Aia Al-Qasab

Smart Server management (WINDOWS / LINUX)

Server Remote management project plan

Report
Advanced Server development project

2018

South-Eastern Finland
University of Applied Sciences

CONTENTS

1 INTRODUCTION TO SERVER MANAGEMENT

The cost and complexity of system tuning, and management is leading numerous enterprises to offload their IT demands to hosting/data centers, these hosting centers are making a considerable investment in procuring and operating servers to take on these demanding loads. The growing importance of energy/power consumption of these servers at hosting centers in terms of the electricity cost to keep them powered on, as well as in the design of extensive cooling systems to their operating temperatures within thermal stability limits for server components. Windows Server has powered a generation of organizations, from small business to large enterprises. Customers want to access their applications in a variety of ways and be confident that they can complete their daily tasks in a secure and efficient manner. They simply are not concerned about how IT infrastructures are made up and the challenges that team's supporting these environments experience basis. Windows Server developing the Servers with new features every year, the latest one is Windows Server 2019 that built on the strong foundation of Windows Server 2016 which continues to see great momentum in customer adoption. Windows Server 2016 is the fastest adopted version of Windows Server that required to spend a lot of time with customers to understand the future challenges and where the industry is going. Four themes were consistent: Hybrid, Security, Application platform, and Hyper-converged infrastructure. Hybrid cloud scenarios one that combines on premises and cloud environments working together, that make sense to customers. Extending Active Directory, synchronizing file servers, and backup in the cloud. It also allows for apps running on premises to take advantage of innovation in the cloud such as Artificial Intelligence and IoT. Hybrid cloud enables a future proof, long term approach which plays a central role in cloud strategies for the foreseeable future. Security continues to be a top priority for Windows customers, the number of cyber-security incidents continue to grow and the impact if these incidents is escalating quickly. Application Platform two key aspects to call out for the developer community are improvements to Windows Server containers and Windows Subsystem on Linux (WSL). Tens of millions of container images have been downloaded from the Docker Hub, Windows team had learned from feedback that a smaller container image size will significantly improve experience of develop-

ers and IT pros who are modernizing their existing applications using containers. The goal with Windows Server 2019 to reduce the server core base container image to a third of its current size of 5 GB, this will reduce download time of the image by 72% further optimizing the development time and performance. Hybrid- converged infrastructure (HCI) is one of the latest trends in the server industry today, it market grew 64% in 2016. This trend is primarily because customers understand the value of using x86 servers with high performant local disks to run their compute and storage needs at the same time, also HCI gives the flexibility to easily scale such deployments.

Ubuntu Server 18.04 LTS introduces a new installer, the “live server” installer called Ubiquity for Servers which provides a more user friendly and faster installation experiences, at the time of writing it only supports amd64 processors and does not support LVM or RAID or other more sophisticated storage options, nor does it support reusing existing partitions on the disks of the system that installing. It also requires access to the Ubuntu archive via a proxy. The Server Edition provides a common base for all sorts of server applications, it’s a minimalist design providing a platform for a desired services such as file/print services, web hosting, email hosting. There are few differences between the Ubuntu Server Edition and the Ubuntu Desktop Edition, they both use the same apt repositories, making it just as easy to install a server application on the Desktop Edition as it is on the Server Edition. The differences between the two editions are the lack of an X window environment in the Server Edition and the installation process. Ubuntu version 10.10 and prior, had different kernels for the server and desktop editions, Ubuntu no longer has separate server and generic kernel flavors. These have been merged into a single generic kernel flavor to help reduce the maintenance burden over the life of the release.

2 SMART SERVER MANAGEMENT

In this project, it's important to build a virtual machine to manage and configure the server remotely by using features and tools, also provide high security level.

The smart server manager (**S**tandard, **M**onitor, **A**utomate, **R**eview, **T**est) is a free server system management solution for IT professionals to monitor and receive proactive email alerts in the event of any system failure (hardware/software). This powerful solution connects seamlessly to server via the on-board BMC (based board management controller).

BMC is a specialized service processor that monitors the physical state of a computer, network server or other hardware device using sensors and communicating with the system administrator through an independent connection. BCM is part of the intelligent platform management interface, usually it's contained in the motherboard or main circuit board of the device to be monitored. The sensors of a BMC measure internal physical variables such as temperature, humidity, power supply voltage, fan, speeds, communications parameters and OS functions. If any of these variables happens to stray outside specified limits, the administrator is notified.

Smart Server Manager can also be set to send email alerts to IT administrators in the event any of these monitored components experience a technical issue. It includes operating system monitoring for Windows/Linux platforms, and virtual machine performance monitoring, within OS monitoring users can view the status and remotely trouble running processes and applications, as well as view the system resource status of the hardware being used by the given OS.

Smart Server Manger monitors Virtual Machines VMs via its VM management function and supports VMs from both VMware and Microsoft Hyper- V, the management tool allows for the performance of the VM hosts and guest OS to be monitored to the component is becoming a bottle neck, thereby allowing IT administrators to determine whether to allocate more hardware resources to the VM.

SSM is 100% agentless, meaning that it only needs to be installed once on a core system, and then all other servers on the network can be monitored and no additional installation required. The system can support up to 250 devices including physical hardware, OS and VMs.

2.1 Hardware and Software dependencies:

Minimum hardware requirements for SSM installation:

- System processor 2 GHz
- System memory 2 GB RAM
- Free disk space 4 GB (more disks space need depending in the nodes management and the amount of history information needed)
- BMC chip for remote manageability.

Minimum Software requirements for SSM installation:

- Windows Server last version 2019
- Linux Server 18.04.1 LTS

Smart Server Manager should be run across a gigabit Ethernet network dedicated to system management and the first Ethernet port used by the operating systems deployed. It's recommended to route the OS connection from NIC 1 along the BMC port to ensure maximum bandwidth and functionality.

2.2 Virtual Machine:

VMware Server is a free virtualization product for Microsoft Windows and Linux servers. It enables users to quickly provision new server capacity by partitioning a physical server into multiple virtual machines, it's used to provision a wide variety of plug and play virtual applications for commonly used infrastructure.

Features of VMware Server:

- Support for 32-bit and 64-bit Guest Operating system.
- Two-Way virtual SMP (Symmetric Multiprocessing) experimental support.
- Connect to VMware GSX virtual Machines and Hosts.
- Upgrade and use GSX Virtual Machines.
- More existing virtual machines.
- Compatible with VMware workstation virtual machines.
- Configure virtual hardware devices to be automatically detected.
- Take and revert to snapshots in the background.
- Support for VMware virtual machine importer.
- Support for VirtualCenter.

2.3 Server Configuration

2.3.1 Windows Server Features

Windows Server has over 300 new features and connectivity with the cloud. Explaining those features will take much time, but in this project it will include the most important features that needs to be installed. Cloud Technology was intended with Windows Server, it's the practice of using a network of remote servers to store, manage and process data rather than local server. Windows Server extends these technologies to corporations to be used in the same way for their employees. All corporate data using either virtual machines or individual workstations can be backed up directly to the cloud either on or off site, Cloud technologies are the driving force for the way the world conducts business today and in the future.

Windows configuration's part will include:

- Active Directory, DNS and Name Resolution in Windows Server.
- Smart Card Certificate
- Dynamic access control: File shares, Reimagined.
- Web Server Management with IIS.
- VPNs.
- Server Virtualization with Hyper- V
- Patch management.
- Web Server Management with IIS.

Active Directory is in many ways the keystone piece of Windows networking, the central database of user and machine authentication data. ADs include several useful new capabilities for Active Directory Certificate Services, Active Directory Rights management services and Active Directory domain services. The feature focus on deployment and manageability, it's making fast and easy to deploy AD services and to have more flexibility accessing files with better security.

Also by configuring Virtualization, it allows to put multiple computer operating systems in one physical machine. Breaking one physical server up into a bunch of virtual machines is one of the most significant changes in server management in the past. By installing Hyper –V features, client hyper –v gives

desktop Windows Hyper –v technology without the need for installing a server OS, also Hyper –V module for Windows PowerShell provides more than 160 cmdlets to manage Hyper –V.

Servers are not good without the ability to talk to one another but being able to communicate with other systems means that infected systems and can be unsecure. IP address management framework is a set of technologies for managing, monitoring and auditing IP address space. By monitoring DHCP and DNS, IPAM can locate IP address servers within a network and allows user to manage from a single central UI.

Remote Server management is one of the challenges to access and control servers between sites, it require more security features and policies to configure, VPN feature used to provide access to a private network over a public network. It's a private connection that is created over a public network such as the Internet, Windows Server Remote Access role enables the traditional Routing and Remote Access Service features, but it get a massive upgrade with the enhanced Direct Access functionality that also comes bundled with this role.

2.3.2 Linux Server Features.

The secure Shell tools are a set of client and server applications that all the administrator to do basic communication between client computers and Linux Server, the tools includes ssh, scp, sftp, and many others. Because communication is encrypted between the server and the clients, these tools are more secure than similar, older tools.

With Secure Shell tools, both the authentication process and all communications that follow are encrypted. Communications from telnet commands expose passwords and all data to someone sniffing the network. Telnet is only used for testing access to remote ports or doing other tasks that don't expose the private data.

In this part of the project, Linux will be configured with more advanced security features, because many Windows server programs are designed around

proprietary or semi proprietary Microsoft protocols, or provide extended features that be accessed from Microsoft clients. Linux servers must necessarily either play catch up or use alternative protocols.
And because Linux doesn't run the popular Windows programs except under emulators, file format compatibility may be an issue.

