Windows Active Directory Setup Lab
By Michael Ambeguia

Purpose: The purpose of this lab is to gain hands-on experience setting up a Windows Active Directory environment. In this Lab I will set up a Windows domain controller hosted on a Windows 2022 Server and will perform the prerequisite tasks such as setting a static ip address and configuring DNS on the DC. Active Directory is so important for organizations since it simplifies the management of Windows environments and serves as a centralized directory of a company's users, devices, and network resources. Not only this, AD can help organizations configure settings in an organized fashion through the use of Group Policy Objects. By completing this lab I will greatly improve my Windows system administration skills and knowledge as well.

Sections:

1. Introduction to Active Directory:
2. Setting up environment:
3. Installing and Configuring AD:

Section #1 Introduction to Active Directory:

1.1 What is Active Directory? Why is it used?

Microsoft Active Directory is a directory service and database system created by Microsoft to ease the management of a large organization's IT infrastructure and Users. AD has eight main benefits for organizations that choose to adopt it.

1. AD makes configuring a Windows environment easier:

AD helps organizations configure and manage a Windows OS environment by allowing administrators to use baseline policies in the form of GPOs (Group Policy Objects).

2. AD helps organizations manage user accounts:

AD helps organizations manage user accounts by simplifying the provisioning and deprovisioning of user accounts. From an AD domain controller administrators can create new users, set proper permissions for users, update user information, and reset user passwords. Deprovising is easy too. You can delete users from the DC.

3. AD helps organizations manage access to network services and resources:

AD allows organizations to manage access to network services and resources through the use of Kerberos (authentication) and security tokens/acls (authentication). Kerberos is used to verify a user's identity, and once their identity is verified they are granted a security token based on their security group membership. This ticket is then compared against the acl for a network resource

and if the ticket grants permission then the user can access the resource.

4. AD provides easy login capabilities for users:

Active Directory supports single sign on capabilities to make signing into various domain linked applications easier. Using AD credentials once can grant users access to multiple applications without the need to sign in for each one.

5. AD helps organizations logically organize users and devices:

AD can be used to logically organize users and devices in a hierarchical form through the use of organizational units (ous). Ous are containers that are used to store user and device objects. GPOs are applied to OUs. Ous also supports the delegation of administrative permissions. For example, permissions can be given to IT support employees to reset the passwords for a certain OU they are responsible for. ***It should be noted that permissions for users are not based on Ou membership but rather the security group.***

6. AD is scalable:

Active Directory can support high availability since it can be scaled to meet the needs of organizations of any size. Organizations can simply add more DCs to their forests to support growth in their company's size. AD data can be replicated across domain controllers allowing new DCs to start working right away.

7. AD helps organizations configure security policies:

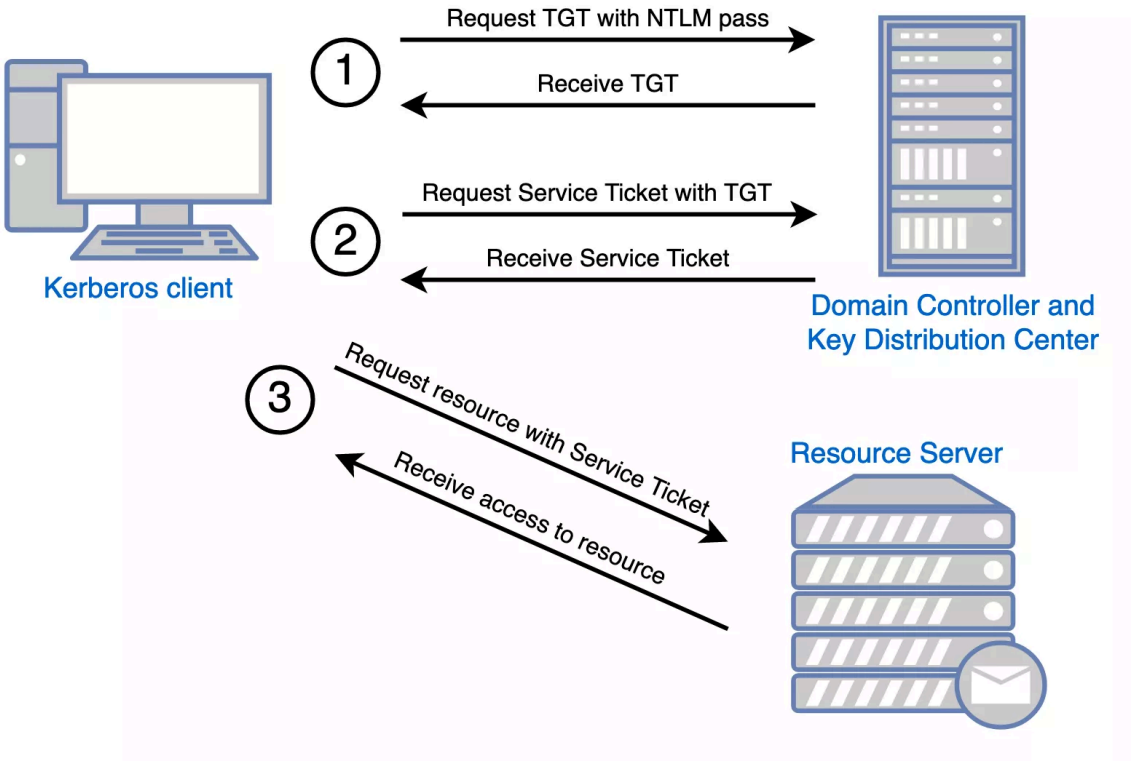
Active Directory GPOS can be used to simplify the deployment of security policies on devices. All you need to do is create the GPO and configure its settings, then apply it to the proper OU.

8. AD can be replicated:

Active Directory can be replicated across multiple domain controllers. AD replication serves as a form of fault tolerance, ensuring that if one DC is down the directory data can still be available on another one.

1.2 How does AD handle authentication and authorization?

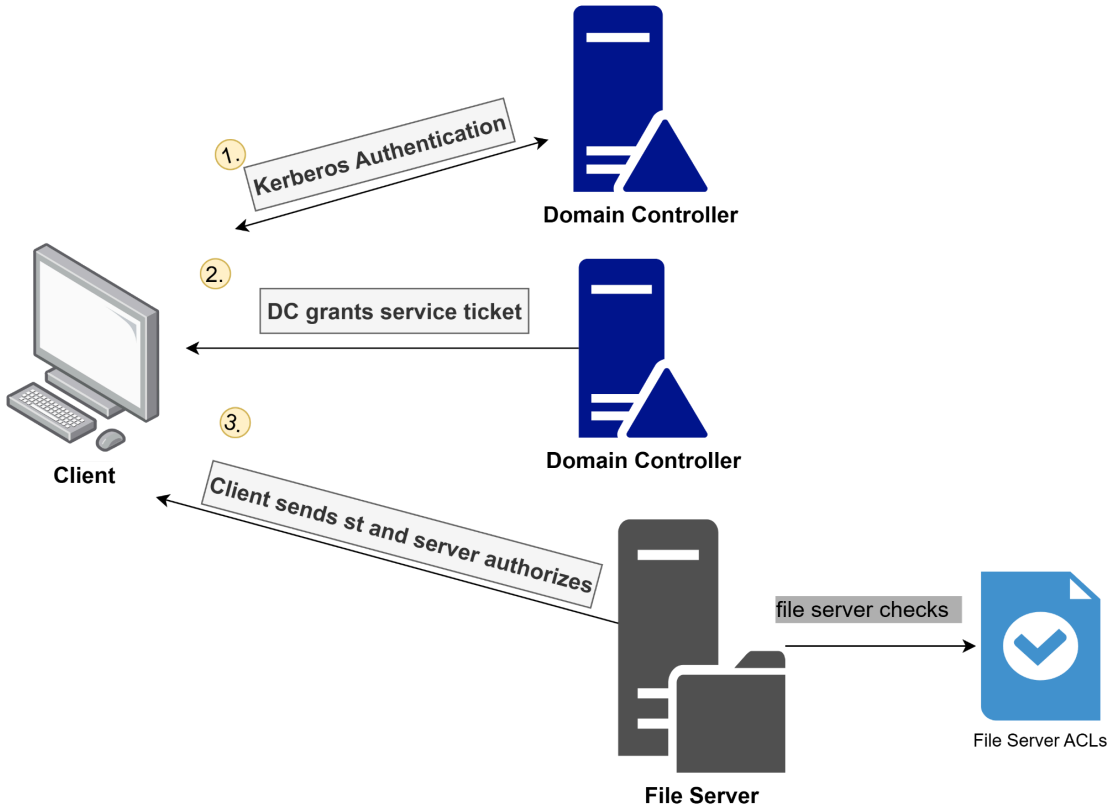
Active Directory uses Kerberos for authentication, and uses security groups and ACLs for authorization. Here is a nice illustration from https://www.optiv.com/insights/source-zero/blog/kerberos-domains-achilles-heel that demonstrates how Kerberos works.



For AD the domain controller is the ticket granting server and the key distribution center all in one. Kerberos focuses on never sending the password over the network to prevent man in the middle, replay, or credential harvesting. This is possible since a user's password is never sent over the network and is instead used to create a key using PBKDF2 or similar key derivation algorithms. This key is the only data sent from a client to the DC. The DC has a copy of the same key and uses this copy to decrypt data sent from the client. If the DC is able to decrypt the data that means that the password is correct. This is a brilliant and secure method of authentication since the client data is useless to attackers. It is impossible to derive the password from the password derived key.

For authorization AD uses ACLs or access control lists and permissions. The ACLs can dictate whether a user can access, modify , or otherwise interact with a resource. They rely on a users security group membership rather than OU membership as well. ACLs typically reside on the device hosting the network service or resource as well.

Putting it all together:

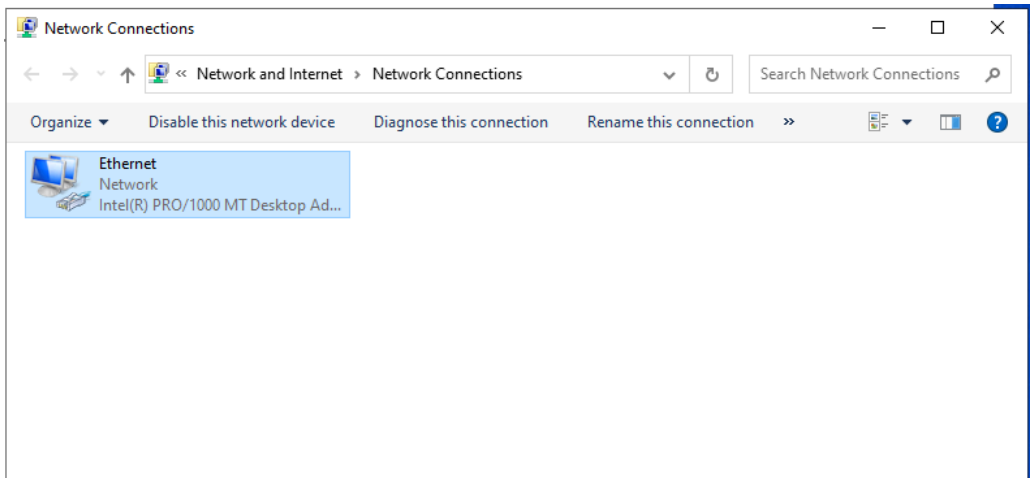


So, to put it all together, a user would sign into their domain joined device (PC/Laptop). Kerberos is used to authenticate them and once they are authenticated they are granted a TGT. Then if a user tries to access a network resource like a file share they send the TGT to the DC. They will ask the DC for access and the DC will send a service ticket in exchange for the TGT. Once the user gets the service ticket they can communicate with the device hosting the resource , which will authorize the action or deny it based on the acl present.

Section #2 Setting up Environment:

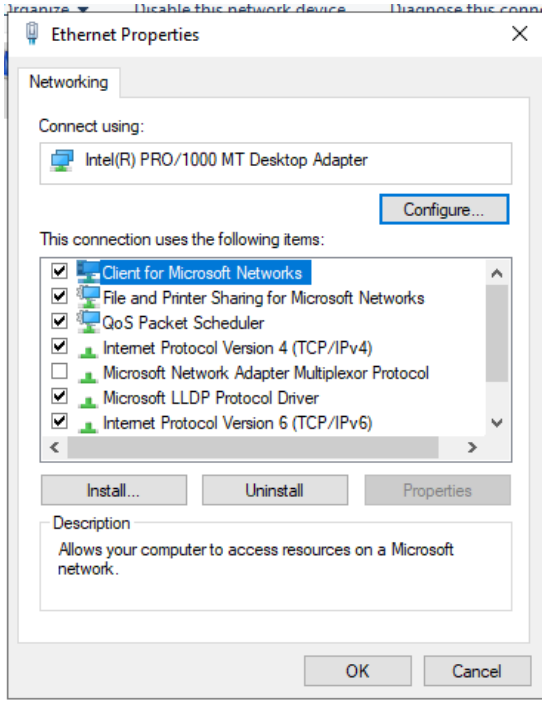
2.1. Assign a static IP address to the server:

To set a static IP address on the server you can go to Control Panel/Network and Internet/Network and Sharing Center/Change Adapter Settings



Then click on the ethernet adapter. After you click on properties.

