

## Overview

This report presents a comprehensive walkthrough of the planning, configuration, and implementation of a complete enterprise network environment for Campbell & Starr Super Bread-makers. The network has been set up to support secure communications, centralized management, redundancy, automated IP assignment, and controlled user access. The solution was built using a virtualized environment to replicate real-world enterprise infrastructure.

---

## Network Architecture Summary

- **Virtualization Tool:** Oracle VirtualBox
- **Network Mode:** Internal Network (CampbellStarrNet)
- **IP Scheme:** IPv4 - 192.168.100.0/24 (Main) and 192.168.200.0/24 (Backup)

## Virtual Machines Configured:

- **DC01** – Windows Server 2022: AD DS, DNS, DHCP, File Server
- **DC02** – Windows Server 2022: Secondary Domain Controller, Redundancy
- **ClientPC01** – Windows 11 Pro: Domain-joined user workstation
- **ClientPC02** – Windows 11 Pro: Domain-joined user workstation

Each server and client was assigned appropriate RAM, hard disk, and system resources, and configured with static or dynamic IPs based on roles.

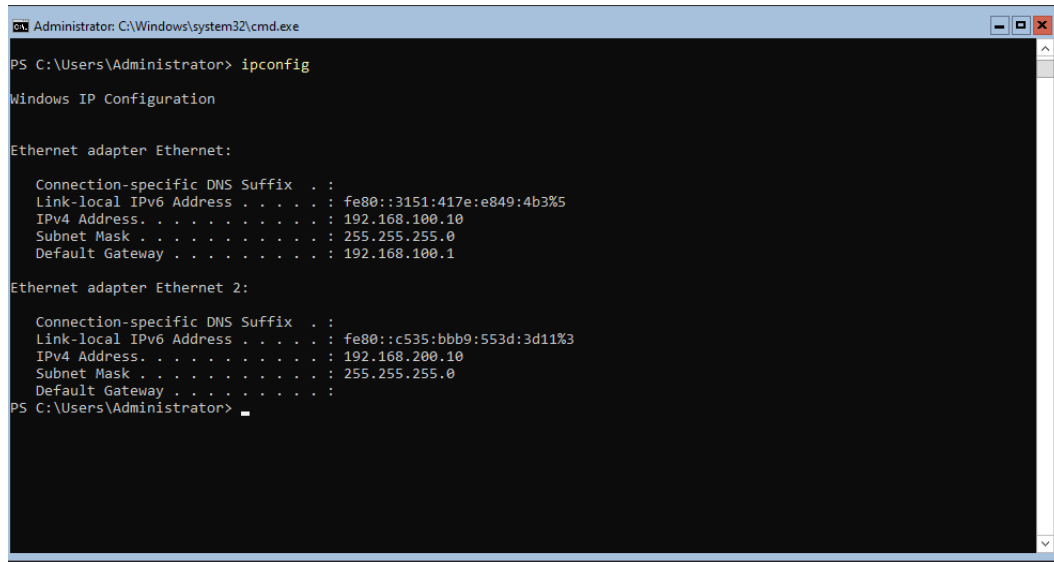
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## Configuration Steps Completed

### 1. Network Connectivity

- Configured static IPs for DC01 and DC02.
- Enabled DHCP to dynamically assign IPs to client PCs.
- Verified successful pings using IP address and hostname resolution.

- Verified domain name resolution using nslookup.



```
Administrator: C:\Windows\system32\cmd.exe

PS C:\Users\Administrator> ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

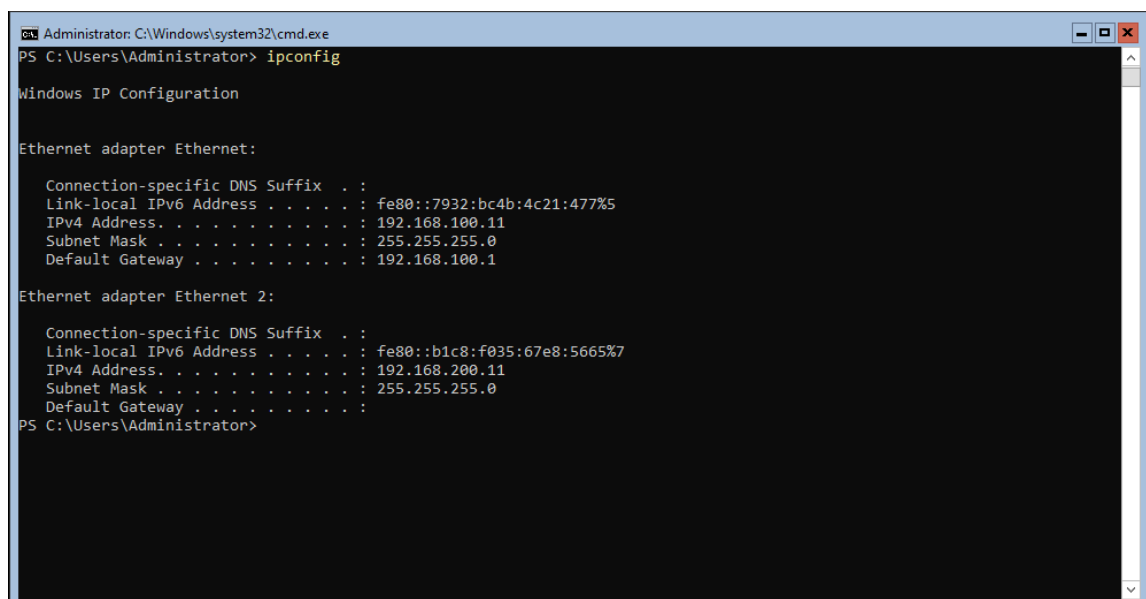
    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::3151:417e:e849:4b3%5
    IPv4 Address. . . . . : 192.168.100.10
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.100.1

Ethernet adapter Ethernet 2:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::c535:bbb9:553d:3d11%3
    IPv4 Address. . . . . : 192.168.200.10
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 

PS C:\Users\Administrator>
```

## Static IP Configuration on DC01



```
Administrator: C:\Windows\system32\cmd.exe

PS C:\Users\Administrator> ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::7932:bc4b:4c21:477%5
    IPv4 Address. . . . . : 192.168.100.11
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.100.1

Ethernet adapter Ethernet 2:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::b1c8:f035:67e8:5665%7
    IPv4 Address. . . . . : 192.168.200.11
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 

PS C:\Users\Administrator>
```

## Static IP Configuration on DC02

```
C:\WINDOWS\system32\cmd. X + v
Microsoft Windows [Version 10.0.26100.1742]
(c) Microsoft Corporation. All rights reserved.

C:\Users\bakerbob>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::5d7b:2ceb:50cf:8b84%3
    IPv4 Address. . . . . : 192.168.100.7
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.100.1

C:\Users\bakerbob>
```

