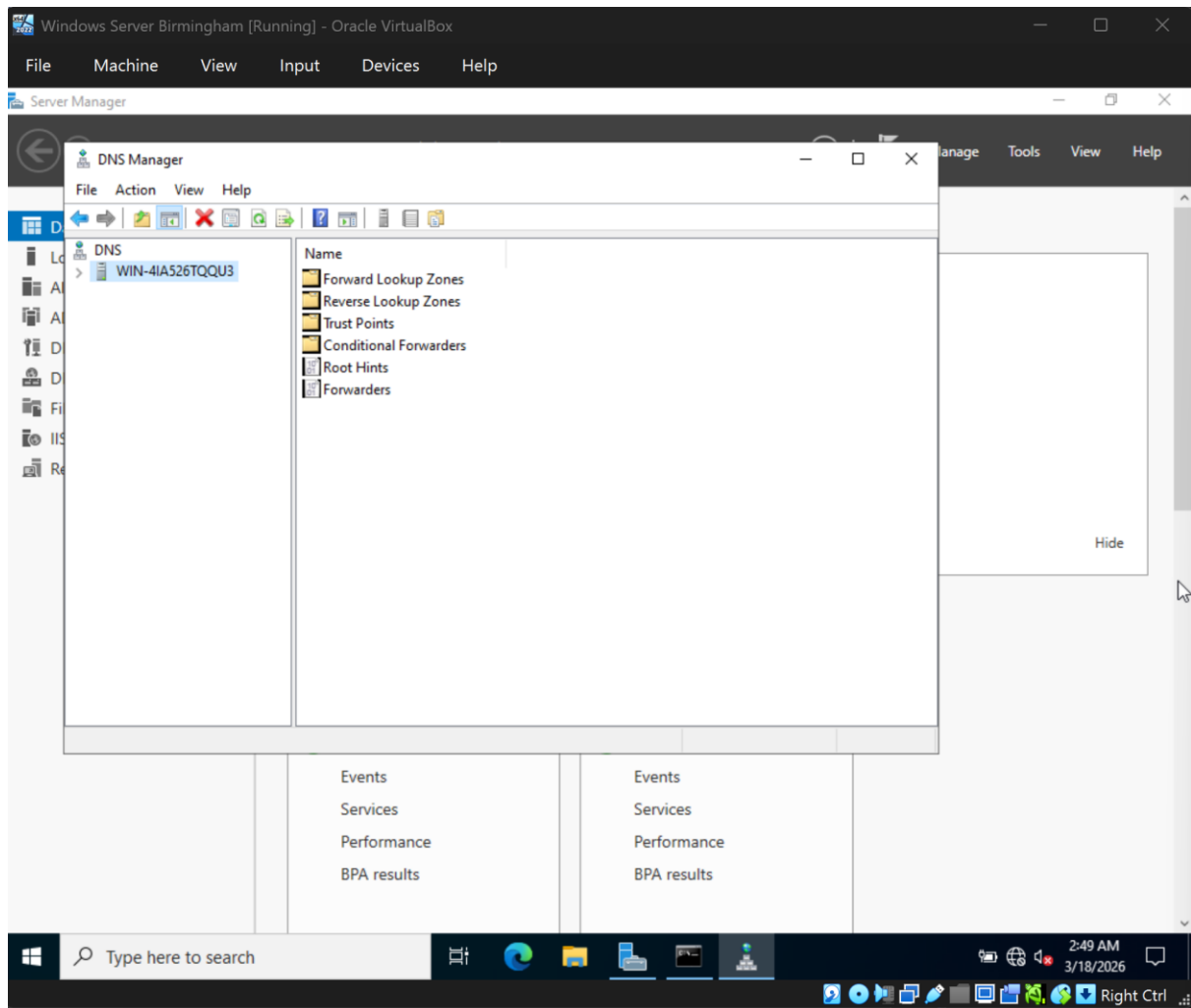
NetBIOS Name Auto-filled :ALEX Next



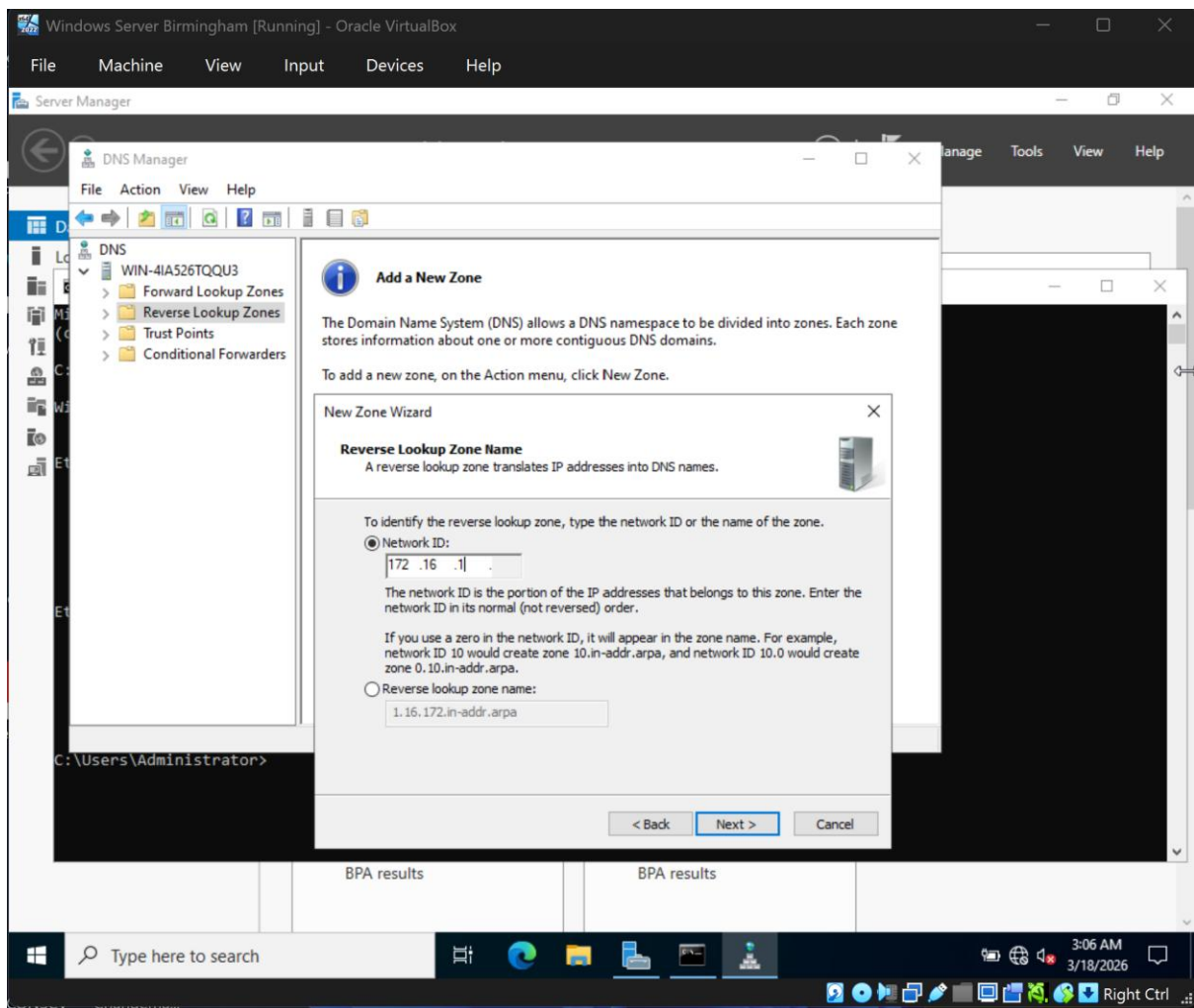
Verify domain controller

**Server Manager Tools Active Directory Users and Computers alex.acca
with folders: Users, Computers, Domain Controllers
Domain successfully created.**