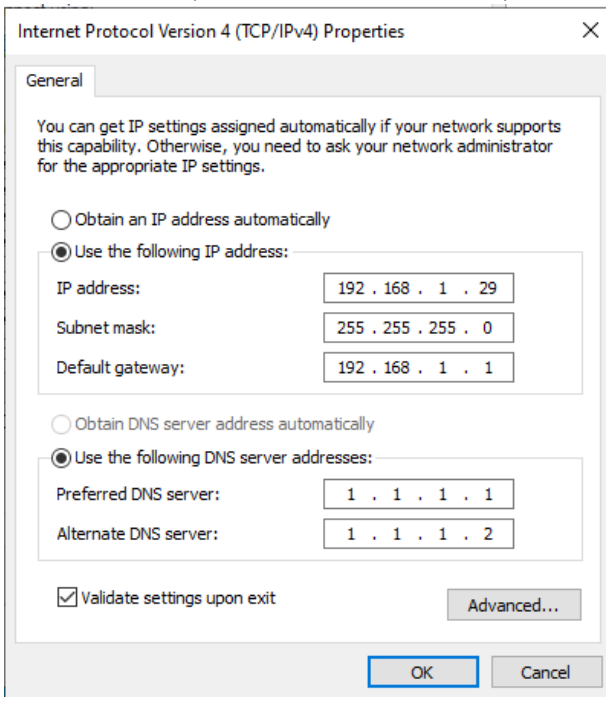
Under properties click on Internet Protocol Version 4.



Next set the static IP address by choosing “use the following ip address”. First find your current IP address using the command line.

```
Microsoft Windows [Version 10.0.20348.1850]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Administrator>ipconfig

Windows IP Configuration


Ethernet adapter Ethernet:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::9668:c8cb:44b9:4234%14
   IPv4 Address. . . . . . . . . . . : 192.168.1.29
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : 192.168.1.1

C:\Users\Administrator>
```

Use the same subnet mask and default gateway. For the dns servers I will use 1.1.1.1 and 1.1.1.2 for this server (Cloudflare DNS servers).

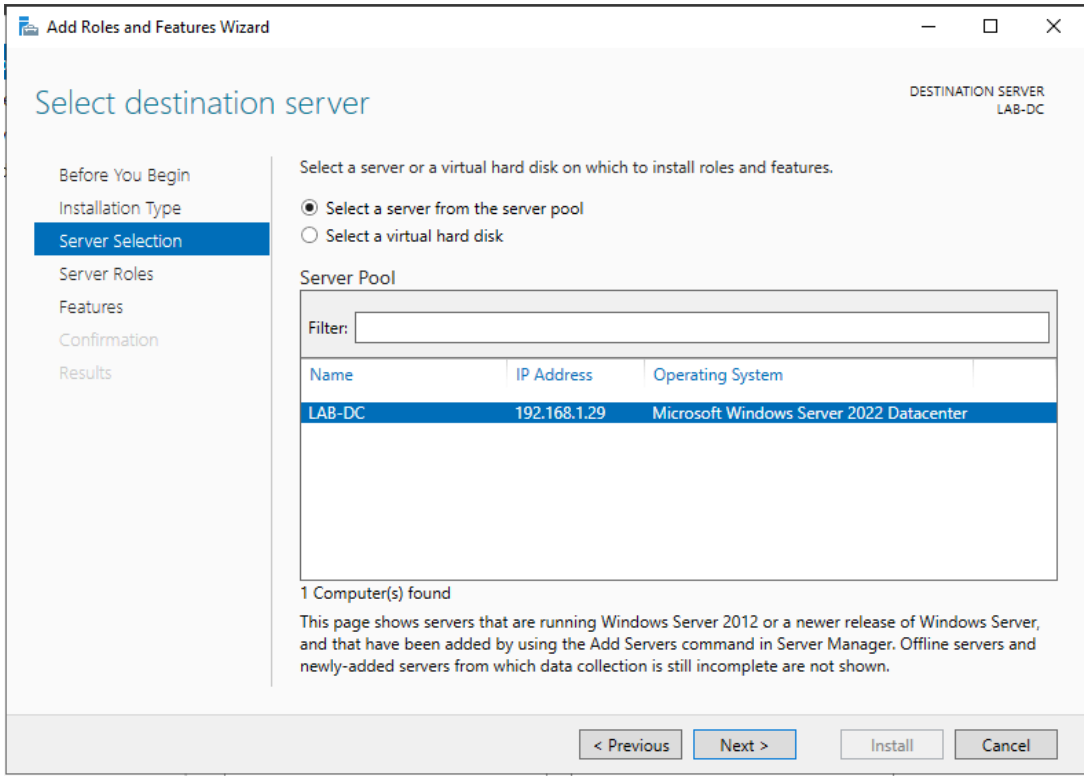


Then I tested the network connection using Ping.

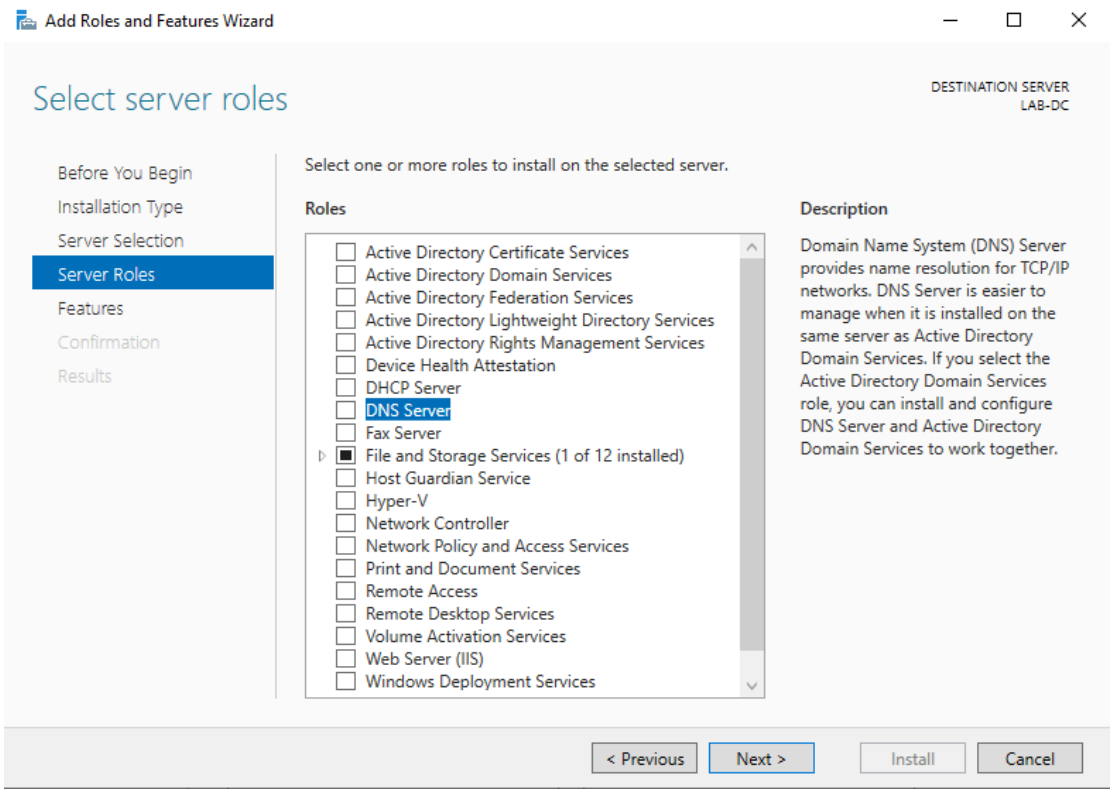
```
C:\Users\Administrator>ping 1.1.1.1

Pinging 1.1.1.1 with 32 bytes of data:
Reply from 1.1.1.1: bytes=32 time=14ms TTL=56
Reply from 1.1.1.1: bytes=32 time=36ms TTL=56

Ping statistics for 1.1.1.1:
    Packets: Sent = 2, Received = 2, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 14ms, Maximum = 36ms, Average = 25ms
Reply from 1.1.1.1: Control-C
^C
C:\Users\Administrator>ping Google.com

Pinging Google.com [142.250.72.142] with 32 bytes of data:
Reply from 142.250.72.142: bytes=32 time=63ms TTL=116
Reply from 142.250.72.142: bytes=32 time=307ms TTL=116
Reply from 142.250.72.142: bytes=32 time=60ms TTL=116

Ping statistics for 142.250.72.142:
    Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 60ms, Maximum = 307ms, Average = 143ms
Control-C
^C
C:\Users\Administrator>
```

2.2 Set up DNS server role on the server:

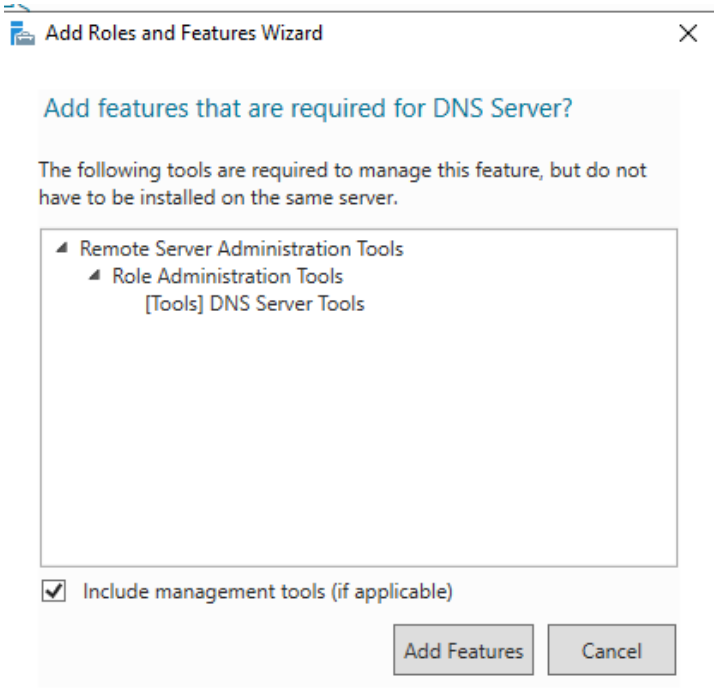
To give the server the DNS server role you need to go to server manager and click manage, then click on add role. Then you need to choose the server you want to add a role to. In my case it is my local server (LAB-DC).



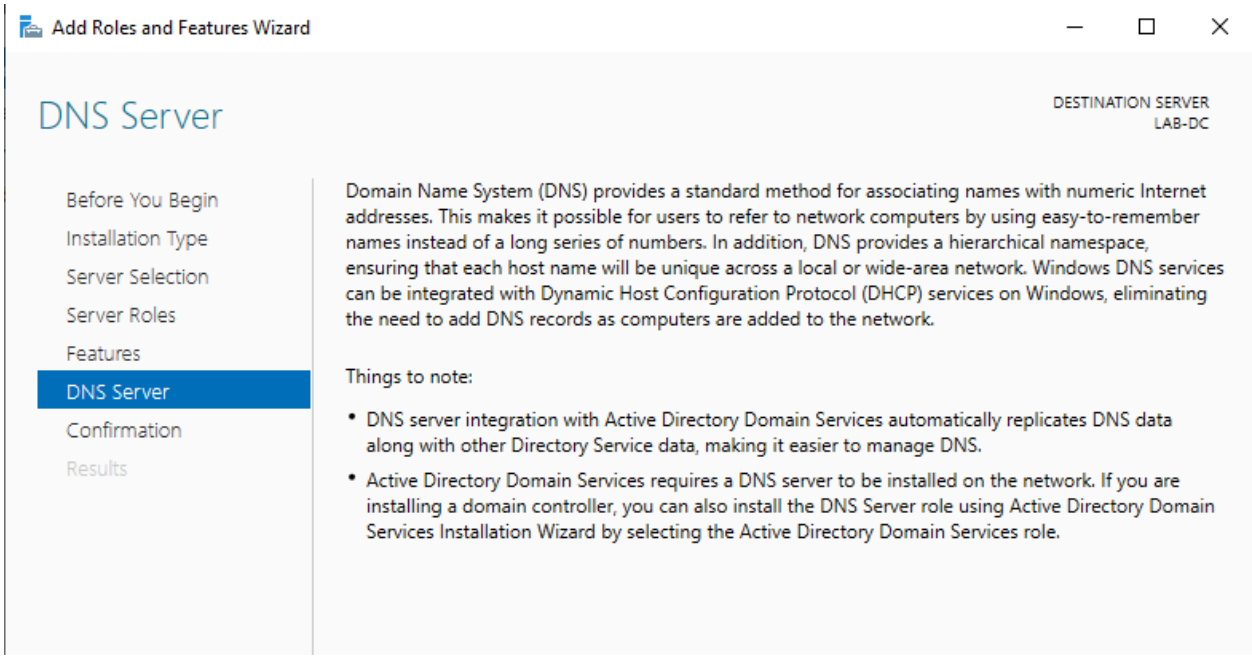
Click next then select the server role (DNS server).