**DHCP IP Assignment on ClientPC01** - Confirms client received IP in the DHCP range (e.g., 192.168.100.50–100)

```
C:\WINDOWS\system32\cmd. X + v
Microsoft Windows [Version 10.0.26100.1742]
(c) Microsoft Corporation. All rights reserved.

C:\Users\bakerbob>ping 192.168.100.10

Pinging 192.168.100.10 with 32 bytes of data:
Reply from 192.168.100.10: bytes=32 time=3ms TTL=128
Reply from 192.168.100.10: bytes=32 time=13ms TTL=128
Reply from 192.168.100.10: bytes=32 time=15ms TTL=128
Reply from 192.168.100.10: bytes=32 time=2ms TTL=128

Ping statistics for 192.168.100.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 15ms, Average = 8ms

C:\Users\bakerbob>
```

**Successful Ping from ClientPC01 to DC01 by IP** - Tests direct IP connectivity between client and server.

```
C:\Users\bakerbob>ping dc01

Pinging DC01.TestNet.Domain [192.168.100.10] with 32 bytes of data:
Reply from 192.168.100.10: bytes=32 time=15ms TTL=128
Reply from 192.168.100.10: bytes=32 time=3ms TTL=128
Reply from 192.168.100.10: bytes=32 time=39ms TTL=128
Reply from 192.168.100.10: bytes=32 time=19ms TTL=128

Ping statistics for 192.168.100.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 3ms, Maximum = 39ms, Average = 19ms
```

**Successful Ping from ClientPC01 to DC01 by Hostname** - Tests NetBIOS/hostname resolution. Ensures DNS is resolving names correctly.

```
C:\WINDOWS\system32\cmd. X + v
Ping statistics for 192.168.100.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 15ms, Average = 8ms

C:\Users\bakerbob>ping dc01

Pinging DC01.TestNet.Domain [192.168.100.10] with 32 bytes of data:
Reply from 192.168.100.10: bytes=32 time=15ms TTL=128
Reply from 192.168.100.10: bytes=32 time=3ms TTL=128
Reply from 192.168.100.10: bytes=32 time=39ms TTL=128
Reply from 192.168.100.10: bytes=32 time=19ms TTL=128

Ping statistics for 192.168.100.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 3ms, Maximum = 39ms, Average = 19ms

C:\Users\bakerbob>nslookup testnet.domain
Server:      UnKnown
Address:     192.168.100.10

Name:       testnet.domain
Addresses:  192.168.100.10
            192.168.200.10

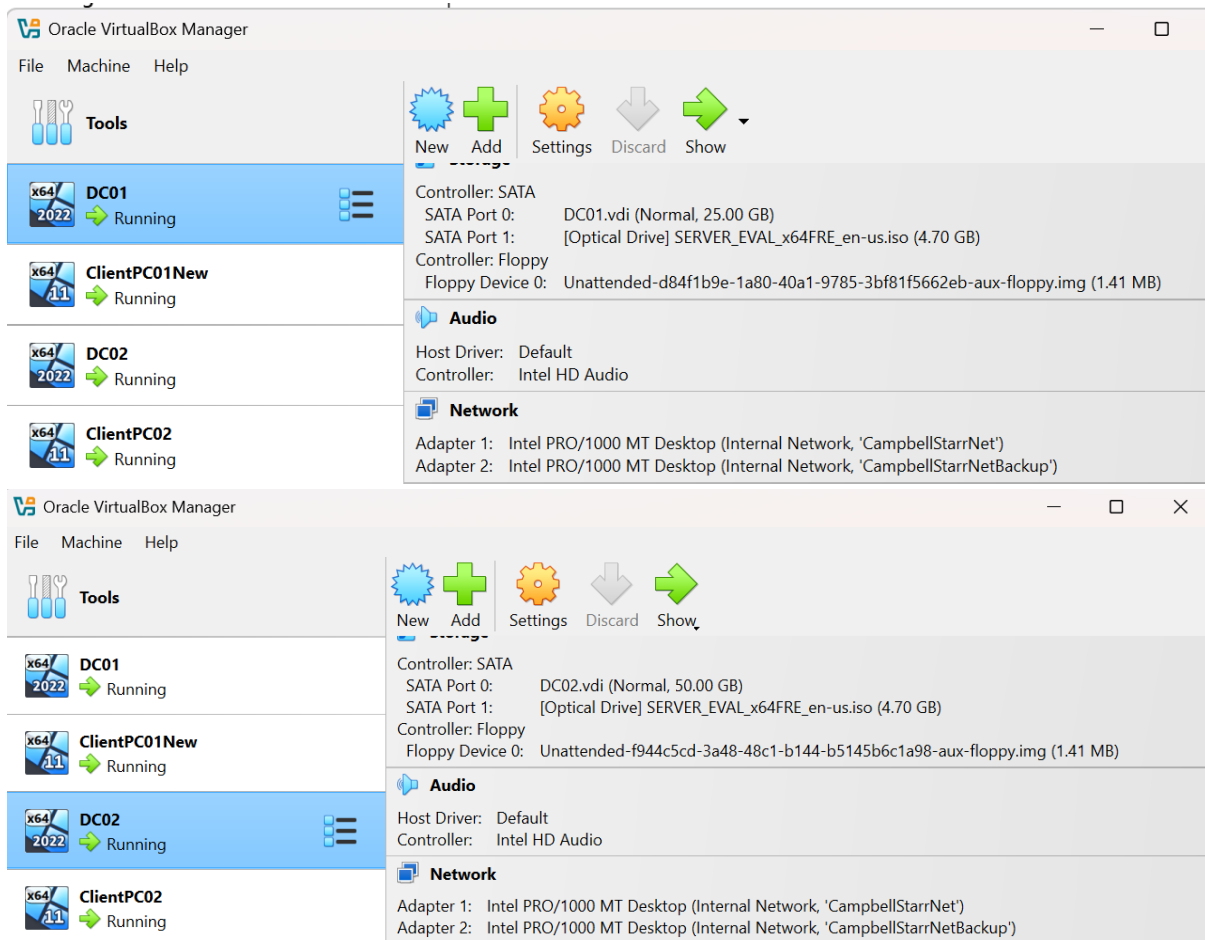
C:\Users\bakerbob>
C:\Users\bakerbob>
C:\Users\bakerbob>
C:\Users\bakerbob>
```

**Domain Name Resolution Using nslookup** - Validates DNS forward lookup from the client to the domain name.

---

## 2. Redundancy Setup

- Added a second network adapter to both domain controllers.
- Assigned IPs on the backup network (192.168.200.0/24).
- Ensured failover ping works if one adapter/network is down.
- Validated DNS and replication continued through backup network.