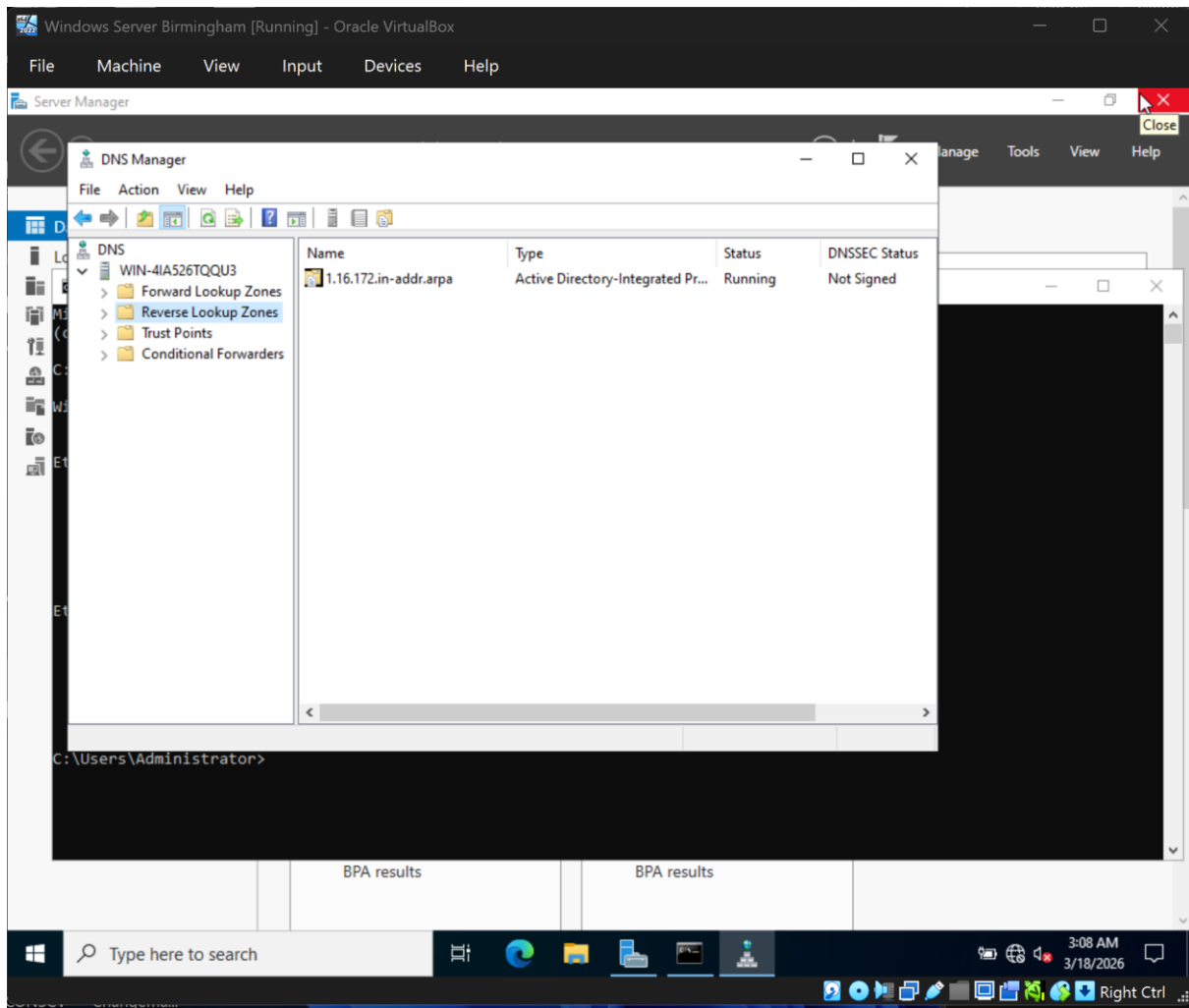
3 Encrypted Connection



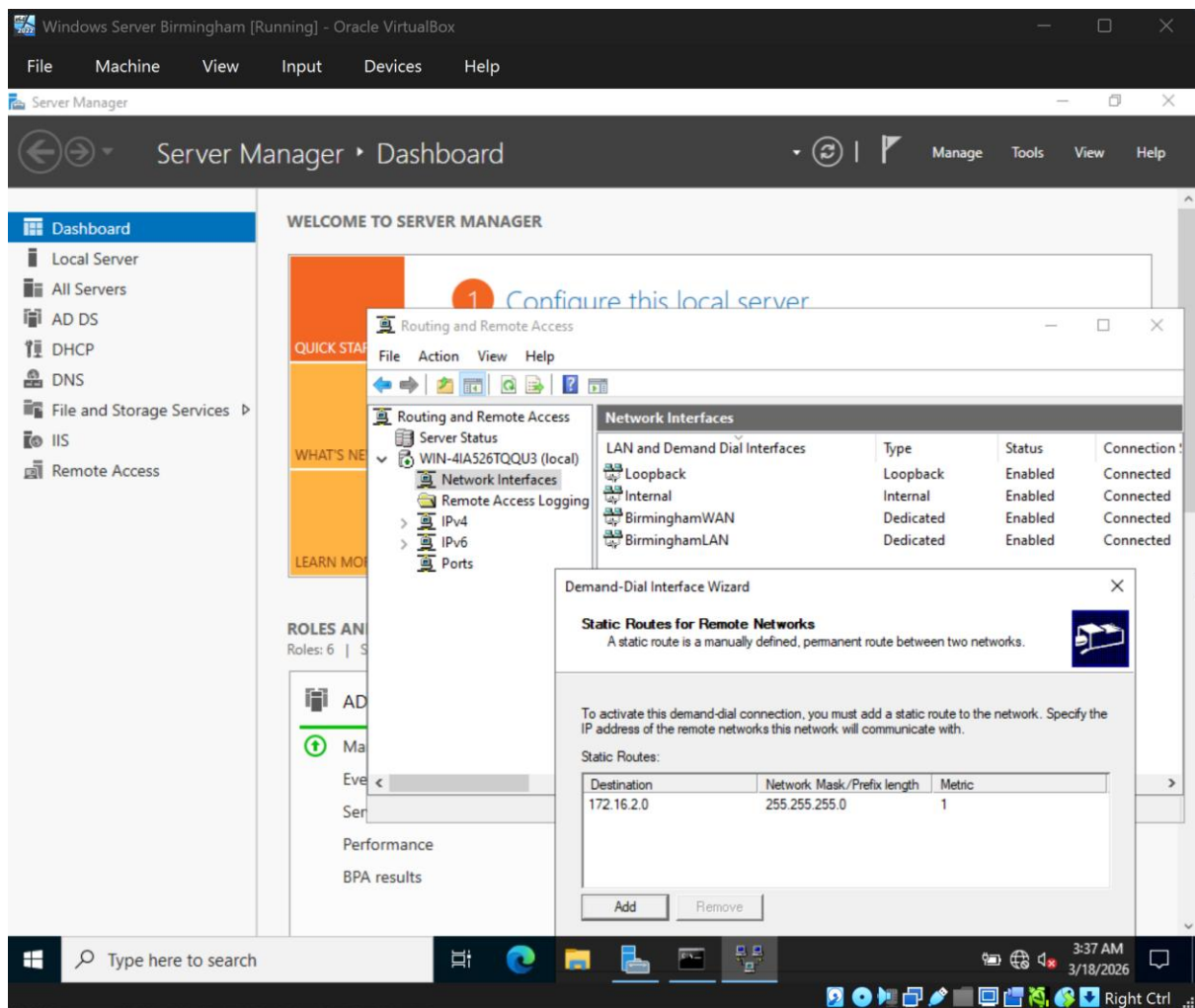
Lookup Zones / Reverse Lookup Zones



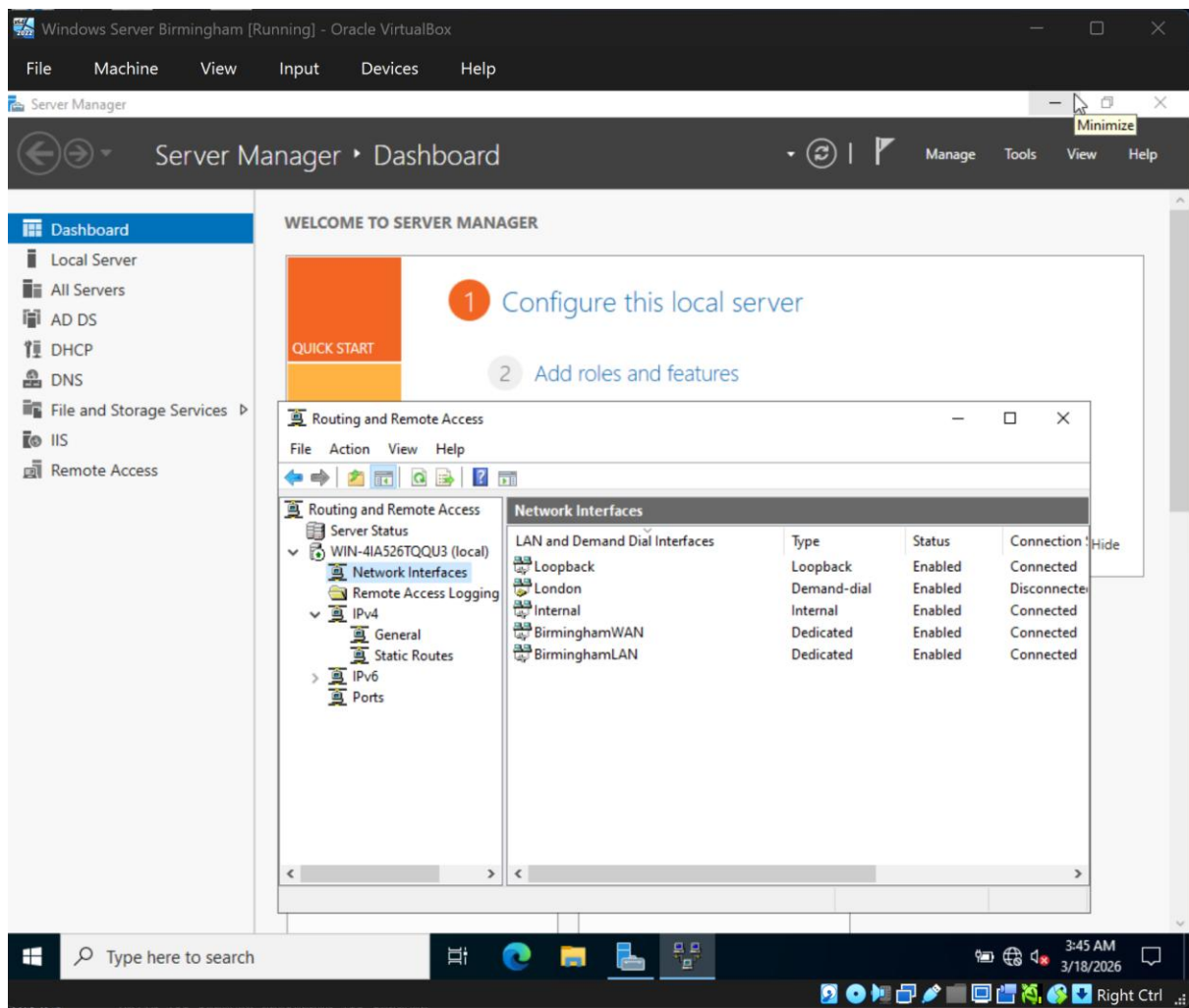
New lookup zone 172.16.1



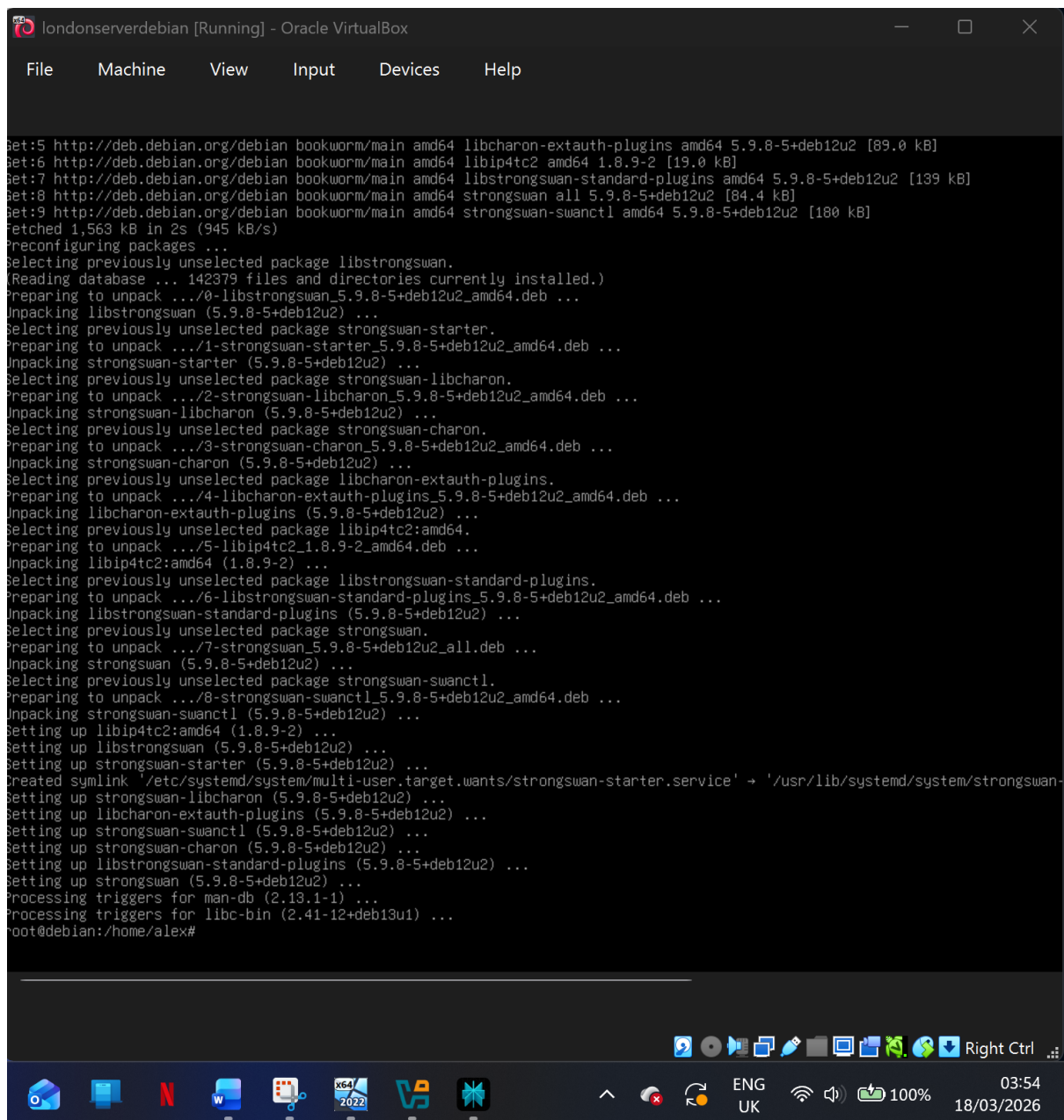
New lookup zone created



Creating a static route for remote network



RRAS showing london interface



```
Get:5 http://deb.debian.org/debian bookworm/main amd64 libcharon-extauth-plugins amd64 5.9.8-5+deb12u2 [89.0 kB]
Get:6 http://deb.debian.org/debian bookworm/main amd64 libip4tc2 amd64 1.8.9-2 [19.0 kB]
Get:7 http://deb.debian.org/debian bookworm/main amd64 libstrongswan-standard-plugins amd64 5.9.8-5+deb12u2 [139 kB]
Get:8 http://deb.debian.org/debian bookworm/main amd64 strongswan all 5.9.8-5+deb12u2 [84.4 kB]
Get:9 http://deb.debian.org/debian bookworm/main amd64 strongswan-swanktl amd64 5.9.8-5+deb12u2 [180 kB]
Fetched 1,563 kB in 2s (945 kB/s)
Preconfiguring packages ...
Selecting previously unselected package libstrongswan.
(Reading database ... 142379 files and directories currently installed.)
Preparing to unpack .../0-libstrongswan_5.9.8-5+deb12u2_amd64.deb ...
Unpacking libstrongswan (5.9.8-5+deb12u2) ...
Selecting previously unselected package strongswan-starter.
Preparing to unpack .../1-strongswan-starter_5.9.8-5+deb12u2_amd64.deb ...
Unpacking strongswan-starter (5.9.8-5+deb12u2) ...
Selecting previously unselected package strongswan-libcharon.
Preparing to unpack .../2-strongswan-libcharon_5.9.8-5+deb12u2_amd64.deb ...
Unpacking strongswan-libcharon (5.9.8-5+deb12u2) ...
Selecting previously unselected package strongswan-charon.
Preparing to unpack .../3-strongswan-charon_5.9.8-5+deb12u2_amd64.deb ...
Unpacking strongswan-charon (5.9.8-5+deb12u2) ...
Selecting previously unselected package libcharon-extauth-plugins.
Preparing to unpack .../4-libcharon-extauth-plugins_5.9.8-5+deb12u2_amd64.deb ...
Unpacking libcharon-extauth-plugins (5.9.8-5+deb12u2) ...
Selecting previously unselected package libip4tc2:amd64.
Preparing to unpack .../5-libip4tc2_1.8.9-2_amd64.deb ...
Unpacking libip4tc2:amd64 (1.8.9-2) ...
Selecting previously unselected package libstrongswan-standard-plugins.
Preparing to unpack .../6-libstrongswan-standard-plugins_5.9.8-5+deb12u2_amd64.deb ...
Unpacking libstrongswan-standard-plugins (5.9.8-5+deb12u2) ...
Selecting previously unselected package strongswan.
Preparing to unpack .../7-strongswan_5.9.8-5+deb12u2_all.deb ...
Unpacking strongswan (5.9.8-5+deb12u2) ...
Selecting previously unselected package strongswan-swanktl.
Preparing to unpack .../8-strongswan-swanktl_5.9.8-5+deb12u2_amd64.deb ...
Unpacking strongswan-swanktl (5.9.8-5+deb12u2) ...
Setting up libip4tc2:amd64 (1.8.9-2) ...
Setting up libstrongswan (5.9.8-5+deb12u2) ...
Setting up strongswan-starter (5.9.8-5+deb12u2) ...
Created symlink '/etc/systemd/system/multi-user.target.wants/strongswan-starter.service' -> '/usr/lib/systemd/system/strongswan-
Setting up strongswan-libcharon (5.9.8-5+deb12u2) ...
Setting up libcharon-extauth-plugins (5.9.8-5+deb12u2) ...
Setting up strongswan-swanktl (5.9.8-5+deb12u2) ...
Setting up strongswan-charon (5.9.8-5+deb12u2) ...
Setting up libstrongswan-standard-plugins (5.9.8-5+deb12u2) ...
Setting up strongswan (5.9.8-5+deb12u2) ...
Processing triggers for man-db (2.13.1-1) ...
Processing triggers for libc-bin (2.41-12+deb13u1) ...
root@debian:/home/alex#
```

Install strongSwan on Debian On the London Debian terminal (as root or with sudo): This installs the IPsec service strongSwan uses for site-to-site VPNs

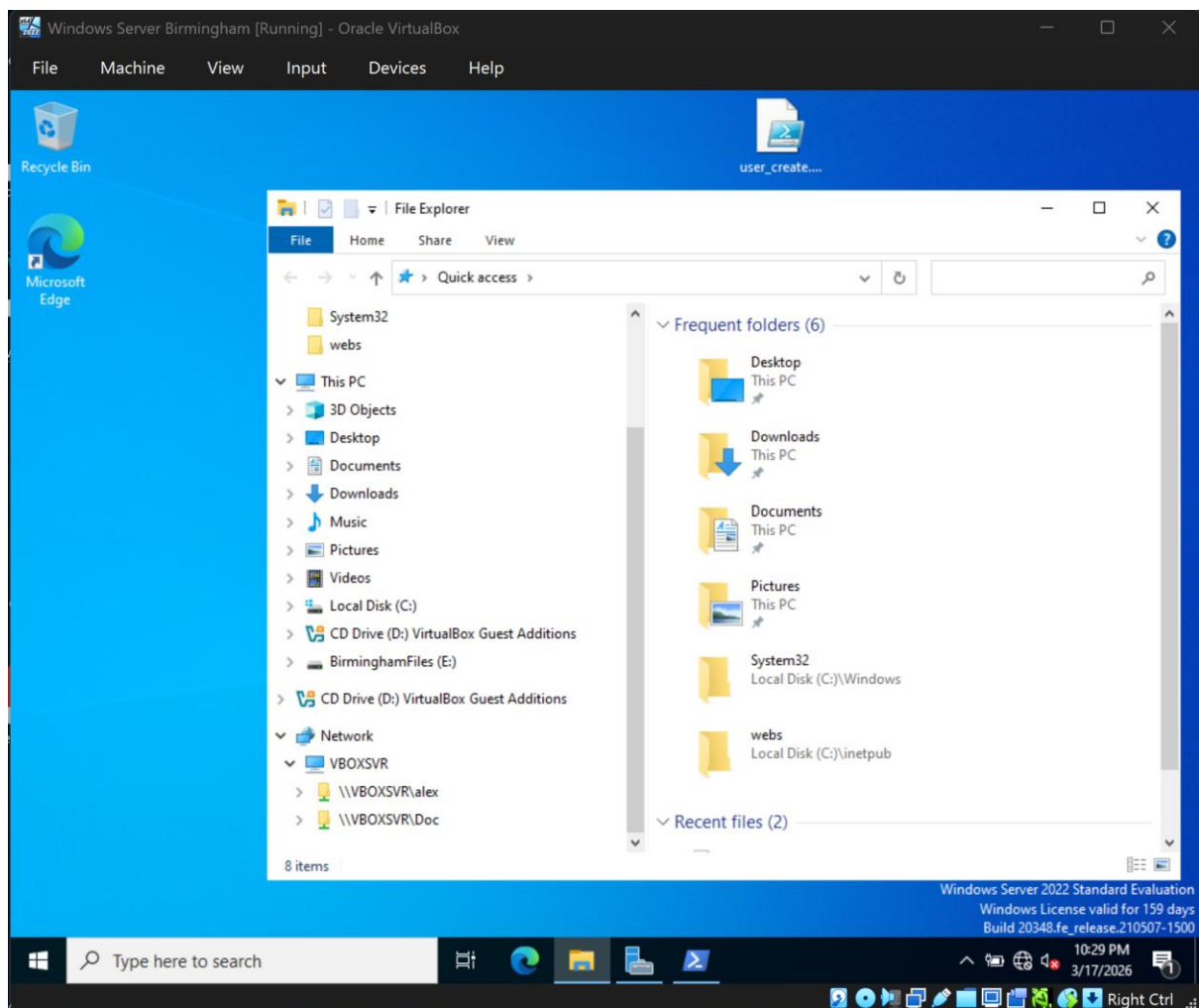
apt update

apt install strongswan strongswan-swanktl

On Birmingham (Windows): RRAS is installed and running, A demand-dial VPN interface “london” is configured to 10.0.0.6, Static route added to the London LAN 172.16.2.0/24, IPsec pre-shared key configured on the Security tab,

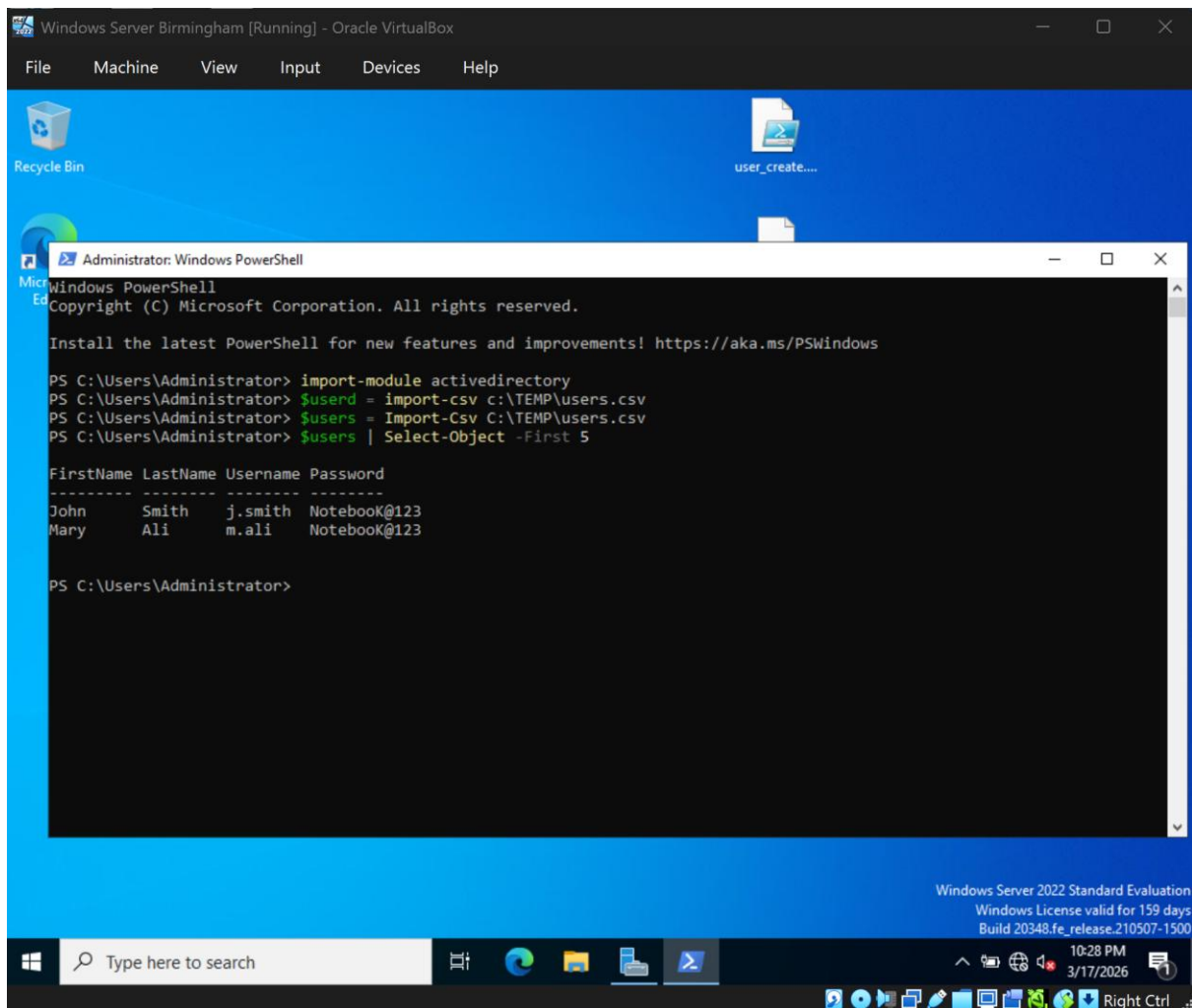
**On London (Debian): strongSwan package is installed (or attempted),
/etc/ipsec.conf and /etc/ipsec.secrets prepared for a site-to-site tunnel between
10.0.0.2 and 10.0.0.6, with 172.16.1.0/24 172.16.2.0/24, IP forwarding planned
via net.ipv4.ip_forward=1 (but tooling on the VM is limited).**

4 Users Create user accounts for alex.acca domain



In this part because I have issues with the usb I choose the option of create a share folder from my laptop to the virtual machine using going to files tools extentions and then installing the program oracle virtual box extention pack but because my laptop doesn't recognise the usb I use the option of sharing folder and I when to virtual box virtual machine righth click settings share folders add new share folder and I select the folder that I want to share from my laptop to the virtual machine then I go to file

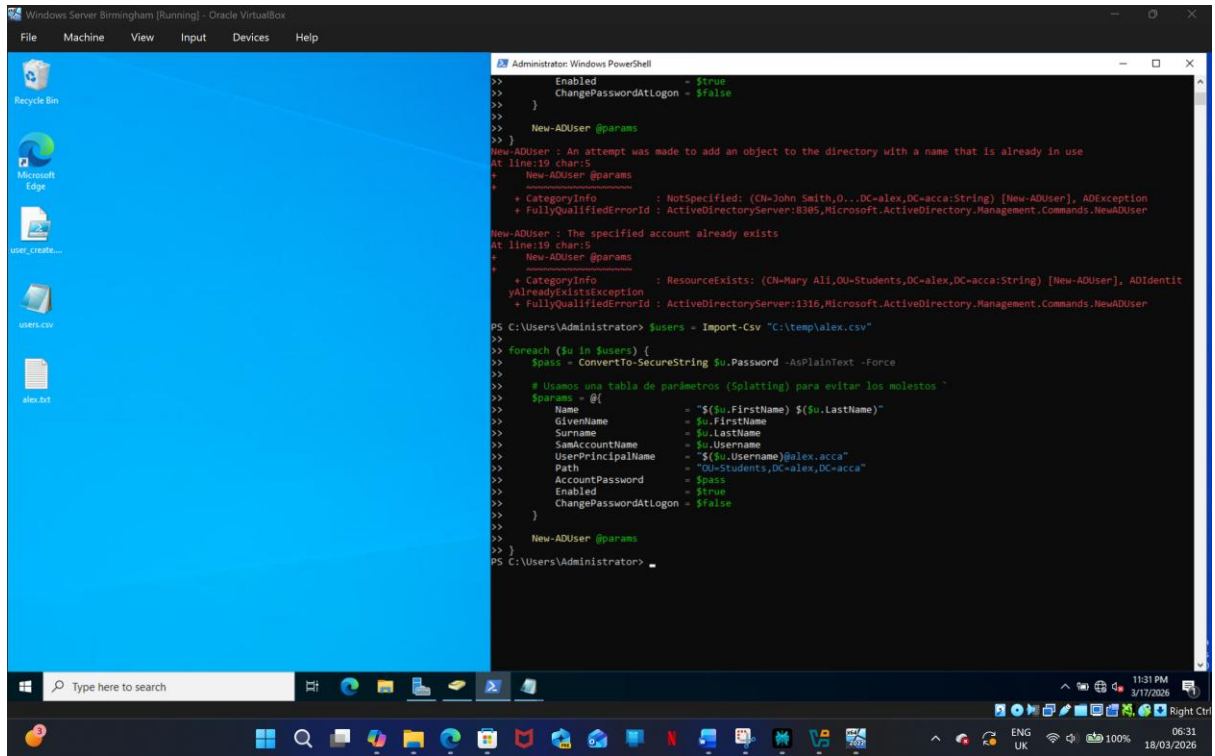
explorer and I installed the virtual box guest additions and then I have acces to any folder that I can add