Linux configuration's part will include:

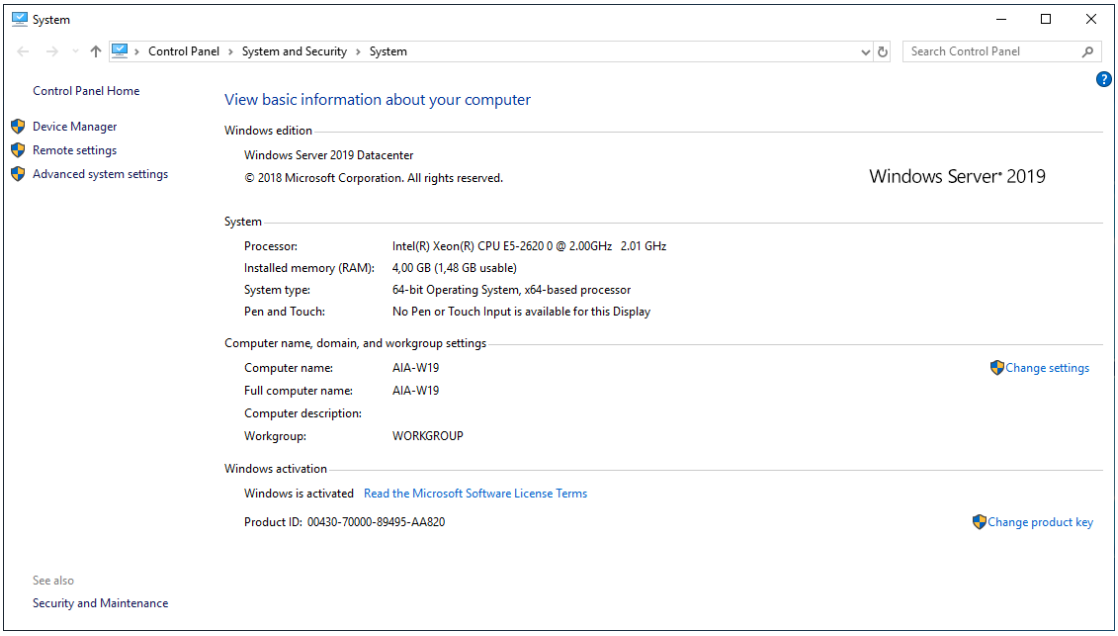
- Configuring System logging.
- Administering Networking.
- Starting and Stopping Services.
- Configuring a Web Server.
- Configuration an FTP Server.
- Advanced Linux Security.
- Enhancing Linux Security with SELinux.

3. Servers Configuration (Practical)

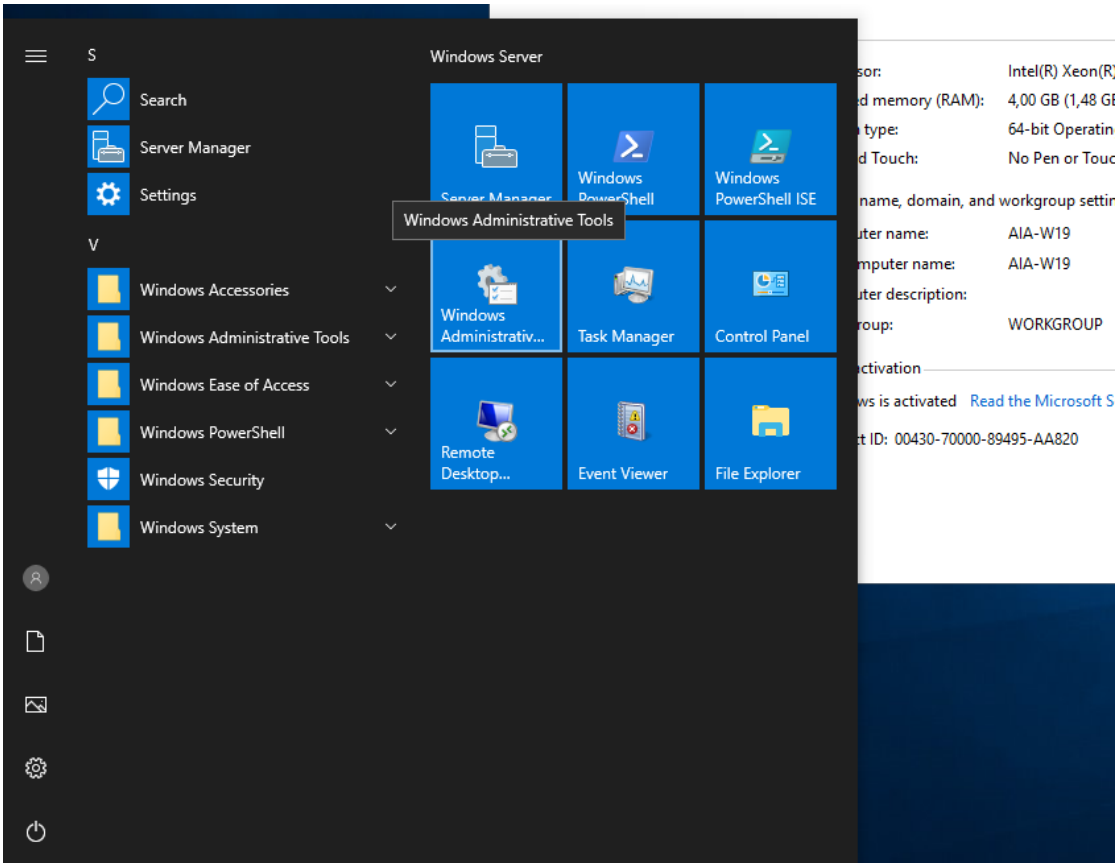
3.1 Windows Server Configuration

- **Active Directory DNS and Name Resolution in Windows Server:**

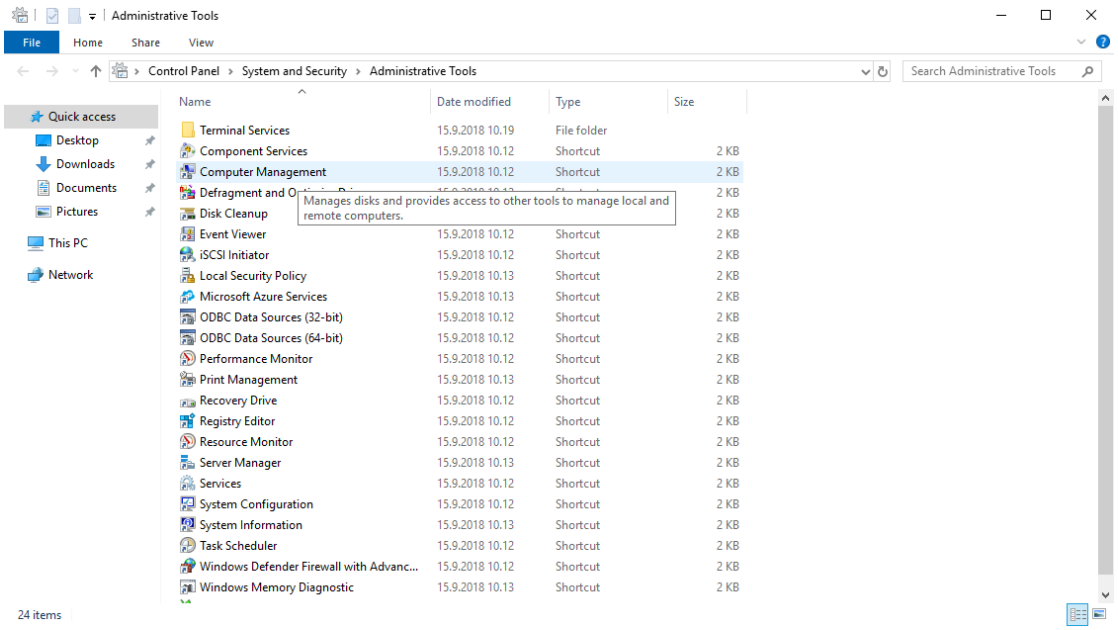
Right-click on **This PC** in your start menu and select **Properties**. If it's activated, you'll find it saying "**Windows is activated**" and you'll see the product key. If it says Windows is not activated you'll need to enter your key.



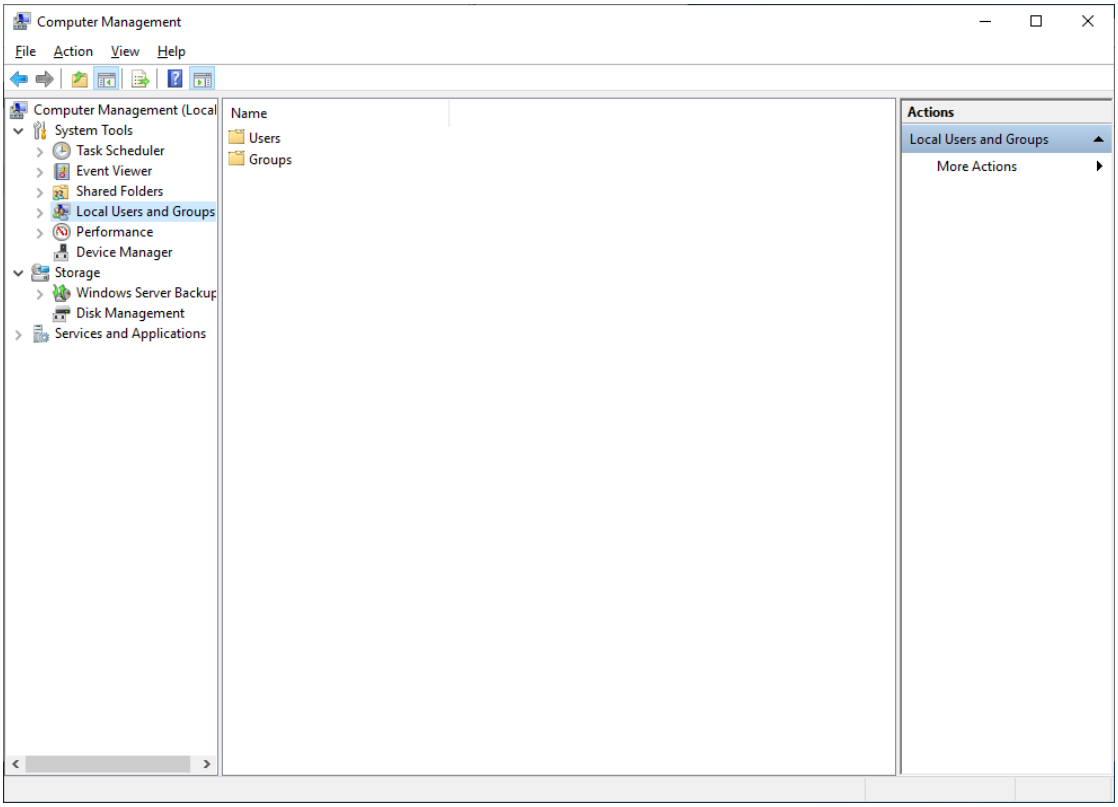
Open **Administrative tools** from your Start menu to set a password for administrator access.