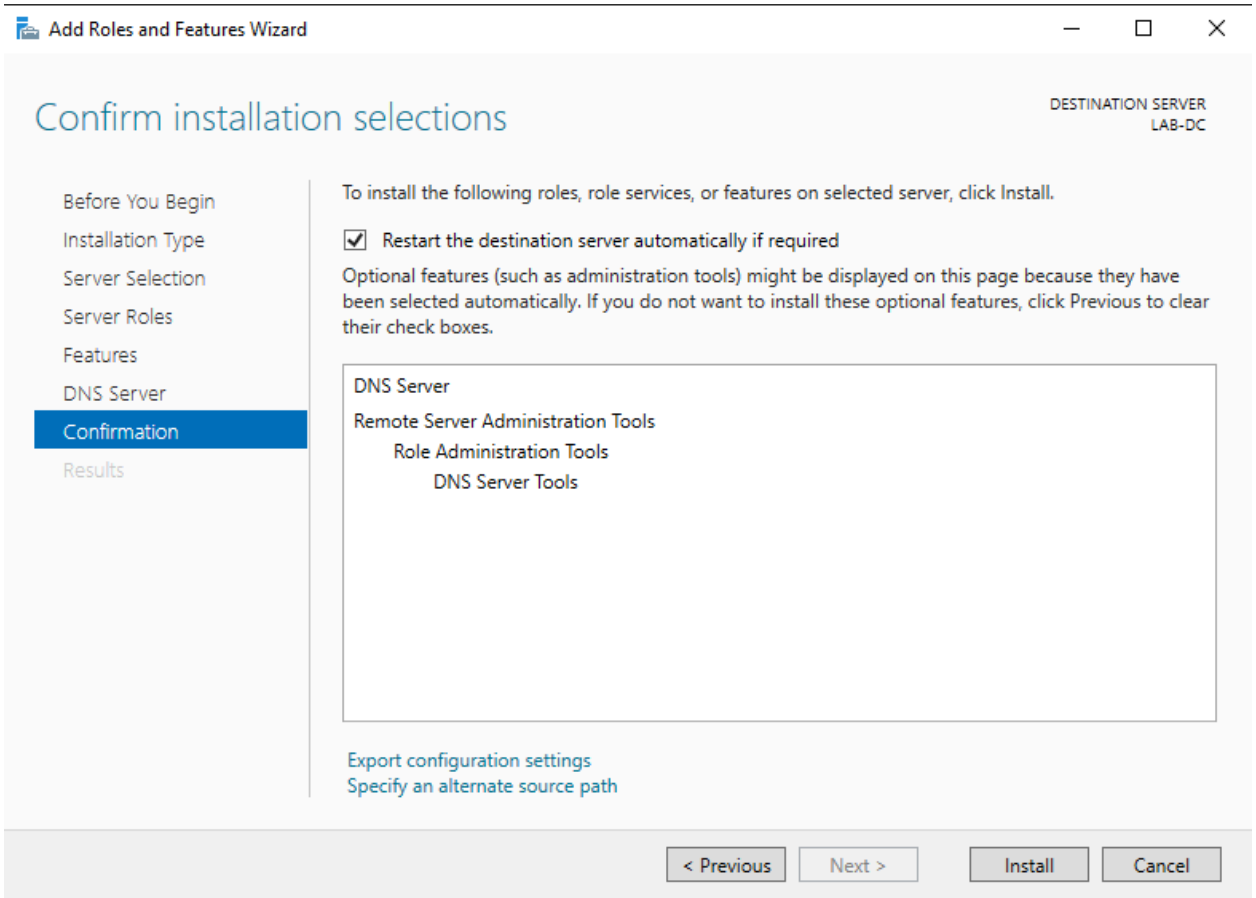
The roles and features associated with this service are shown. Then click add features.



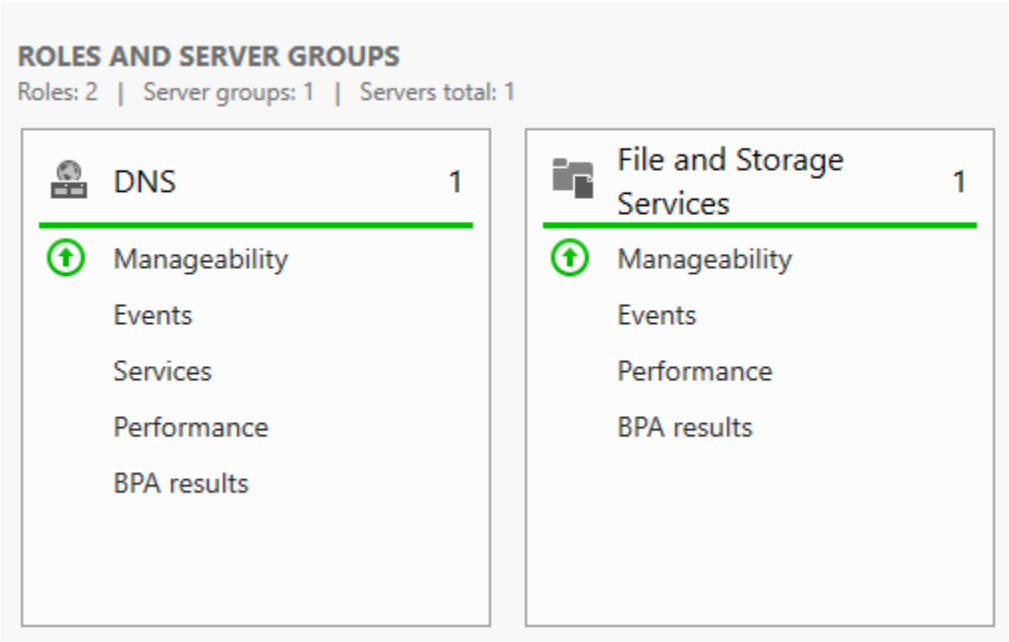
Click next again and skip the features section. Then you will see a page describing the DNS server role.



Then install the service. You want to restart the server right away once the role is installed.



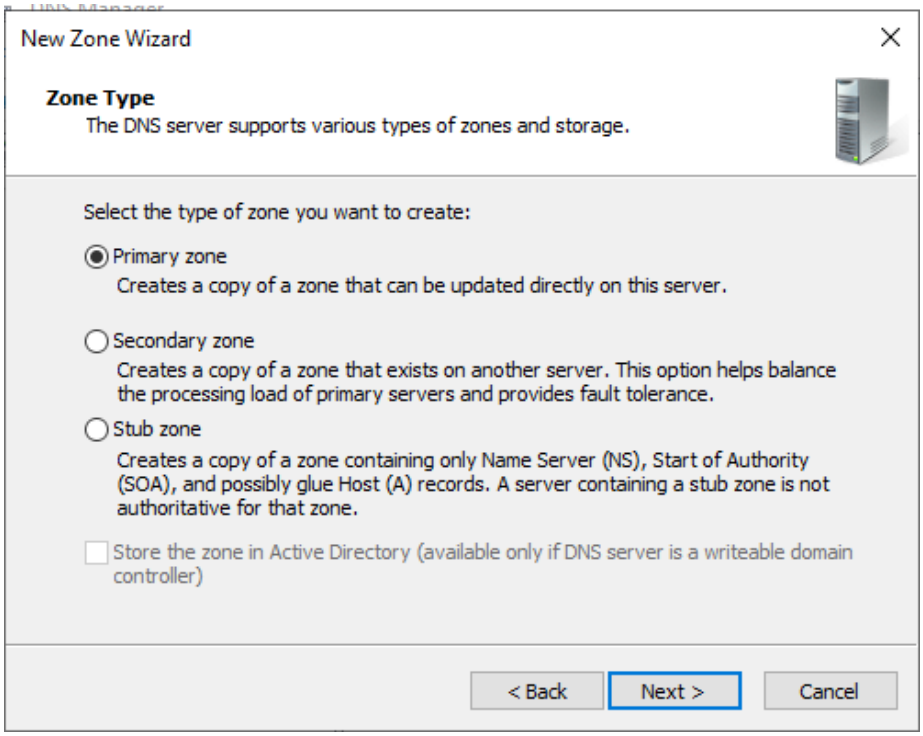
Now my server has the DNS role!