**Confirms redundancy using dual NICs across separate internal networks.**

```
Administrator: C:\Windows\system32\cmd.exe

PS C:\Users\Administrator> ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::3151:417e:e849:4b3%5
    IPv4 Address. . . . . : 192.168.100.10
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.100.1

Ethernet adapter Ethernet 2:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::c535:bbb9:553d:3d11%3
    IPv4 Address. . . . . : 192.168.200.10
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 

PS C:\Users\Administrator>
```

## Static IP Configuration on Backup Network for DC01

```
Administrator: C:\Windows\system32\cmd.exe

PS C:\Users\Administrator> ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::7932:bc4b:4c21:477%5
    IPv4 Address. . . . . : 192.168.100.11
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.100.1

Ethernet adapter Ethernet 2:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::b1c8:f035:67e8:5665%7
    IPv4 Address. . . . . : 192.168.200.11
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 

PS C:\Users\Administrator>
```

## Static IP Configuration on Backup Network for DC02

```
Administrator: C:\Windows\system32\cmd.exe

PS C:\Users\Administrator>
PS C:\Users\Administrator>
PS C:\Users\Administrator> ping 192.168.200.11

Pinging 192.168.200.11 with 32 bytes of data:
Reply from 192.168.200.11: bytes=32 time=33ms TTL=128
Reply from 192.168.200.11: bytes=32 time=4ms TTL=128
Reply from 192.168.200.11: bytes=32 time=41ms TTL=128
Reply from 192.168.200.11: bytes=32 time=19ms TTL=128

Ping statistics for 192.168.200.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 4ms, Maximum = 41ms, Average = 24ms
PS C:\Users\Administrator>
```

**Ping from DC01 to DC02 via Backup IP** - Confirms network failover link works between DCs via backup adapter.

```
Administrator: C:\Windows\system32\cmd.exe

Connection-specific DNS Suffix . : 
Link-local IPv6 Address . . . . . : fe80::b1c8:f035:67e8:5665%7
IPv4 Address. . . . . : 192.168.200.11
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 
PS C:\Users\Administrator> 
PS C:\Users\Administrator> 
PS C:\Users\Administrator> ping 192.168.200.10

Pinging 192.168.200.10 with 32 bytes of data:
Reply from 192.168.200.10: bytes=32 time=18ms TTL=128
Reply from 192.168.200.10: bytes=32 time=2ms TTL=128
Reply from 192.168.200.10: bytes=32 time=3ms TTL=128
Reply from 192.168.200.10: bytes=32 time=56ms TTL=128

Ping statistics for 192.168.200.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 56ms, Average = 19ms
PS C:\Users\Administrator> _
```

**Ping from DC02 to DC01 via Backup IP** - Validates return connectivity on redundant path.

```
Administrator: C:\Windows\system32\cmd.exe

PS C:\Users\Administrator> 
PS C:\Users\Administrator> 
PS C:\Users\Administrator> repadmin /showrepl

Repadmin: running command /showrepl against full DC localhost
Default-First-Site-Name\DC01
DSA Options: IS_GC
Site Options: (none)
DSA object GUID: ec7b613e-fca6-473c-b69b-99d6504dcada
DSA invocationID: ec7b613e-fca6-473c-b69b-99d6504dcada

PS C:\Users\Administrator>
```

**Replication Still Functional** - Ensures AD replication is still occurring through any network available.

```
Administrator: C:\Windows\system32\cmd.exe

WARNING: To launch Server Configuration tool again, run "SConfig"
PS C:\Users\Administrator> powershell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

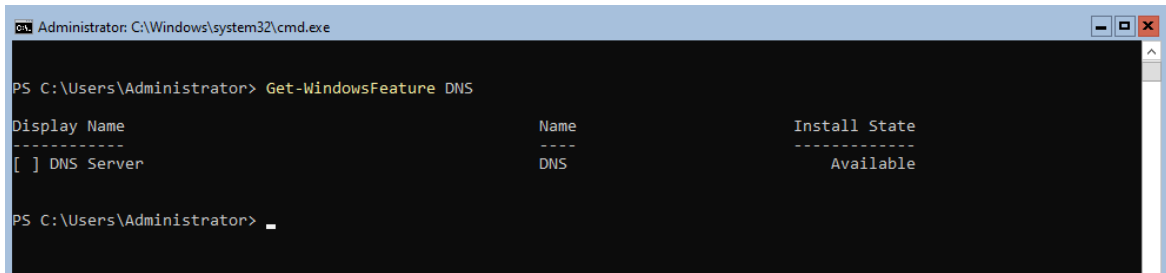
Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\Administrator> Get-WindowsFeature AD-Domain-Services

Display Name                                     Name                                Install State
-----
[X] Active Directory Domain Services             AD-Domain-Services                 Installed

PS C:\Users\Administrator> _
```

## Active Directory Domain Services role installed on DC02.



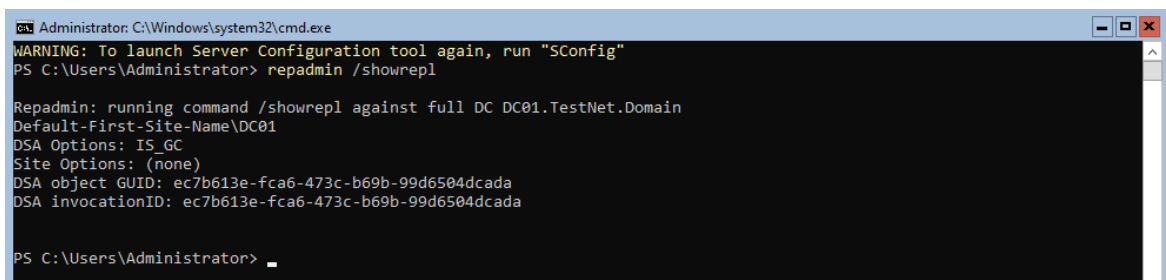
```
Administrator: C:\Windows\system32\cmd.exe

PS C:\Users\Administrator> Get-WindowsFeature DNS

Display Name          Name          Install State
-----
[ ] DNS Server        DNS           Available

PS C:\Users\Administrator> _
```

## DNS role installed on DC02 for redundancy.



```
Administrator: C:\Windows\system32\cmd.exe

WARNING: To launch Server Configuration tool again, run "SConfig"
PS C:\Users\Administrator> repadmin /showrepl

Repadmin: running command /showrepl against full DC DC01.TestNet.Domain
Default-First-Site-Name\DC01
DSA Options: IS_GC
Site Options: (none)
DSA object GUID: ec7b613e-fca6-473c-b69b-99d6504dcada
DSA invocationID: ec7b613e-fca6-473c-b69b-99d6504dcada

PS C:\Users\Administrator> _
```