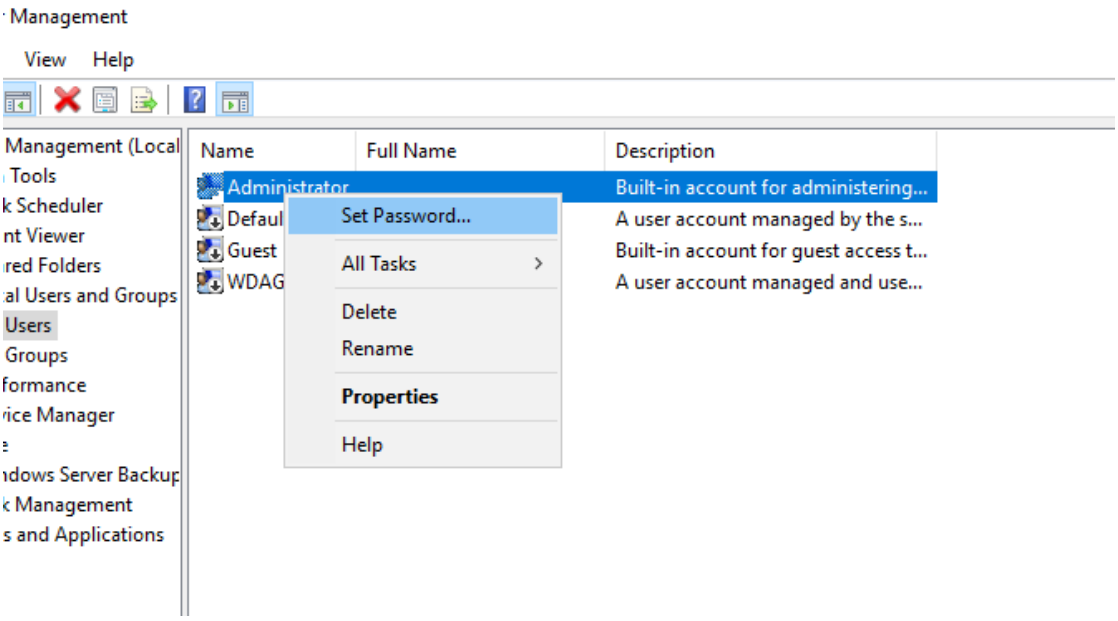
Open **Computer Management**.



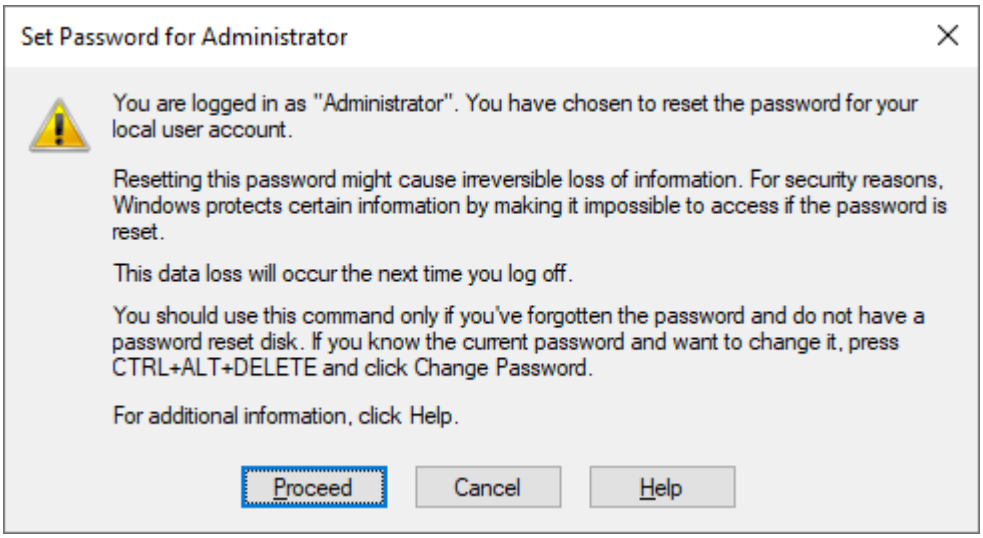
Select **Local Users and Groups** from the left pane and then double-click on the **Users** folder.



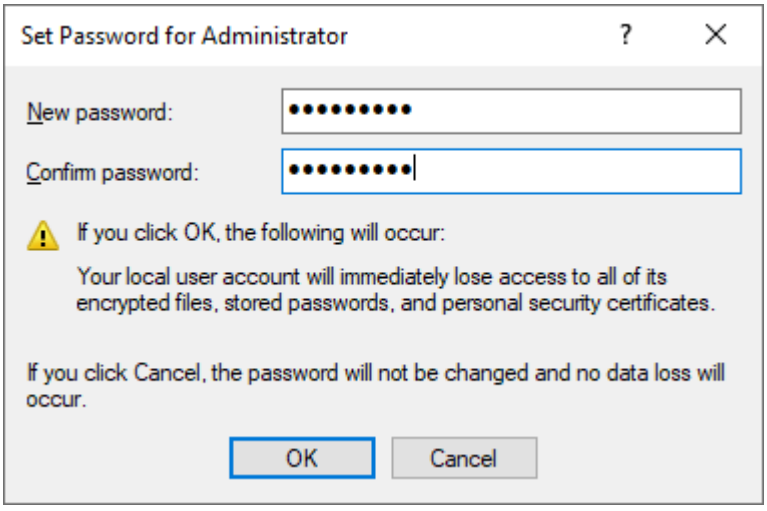
Right-click on **Administrator** and select **Set Password P@ssw0rd!**

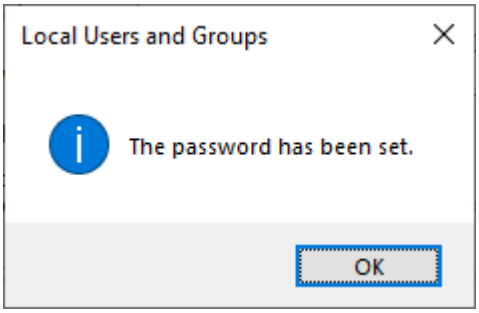


Click **Proceed**.

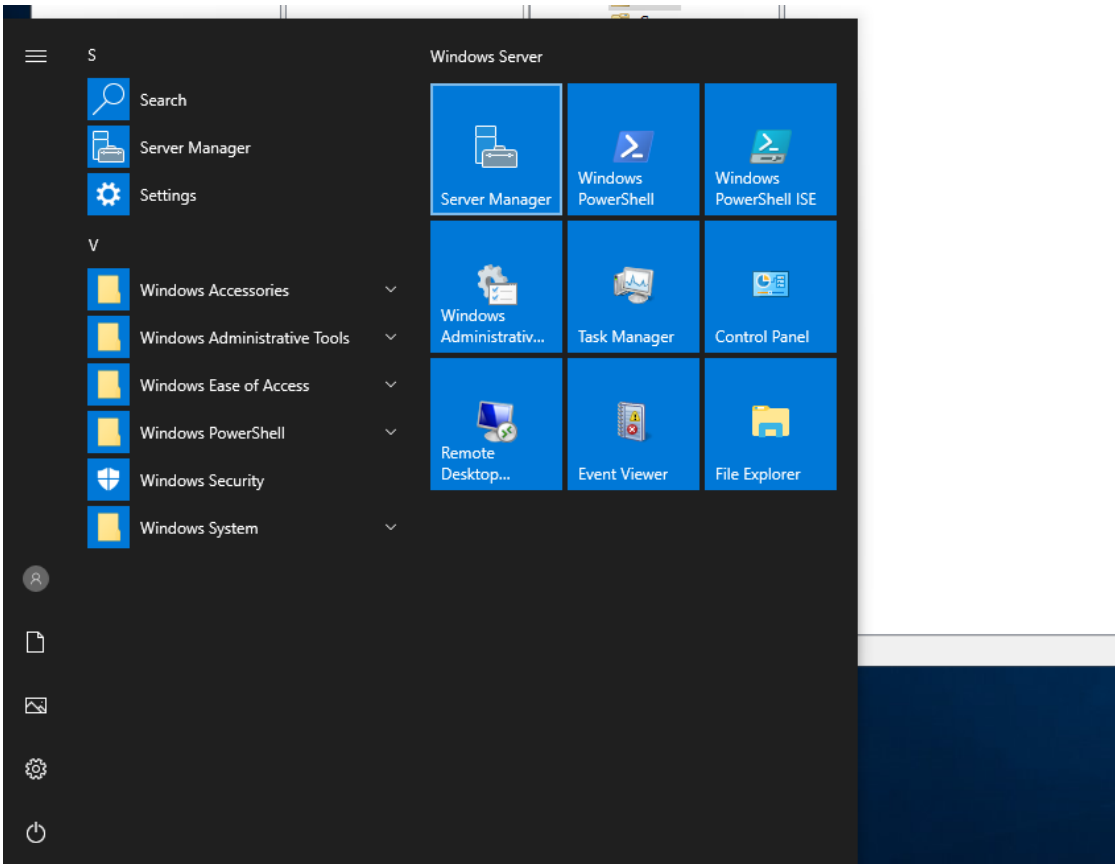


Enter and confirm your password. It must contain 8 characters at least, a combination of letters, symbols and numbers.