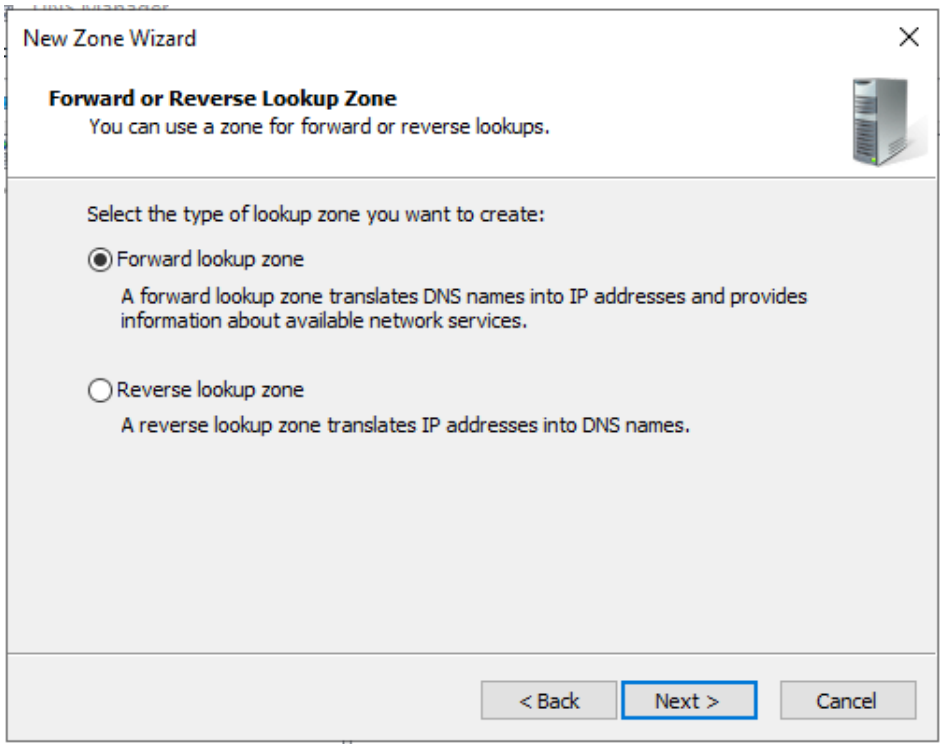


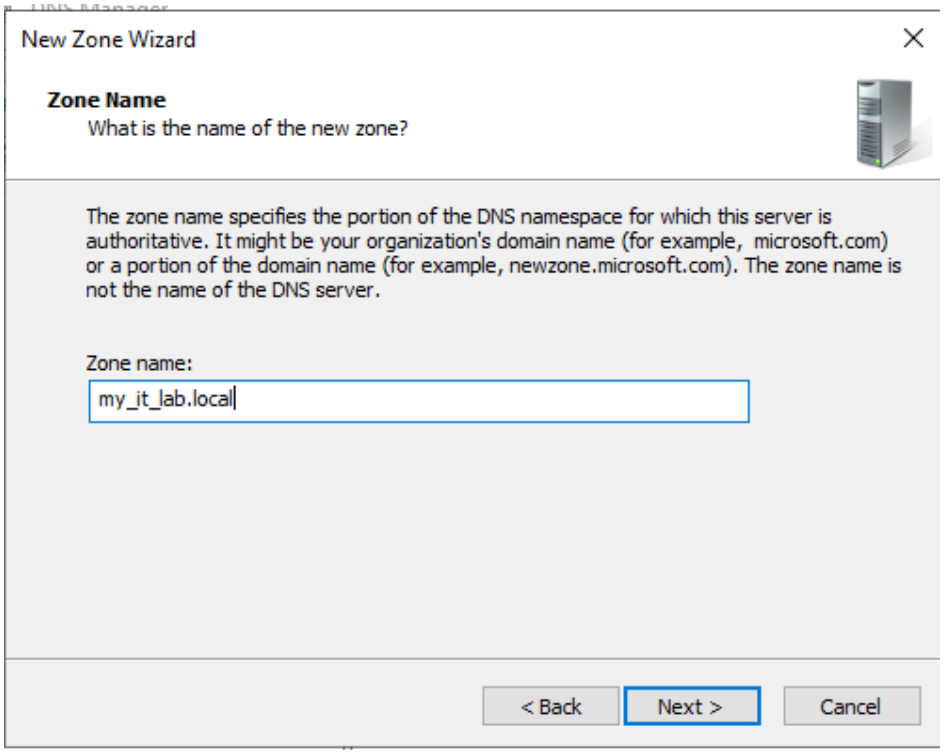
2.3 Configuring DNS

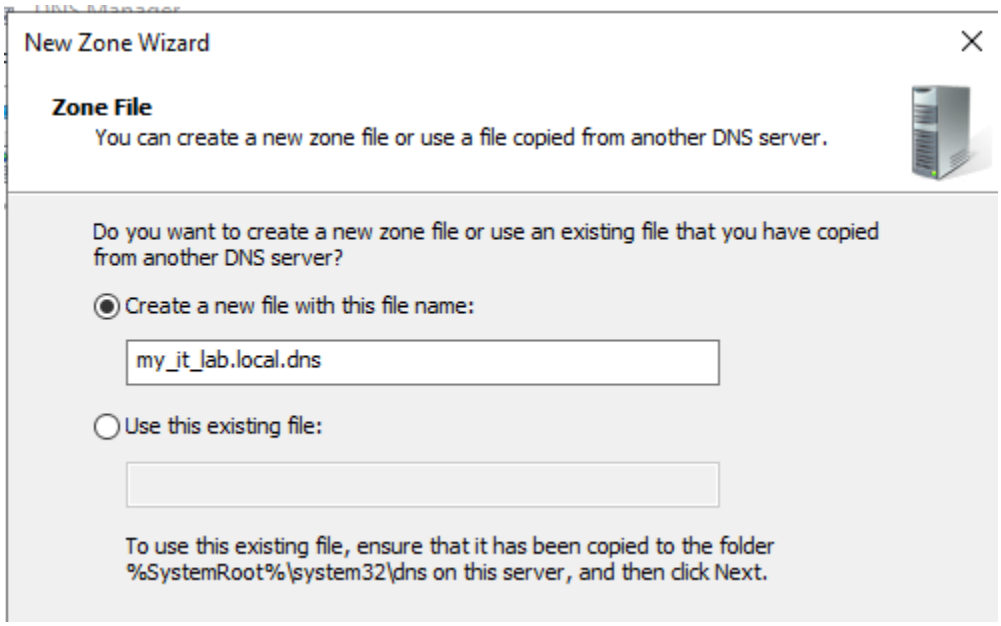
Create a forward lookup zone.

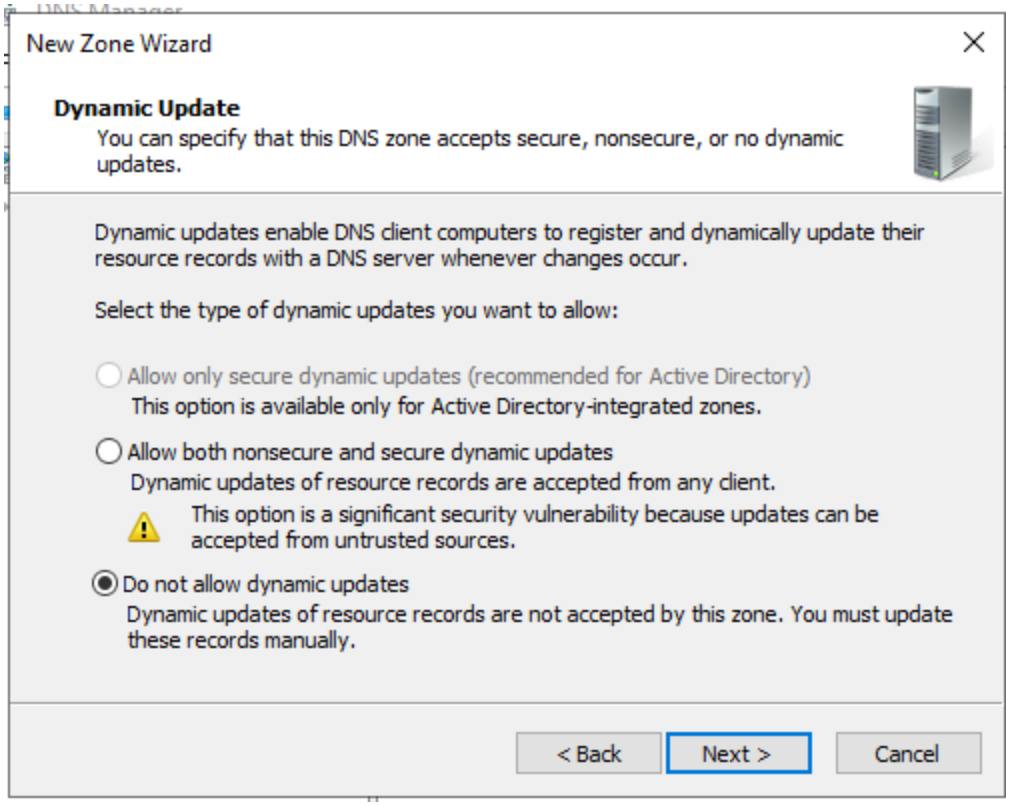
Forward lookup zones are used to translate domain names and urls to their ip address. An active directory controller needs to have a forward lookup zone that points its domain name to the server ip address since without a forward lookup zone the clients won't be able to resolve the domain controller's domain name.

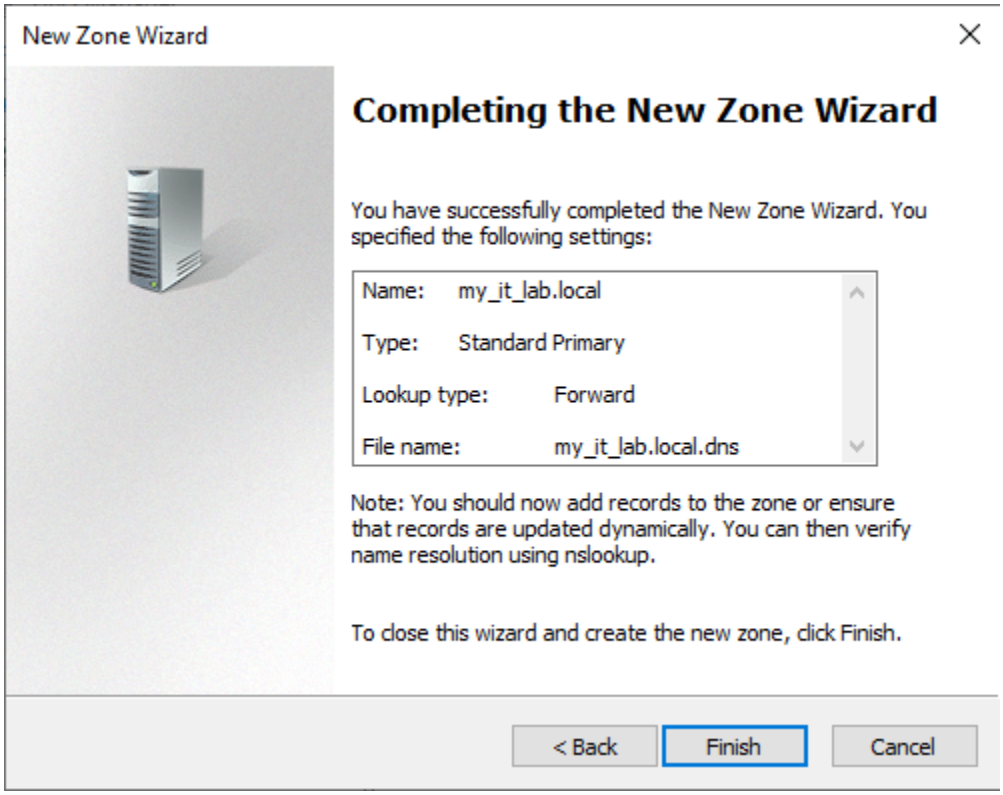

New Zone Wizard
Zone Type
The DNS server supports various types of zones and storage.
Select the type of zone you want to create:
Primary zone
Creates a copy of a zone that can be updated directly on this server.
Secondary zone
Creates a copy of a zone that exists on another server. This option helps balance the processing load of primary servers and provides fault tolerance.
Stub zone
Creates a copy of a zone containing only Name Server (NS), Start of Authority (SOA), and possibly glue Host (A) records. A server containing a stub zone is not authoritative for that zone.
Store the zone in Active Directory (available only if DNS server is a writeable domain controller)
< Back
Next >
Cancel


New Zone Wizard
Forward or Reverse Lookup Zone
You can use a zone for forward or reverse lookups.
Select the type of lookup zone you want to create:
Forward lookup zone
A forward lookup zone translates DNS names into IP addresses and provides information about available network services.
Reverse lookup zone
A reverse lookup zone translates IP addresses into DNS names.
< Back
Next >
Cancel

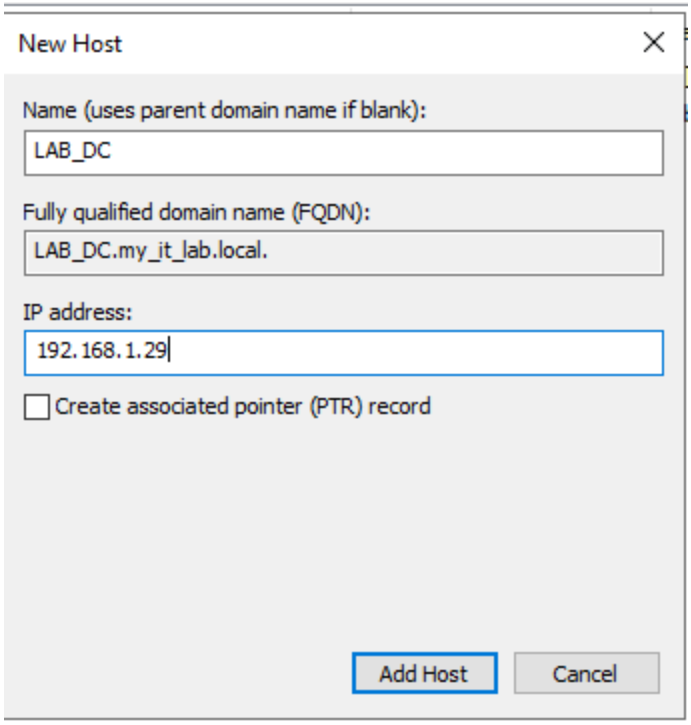

New Zone Wizard
Zone Name
What is the name of the new zone?
The zone name specifies the portion of the DNS namespace for which this server is authoritative. It might be your organization's domain name (for example, microsoft.com) or a portion of the domain name (for example, newzone.microsoft.com). The zone name is not the name of the DNS server.
Zone name:
my_it_lab.local
< Back
Next >
Cancel


New Zone Wizard
Zone File
You can create a new zone file or use a file copied from another DNS server.
Do you want to create a new zone file or use an existing file that you have copied from another DNS server?
Create a new file with this file name:
my_it_lab.local.dns
Use this existing file:
To use this existing file, ensure that it has been copied to the folder %SystemRoot%\system32\dns on this server, and then click Next.