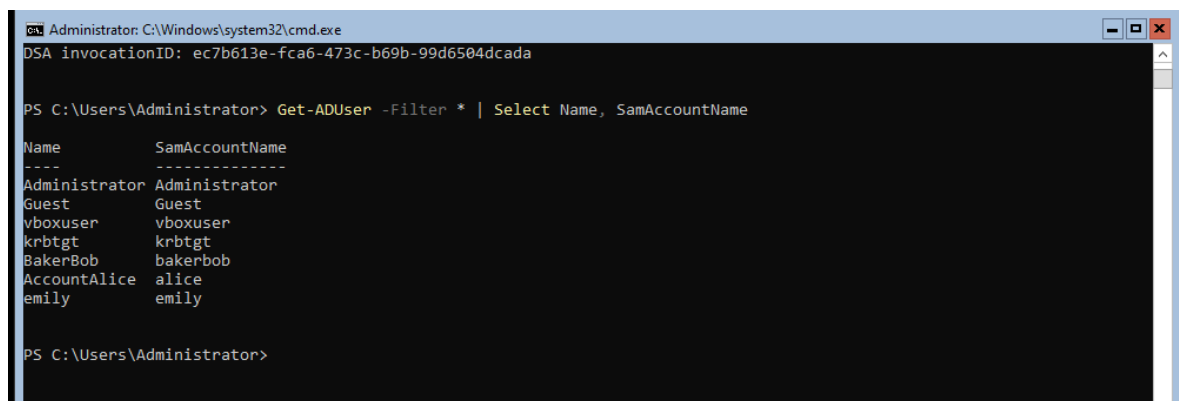
## Validated DNS and replication continued through backup network

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### 3. User Creation & Automation

- Created users using PowerShell (bakerbob, emily).
- Used Set-ADUser to assign home directories.
- Simulated user-based access and login.
- Group Policy automation was planned but not implemented due to time.

A screenshot of a PowerShell window titled 'Administrator: C:\Windows\system32\cmd.exe'. The window shows the output of the command 'Get-ADUser -Filter \* | Select Name, SamAccountName'. The output is a table with two columns: 'Name' and 'SamAccountName'. The rows listed are: Administrator, Guest, vboxuser, krbtgt, BakerBob, AccountAlice, and emily. The 'BakerBob' and 'emily' entries are highlighted in blue.

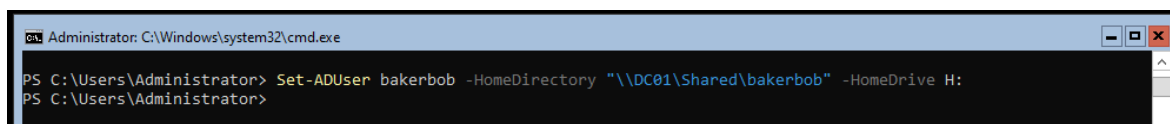
```
Administrator: C:\Windows\system32\cmd.exe
DSA invocationID: ec7b613e-fca6-473c-b69b-99d6504dcada

PS C:\Users\Administrator> Get-ADUser -Filter * | Select Name, SamAccountName

Name                SamAccountName
-----
Administrator       Administrator
Guest                Guest
vboxuser             vboxuser
krbtgt               krbtgt
BakerBob             bakerbob
AccountAlice         alice
emily                emily

PS C:\Users\Administrator>
```

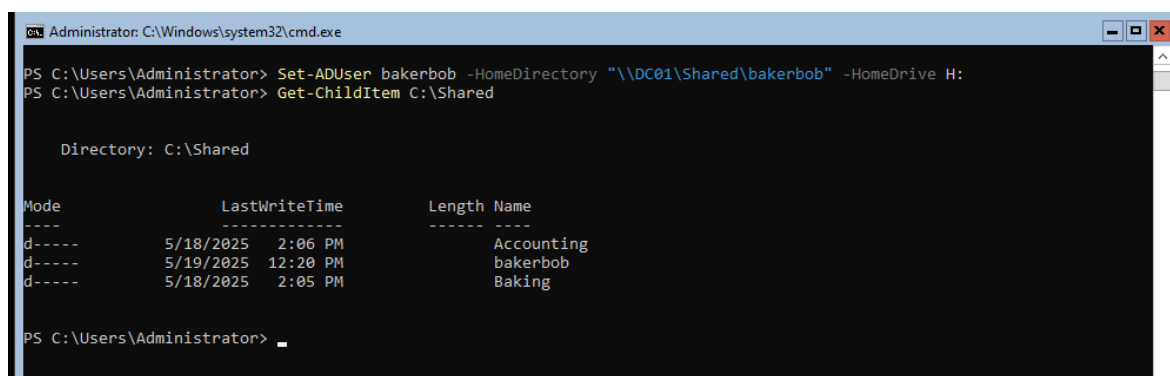
**PowerShell Output: Users Created (bakerbob, emily)** - Shows bakerbob and emily were created in Active Directory.

A screenshot of a PowerShell window titled 'Administrator: C:\Windows\system32\cmd.exe'. The window shows the command 'Set-ADUser bakerbob -HomeDirectory "\\DC01\Shared\bakerbob" -HomeDrive H:' being entered at the prompt.

```
Administrator: C:\Windows\system32\cmd.exe

PS C:\Users\Administrator> Set-ADUser bakerbob -HomeDirectory "\\DC01\Shared\bakerbob" -HomeDrive H:
PS C:\Users\Administrator>
```

**Assign Home Directory using Set-ADUser** - Demonstrates understanding of user home directory mapping (even though the folder isn't auto-created).