Open PowerShell with AD module

1. Click Start → Windows PowerShell (run as Administrator).
2. In the blue window, type:
Import-Module ActiveDirectory
3. Test reading your CSV In the same PowerShell window:
\$users = Import-Csv C:\Temp\users.csv
\$users | Select-Object -First 5
4. You should see the first 5 rows with columns like FirstName, LastName, SamAccountName

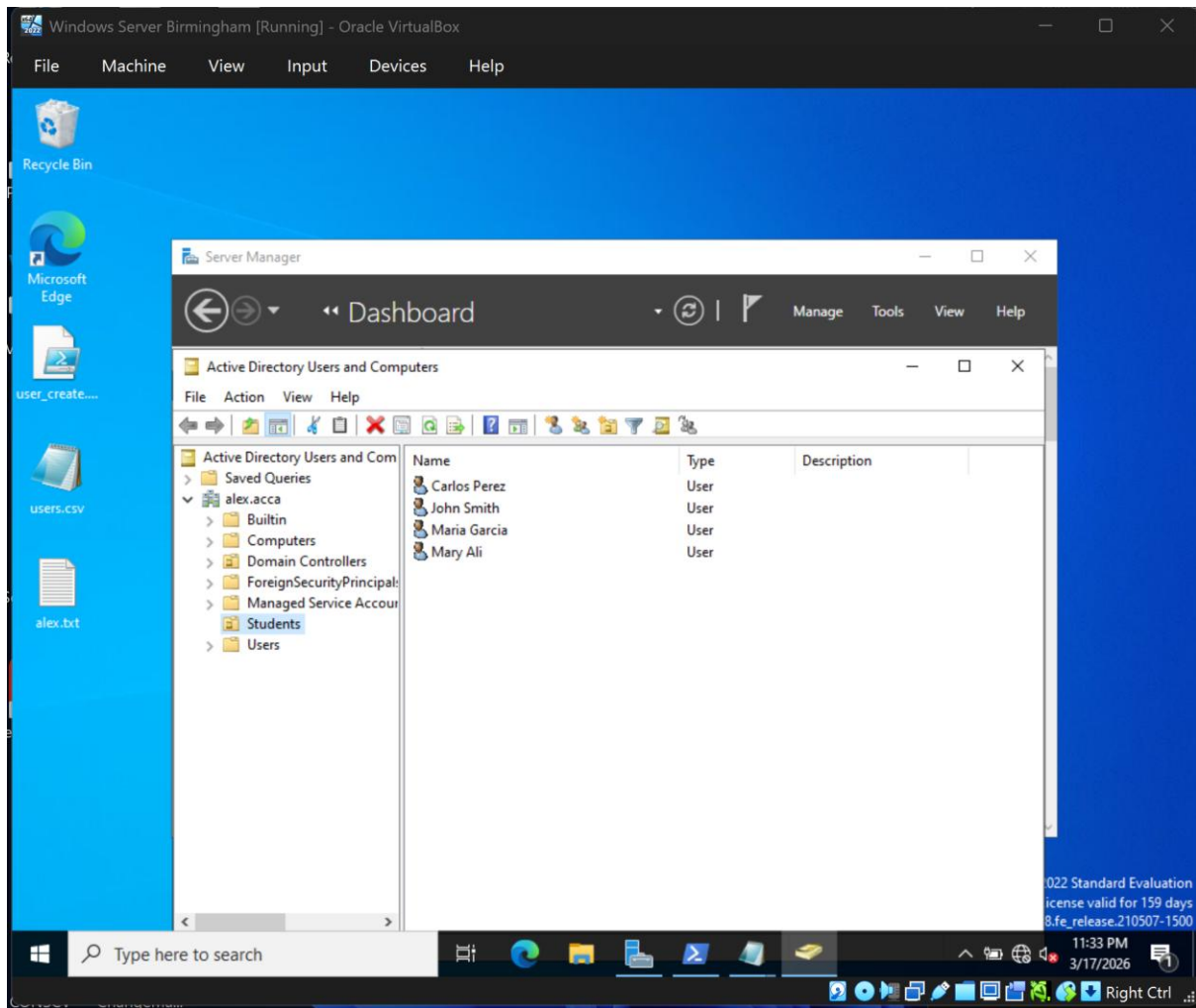
Check users in Active Directory Users and Computers



```
Administrator: Windows PowerShell
>> Enabled = $true
>> ChangePasswordAtLogon = $false
>> }
>> New-ADUser @params
>> }
New-ADUser : An attempt was made to add an object to the directory with a name that is already in use
At line:19 char:5
+ New-ADUser @params
+ ~~~~~
+ CategoryInfo          : NotSpecified: (CN=John Smith,O=...DC=alex,DC=acca:String) [New-ADUser], ADException
+ FullyQualifiedErrorId : ActiveDirectoryServer:8306,Microsoft.ActiveDirectory.Management.Commands.NewADUser

New-ADUser : The specified account already exists
At line:19 char:5
+ New-ADUser @params
+ ~~~~~
+ CategoryInfo          : ResourceExists: (CN=Mary Ali,OU=Students,DC=alex,DC=acca:String) [New-ADUser], ADIdentit
yAlreadyExistsException
+ FullyQualifiedErrorId : ActiveDirectoryServer:1316,Microsoft.ActiveDirectory.Management.Commands.NewADUser

PS C:\Users\Administrator> $users = Import-Csv "C:\templalex.csv"
>> foreach ($u in $users) {
>>     $pass = ConvertTo-SecureString $u.Password -AsPlainText -Force
>>     # Usamos una tabla de parámetros (Splatting) para evitar los molestos "
>>     $params = @{
>>         Name              = "$($u.Firstname) $($u.LastName)"
>>         GivenName         = $u.Firstname
>>         Surname           = $u.LastName
>>         SamAccountName    = $u.Username
>>         UserPrincipalName = "$($u.Username)@alex.acca"
>>         Path              = "OU=Students,DC=alex,DC=acca"
>>         AccountPassword   = $pass
>>         Enabled           = $true
>>         ChangePasswordAtLogon = $false
>>     }
>>     New-ADUser @params
>> }
PS C:\Users\Administrator>
```



Users created in powershell with this code

```
$users = Import-Csv "C:\temp\alex.csv"
```

```
foreach ($u in $users) {
```

```
    $pass = ConvertTo-SecureString $u.Password -AsPlainText -Force
```

```
    # Usamos una tabla de parámetros (Splatting) para evitar los molestos `
```

```
$params = @{
```

```
    Name          = "$($u.FirstName) $($u.LastName)"
```

```
    GivenName     = $u.FirstName
```

```
    Surname       = $u.LastName
```

```
    SamAccountName = $u.Username
```

```
    UserPrincipalName = "$($u.Username)@alex.acca"
```

```
    Path          = "OU=Students,DC=alex,DC=acca"
```

```
    AccountPassword = $pass
```

```
Enabled          = $true
ChangePasswordAtLogon = $false
}
```

```
New-ADUser @params
}
```

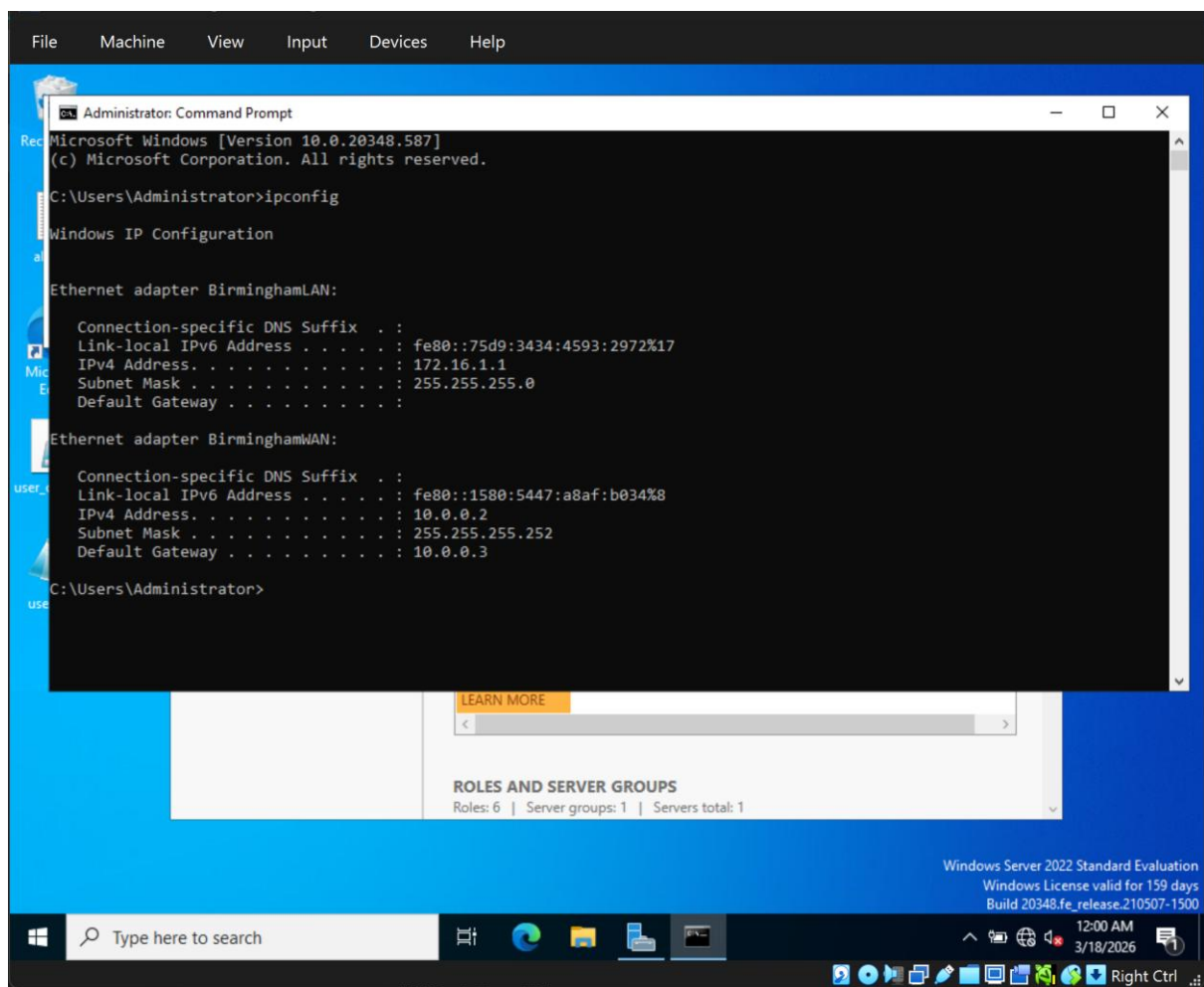
And text document with extention .csv

FirstName,LastName,Username>Password

Carlos,Perez,c.perez,Notebook@123

Maria,Garcia,m.Garcia,Notebook@123

5 Domain Membership



Identify which adapter reaches the domain controller

On that Windows client: Open **Command Prompt**,

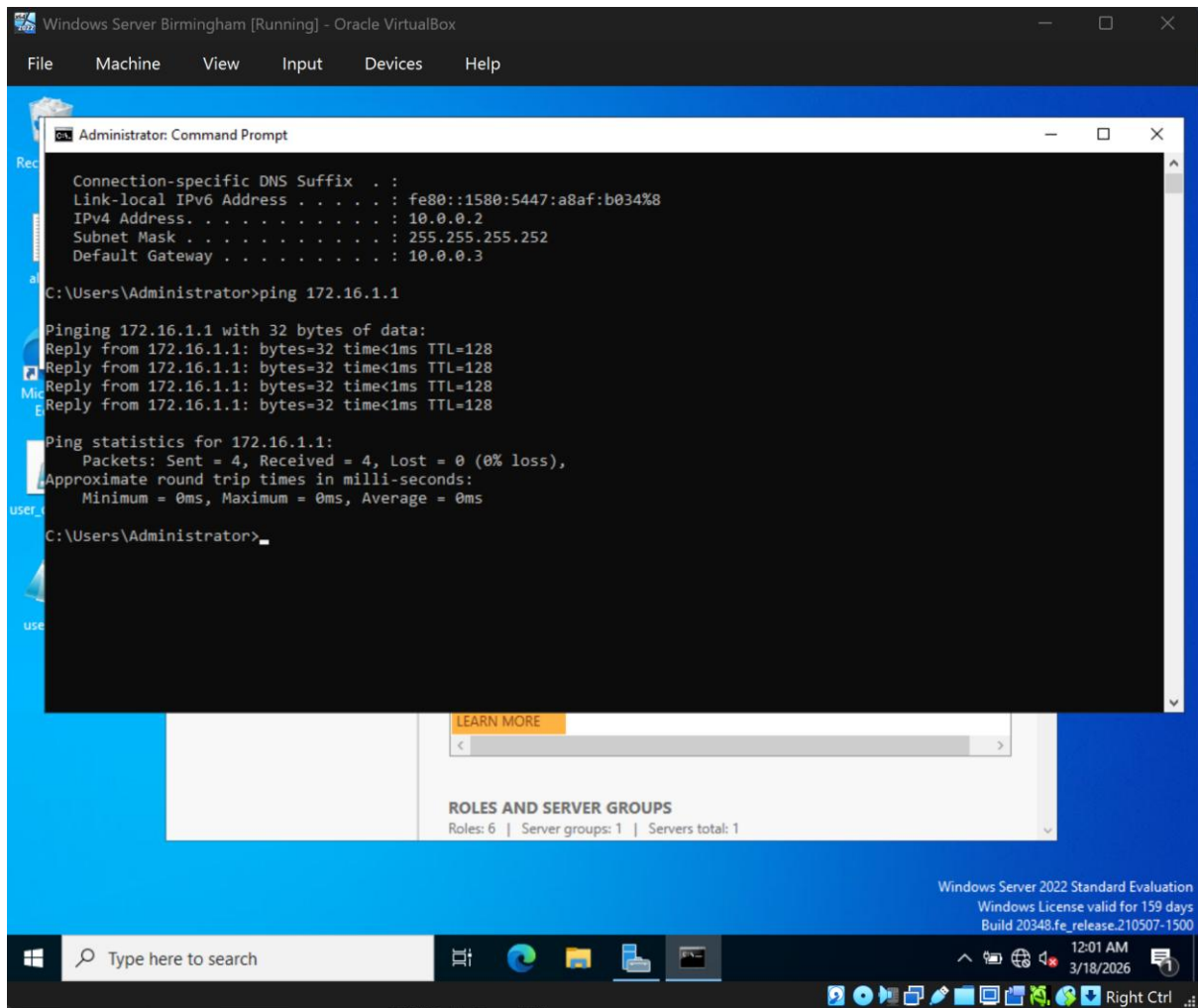
Run: `ipconfig`

Look at each section:

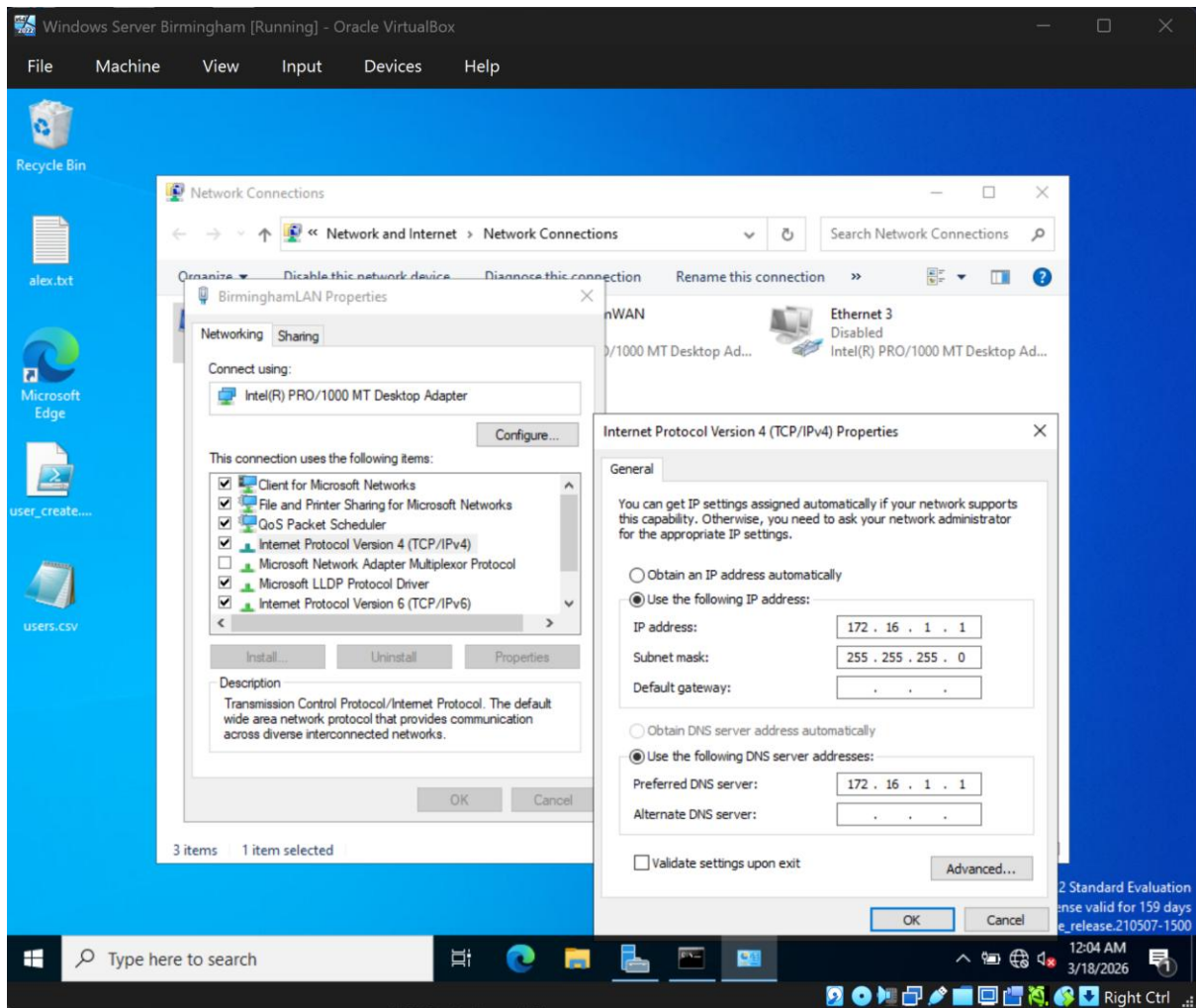
BirminghamLAN – note its IPv4 address.

BirminghamWAN – note its IPv4 address.

Ethernet 3 – note if it even has an IP or says “Media disconnected”.



Ping the domain controller IP from this client. If replies come back, look which adapter has an IP in the same network as 172.16.1.1



Set DNS on the correct adapter (probably BirminghamLAN)

Now configure DNS on that one adapter only (assume it's BirminghamLAN):

On the client, press Windows key + R, type: ncpa.cpl

press Enter. This opens **Network Connections**.

In the list, **right-click BirminghamLAN Properties**.

Click **Internet Protocol Version 4 (TCP/IPv4) Properties**.

In the **IP address** area, leave your IP / subnet / gateway as they are (they already work).