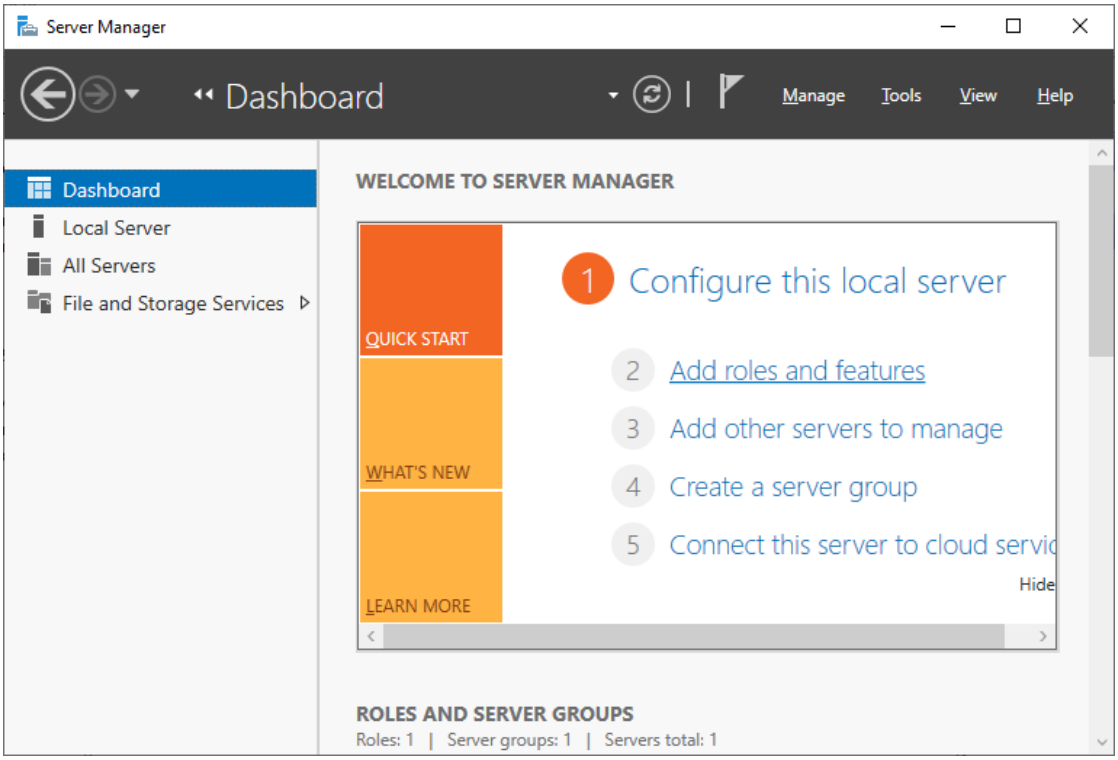




Open **Server Manager** from your taskbar or Start menu.

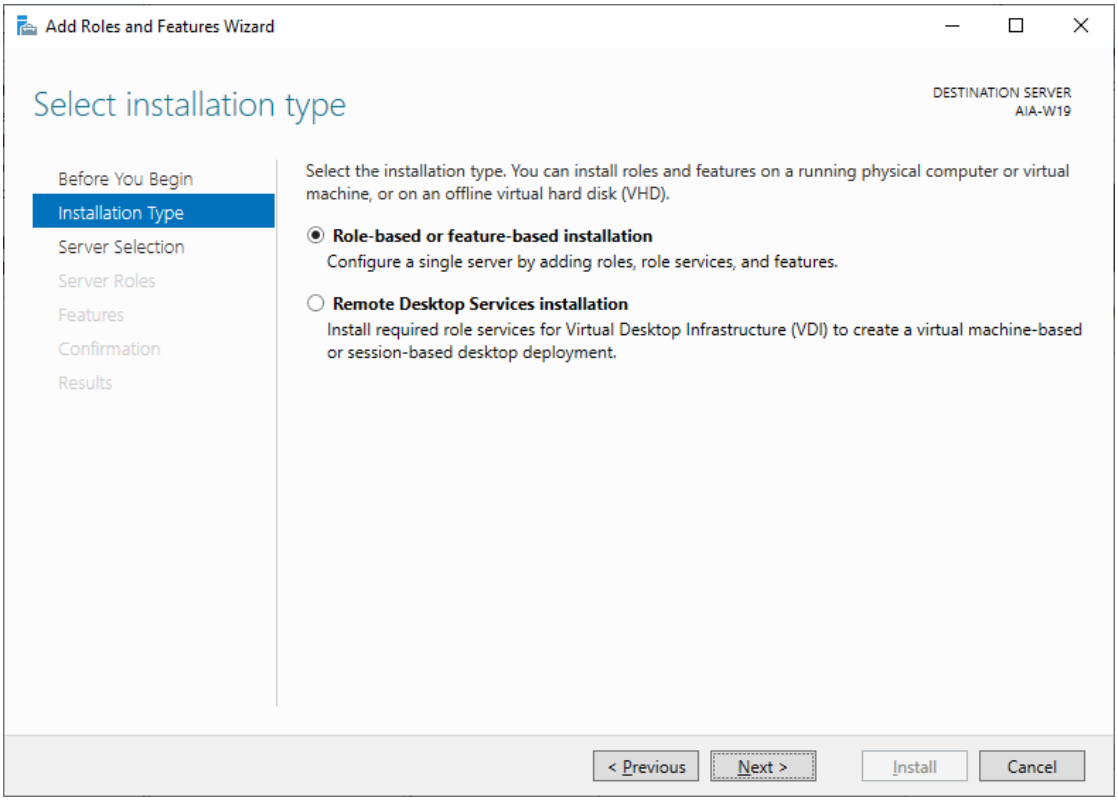


Click **Add roles and features**.

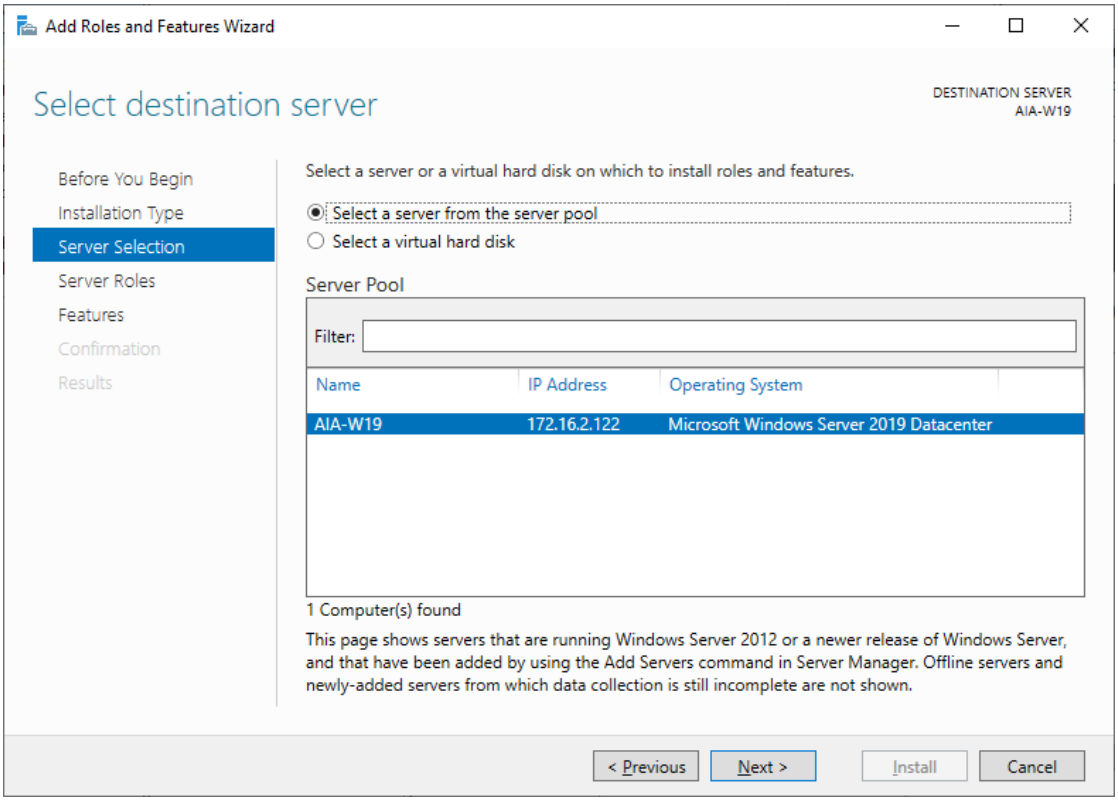


Click **Next**.