A screenshot of a PowerShell window titled 'Administrator: C:\Windows\system32\cmd.exe'. The window shows the command 'Get-ChildItem C:\Shared' being entered at the prompt. The output shows the contents of the 'C:\Shared' directory as a table with columns: 'Mode', 'LastWriteTime', 'Length', and 'Name'. The rows listed are: Accounting, bakerbob, and Baking.

```
Administrator: C:\Windows\system32\cmd.exe

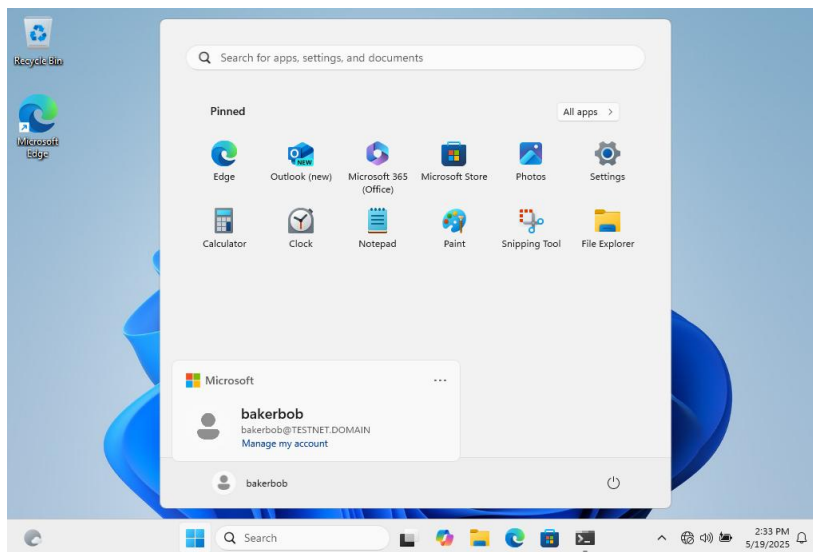
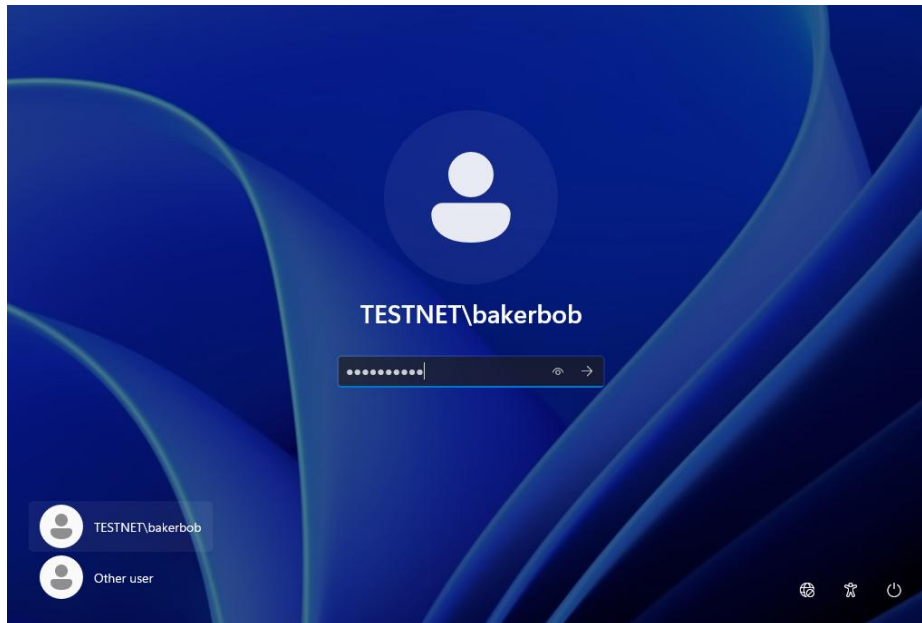
PS C:\Users\Administrator> Set-ADUser bakerbob -HomeDirectory "\\DC01\Shared\bakerbob" -HomeDrive H:
PS C:\Users\Administrator> Get-ChildItem C:\Shared

Directory: C:\Shared

Mode                LastWriteTime         Length Name
----
d-----          5/18/2025   2:06 PM             Accounting
d-----          5/19/2025  12:20 PM             bakerbob
d-----          5/18/2025   2:05 PM             Baking

PS C:\Users\Administrator>
```

**Verify Folder Path Exists** - Confirm that the home directory path like C:\Shared\bakerbob exists for the user.



**Domain Login as User** - Desktop after login or the login screen showing domain user. Confirms successful domain user login simulation.

```
Administrator: C:\Windows\system32\cmd.exe
PS C:\Users\Administrator> Get-ADGroup -Filter *

DistinguishedName : CN=Administrators,CN=Builtin,DC=TestNet,DC=Domain
GroupCategory      : Security
GroupScope         : DomainLocal
Name              : Administrators
ObjectClass        : group
ObjectGUID         : 798cd3a8-9ca6-481a-9d13-7042376e6a8a
SamAccountName     : Administrators
SID               : S-1-5-32-544

DistinguishedName : CN=Users,CN=Builtin,DC=TestNet,DC=Domain
GroupCategory      : Security
GroupScope         : DomainLocal
Name              : Users
ObjectClass        : group
ObjectGUID         : fae4fc0c-4362-46a9-b313-8a1f3364f763
SamAccountName     : Users
SID               : S-1-5-32-545

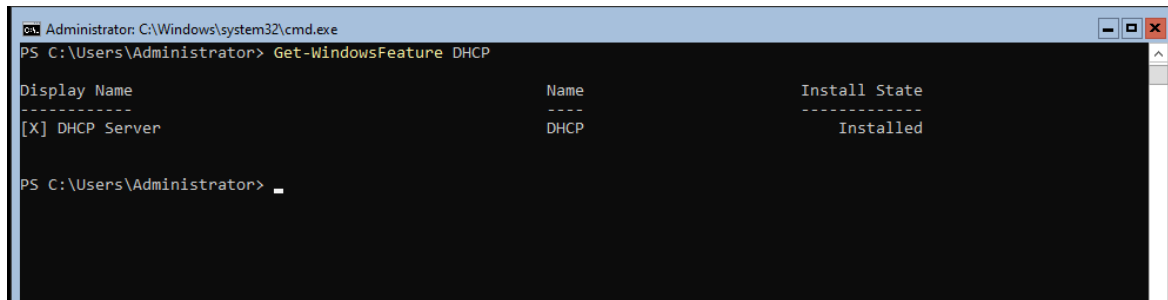
DistinguishedName : CN=Guests,CN=Builtin,DC=TestNet,DC=Domain
GroupCategory      : Security
GroupScope         : DomainLocal
Name              : Guests
ObjectClass        : group
ObjectGUID         : 34d33f1e-fd6a-44c5-beb5-6588599c271f
SamAccountName     : Guests
SID               : S-1-5-32-546
```

**Group Creation** - Shows user groups if you added ones like Accounting, Baking, etc.

---

#### 4. DHCP Configuration

- Installed DHCP role on DC01.
- Configured scope: 192.168.100.50 – 192.168.100.100.
- Defined exclusions and set DNS/Gateway options.
- Clients confirmed to receive correct IP addresses from DHCP.