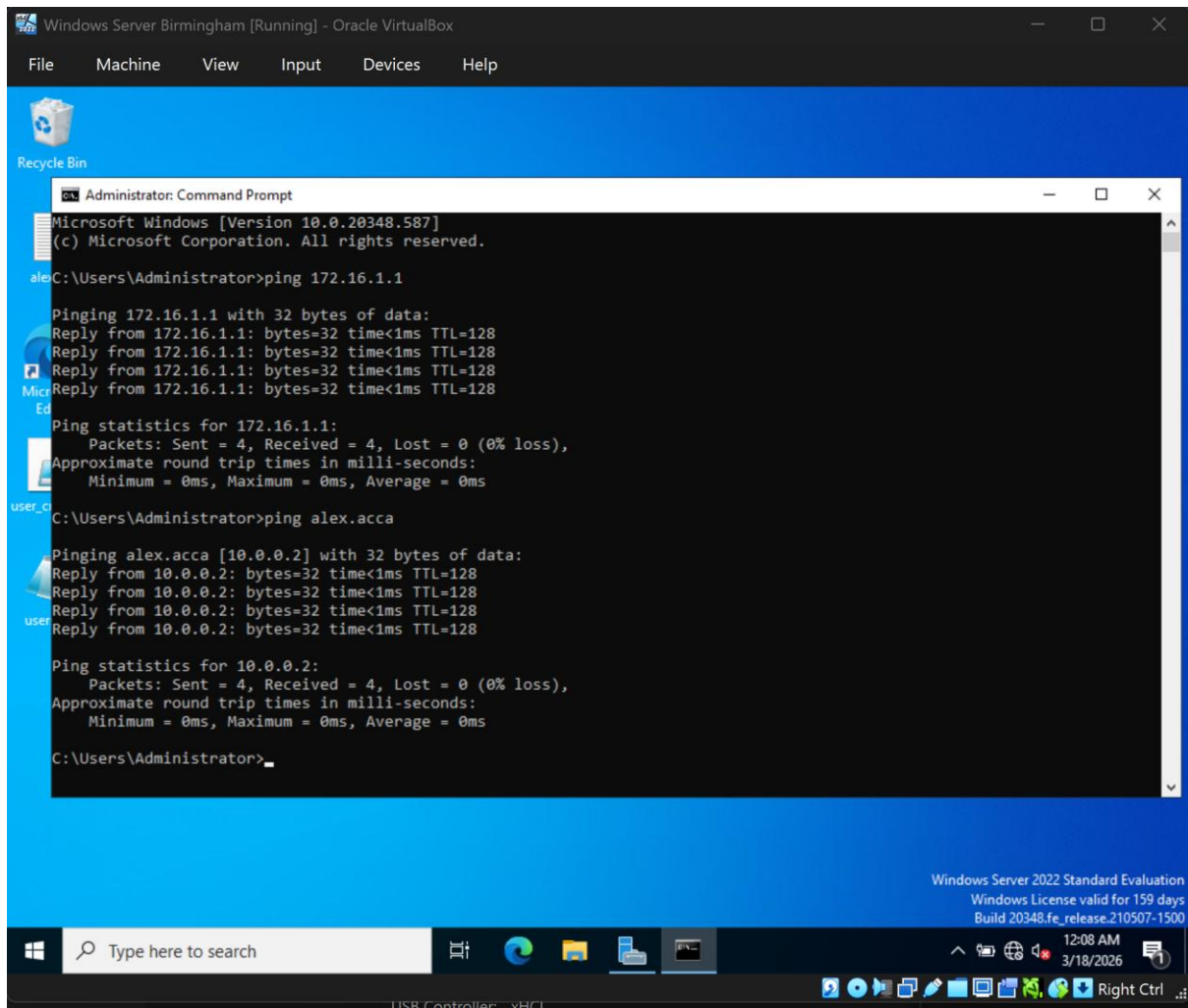
In the **DNS** area at the bottom:

Select **Use the following DNS server addresses**.

Preferred DNS server: type the **IP** of your domain controller, for example 172.16.1.1.

Leave **Alternate DNS server** blank.

Click **OK**, then **Close**.



Test from that machine Still on the same client:

Open **Command Prompt** again

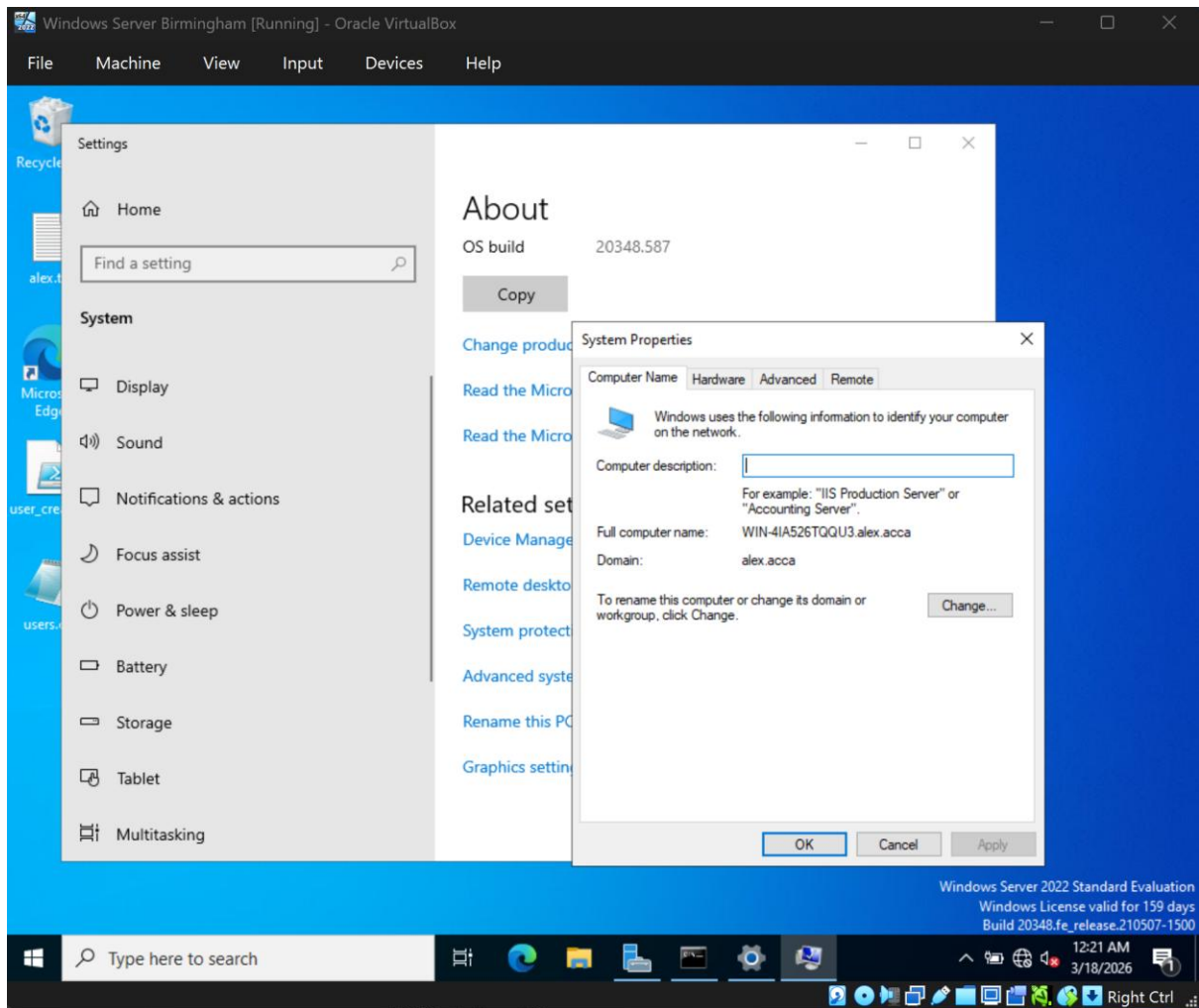
Run:

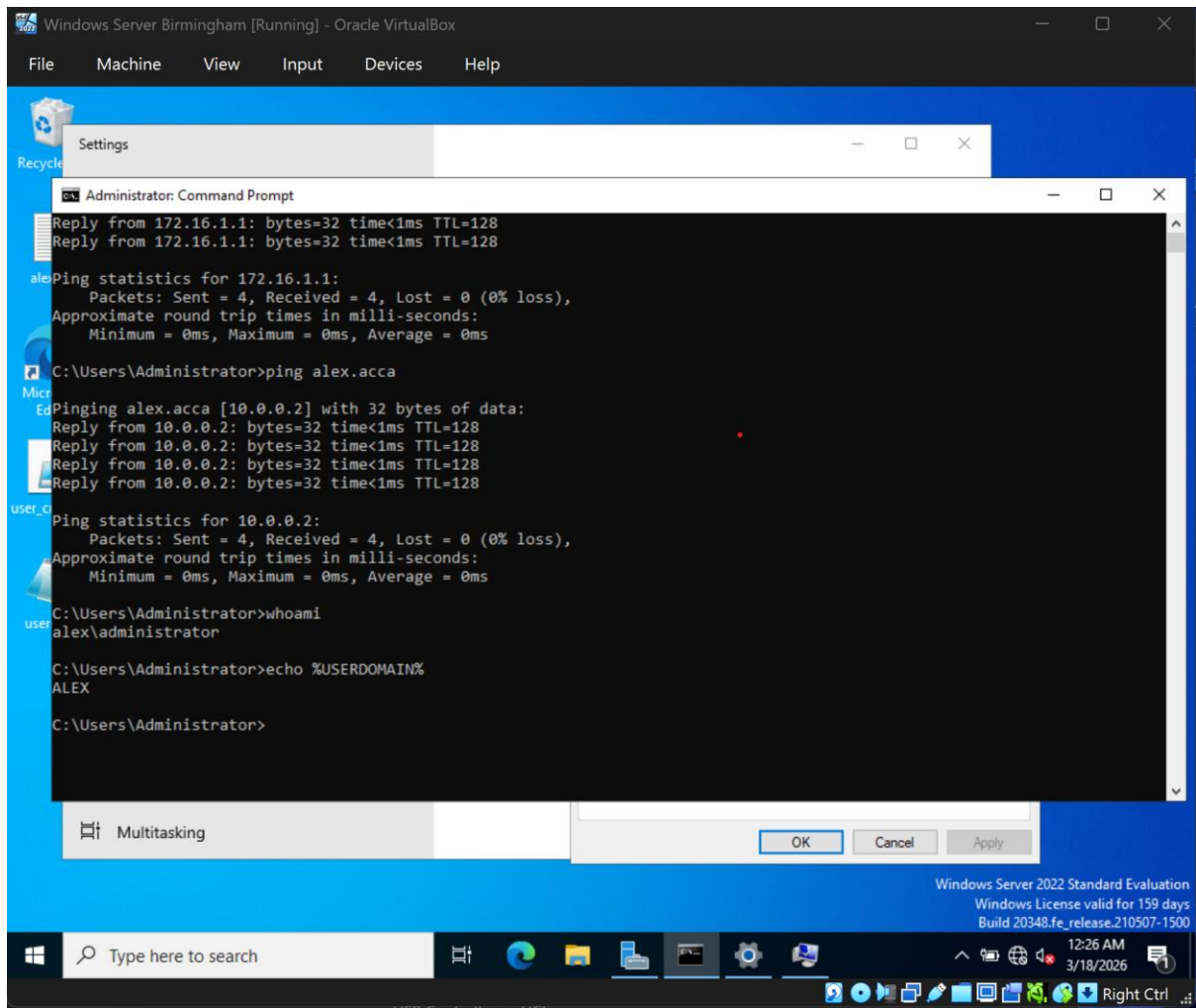
ping 172.16.1.1 this command checks IP connectivity to the DC.

ping alex.acca this command checks that DNS can resolve the **domain name** to the DC's IP.

both succeed, so is ready to **join this machine to the domain** using:

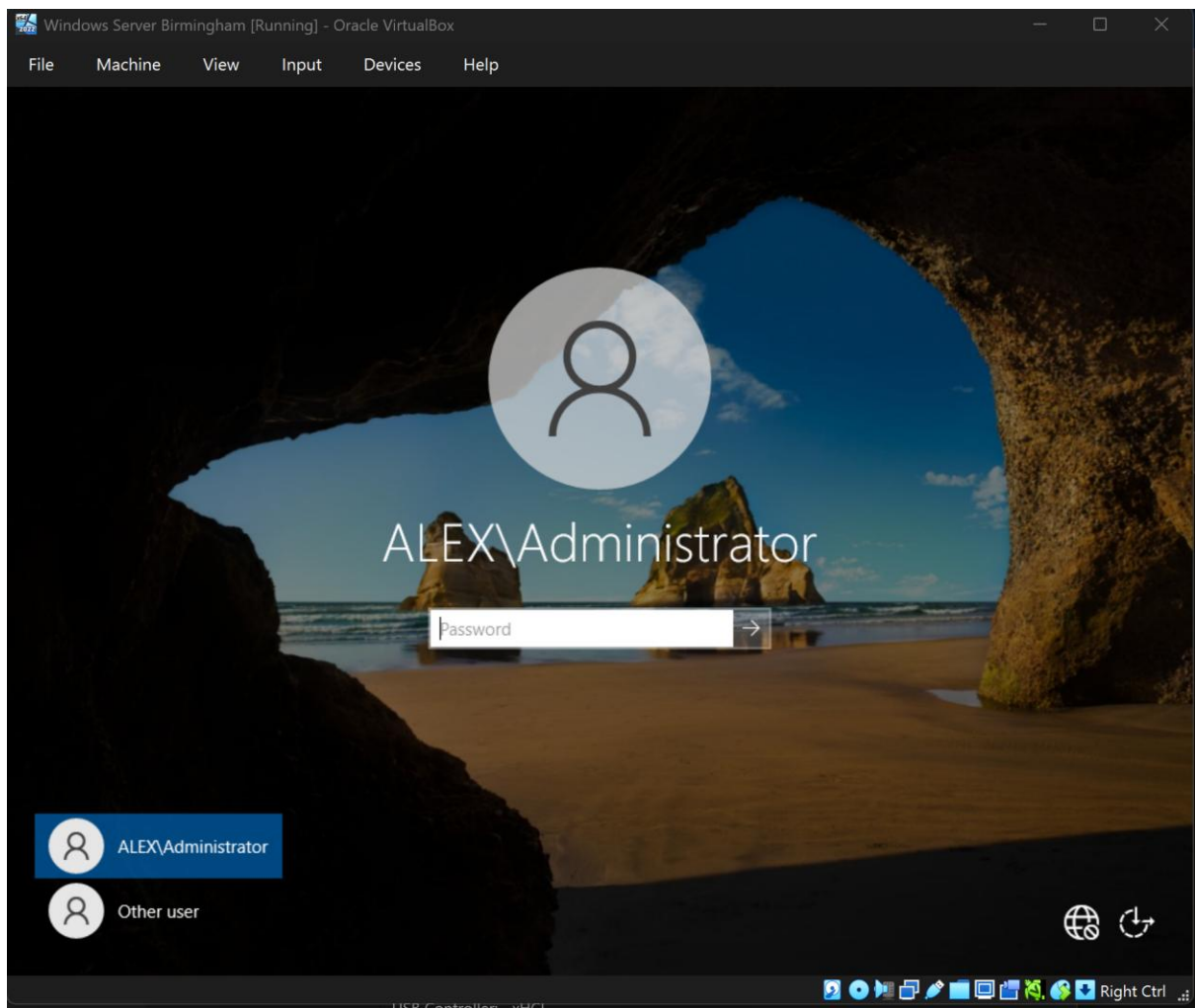
Right-click **This PC Properties Advanced system settings Computer Name Change Domain: alex.acca** Use alex\Administrator + password when prompted.



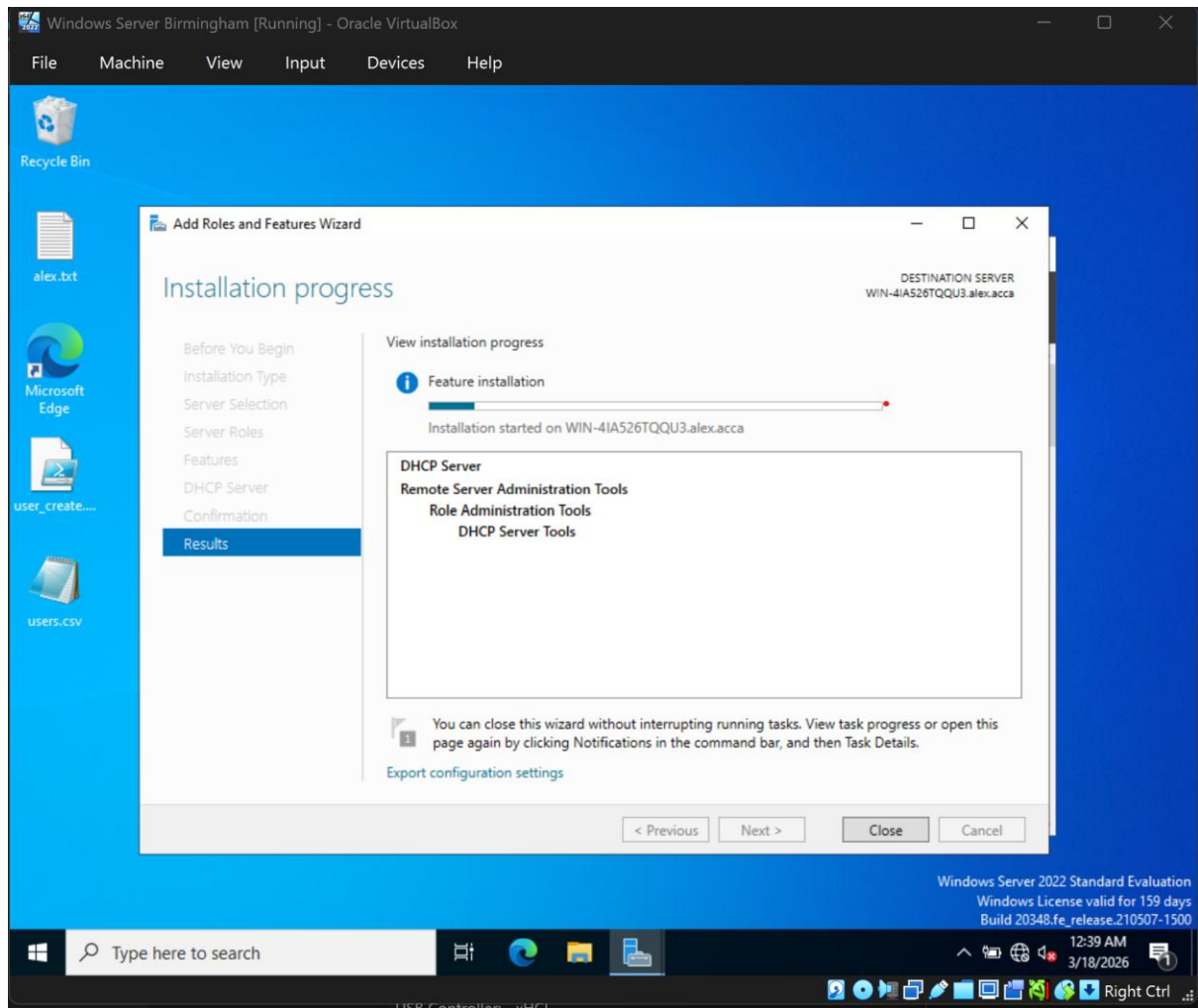


"L-CD successfully joined alex.acca domain as shown in System Properties (Domain: alex.acca).