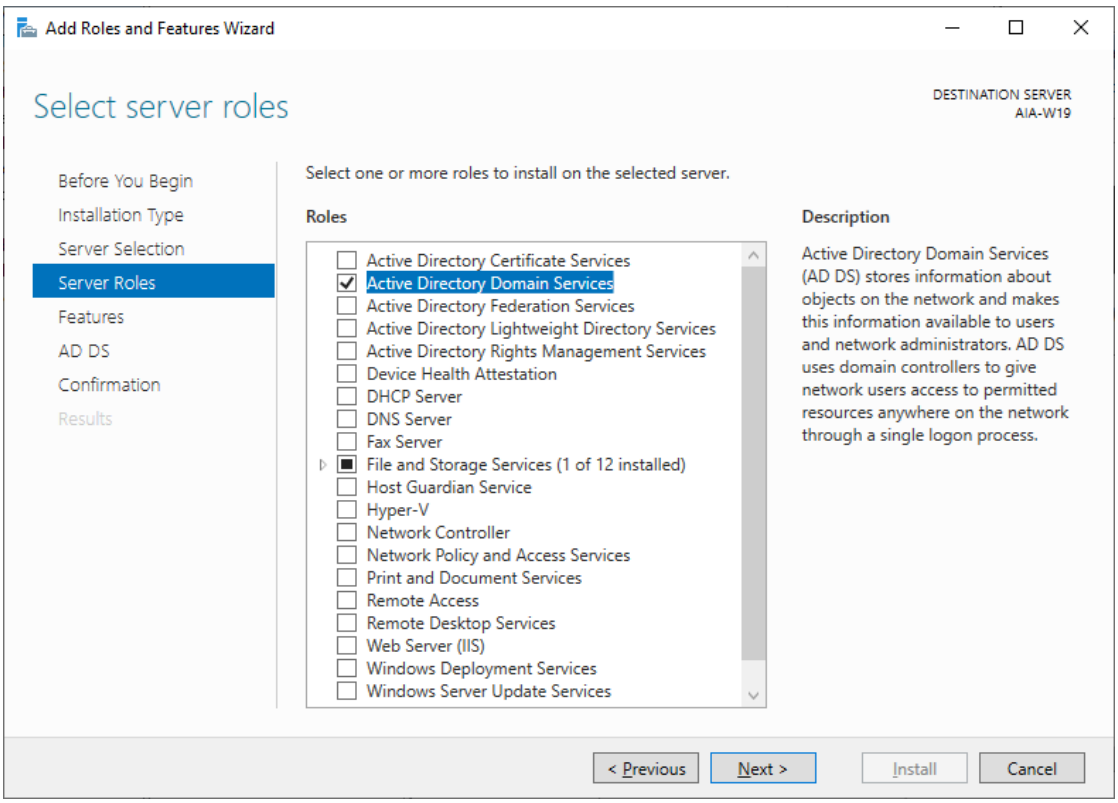
Leave it as it is by default (**Role-based or featured-based installation)** and click **Next**.

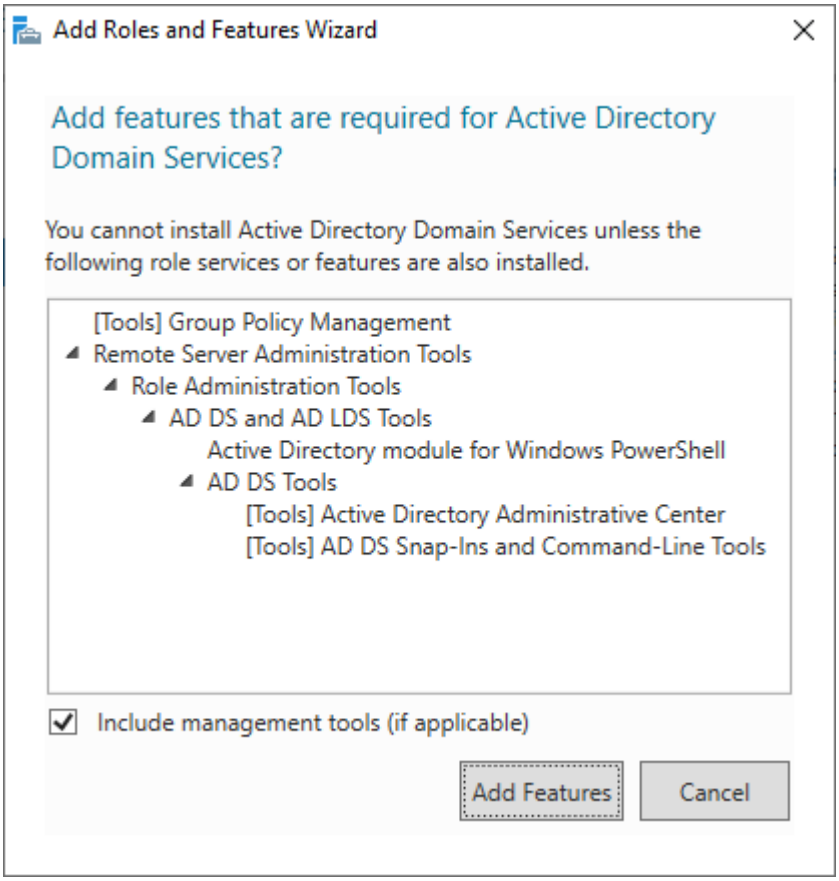


On the **Server Selection** page, you'll find the **Select a server from the server pool** and the default server there. Select it and click **Next**.

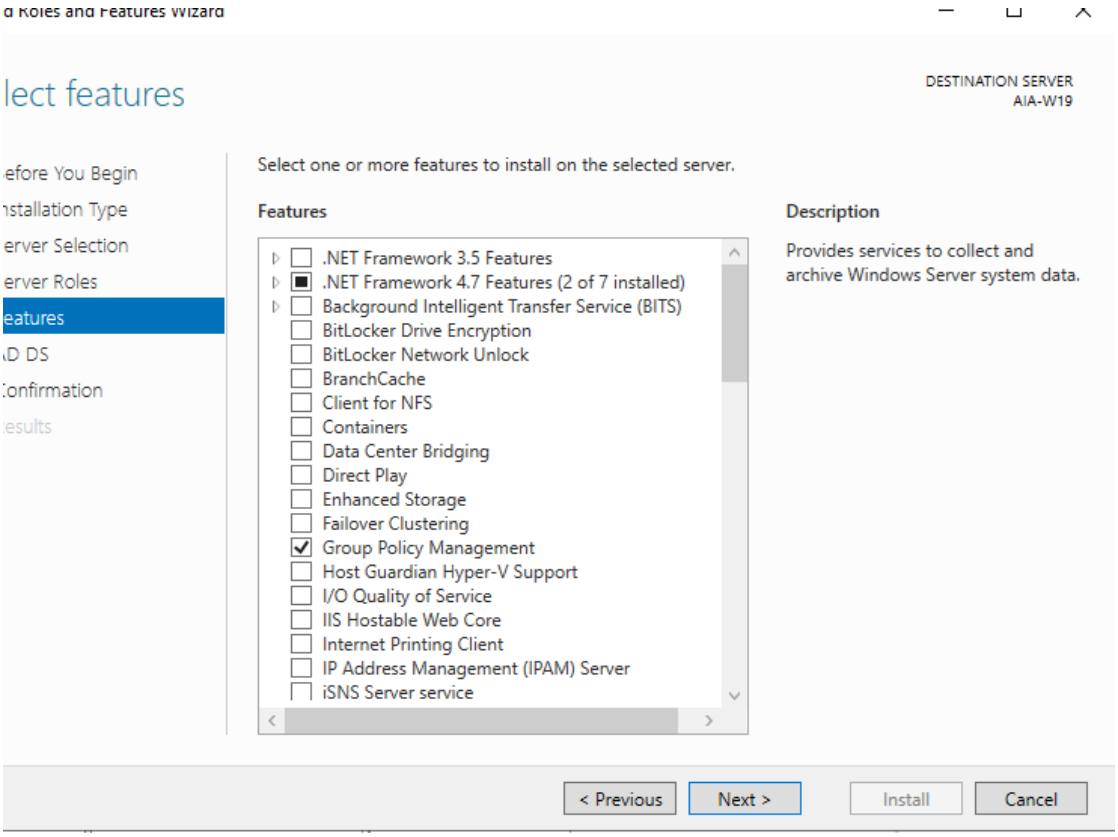


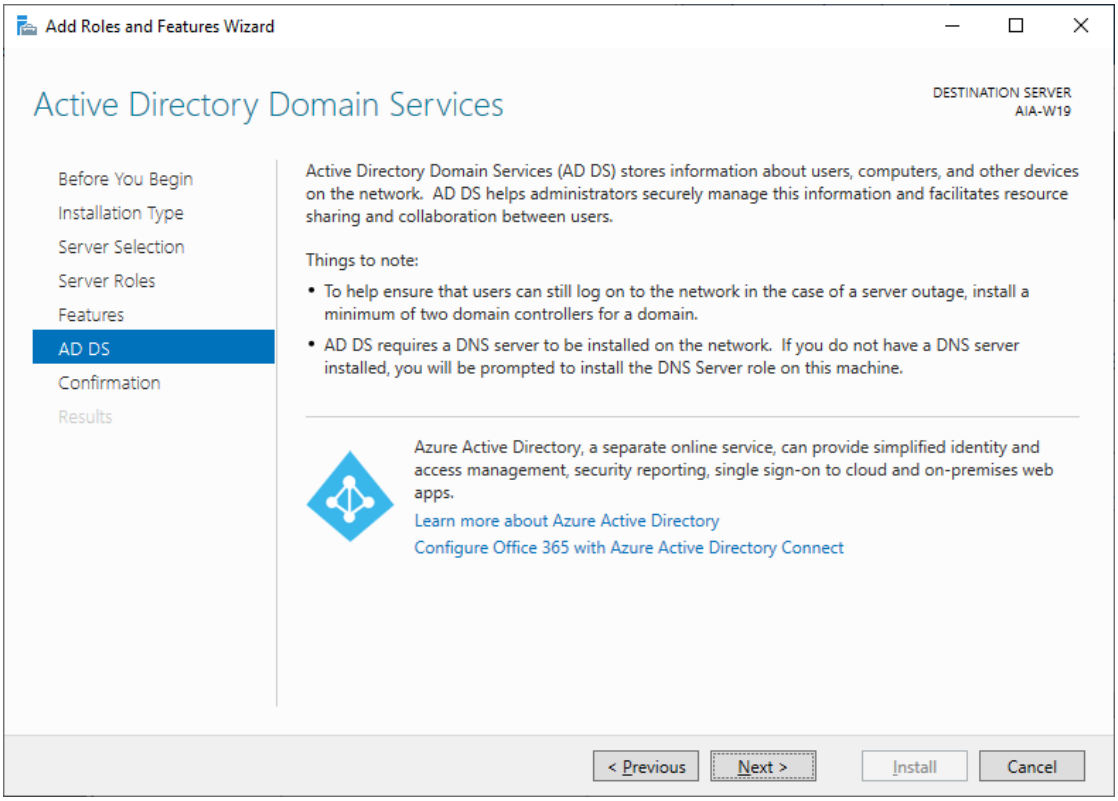
Check **Active Directory Domain Services** and add feature