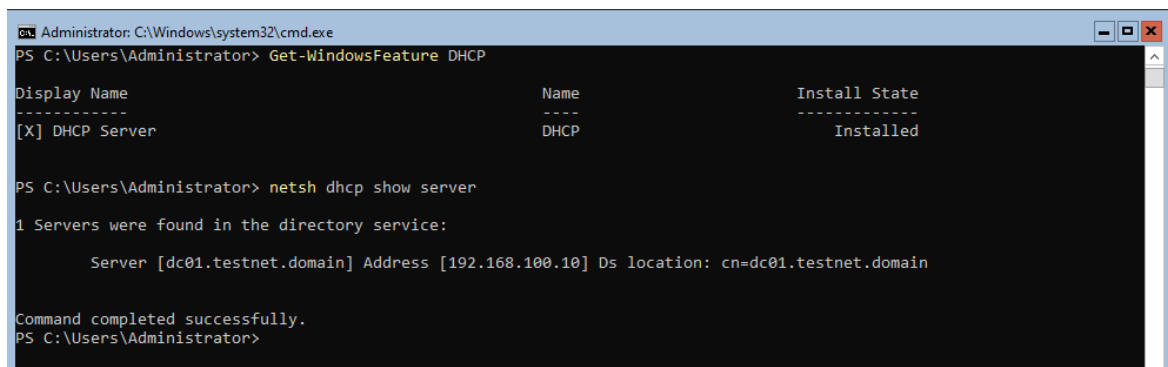


```
Administrator: C:\Windows\system32\cmd.exe
PS C:\Users\Administrator> Get-WindowsFeature DHCP

Display Name      Name      Install State
-----
[X] DHCP Server   DHCP      Installed

PS C:\Users\Administrator>
```

**DHCP Role Installed on DC01** - Shows [X] DHCP is installed and active on DC01.



```
Administrator: C:\Windows\system32\cmd.exe
PS C:\Users\Administrator> Get-WindowsFeature DHCP

Display Name      Name      Install State
-----
[X] DHCP Server   DHCP      Installed

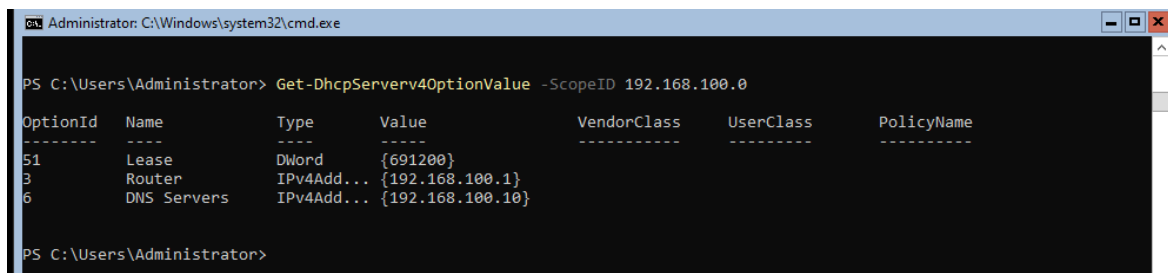
PS C:\Users\Administrator> netsh dhcp show server

1 Servers were found in the directory service:

        Server [dc01.testnet.domain] Address [192.168.100.10] Ds location: cn=dc01.testnet.domain

Command completed successfully.
PS C:\Users\Administrator>
```

**Authorized DHCP Server** - Confirms DC01 is authorized to issue DHCP leases within the domain.



```
Administrator: C:\Windows\system32\cmd.exe
PS C:\Users\Administrator> Get-DhcpServerv4OptionValue -ScopeID 192.168.100.0

OptionId  Name      Type      Value      VendorClass  UserClass  PolicyName
-----
51        Lease     DWord     {691200}
3         Router    IPv4Add... {192.168.100.1}
6         DNS Servers IPv4Add... {192.168.100.10}

PS C:\Users\Administrator>
```

**DHCP Scope Configured** - Shows scope with range 192.168.100.50 – 192.168.100.100.

```
Administrator: C:\Windows\system32\cmd.exe

PS C:\Users\Administrator> Get-DhcpServerv4OptionValue -ScopeID 192.168.100.0

OptionId  Name      Type      Value      VendorClass  UserClass  PolicyName
-----
51        Lease     DWord     {691200}
3         Router    IPv4Add... {192.168.100.1}
6         DNS Servers IPv4Add... {192.168.100.10}

PS C:\Users\Administrator>
```

**DHCP Options Set (DNS, Gateway)** - Verifies DNS server (192.168.100.10) and router (192.168.100.1) were configured correctly.

```
Administrator: C:\Windows\system32\cmd.exe

PS C:\Users\Administrator> powershell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\Administrator> Get-WindowsFeature AD-Domain-Services

Display Name      Name      Install State
-----
[X] Active Directory Domain Services  AD-Domain-Services  Installed

PS C:\Users\Administrator>
```

**Active Directory Domain Services** role successfully installed on DC01.

```
Administrator: C:\Windows\system32\cmd.exe

PS C:\Users\Administrator> Get-WindowsFeature DNS

Display Name      Name      Install State
-----
[X] DNS Server     DNS       Installed

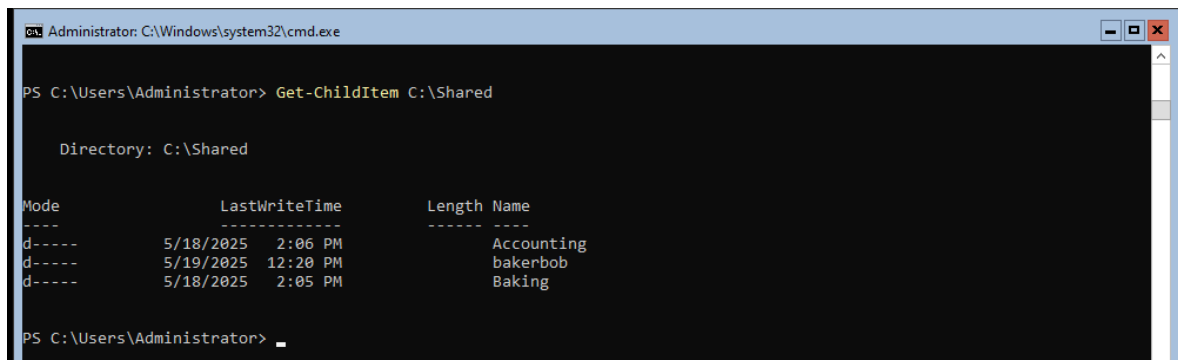
PS C:\Users\Administrator> _
```