Domain authentication confirmed with %USERDOMAIN%=ALEX and domain user login capability."



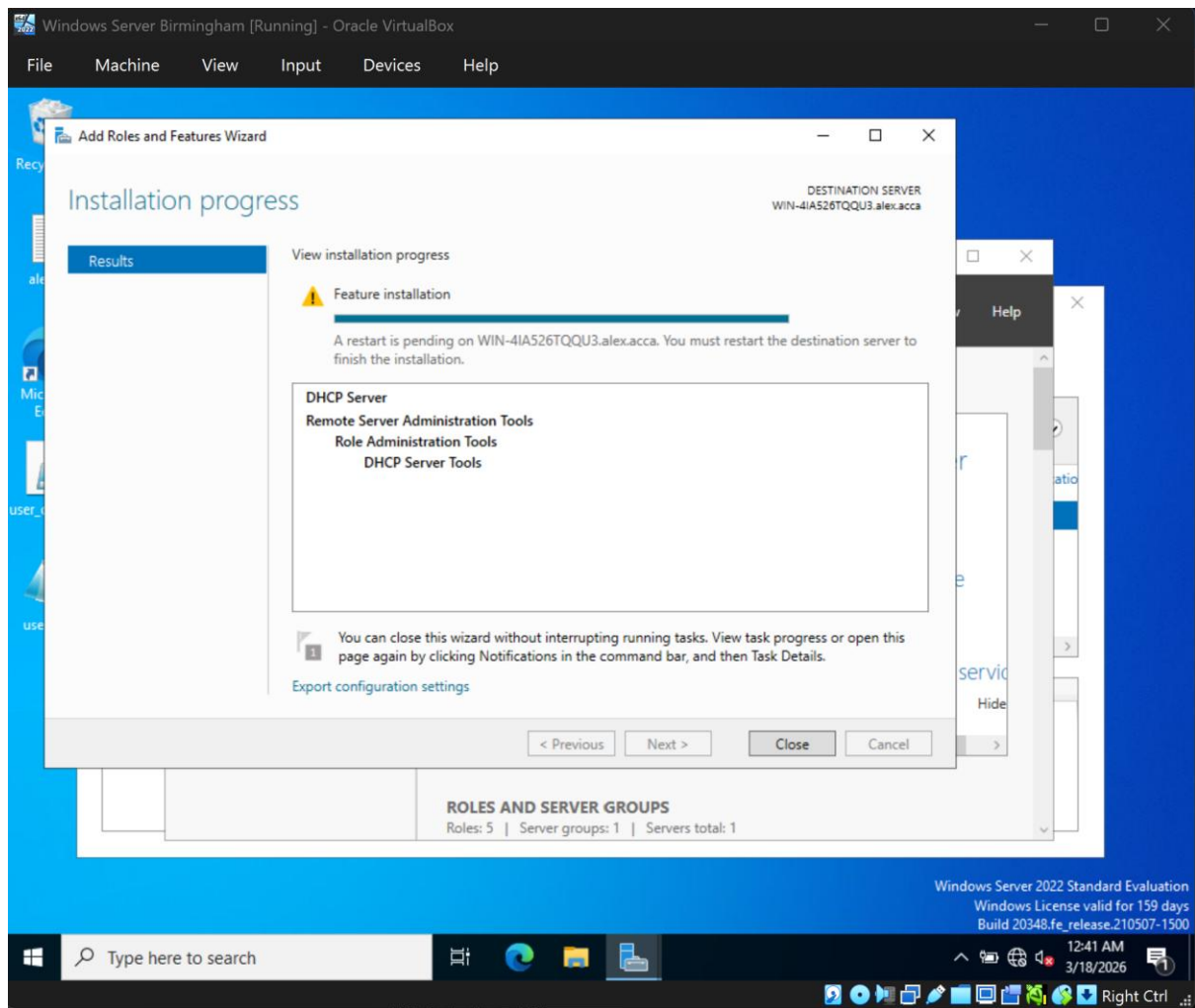
6 DHCP SERVER



Installing DHCP Server

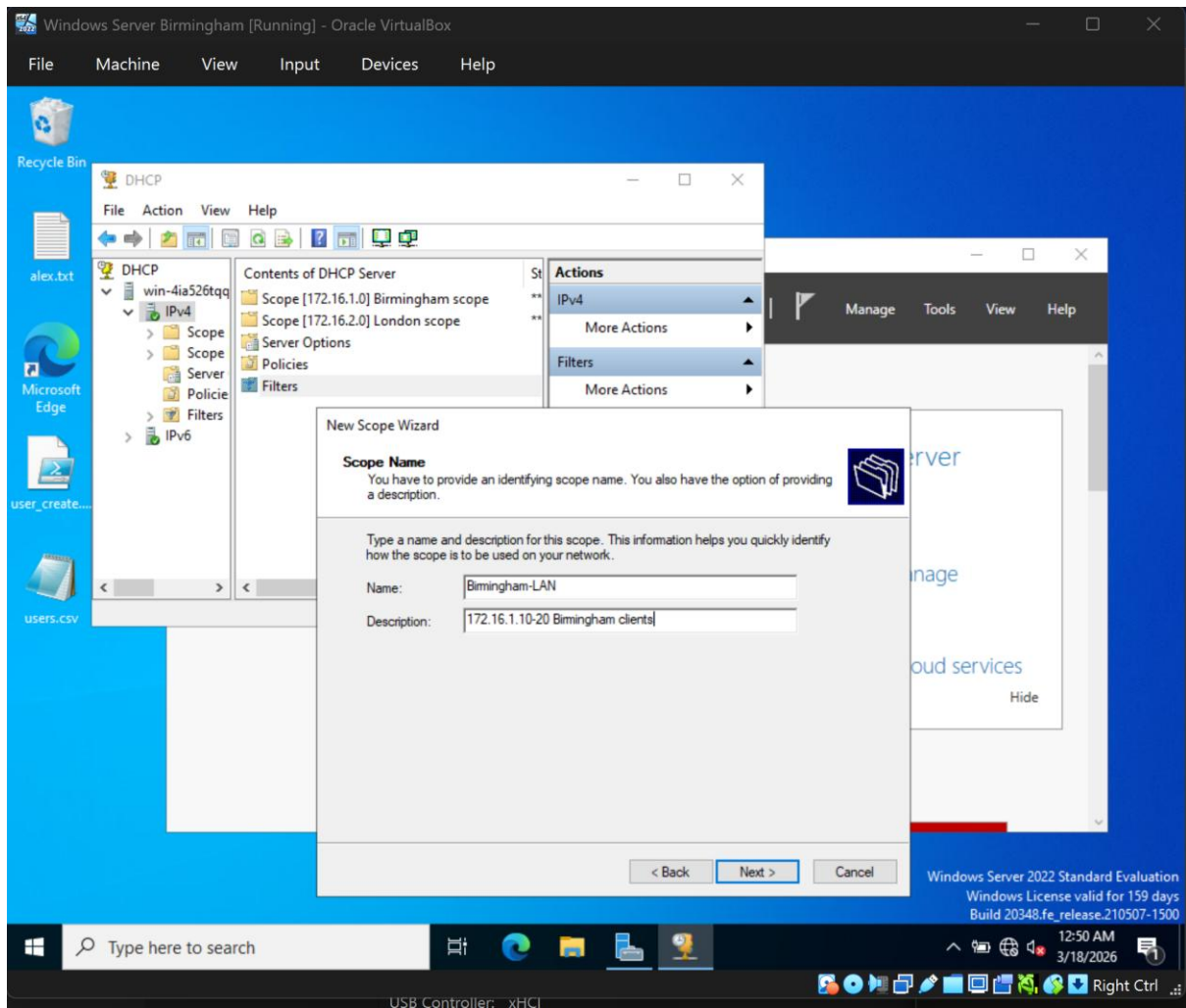
Open server manager, manage, add roles and features, add DHCP Role next installation type role based select the server next server roles tick DHCP Server install close.

Complete DHCP Configuration



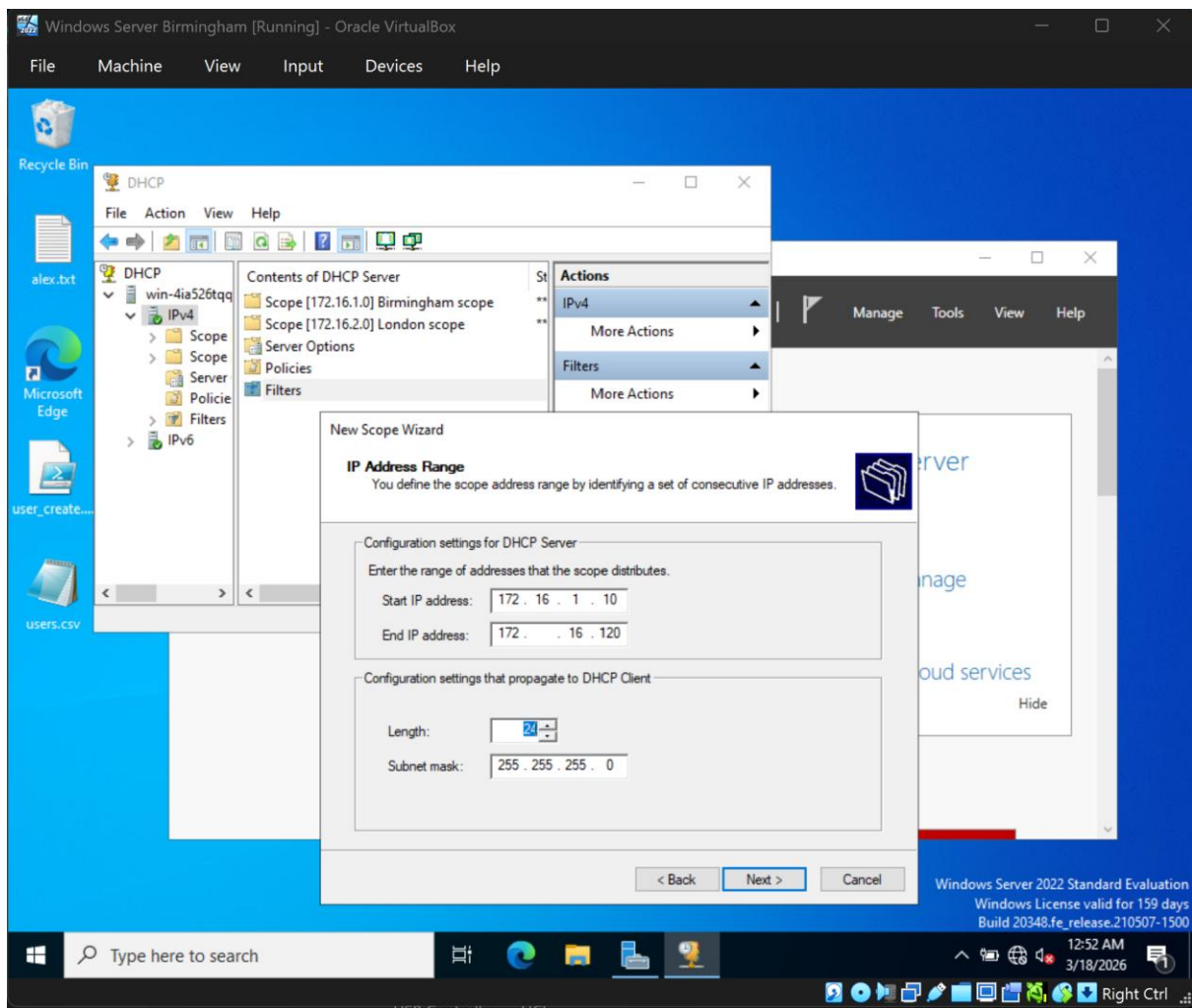
Create Birmingham Scope (172.16.1.10-20)

Tools manager DHCP create new scope



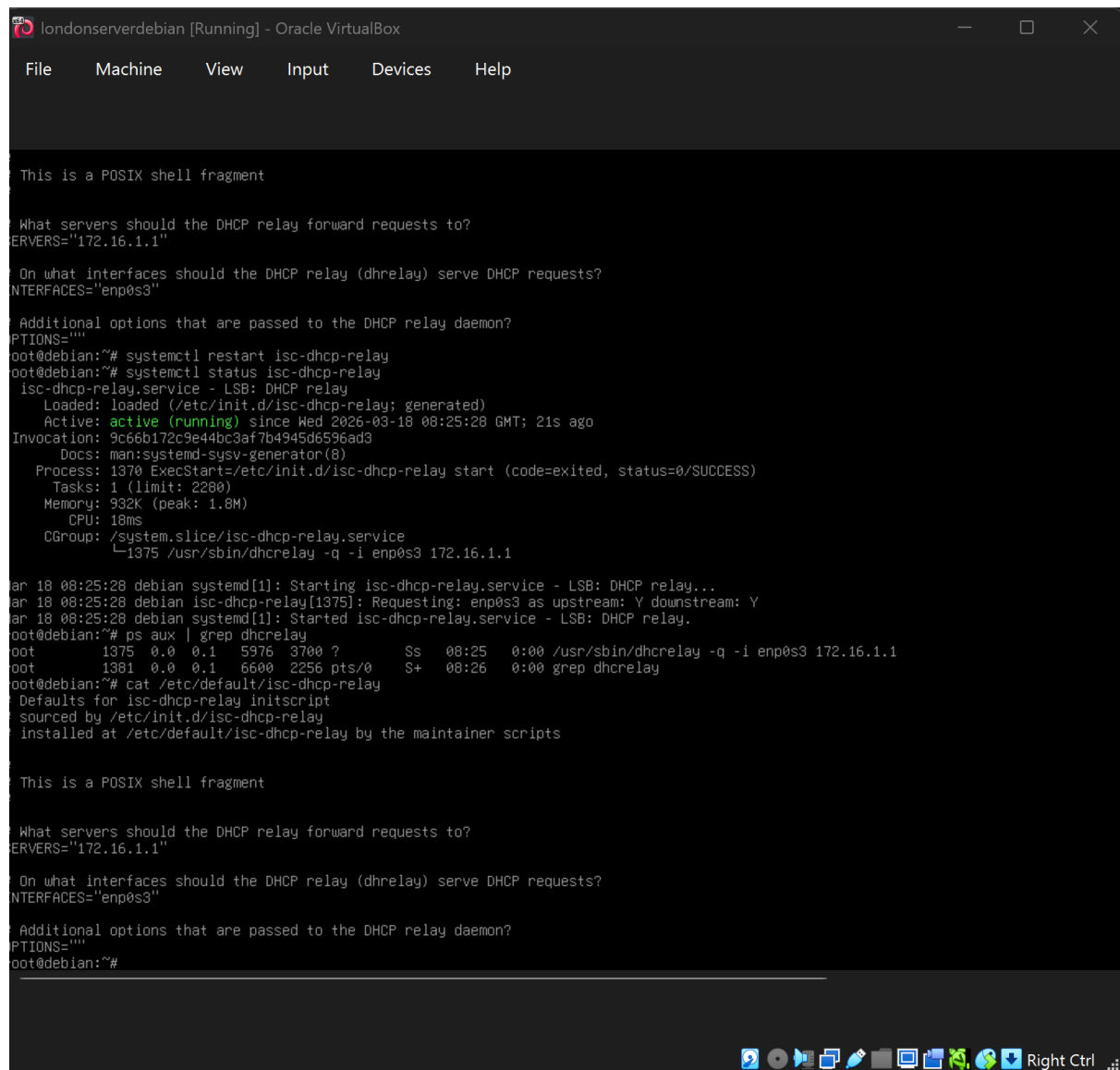
Creating new scope

Tools dhcp server ipv4 right click new scope



Configuring range of ip birmingham and london scope already created

Test DHCP on a Client



```
londonserverdebian [Running] - Oracle VirtualBox
File Machine View Input Devices Help

This is a POSIX shell fragment

What servers should the DHCP relay forward requests to?
SERVERS="172.16.1.1"

On what interfaces should the DHCP relay (dhrelay) serve DHCP requests?
INTERFACES="enp0s3"

Additional options that are passed to the DHCP relay daemon?
PTIONS=""
oot@debian:~# systemctl restart isc-dhcp-relay
oot@debian:~# systemctl status isc-dhcp-relay
isc-dhcp-relay.service - LSB: DHCP relay
Loaded: loaded (/etc/init.d/isc-dhcp-relay; generated)
Active: active (running) since Wed 2026-03-18 08:25:28 GMT; 21s ago
Invocation: 9c66b172c9e44bc3af7b4945d6596ad3
Docs: man:systemd-sysv-generator(8)
Process: 1370 ExecStart=/etc/init.d/isc-dhcp-relay start (code=exited, status=0/SUCCESS)
Tasks: 1 (limit: 2280)
Memory: 932K (peak: 1.8M)
CPU: 18ms
CGroup: /system.slice/isc-dhcp-relay.service
└─1375 /usr/sbin/dhcrelay -q -i enp0s3 172.16.1.1

ar 18 08:25:28 debian systemd[1]: Starting isc-dhcp-relay.service - LSB: DHCP relay...
ar 18 08:25:28 debian isc-dhcp-relay[1375]: Requesting: enp0s3 as upstream: Y downstream: Y
ar 18 08:25:28 debian systemd[1]: Started isc-dhcp-relay.service - LSB: DHCP relay.
oot@debian:~# ps aux | grep dhcrelay
oot      1375  0.0  0.1  5976  3700 ?        Ss   08:25   0:00 /usr/sbin/dhcrelay -q -i enp0s3 172.16.1.1
oot      1381  0.0  0.1  6600  2256 pts/0    S+   08:26   0:00 grep dhcrelay
oot@debian:~# cat /etc/default/isc-dhcp-relay
Defaults for isc-dhcp-relay initscript
sourced by /etc/init.d/isc-dhcp-relay
installed at /etc/default/isc-dhcp-relay by the maintainer scripts

This is a POSIX shell fragment

What servers should the DHCP relay forward requests to?
SERVERS="172.16.1.1"

On what interfaces should the DHCP relay (dhrelay) serve DHCP requests?
INTERFACES="enp0s3"

Additional options that are passed to the DHCP relay daemon?
PTIONS=""
oot@debian:~#
```

DHCP Debian server

check and correct the config

cat /etc/default/isc-dhcp-relay

show exactly: SERVERS="172.16.1.1" INTERFACES="enp0s3"

if not edit file in nano /etc/default/isc-dhcp-relay

and write: SERVERS="172.16.1.1" INTERFACES="enp0s3"

Save: Ctrl+O Enter Ctrl+X

Restart service:

systemctl restart isc-dhcp-relay

systemctl status isc-dhcp-relay

now need to show: Active: active (running) [GREEN]

verify if is working: `ps aux | grep dhcrelay`

need to show dhcrelay process running with 172.16.1.1 and enp0s3.