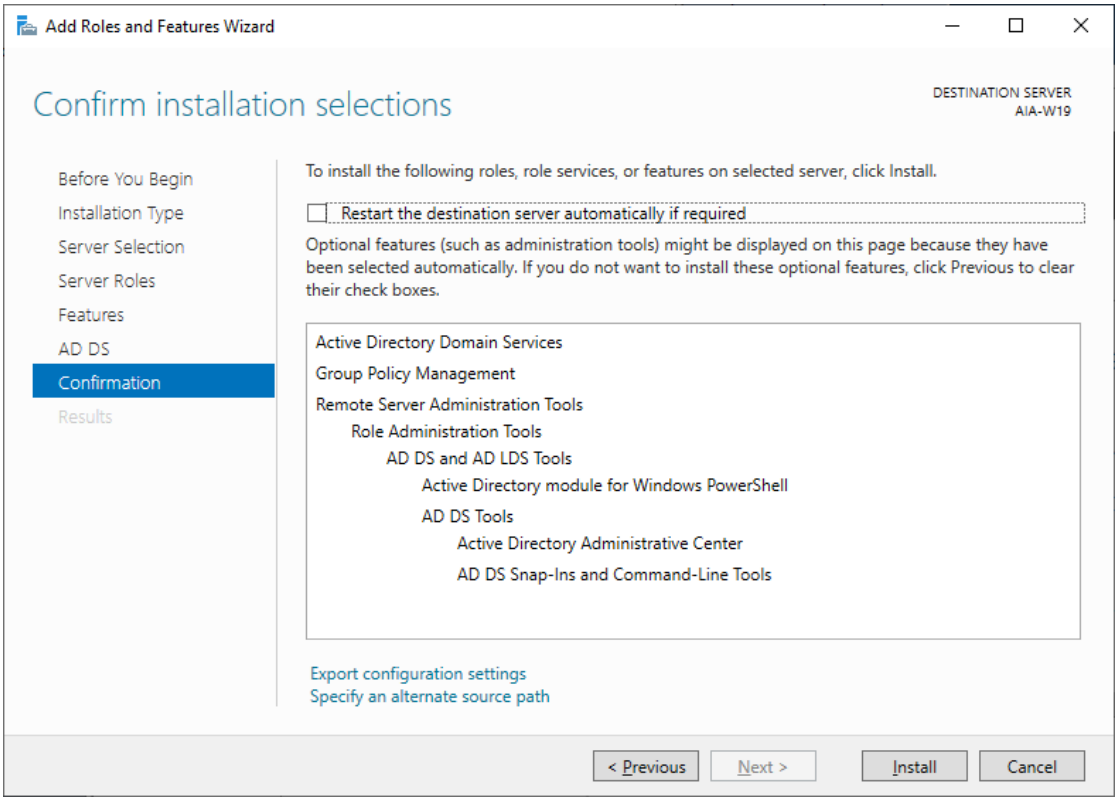


Now once checked, click **Next** and make sure **Group Policy Management** is checked and click **Next**.

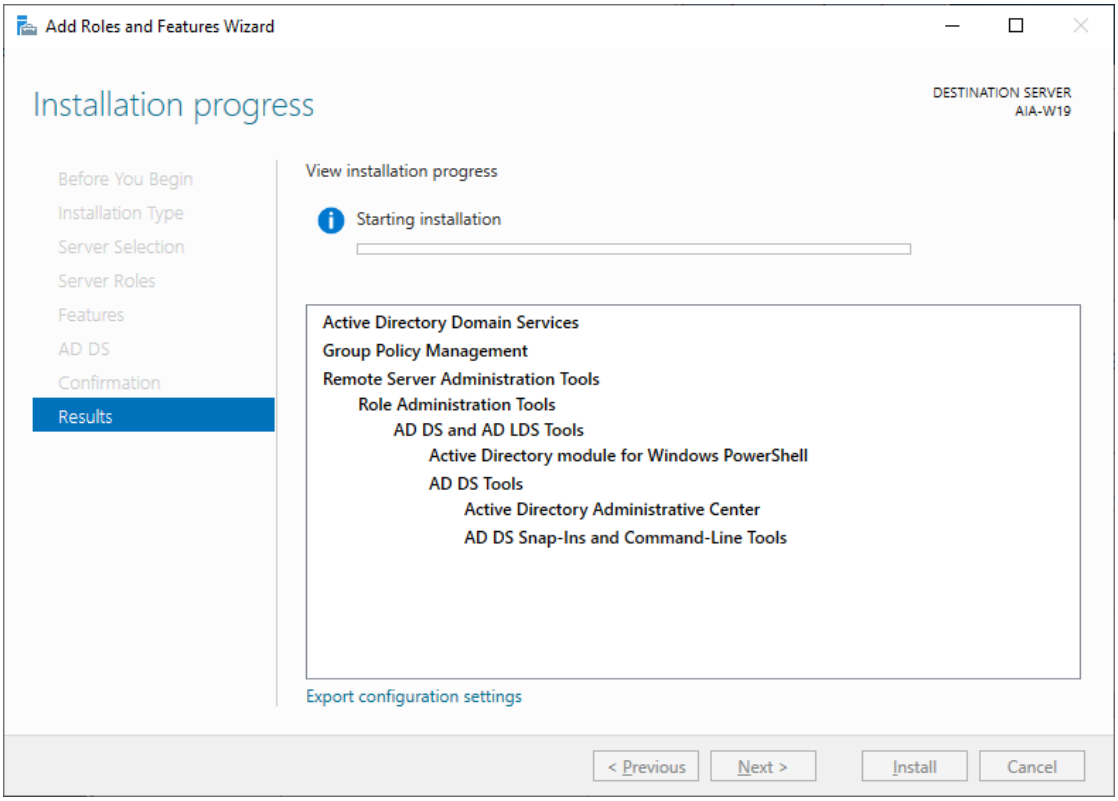


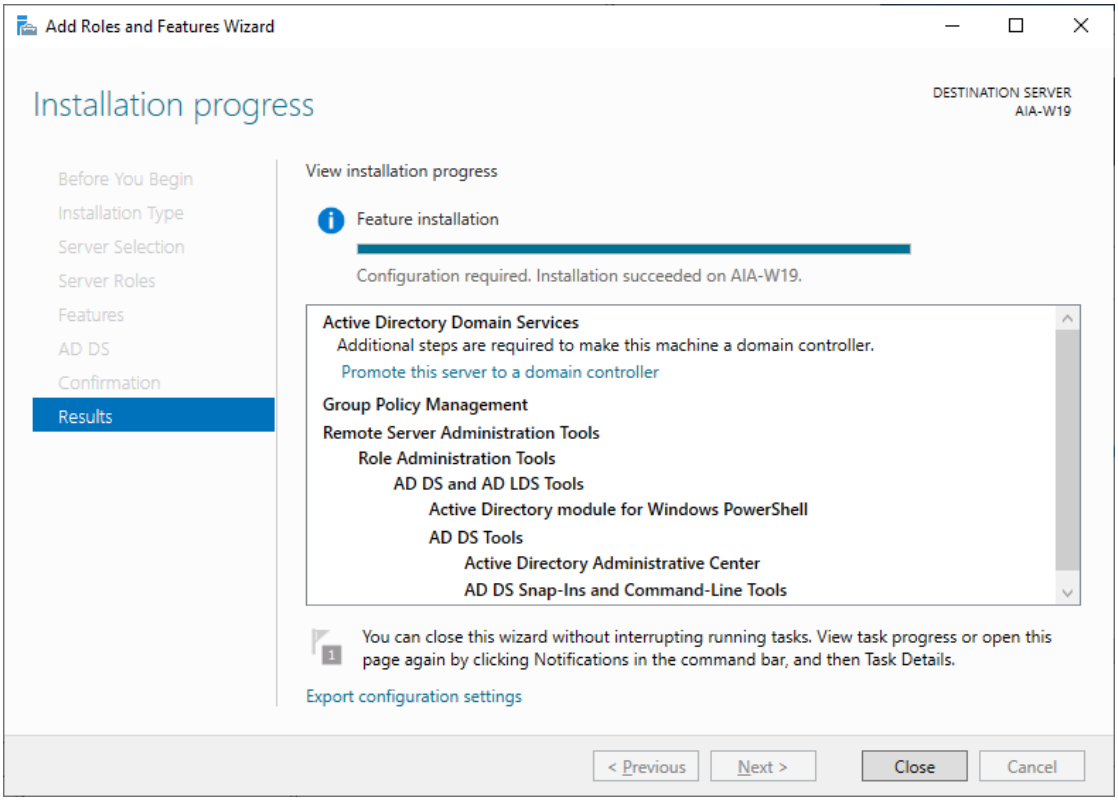


Confirm all your selections and click **Install**.