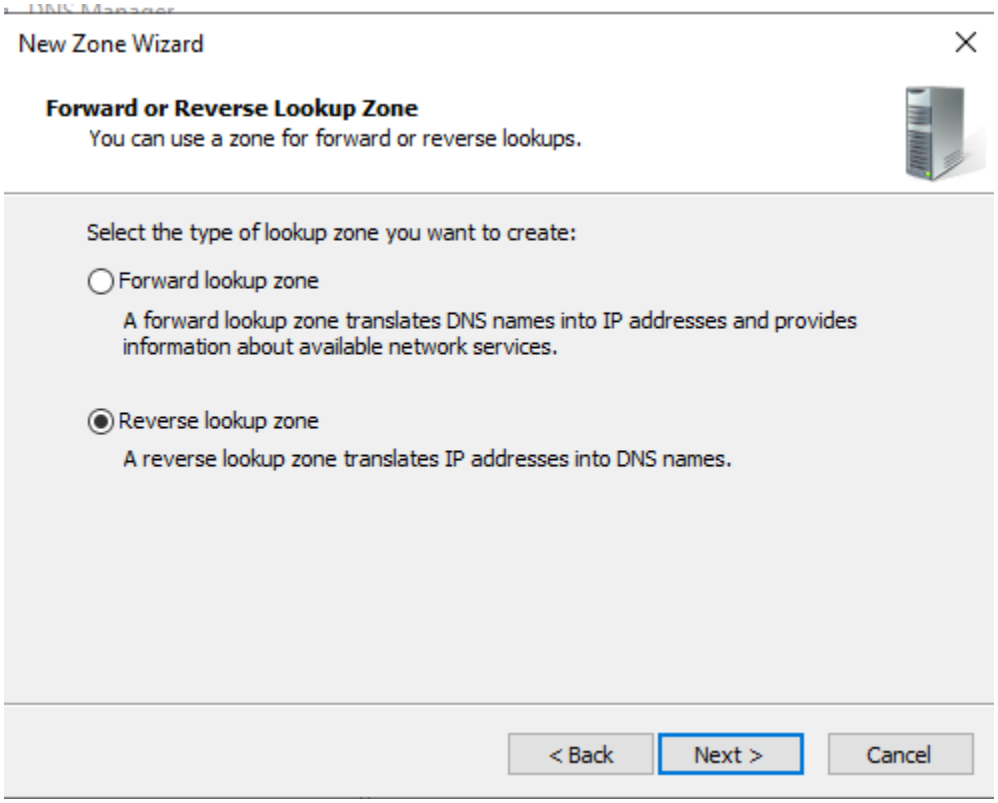




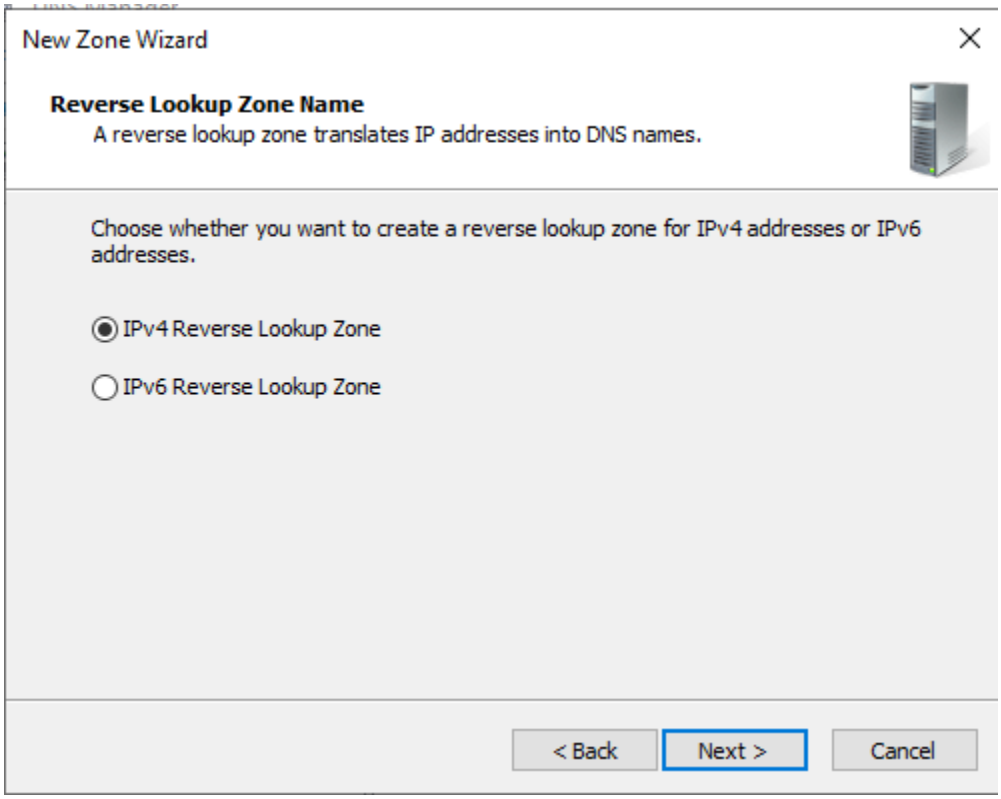
Now create an A record for the server. The A record is used by the forward lookup zone to resolve the DC domain name to its ip address.

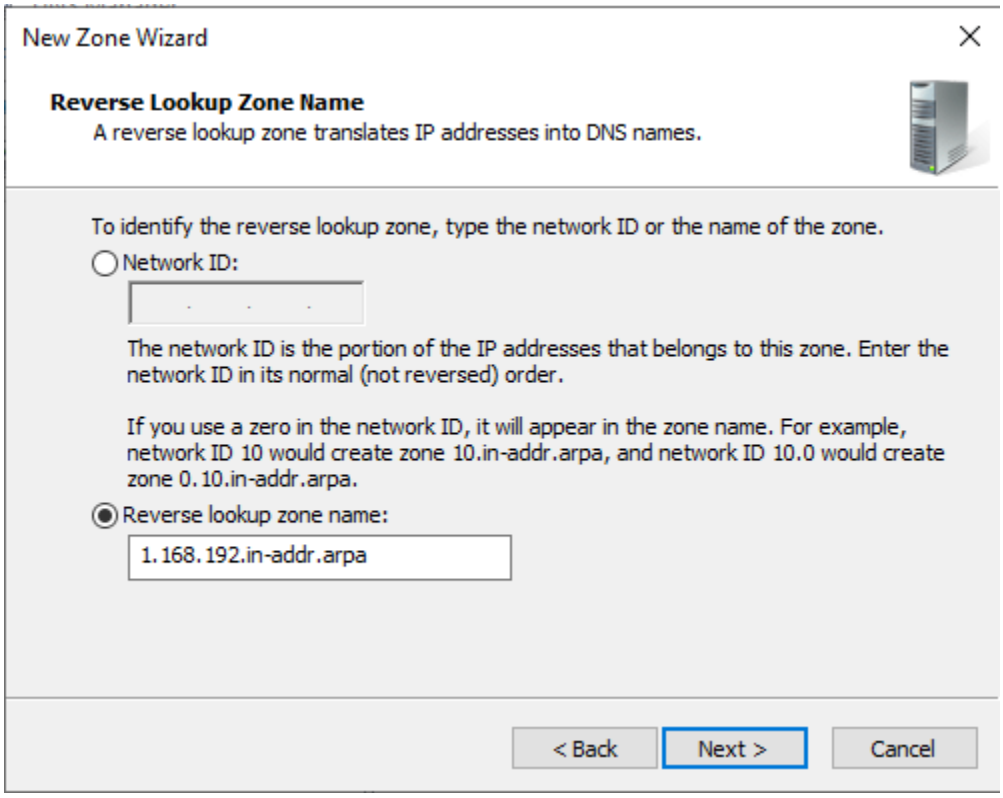


Create a reverse lookup zone.

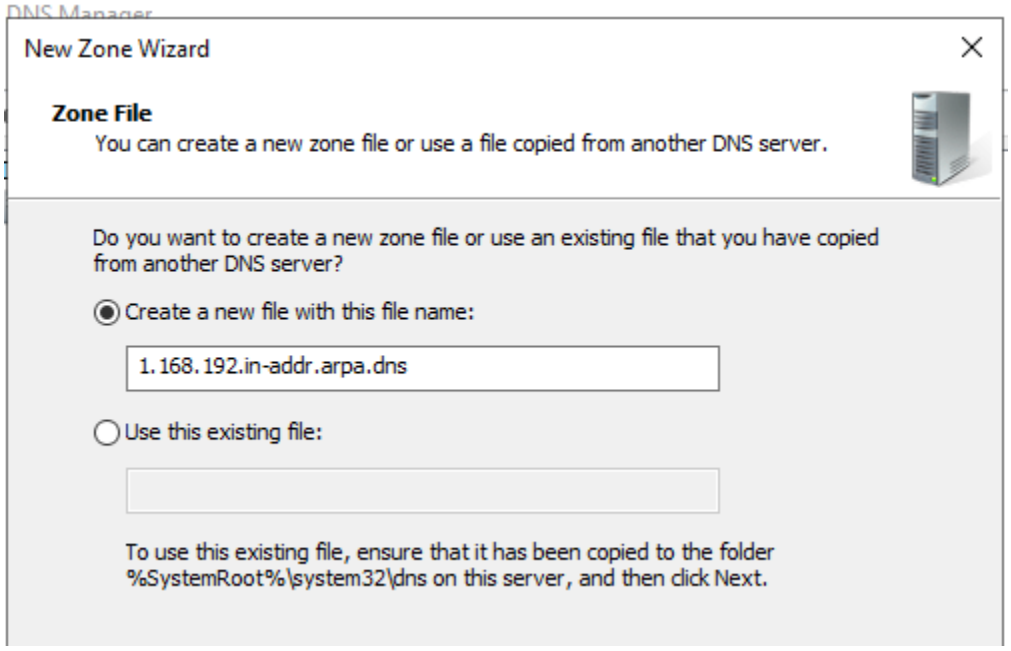


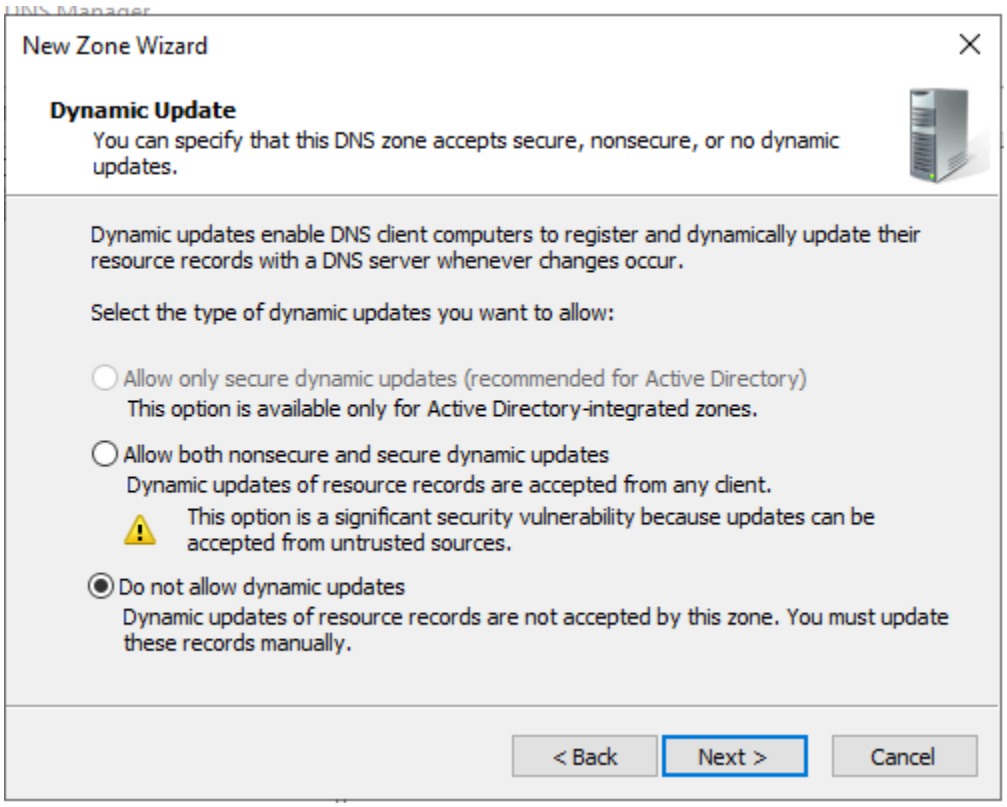
Reverse lookup zones are used to translate ip addresses into hostnames. This is vital for Active Directory since knowing what the hostname of a client device is will allow AD to add the hostname in logs and other sources of data.