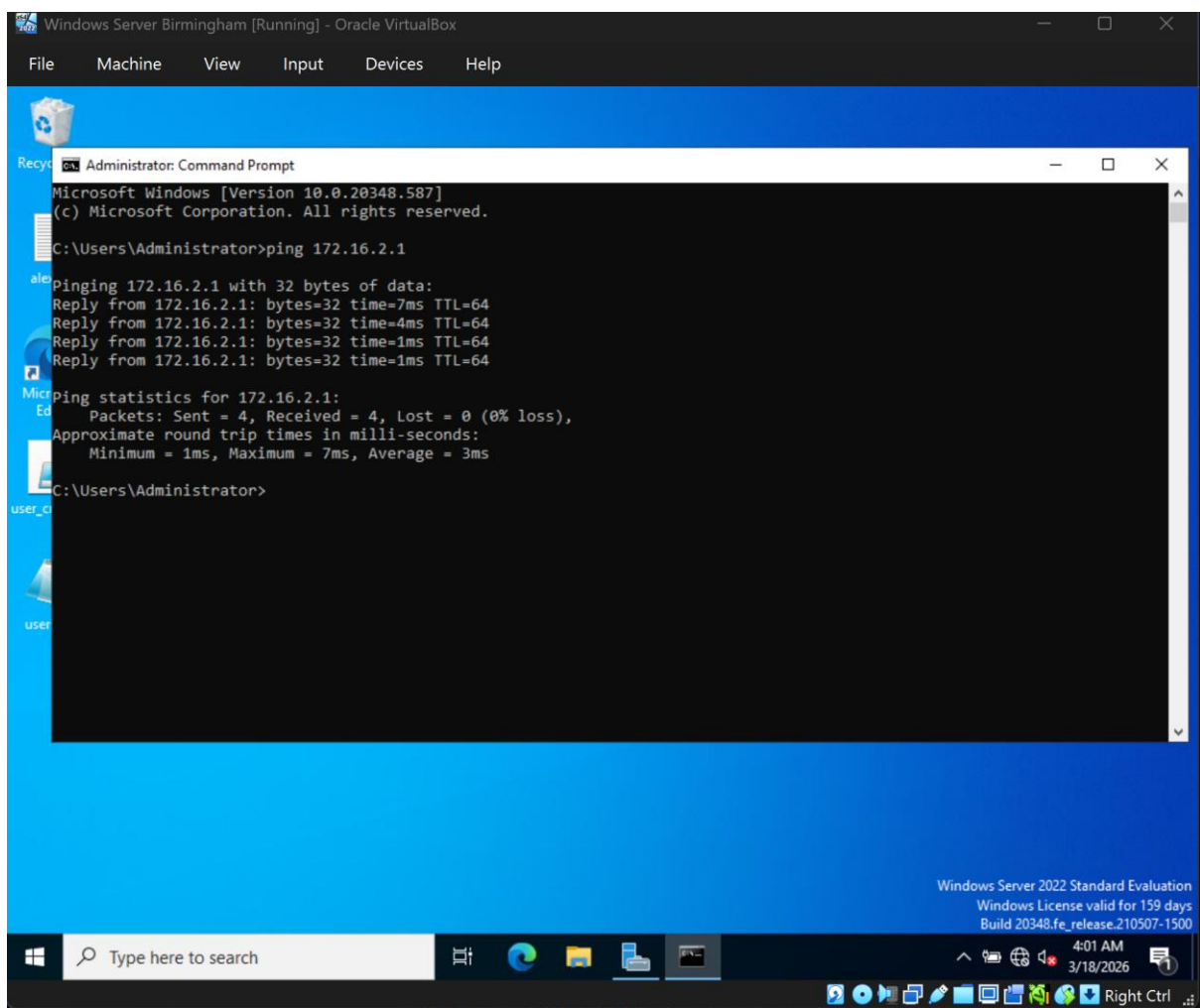
7 Test and Troubleshoot

Test Network Connectivity

I make ping from

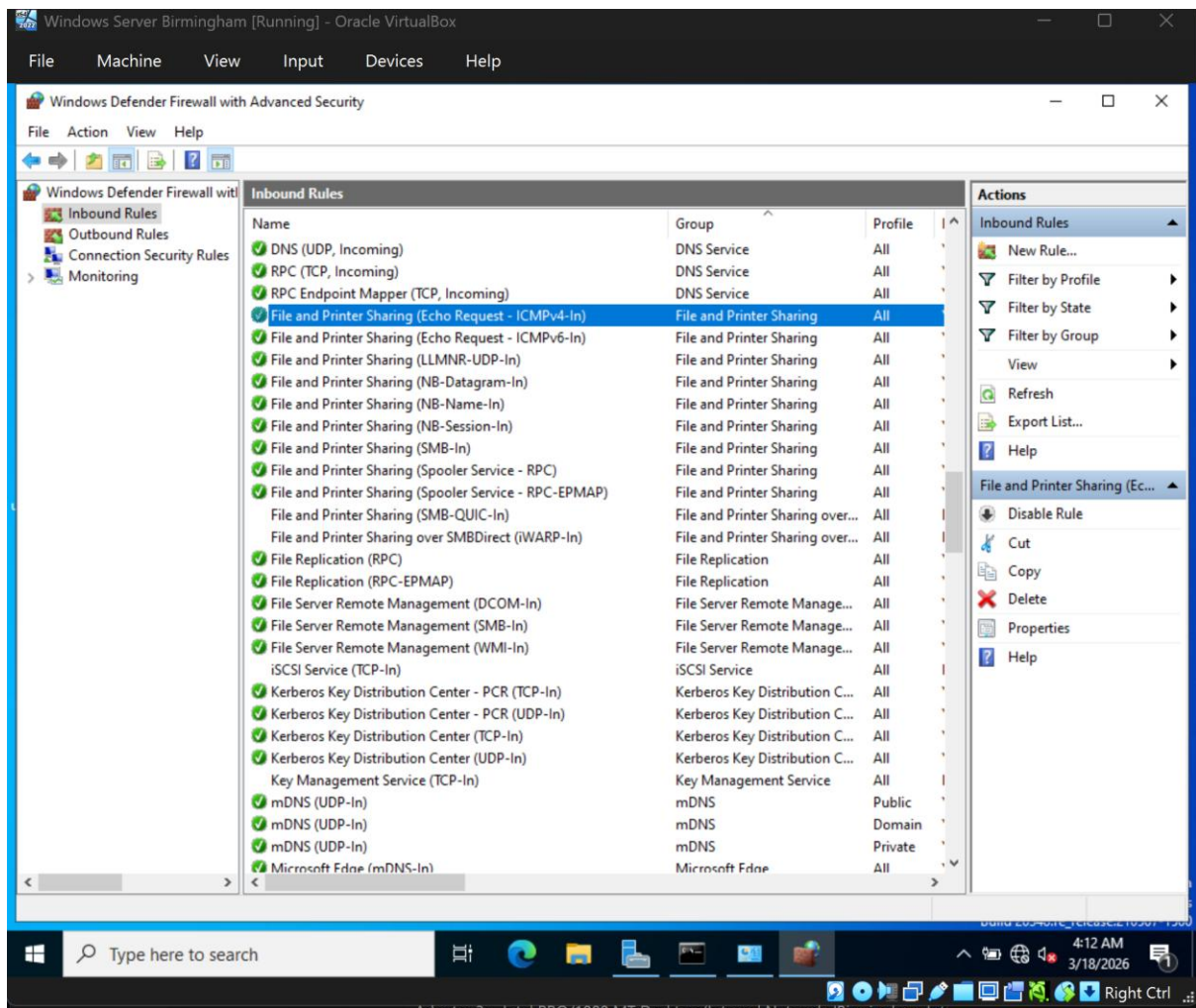
London to Birmingham

Birmingham to London

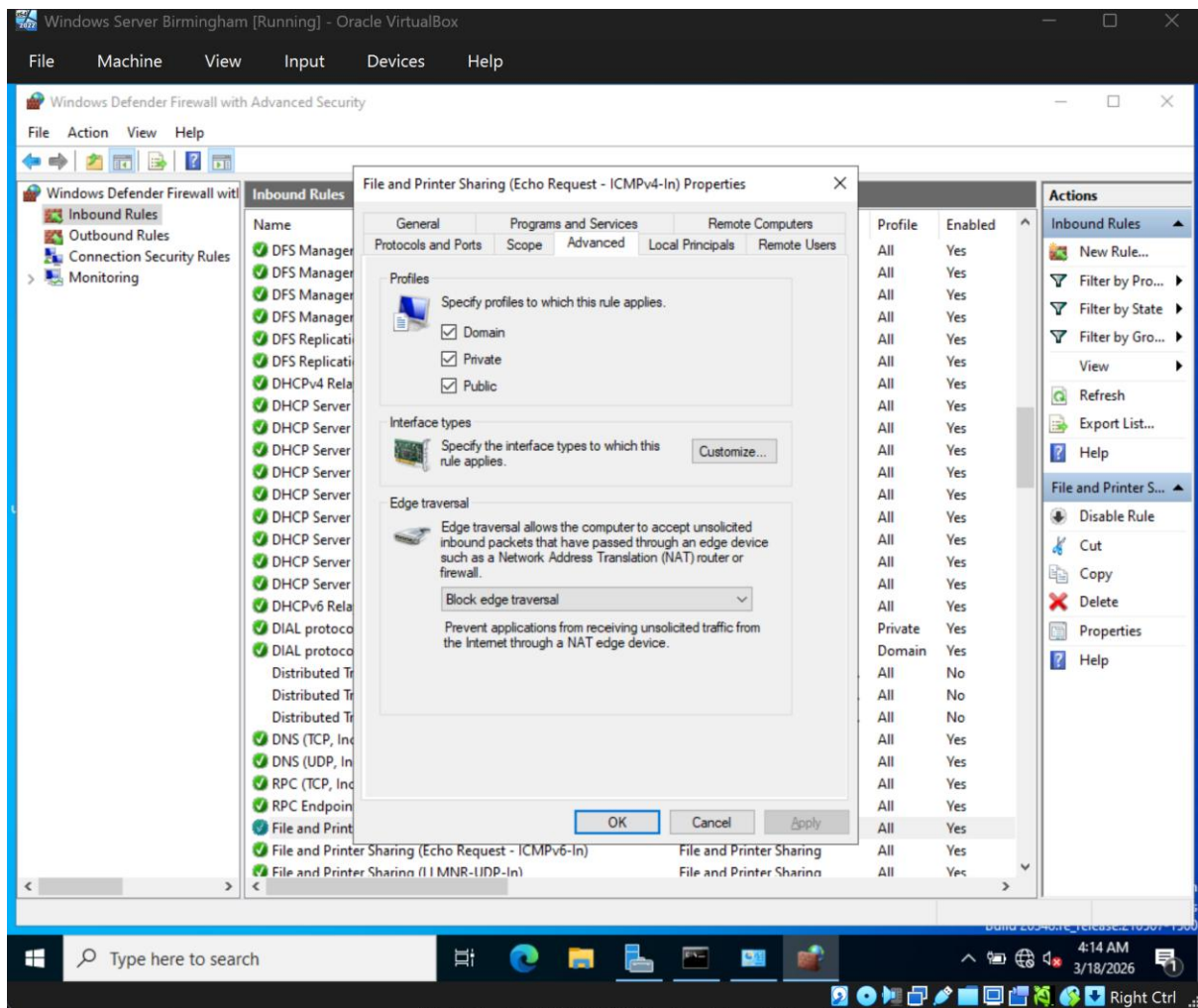


Ping from birmingham server to debian server

Debian server ip 172.16.2.1

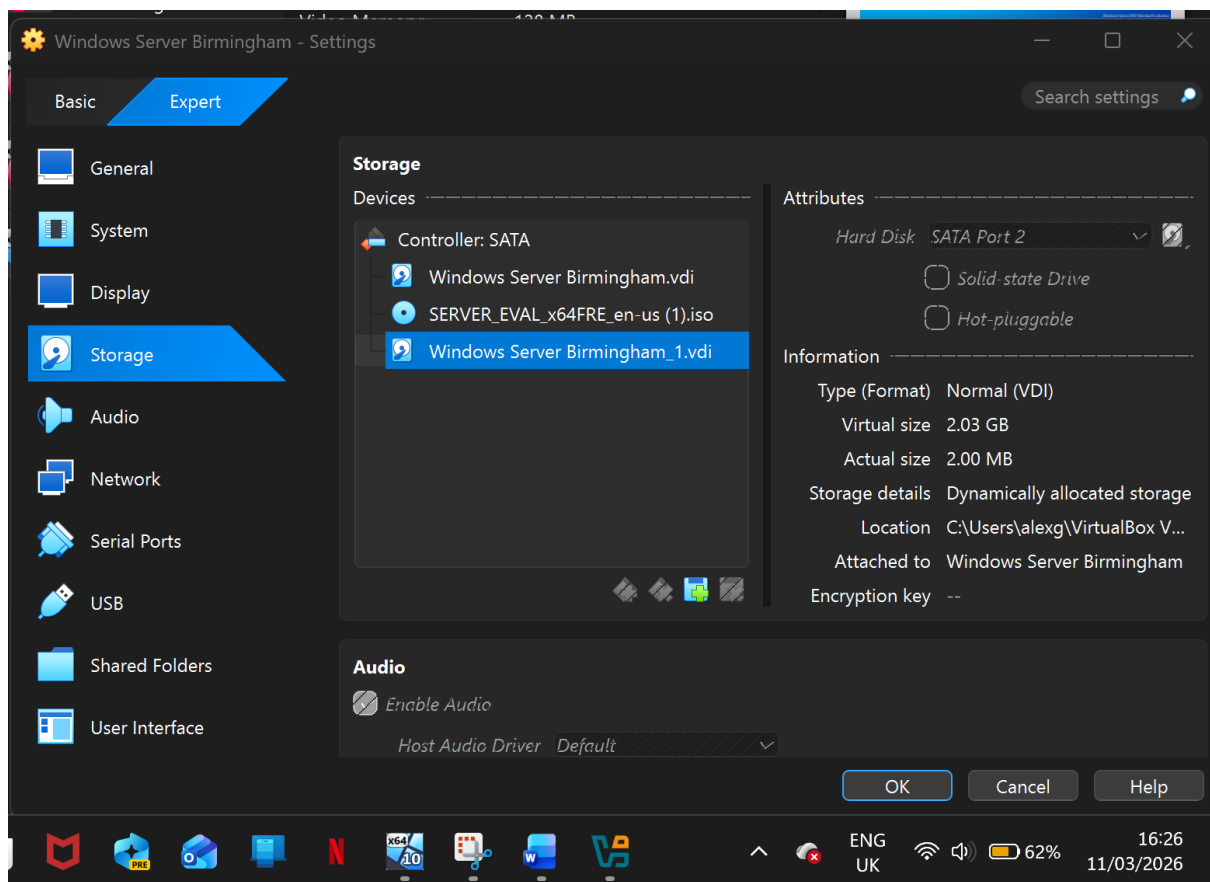


We enable file and printer sharing because 172.16.1.1 cannot ping back = Windows Firewall blocking ICMP on B-DC



We allowed to domain private and public to don't show any restrictions

8 Disk Drive



Right-click Start Disk Management

Action Create VHD

Settings:

Location: C:\Disks\

File: DataDisk.vhdx

Size: 2 GB

Type: Dynamically expanding

OK New disk appears as **"Not Initialized"**

Initialize Disk:

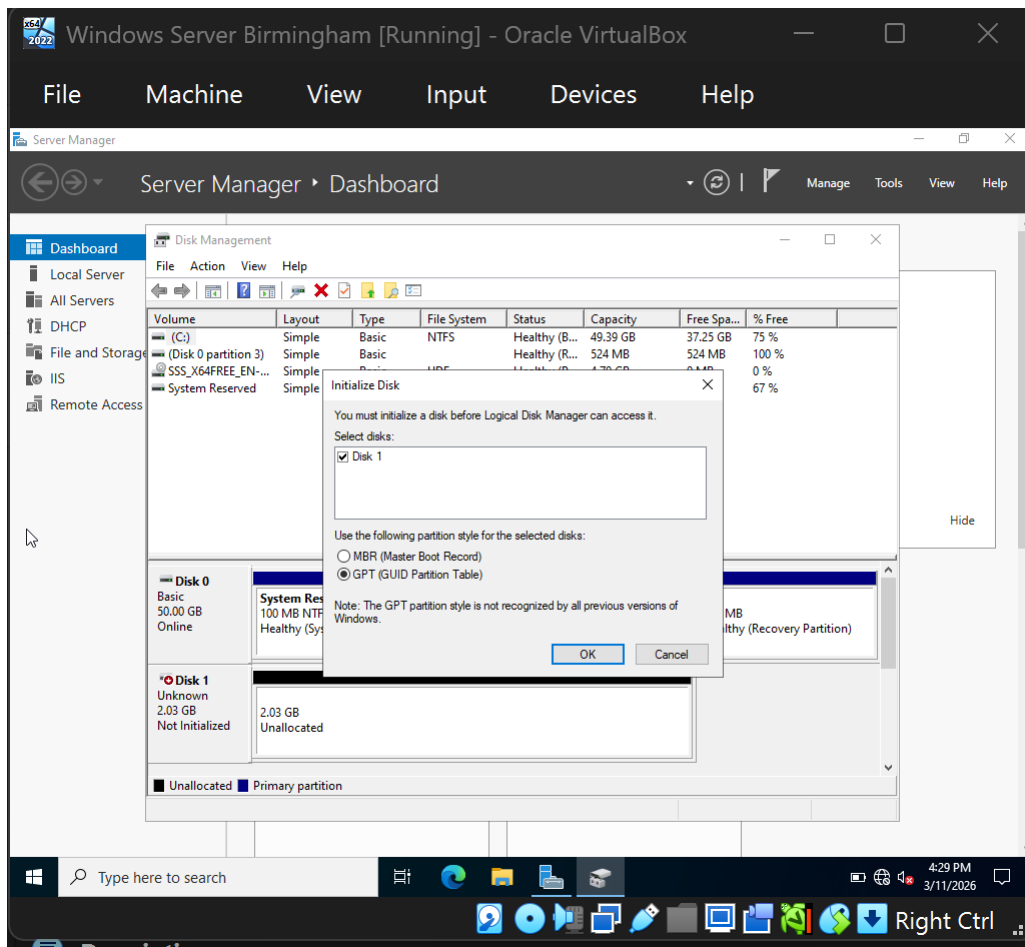
Right-click disk **Initialize Disk**

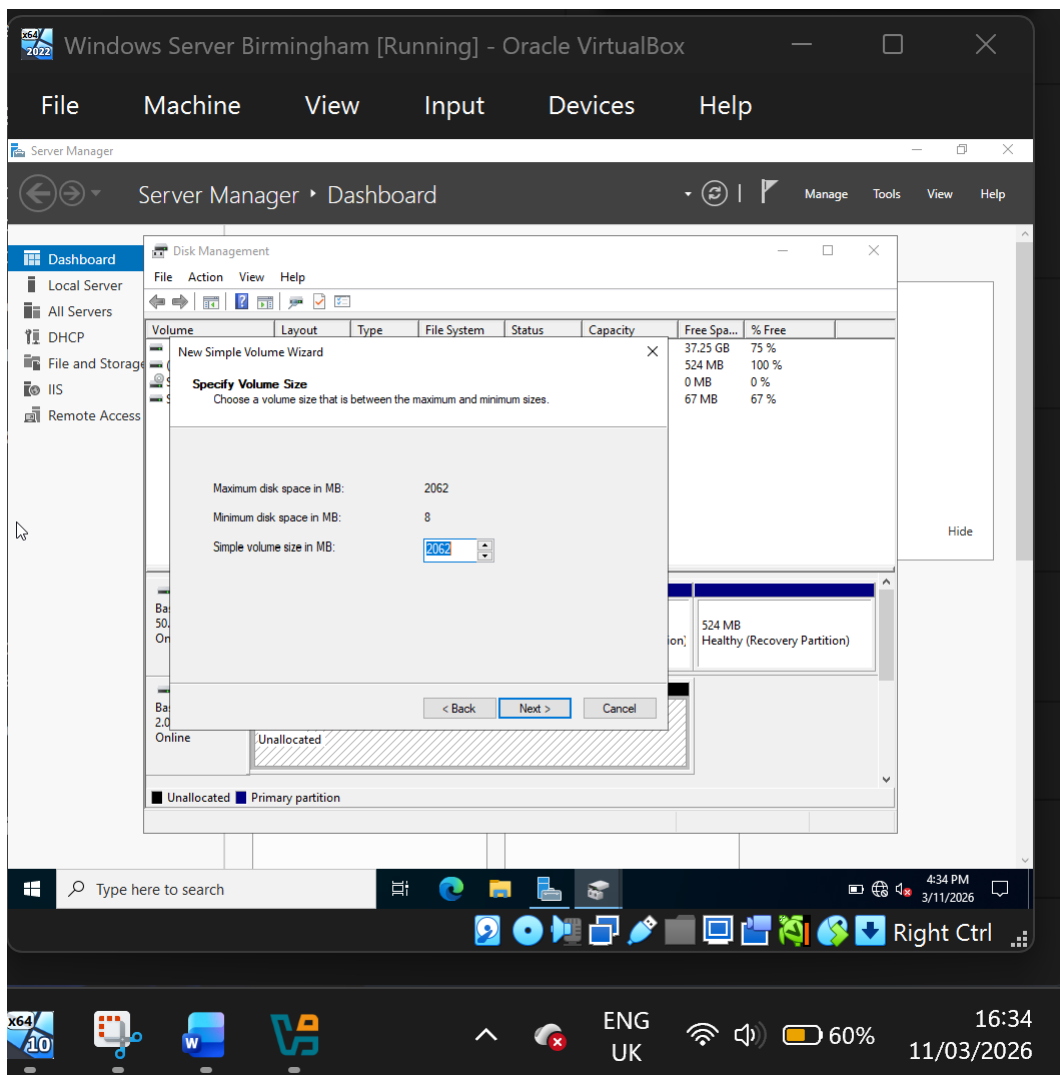
Select **GPT** **OK**

Create Volume:

Right-click unallocated space **New Simple Volume**

Next Next Assign **D:** **NTFS** Label: **DATA** **Finish**



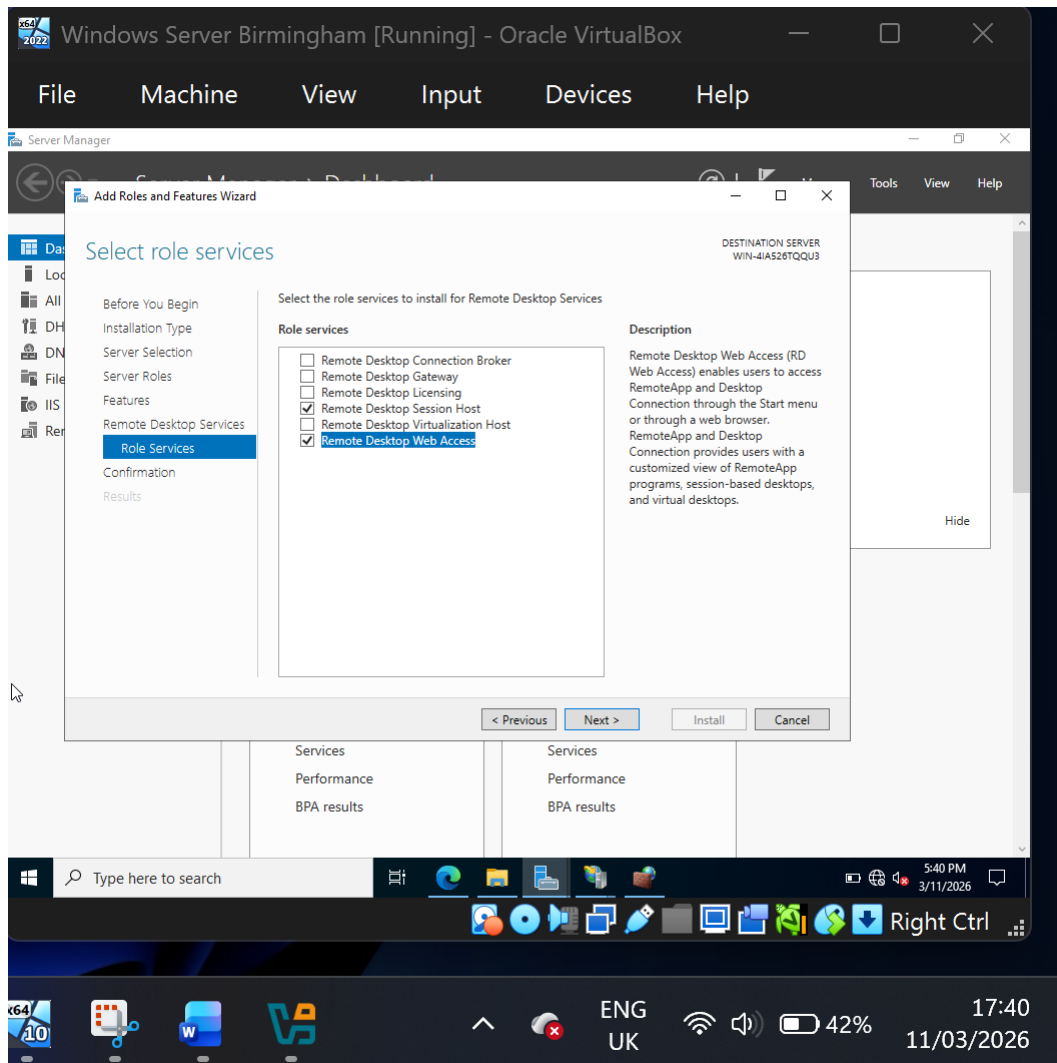


Creating a disk drive

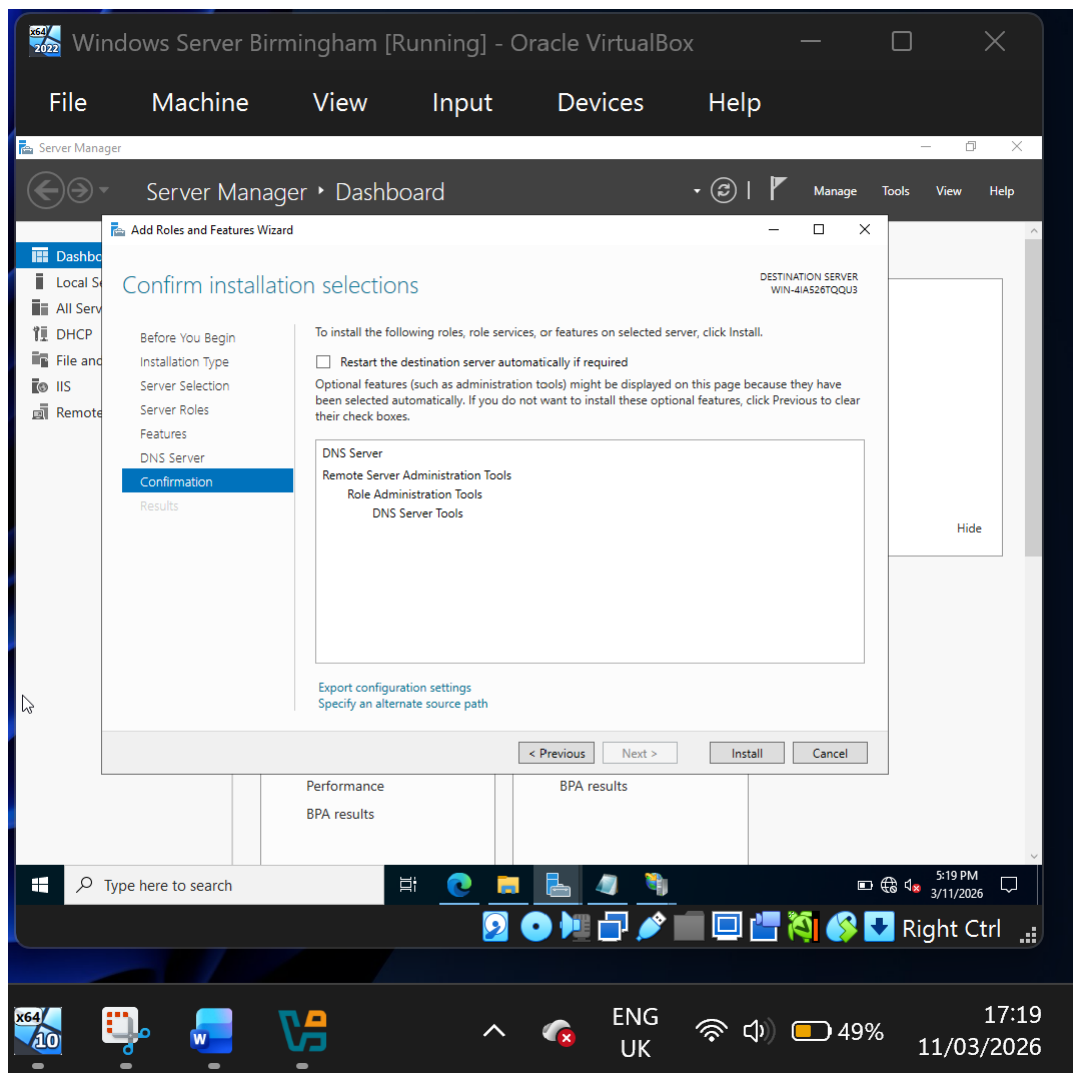
Mount second disk drive to E:\BirminghamFiles. Share and assign required permissions. Only the Domain Users need to have full control permissions and other network users have read only access.

9 IIS Server

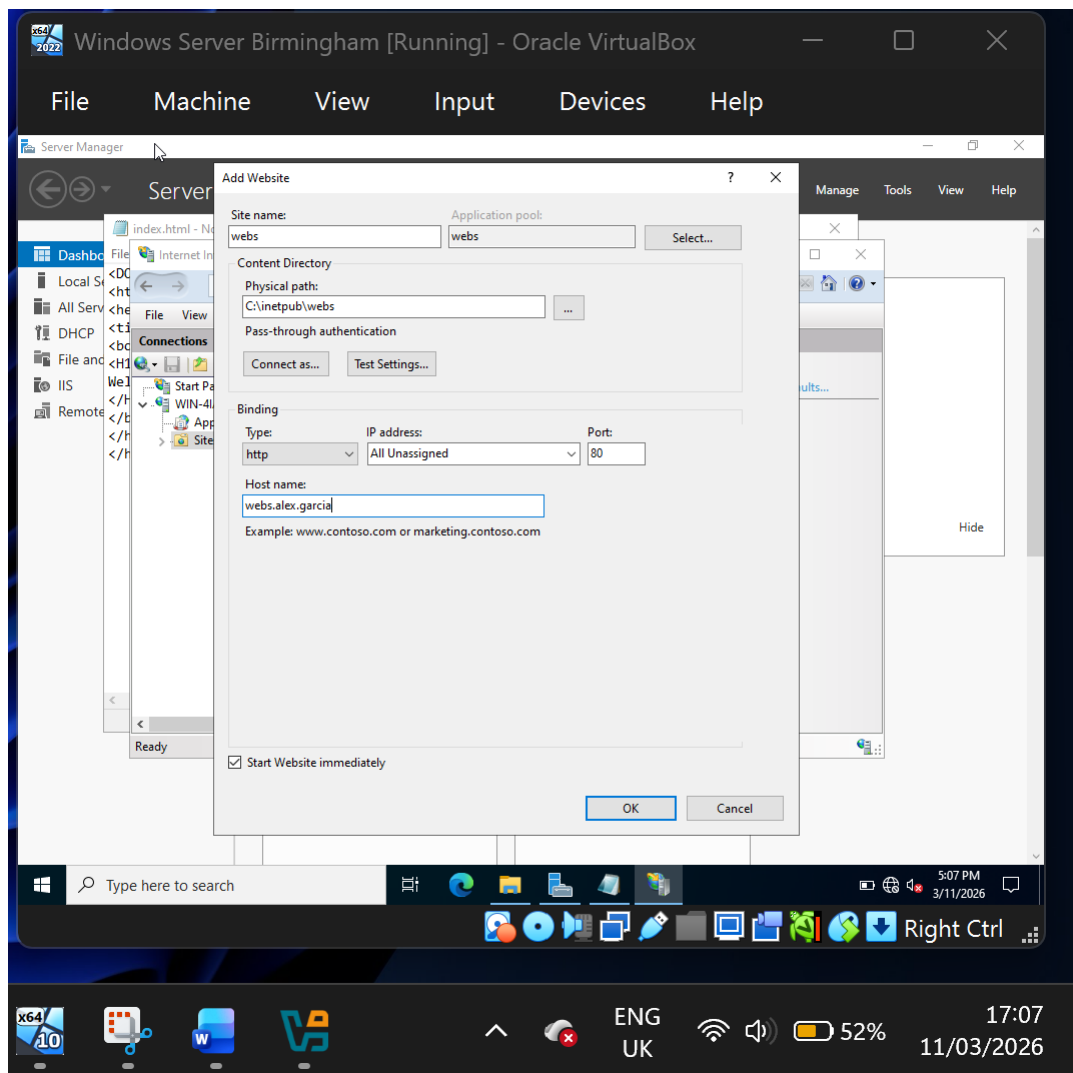
Install DNS server



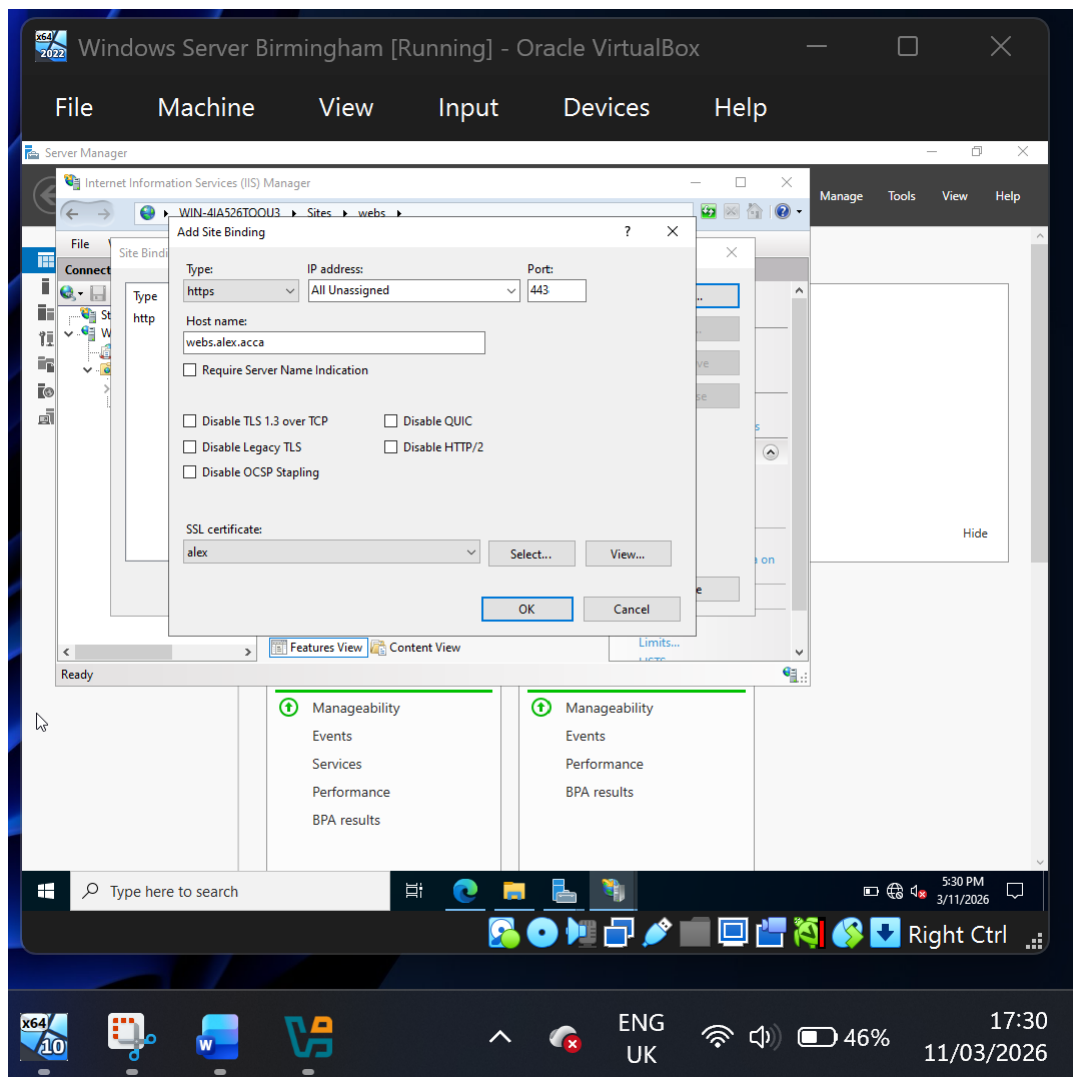
Add roles and services : remote desktop session host and remote desktop web acces