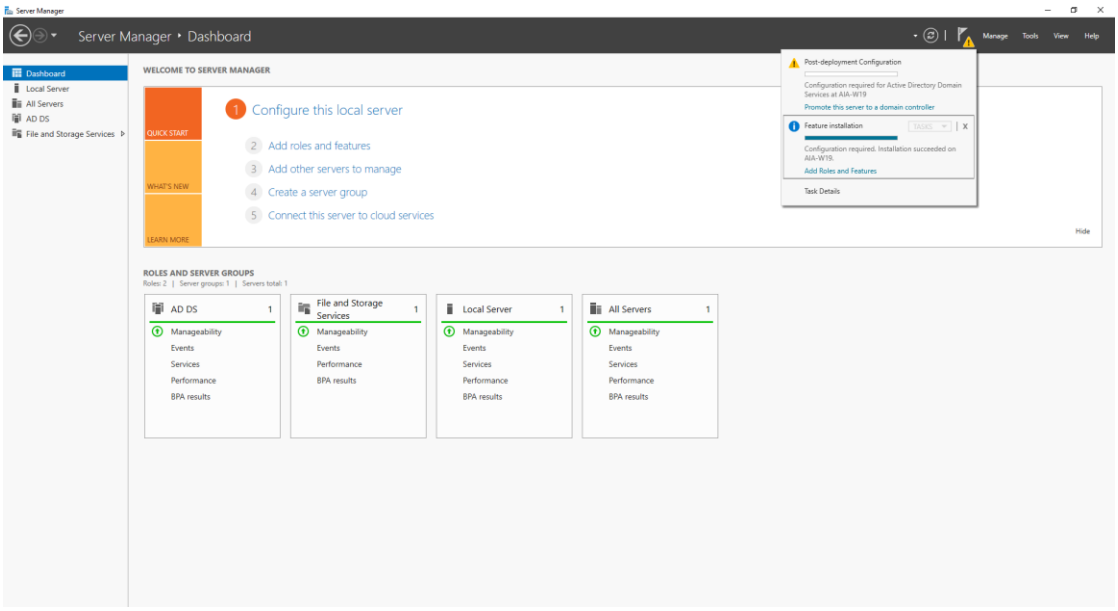


Wait until the installation finishes then click **Close**.

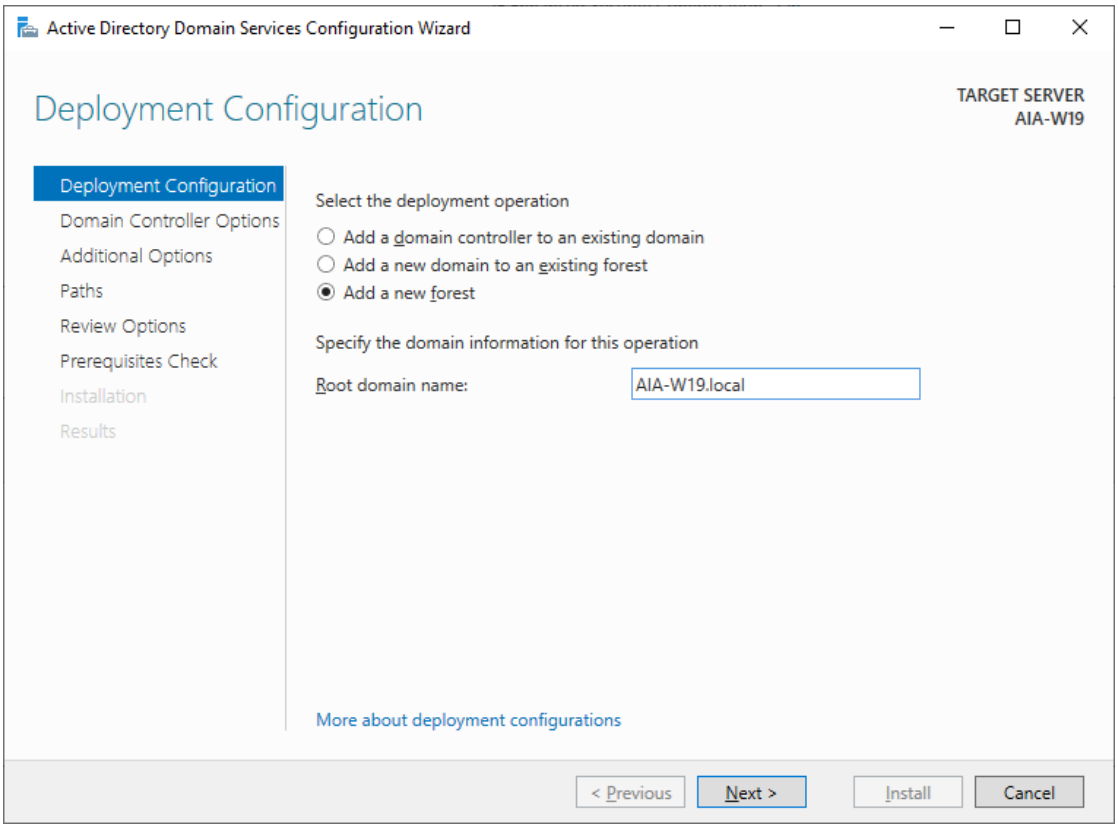




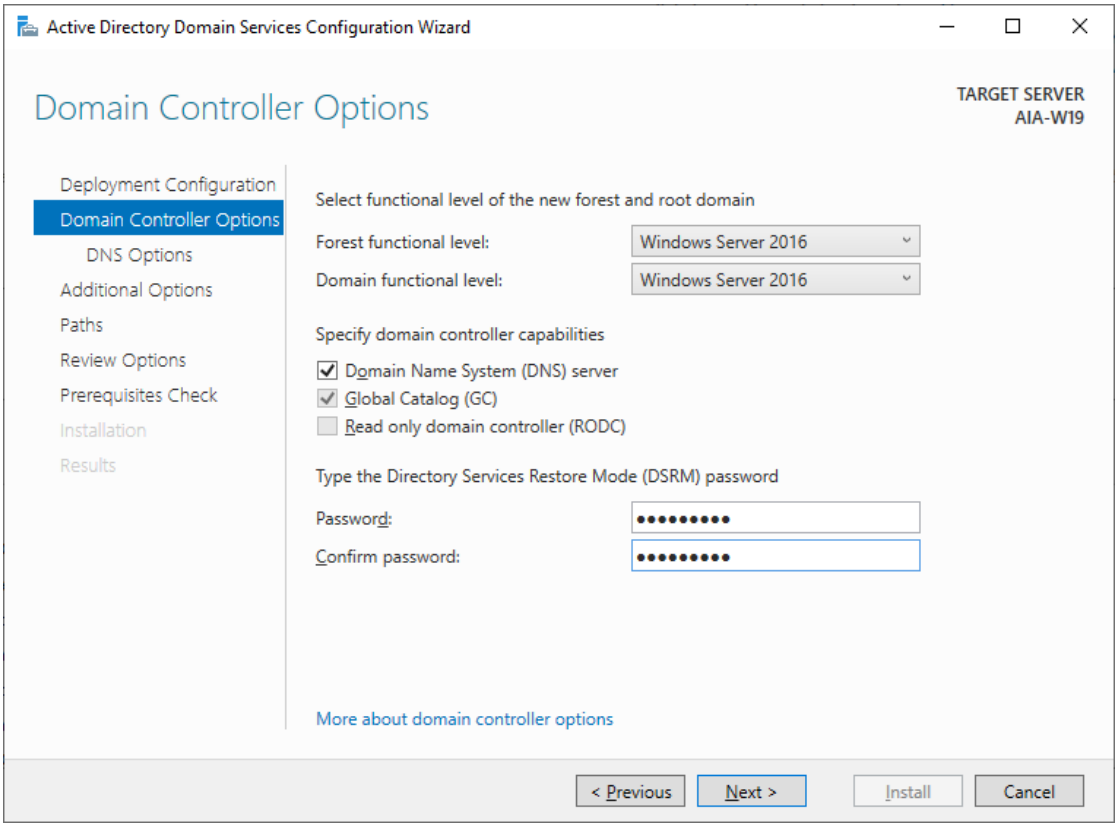
Once done, you'll see a notification on the flag icon. Click on it and select **Promote this server to a domain controller.**



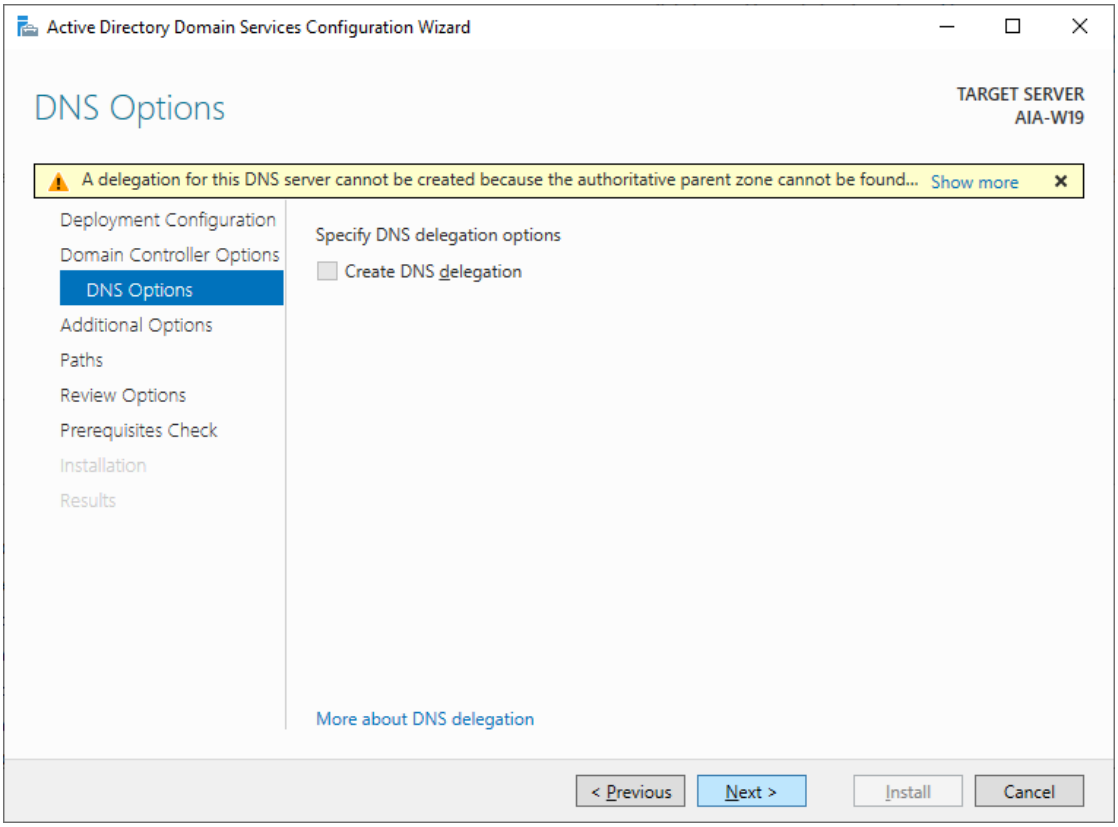
Select **Add a new forest** and enter the domain name ending with **.local** and then click **Next**. (AIA-W19.local)