**DNS Server** role installed and working on DC01.

---

## 5. NTFS Security

- Created a shared folder structure at C:\Shared.
- Subfolders: \Accounting, \Baking created for different departments.
- NTFS permissions applied using icacls, allowing restricted access to groups.
- Shared folder access tested from clients.



```
Administrator: C:\Windows\system32\cmd.exe

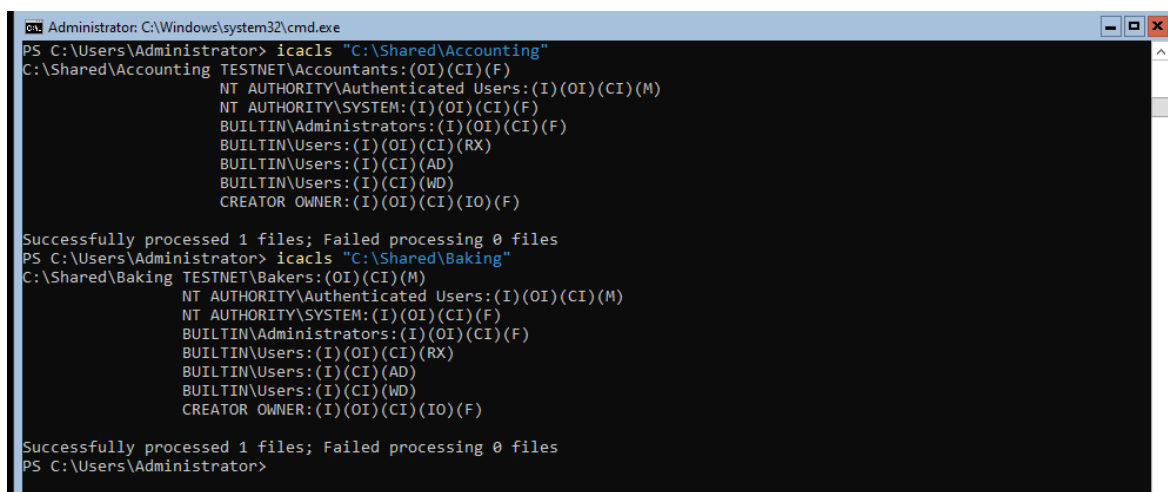
PS C:\Users\Administrator> Get-ChildItem C:\Shared

Directory: C:\Shared

Mode                LastWriteTime         Length Name
----                -
d-----          5/18/2025   2:06 PM             Accounting
d-----          5/19/2025  12:20 PM             bakerbob
d-----          5/18/2025   2:05 PM             Baking

PS C:\Users\Administrator>
```

**Shared Folder Structure Created** - Confirms that department folders were created successfully.



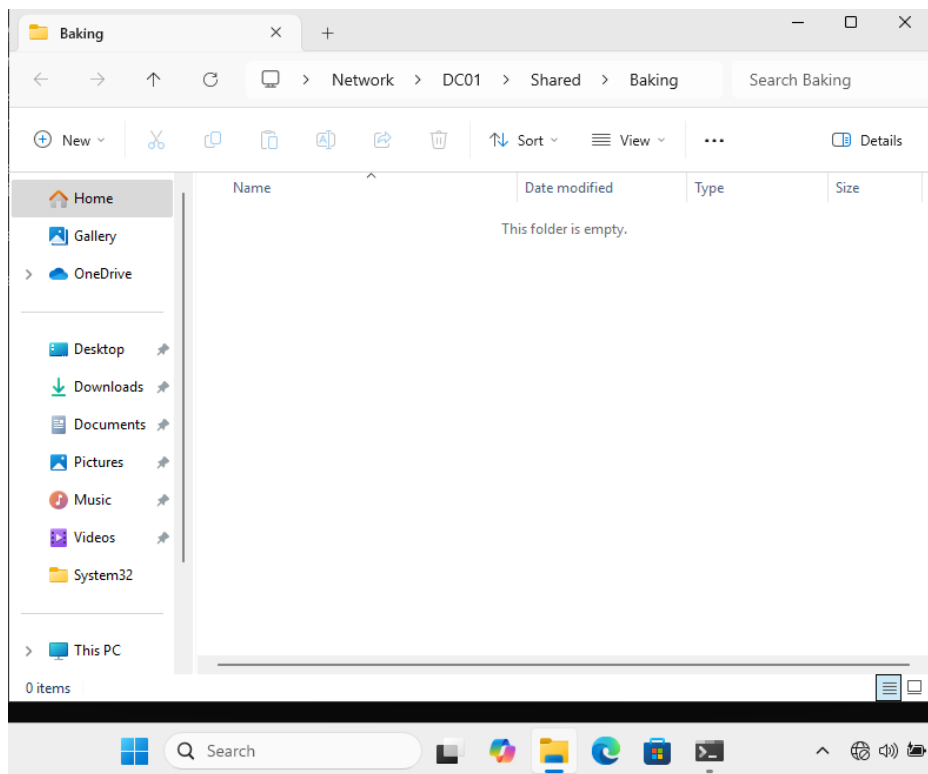
```
Administrator: C:\Windows\system32\cmd.exe

PS C:\Users\Administrator> icacls "C:\Shared\Accounting"
C:\Shared\Accounting TESTNET\Accountants:(OI)(CI)(F)
                     NT AUTHORITY\Authenticated Users:(I)(OI)(CI)(M)
                     NT AUTHORITY\SYSTEM:(I)(OI)(CI)(F)
                     BUILTIN\Administrators:(I)(OI)(CI)(F)
                     BUILTIN\Users:(I)(OI)(CI)(RX)
                     BUILTIN\Users:(I)(CI)(AD)
                     BUILTIN\Users:(I)(CI)(WD)
                     CREATOR OWNER:(I)(OI)(CI)(IO)(F)

Successfully processed 1 files; Failed processing 0 files
PS C:\Users\Administrator> icacls "C:\Shared\Baking"
C:\Shared\Baking TESTNET\Bakers:(OI)(CI)(M)
                  NT AUTHORITY\Authenticated Users:(I)(OI)(CI)(M)
                  NT AUTHORITY\SYSTEM:(I)(OI)(CI)(F)
                  BUILTIN\Administrators:(I)(OI)(CI)(F)
                  BUILTIN\Users:(I)(OI)(CI)(RX)
                  BUILTIN\Users:(I)(CI)(AD)
                  BUILTIN\Users:(I)(CI)(WD)
                  CREATOR OWNER:(I)(OI)(CI)(IO)(F)

Successfully processed 1 files; Failed processing 0 files
PS C:\Users\Administrator>
```

**NTFS Permissions Using icacls** - Shows access control list applied to folders, e.g., TestNet\Accounting has Modify rights.