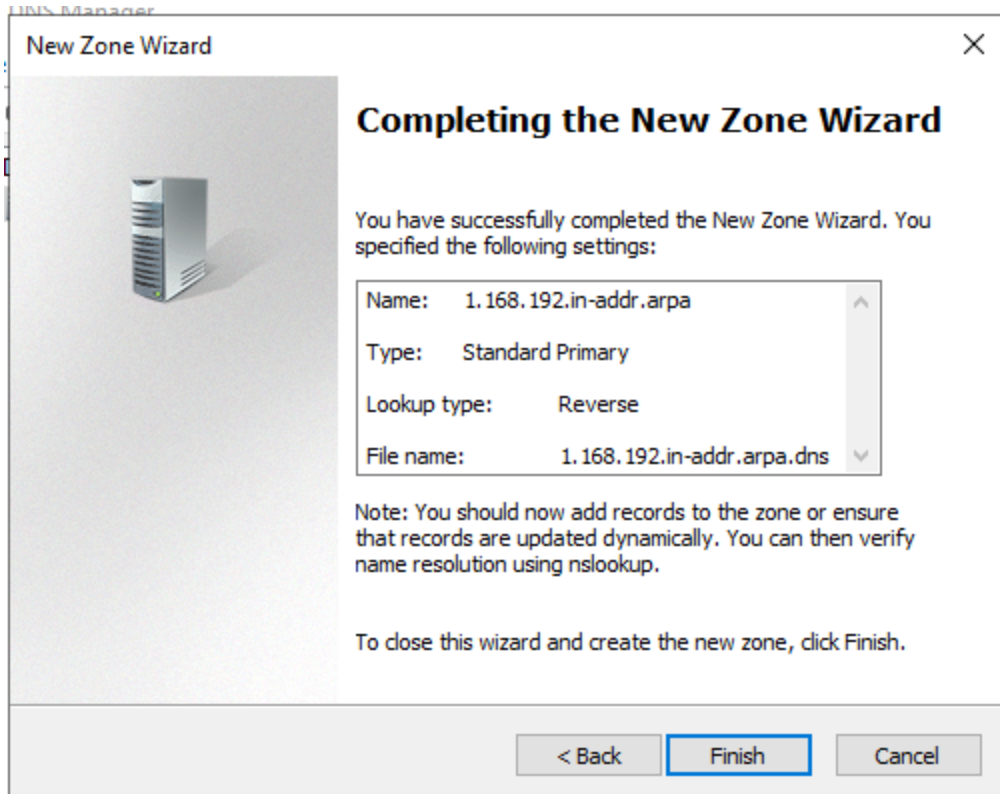




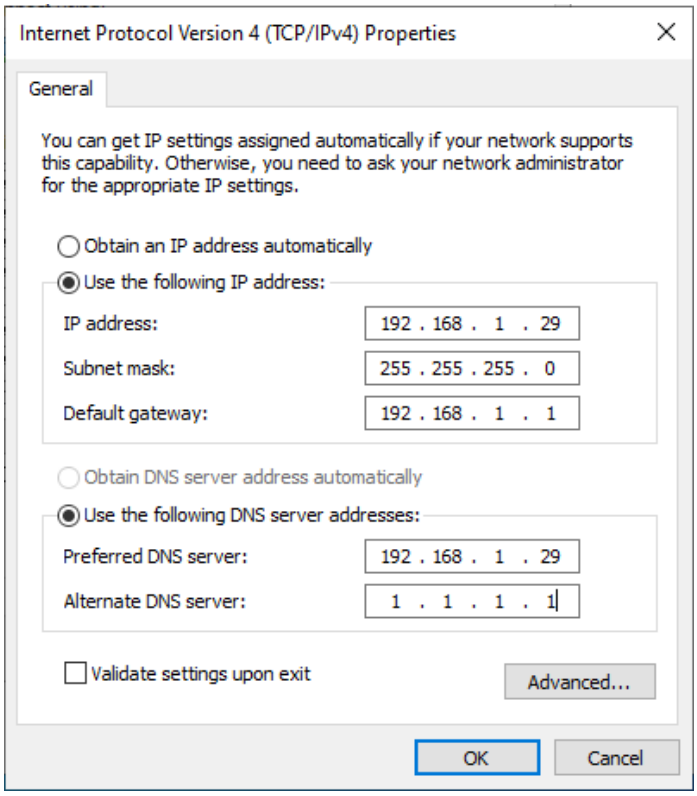
This reverse lookup zone will only work on my home lab network! What this reverse lookup zone will do is tell the DC DNS system what the hostname for a domain joined PC is.







Test the DNS server:



Using nslookup I am able to resolve the domain name of the DC to its host name.

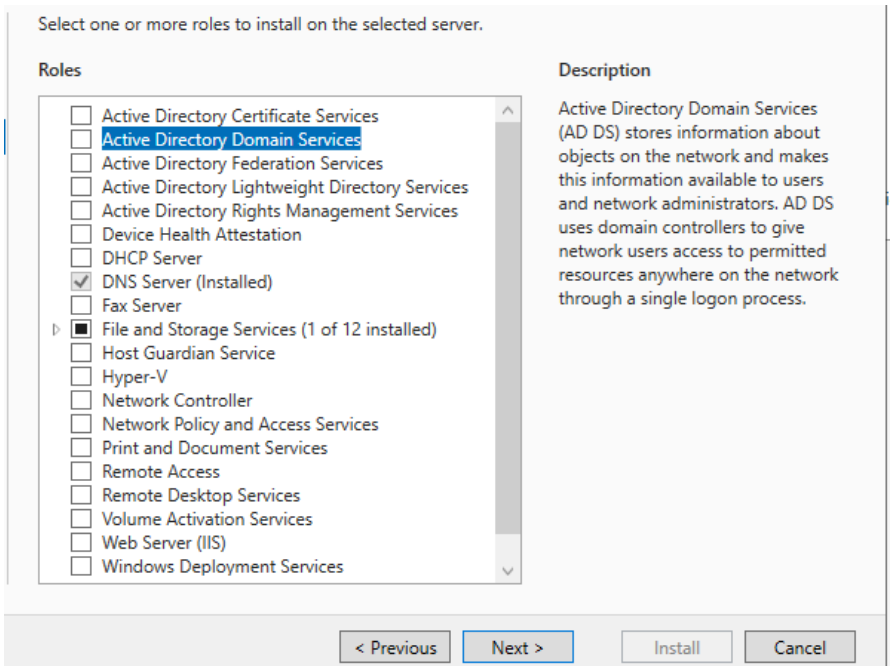
```
C:\Users\Administrator>nslookup LAB_DC.my_it_lab.local
Server:  UnKnown
Address:  192.168.1.29

Name:    LAB_DC.my_it_lab.local
Address:  192.168.1.29
```

Note: All the clients in my lab will need to use the ip address of the DC as their DNS server. They will still be able to access the internet since my DC has its own dns server and it is also connected to the router as well. If a client tries to access a website on the internet the request will be sent to the DC. The DC will then send the request to its own DNS server.

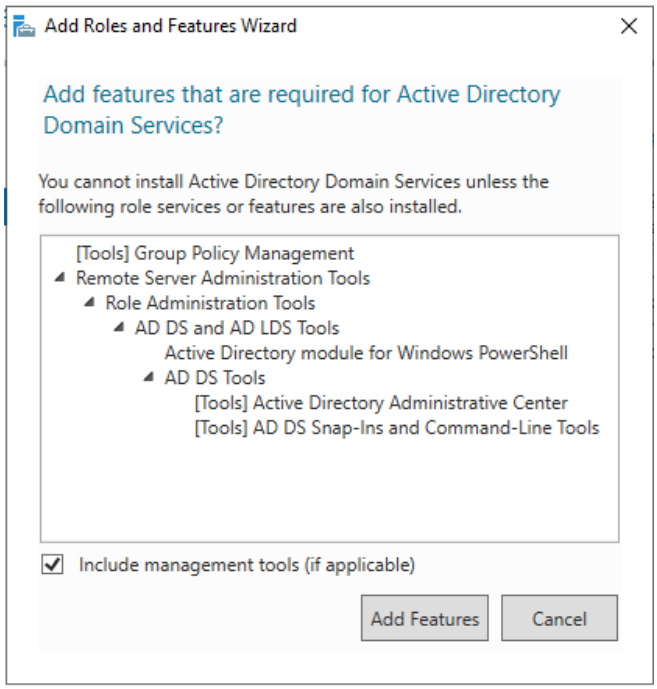
Section #3 Installing and Configuring AD

3.1 Add the AD server role to the server.

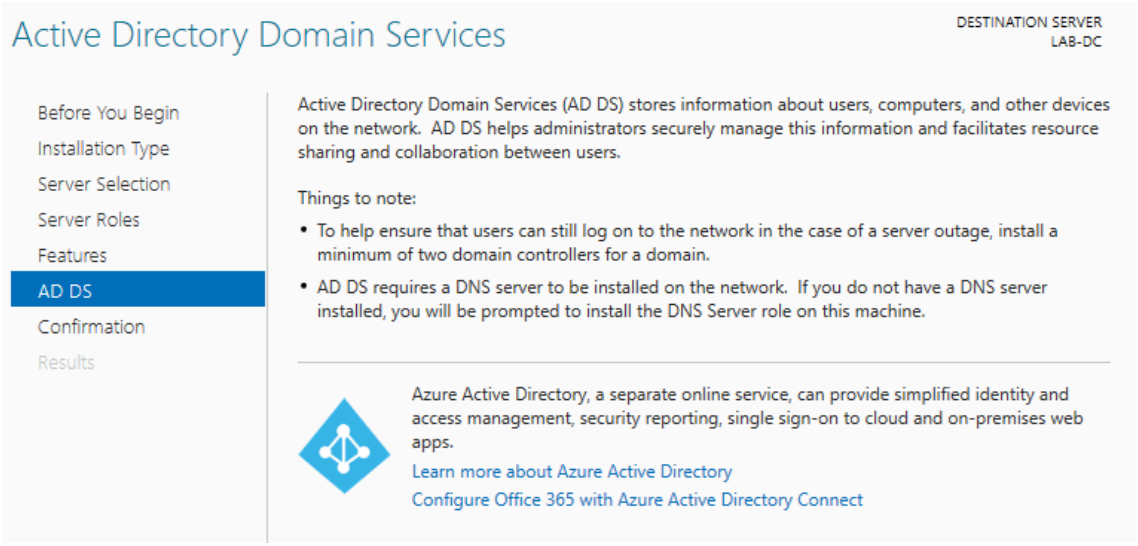
Choose the AD DS role

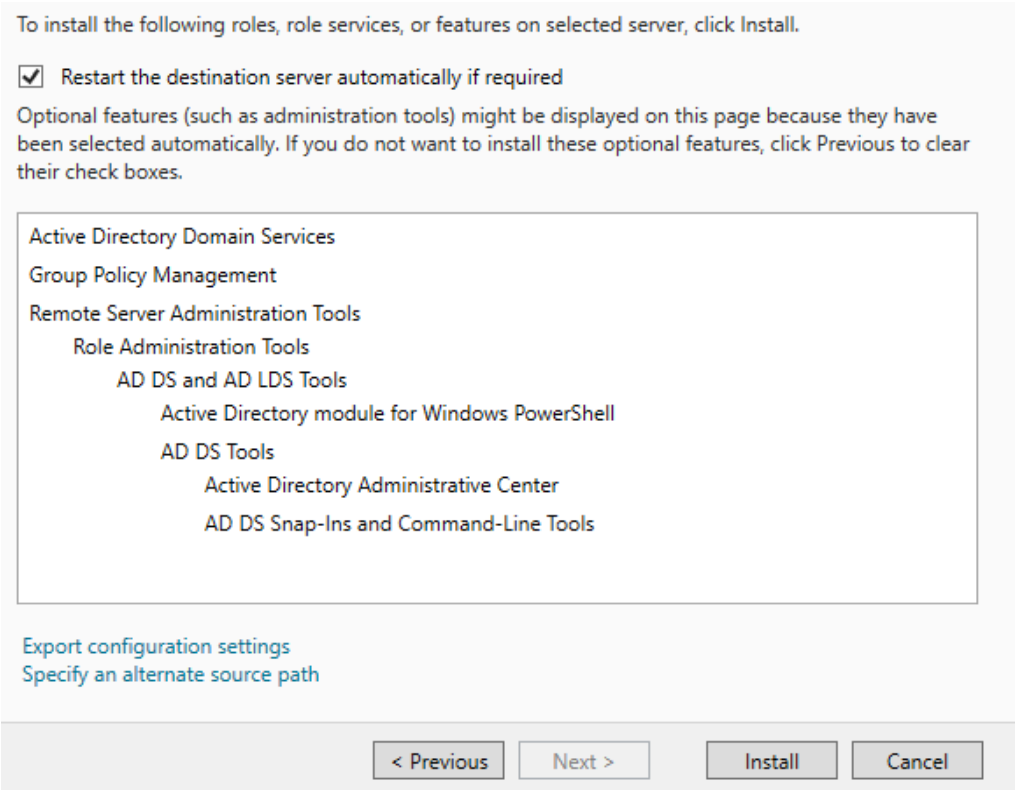


The following are the features that are included with the AD DS service. These features are RSAT (for secure remote management of the DC), AD DS(group policy editor, users and computers), and LDS Tools (LDAP).

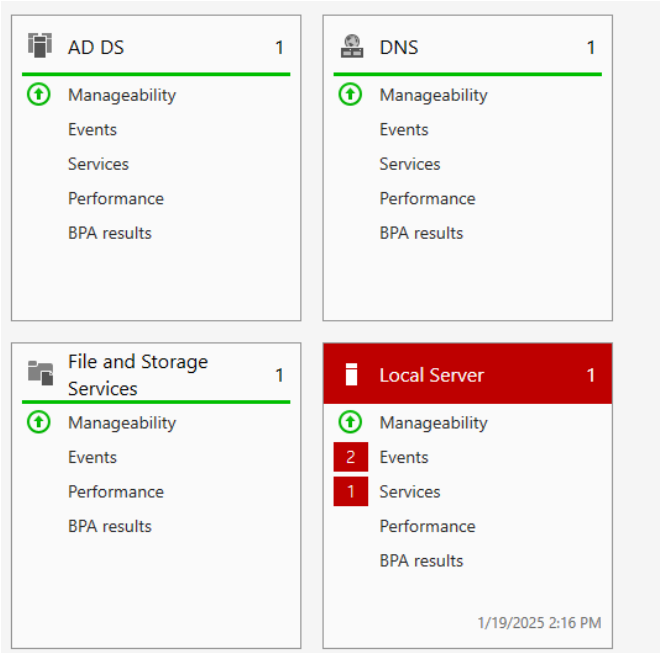


I added these features, then a summary about what the AD DS is provided.