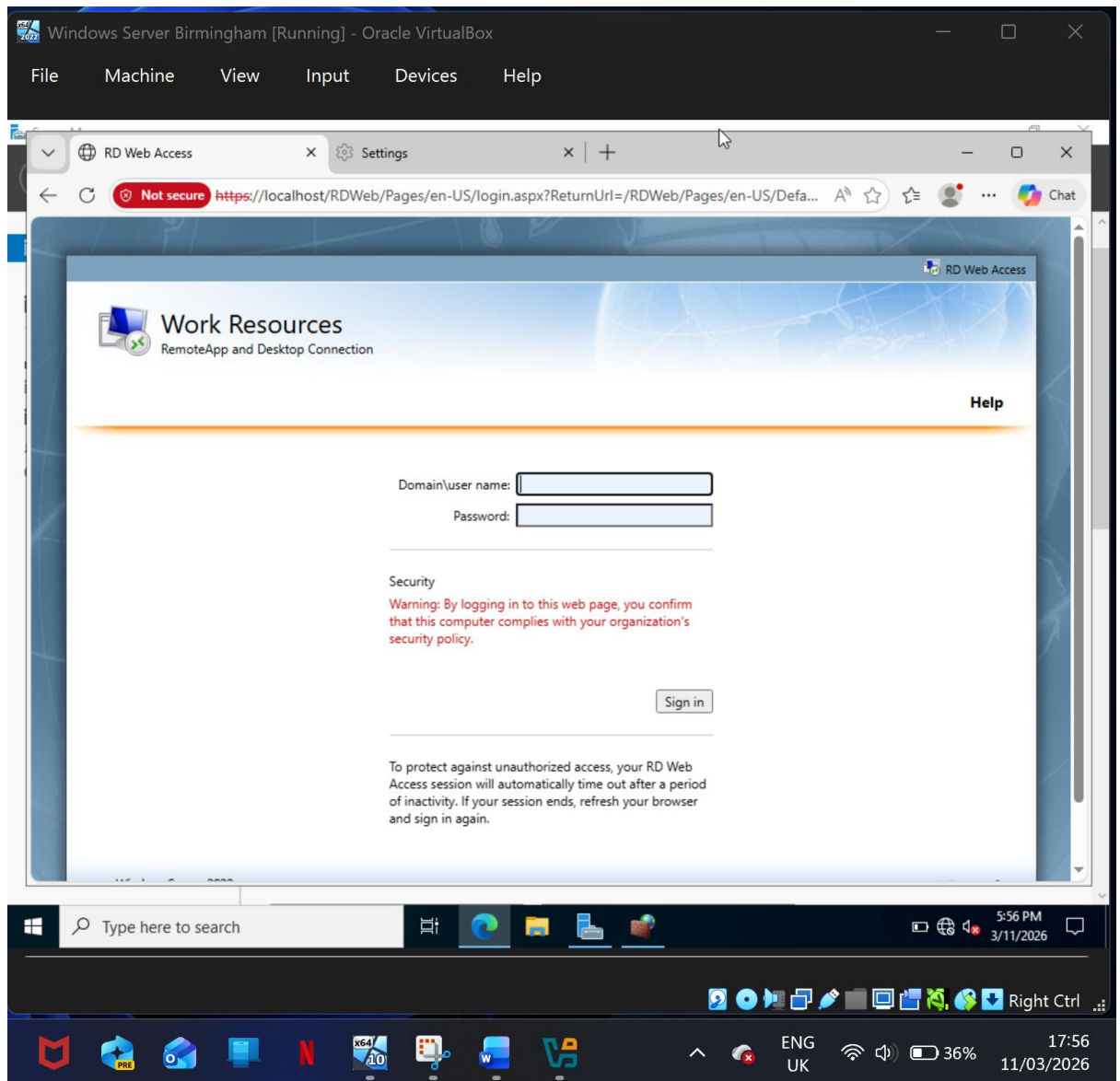
Server manager manage select add roles and features, next select server next find DNS server install



Adding a website we need to configure site name webs physical path :
c:\inetpub\webs binding type http ip address all unassigned port 80 and host
name webs.alex.garcia ok



Ssl certificate alex ok

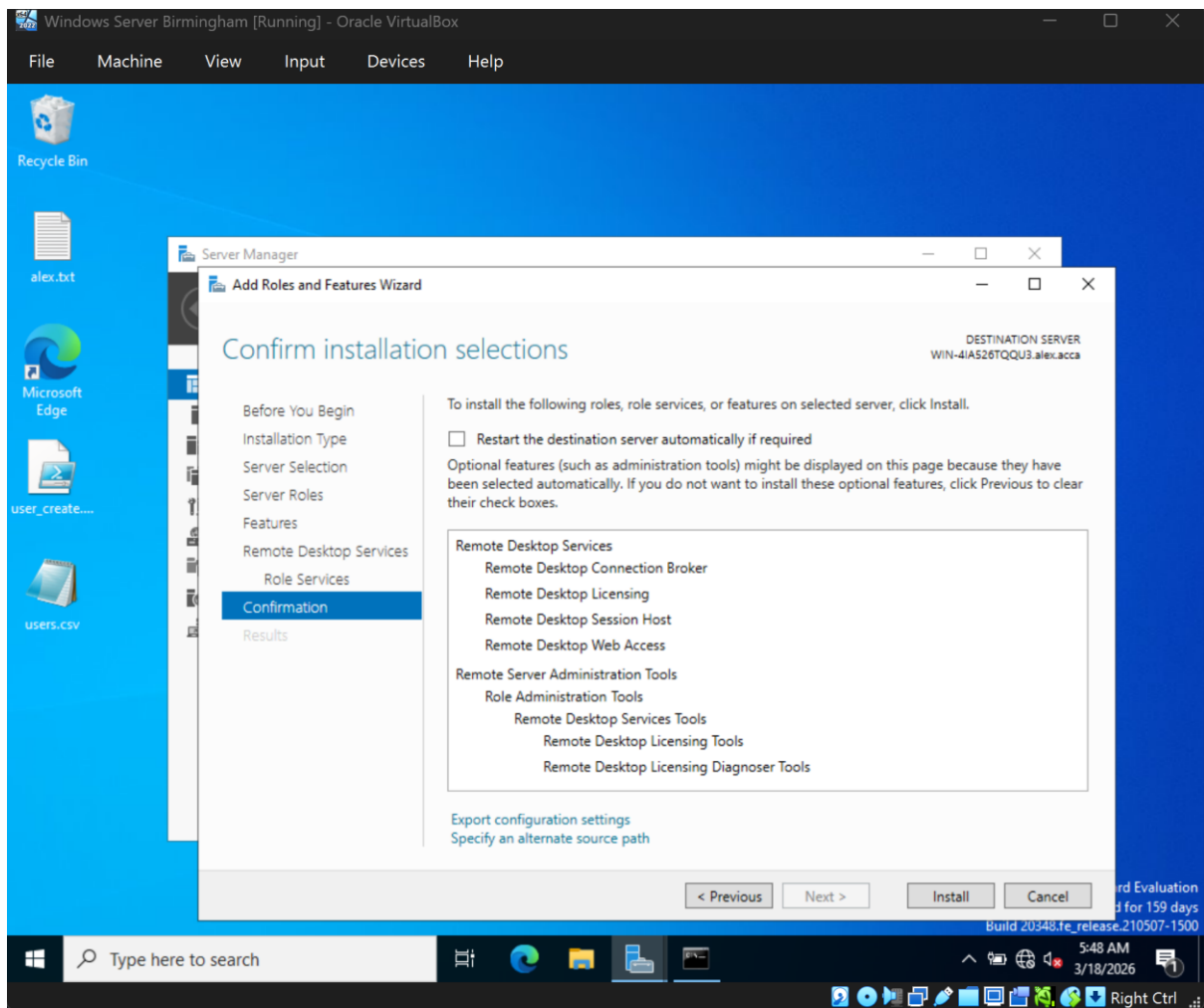


Conecting local host

Open browser : <https://localhost/RDWeb/pages/> enter

And it will show the site

10 Remote Desktop Services



Installing RDS Roles (Server Manager)

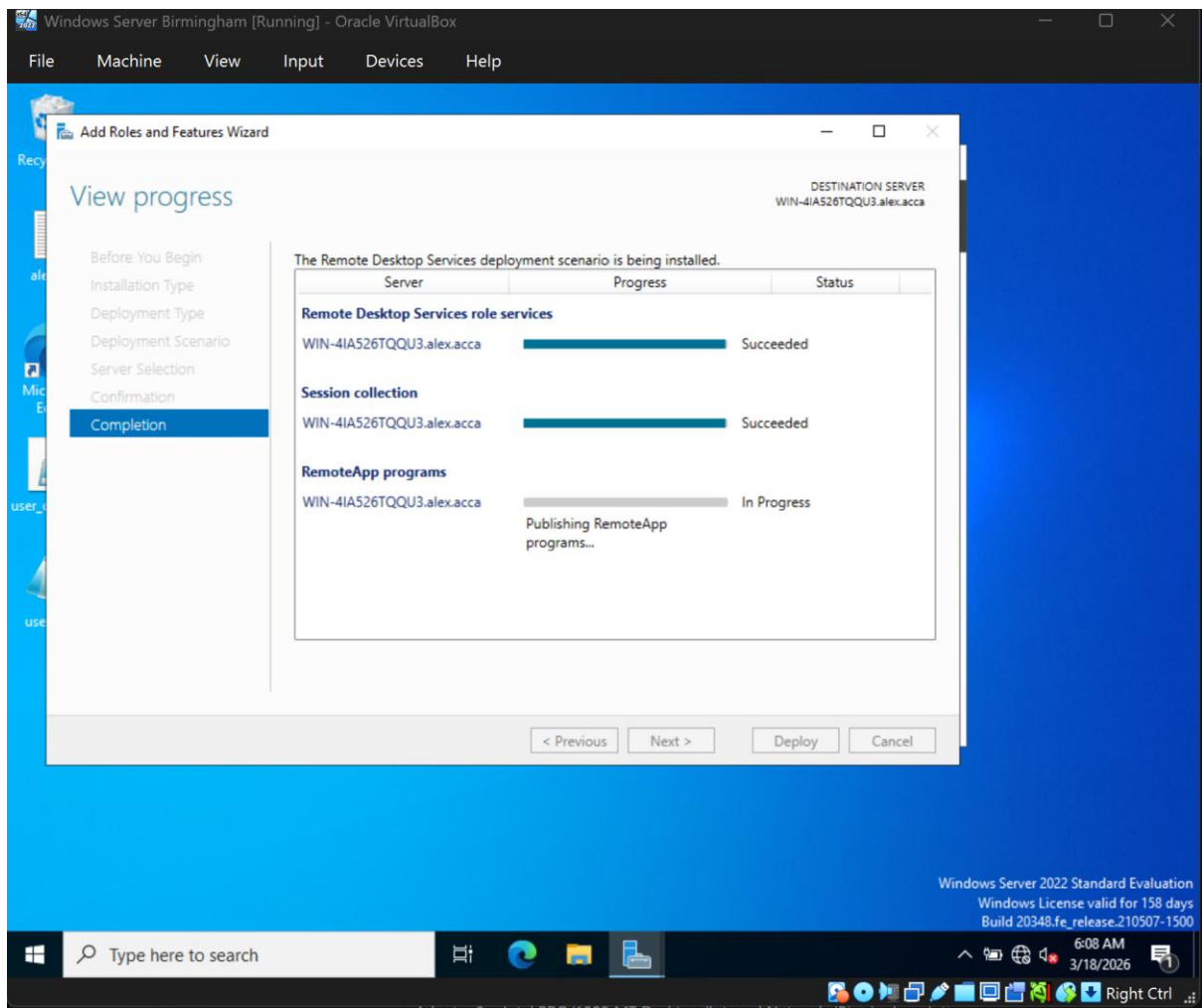
Server Manager Manage Add Roles and Features

Role-based Next Select B-DC Next

Remote Desktop Services Next Next

Check these Role Services:

- ☒ Remote Desktop Session Host
- ☒ Remote Desktop Licensing
- ☒ Remote Desktop Connection Broker
- ☒ Remote Desktop Web Access



Installing

No RDS deployment exists" = You need to RUN the Add Roles Wizard FIRST

EXACT Fix - Step-by-Step:

Step 1: Launch Add Roles Wizard

Server Manager Manage (top-right) Add Roles and Features

Select "Remote Desktop Services Installation"

Before you begin Next

CRITICAL: Select installation type Choose: Remote Desktop Services installation (NOT "Role-based or feature-based") Next

Quick Start (Single Server)

Select deployment type Quick Start Next

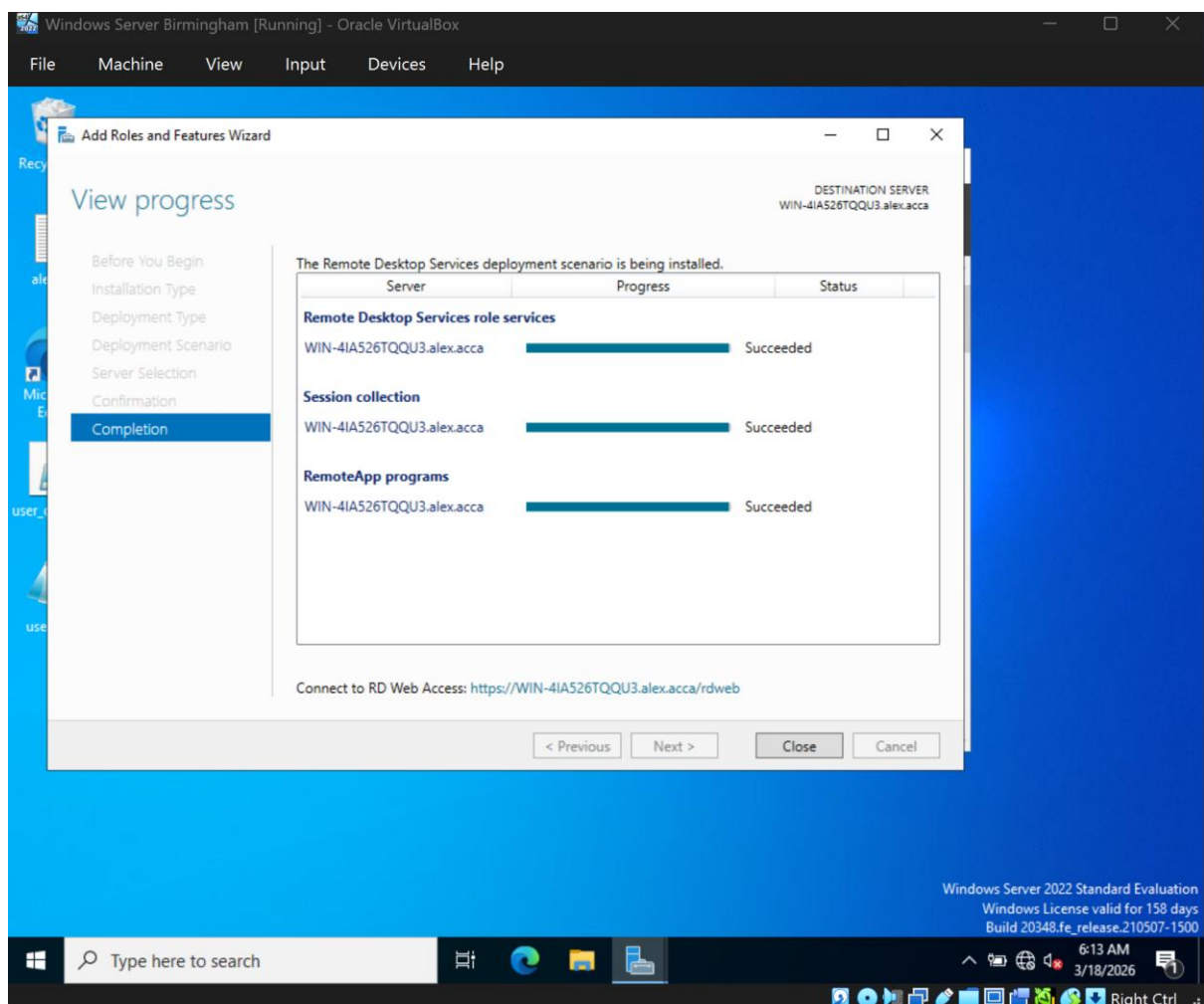
Select deployment scenario Session-based desktop deployment Next

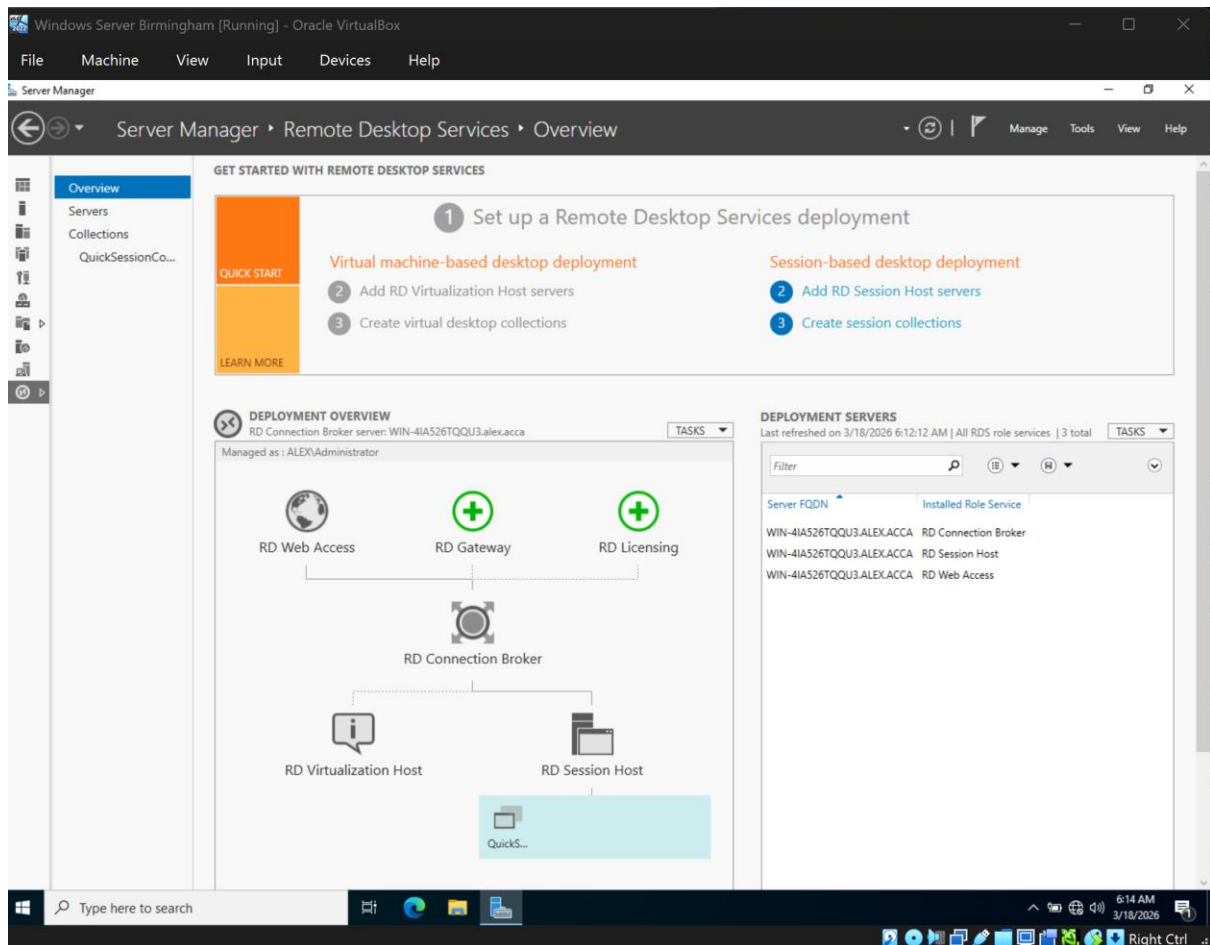
Select your server B-DC for ALL 4 roles:

- RD Connection Broker B-DC Add
- RD Web Access B-DC Add
- RD Session Host B-DC Add
- RD Licensing auto-selects B-DC

Check: Restart destination servers automatically

DEPLOY Wait 5-10 min Server restarts





BEFORE: "Quick Start" button visible + "No deployment" message

AFTER: "Overview" shows 4 roles with green ✓ marks

Run Add Roles Wizard → Select "Remote Desktop Services installation" → Quick Start → B-DC for all roles → DEPLOY

Takes 10 minutes total → RDS fully functional → <https://rds.alex.acca> works!

Do this NOW → post "Deployment successful" screenshot → certificate step next!