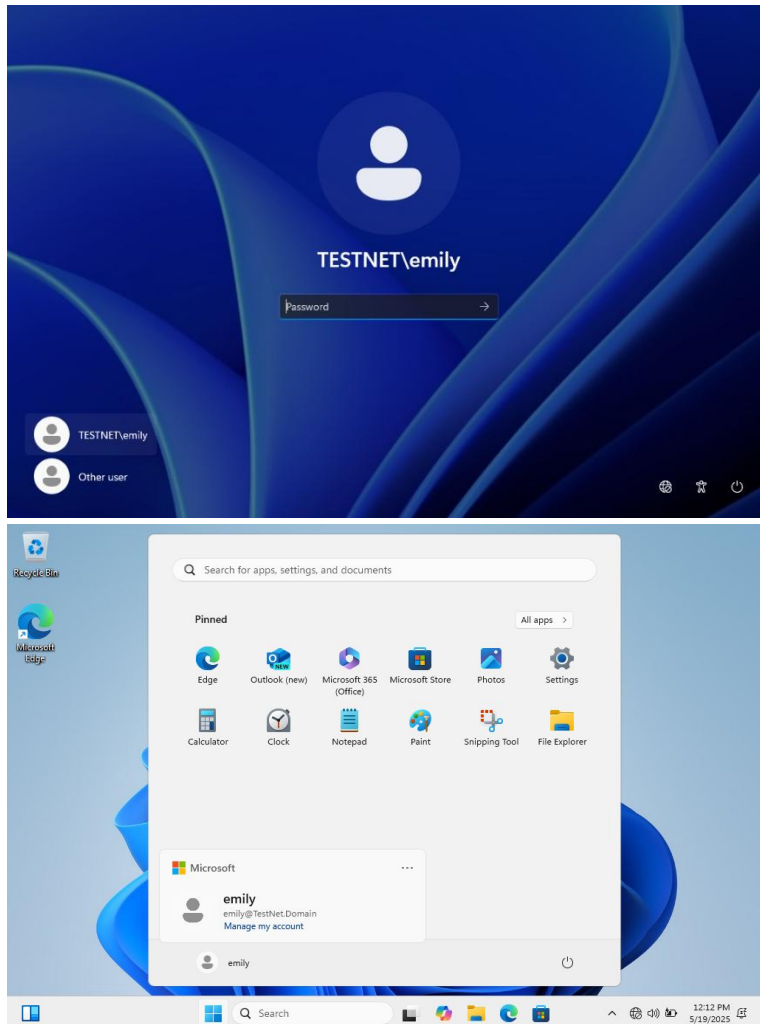


**ClientPC Access Test** - ClientPC01 successfully accessed the domain-shared folder \\DC01\\Shared\\Baking, verifying both network sharing and NTFS permission setup.

---

## 6. Credential Usage

- Avoided using default Administrator account.
- Domain logins were performed using created users like emily.
- Login verification confirmed user profile creation and access to shares.



**Domain Login as Emily on ClientPC01** - User emily successfully logged into ClientPC01 as a domain user, confirming credential use without the default administrator.

```
C:\WINDOWS\system32\cmd. X + v
Microsoft Windows [Version 10.0.26100.1742]
(c) Microsoft Corporation. All rights reserved.

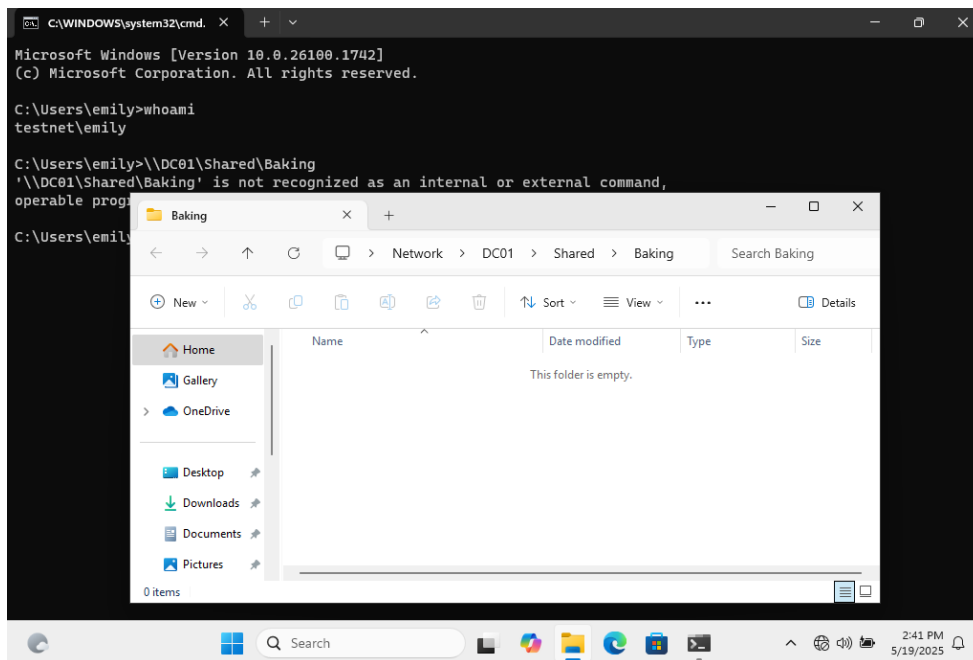
C:\Users\emily>whoami
testnet\emily

C:\Users\emily>|
```

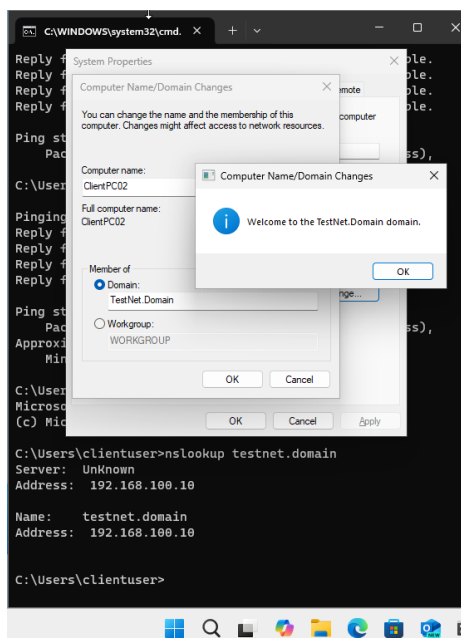
**Command Prompt Showing User Context** - Displays that the logged-in domain user is



testnet\emily, verifying proper credential usage without relying on built-in admin accounts.



**Accessing Shared Folder as Emily** - Domain user emily accessed shared folder \\DC01\Shared\Baking, confirming user-specific permissions and role-based access.



**ClientPC successfully joined to TestNet.Domain.** This is a critical screenshot showing the domain join confirmation.

## Problems Faced and Resolutions

- **DNS Unreachable from Clients:** Clients initially failed to join the domain. Fixed by manually setting DNS to DC01's IP using PowerShell.
  - **AD Web Services Errors:** Encountered issues retrieving user lists; solved by restarting services and creating users with fallback commands.
  - **Network Adapter Conflicts:** Certain pings failed when multiple adapters were misconfigured. Fixed by verifying MAC address uniqueness and adapter order.
  - **Folder Access Errors:** NTFS permissions were too restrictive at first; resolved with icacls adjustments to allow specific group access.
- 

## Conclusion

The network infrastructure successfully replicates a real-world enterprise environment. It supports centralized administration, DHCP IP allocation, user authentication, and controlled file access. By configuring redundancy and verifying client-server communications, this project ensures high availability and reliability for business operations.