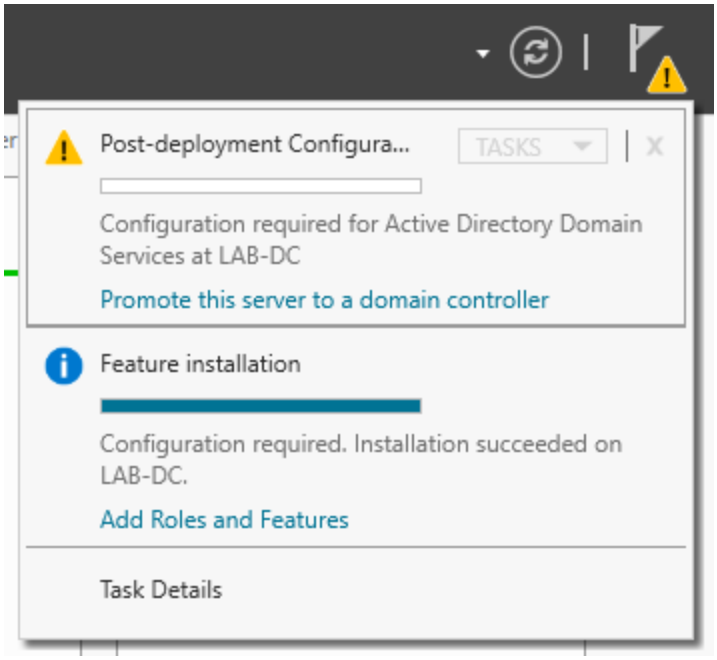


I installed the role and its tools. Now the role is up on the server. I still need to configure AD though

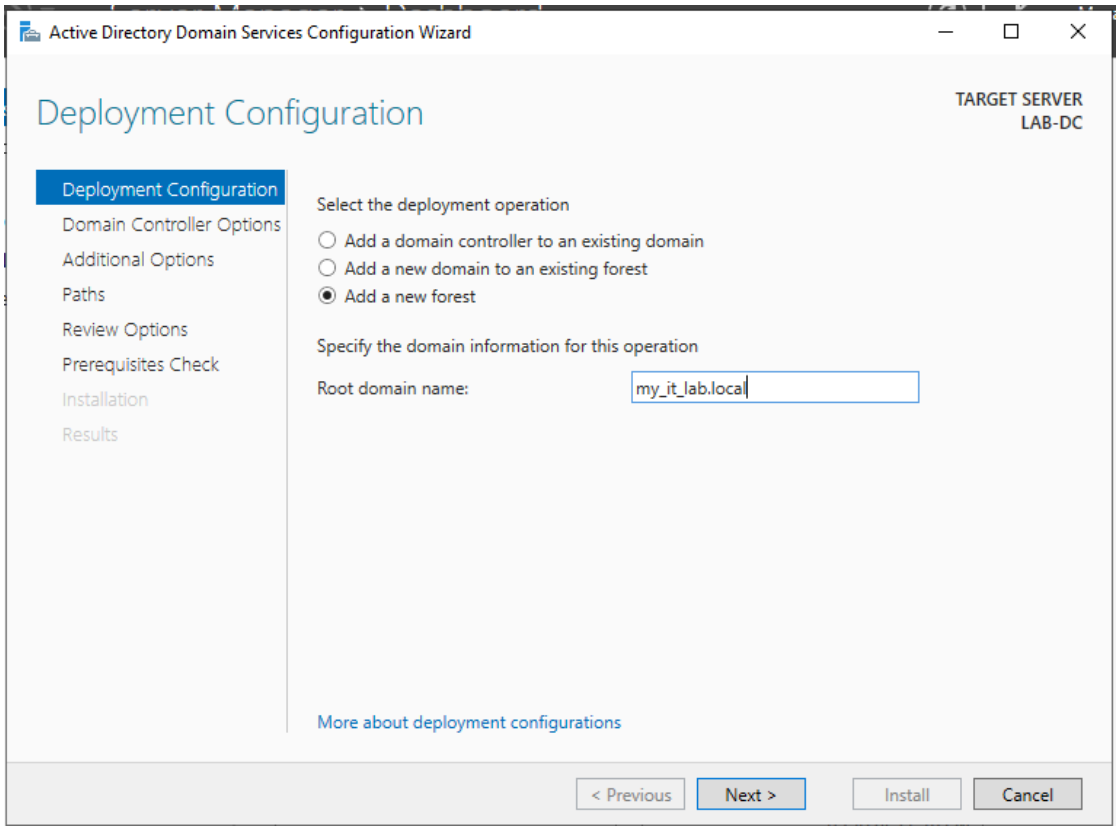


3.2 Configure AD

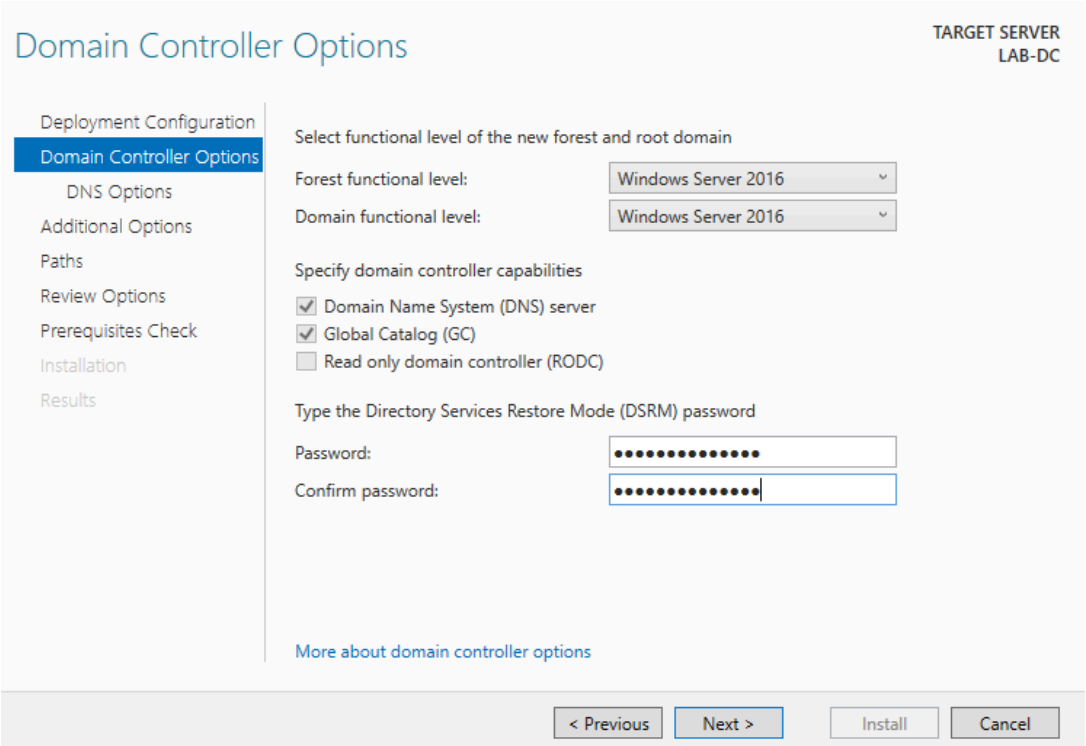
Even though AD is installed on the system it still needs to be configured properly.



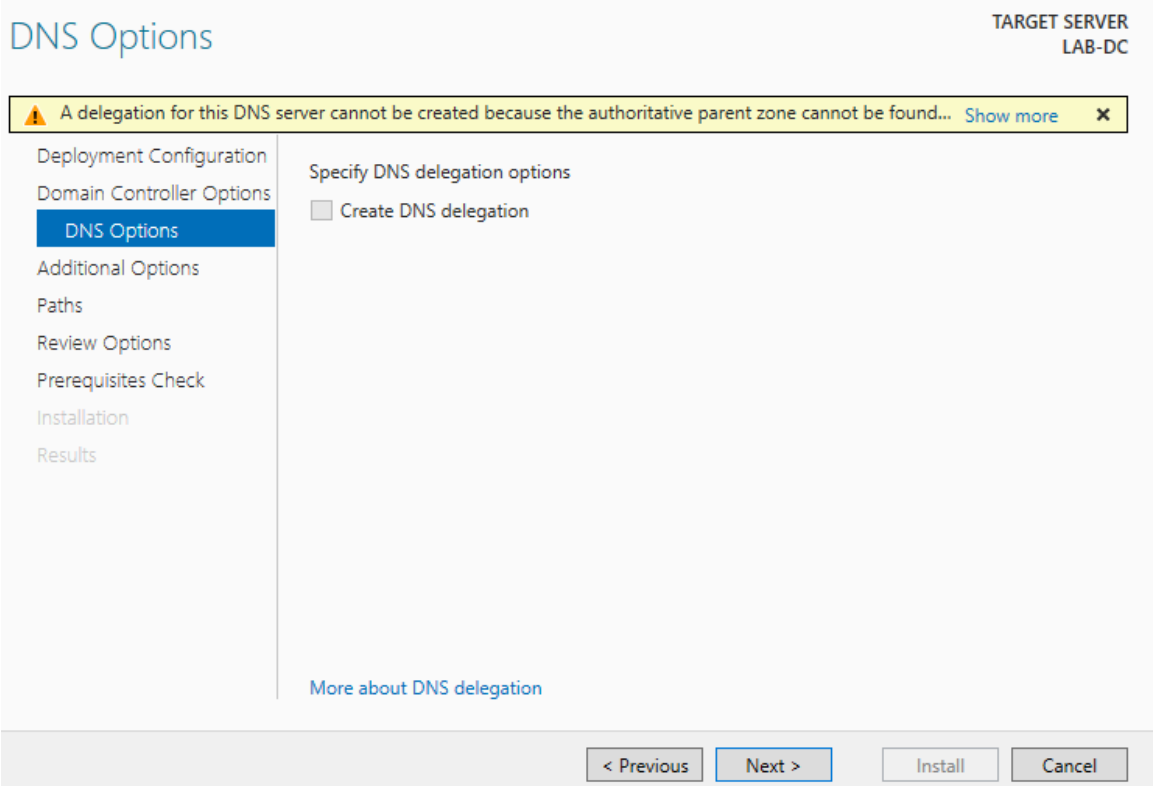
This AD DC will create a new forest since this lab is fresh and I don't have any existing forests.



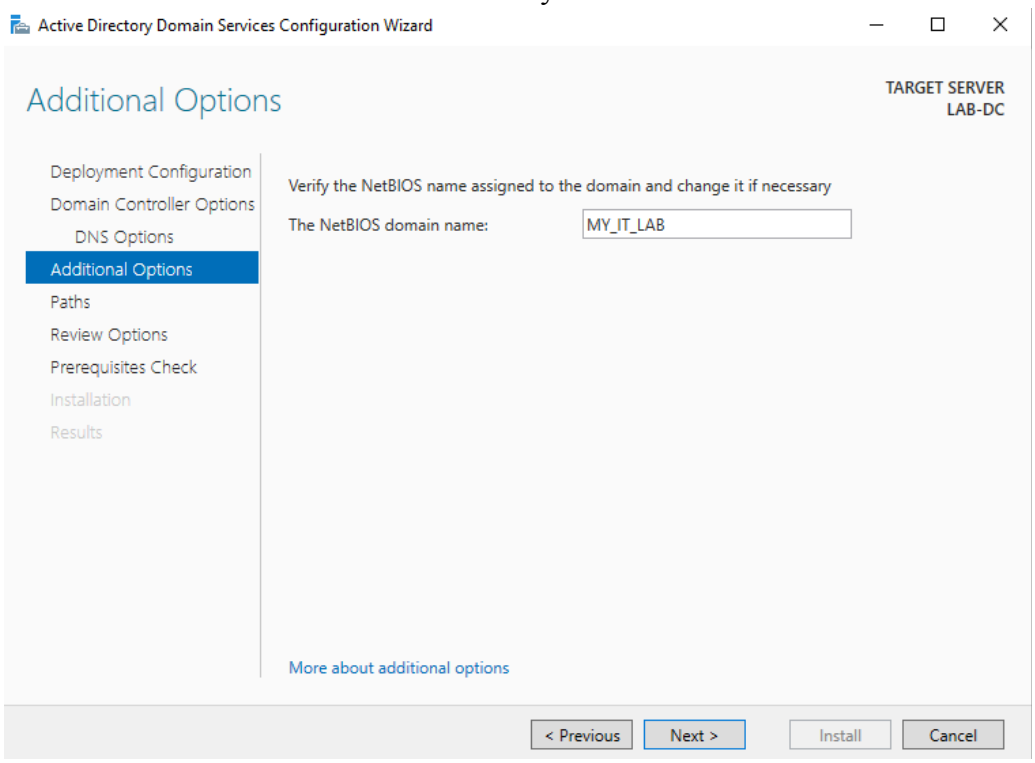
Set the Directory Services Restore Mode password so that I have the ability to restore or repair my Active Directory environment if something goes wrong.



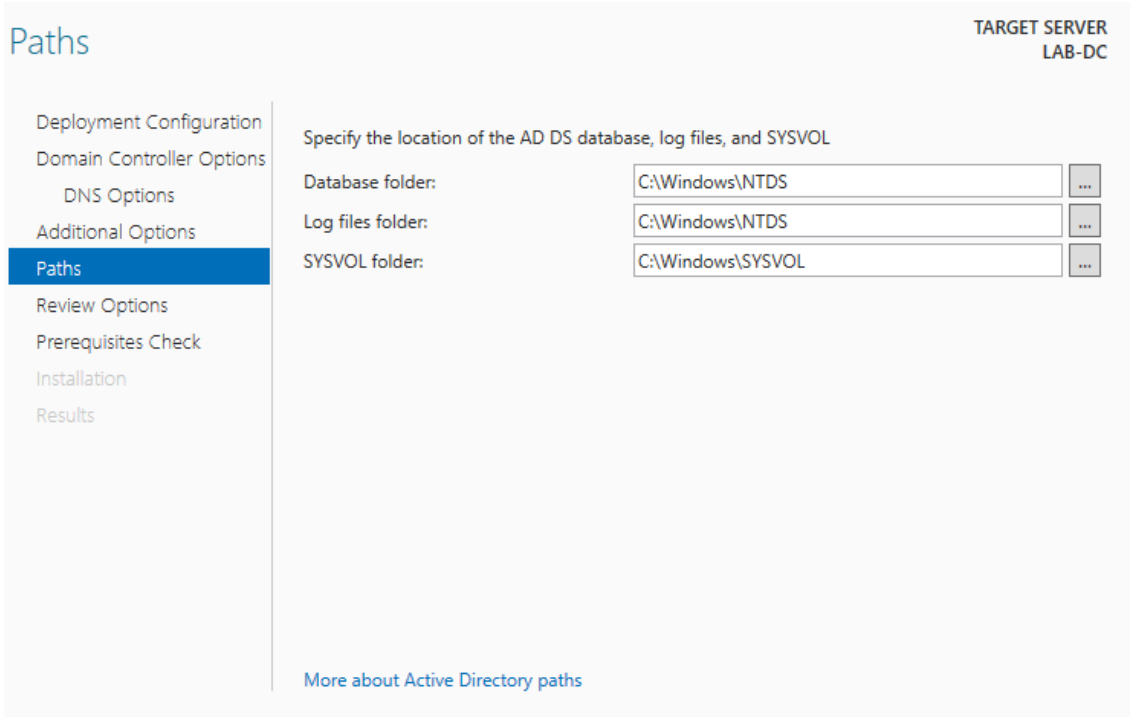
I will set the DNS up later.



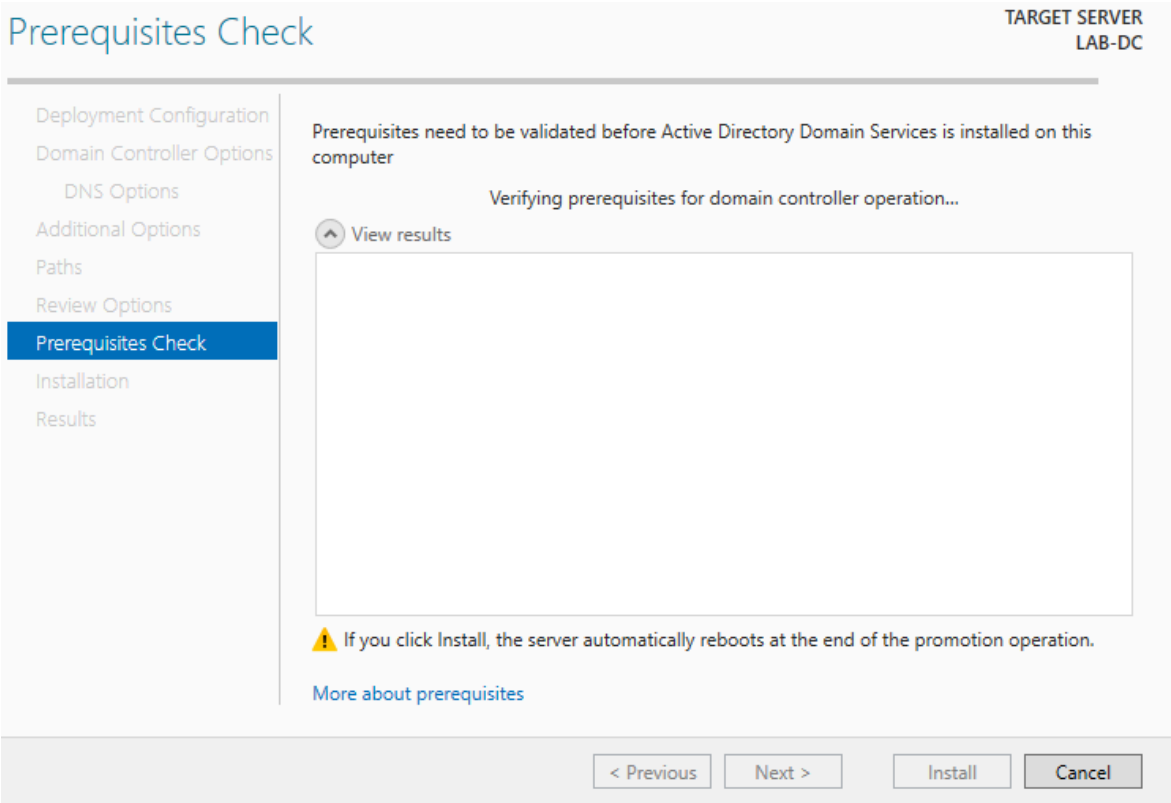
Set a NetBIOS name which will be used by certain Windows services.

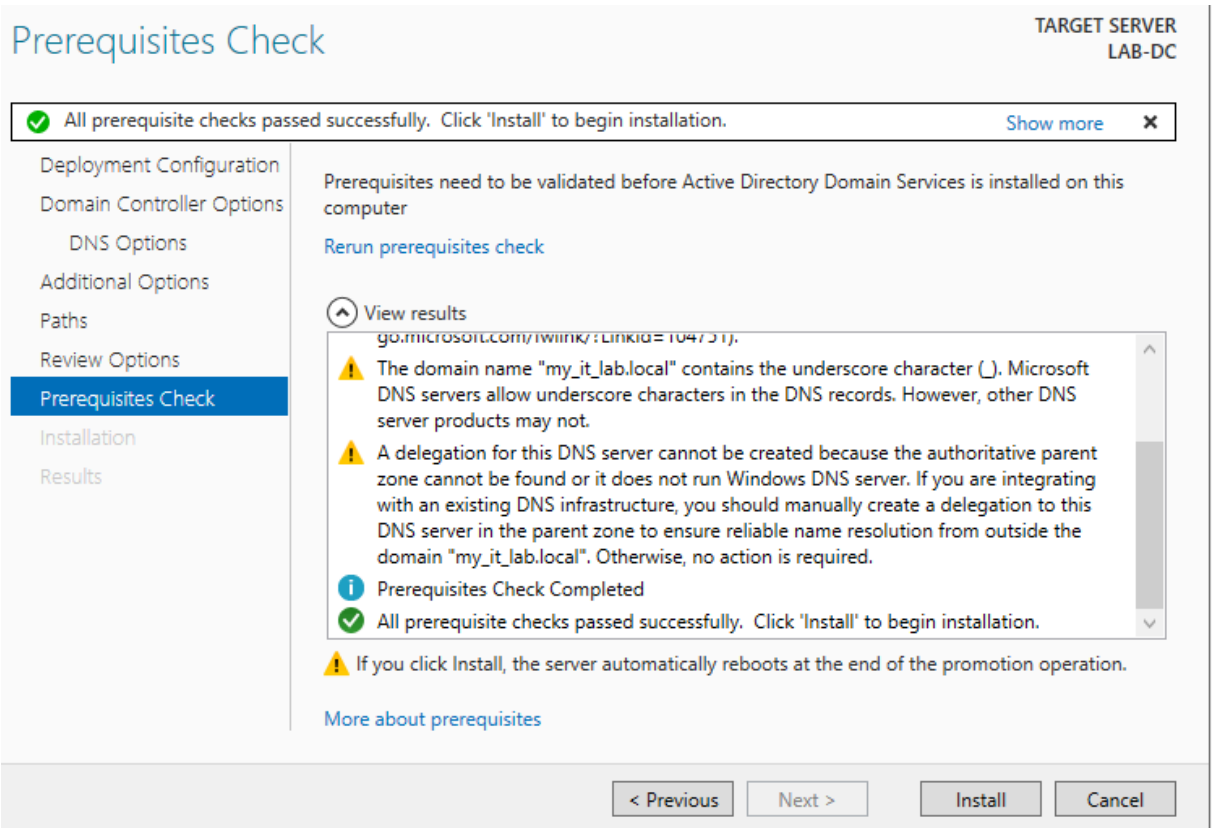


Paths for the AD data. This is a lab so it does not matter where the data is stored.

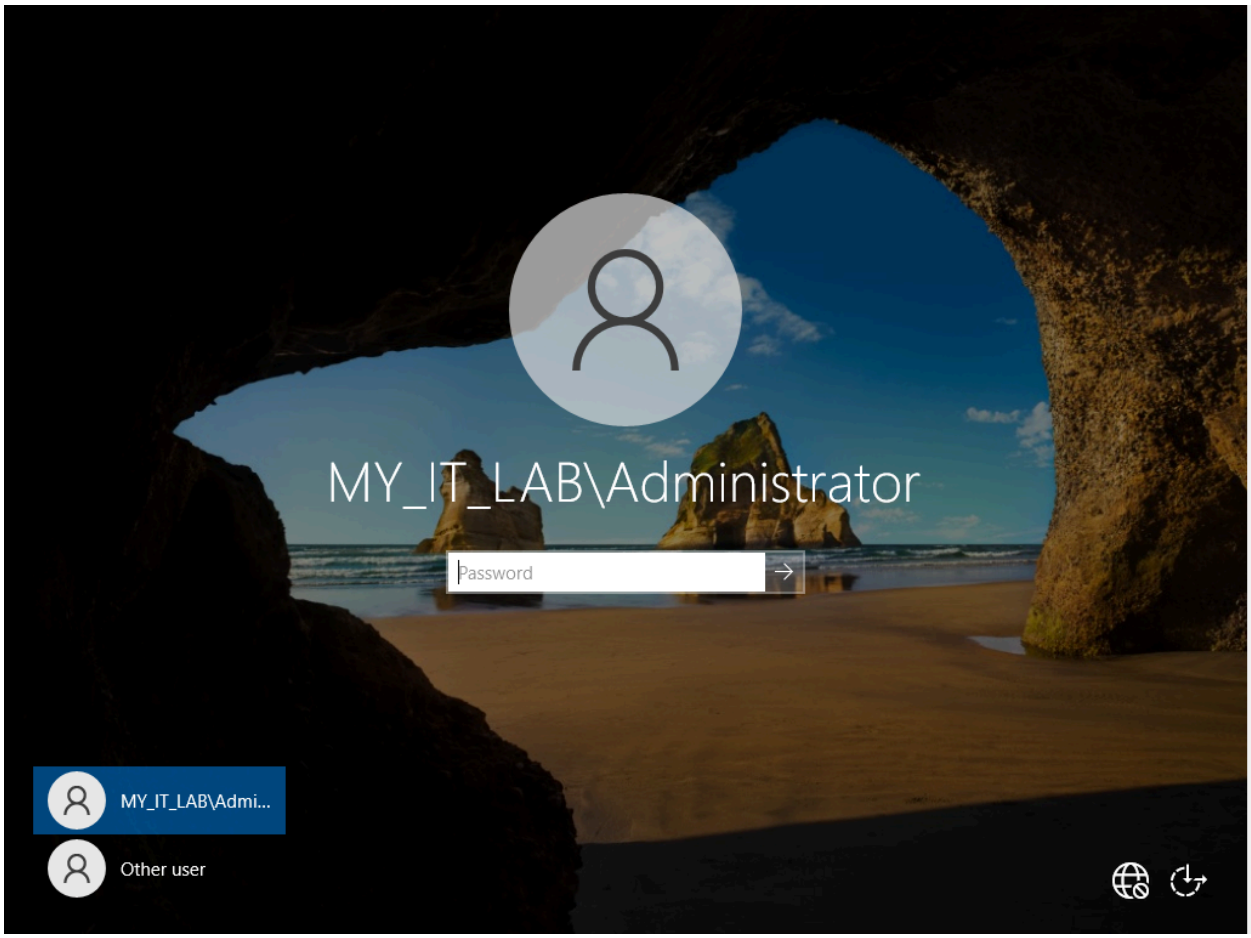


Now the system has to do prerequisite checks to ensure that it can be an AD DC.





All good! Now after the system reboots I can sign into the VM.



The domain has been created. Active Directory has been set up!