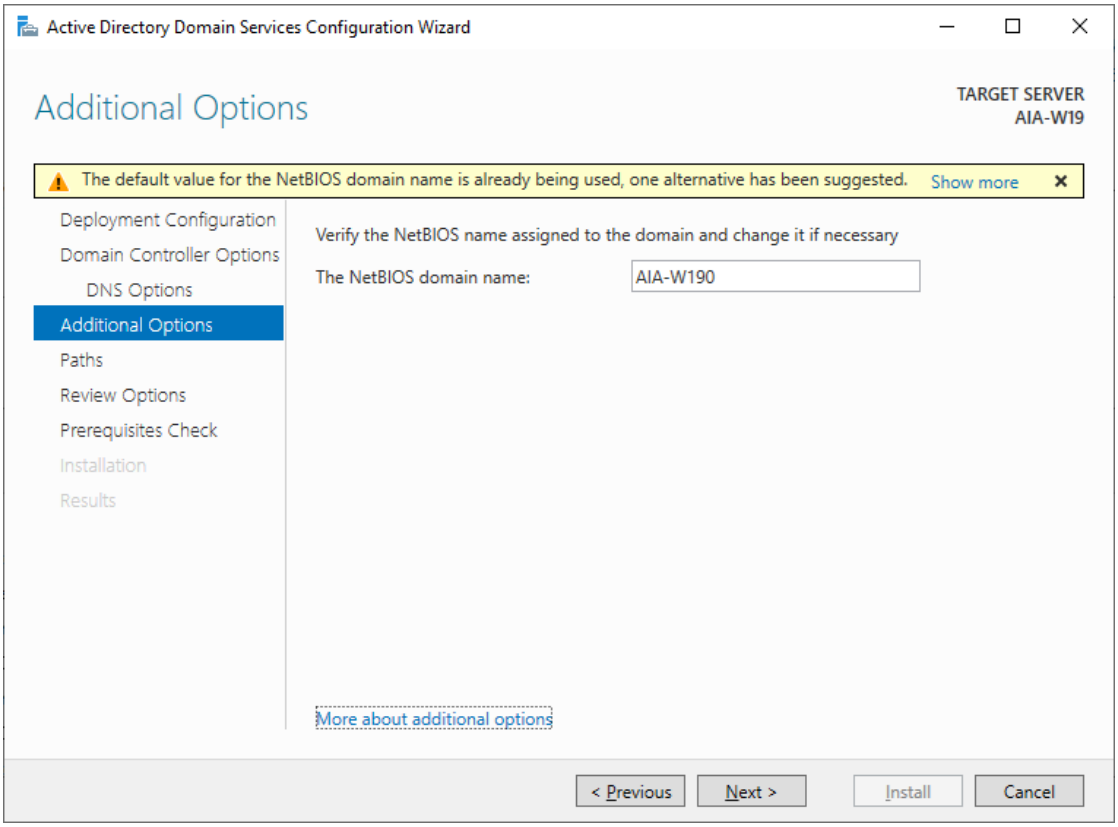
Create a DSRM password and confirm it then click **Next**



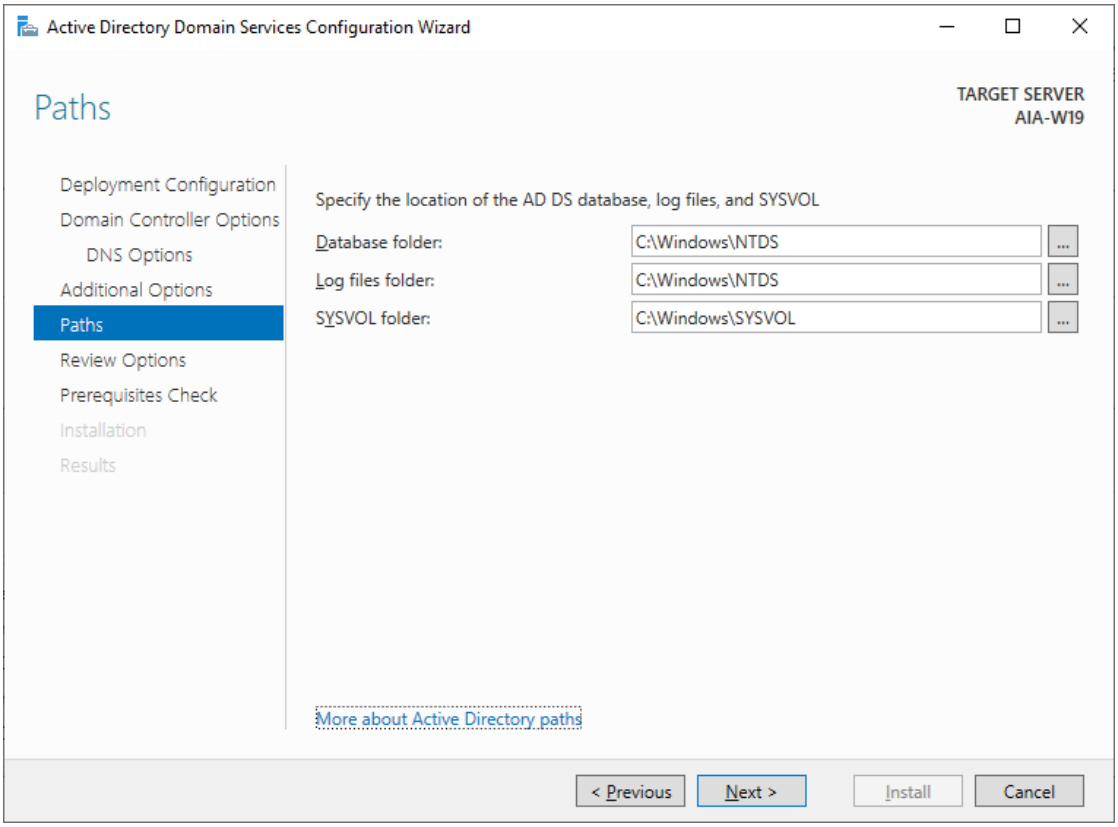
Ignore the DNS warning and click **Next**.



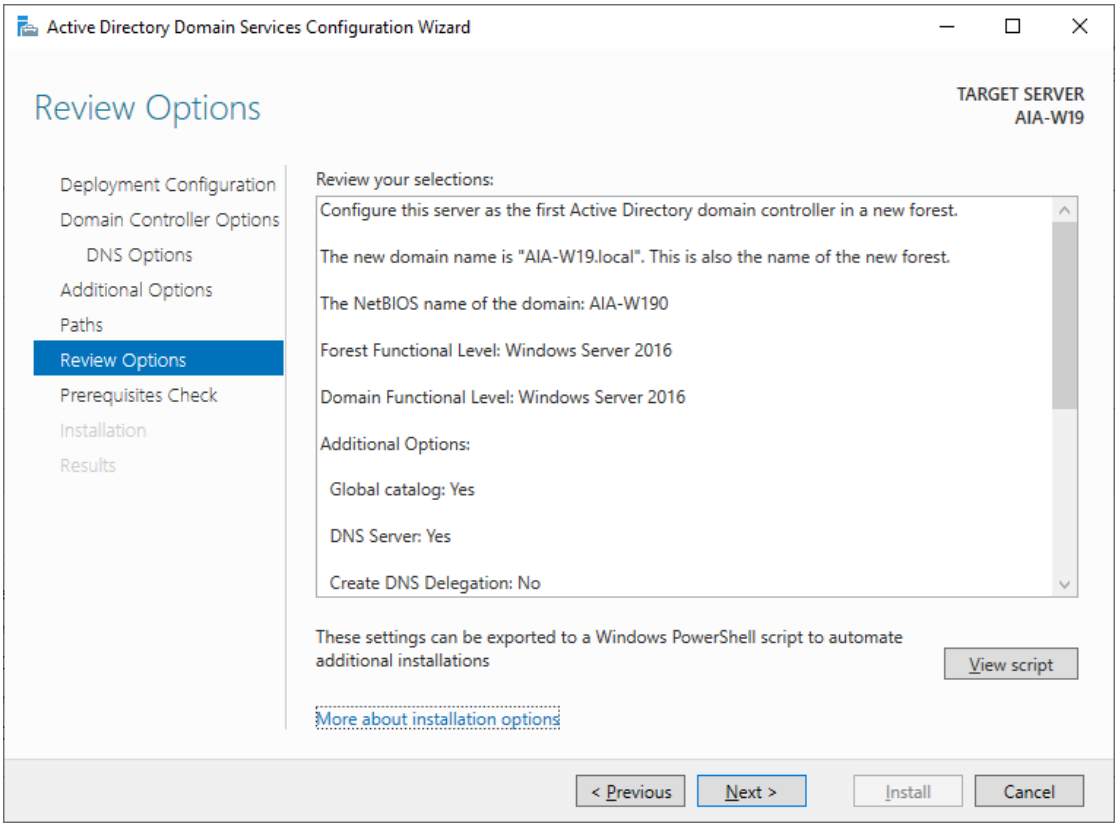
Confirm the NetBIOS domain name (created by default) and click **Next**.



Confirm your paths and click **Next**.

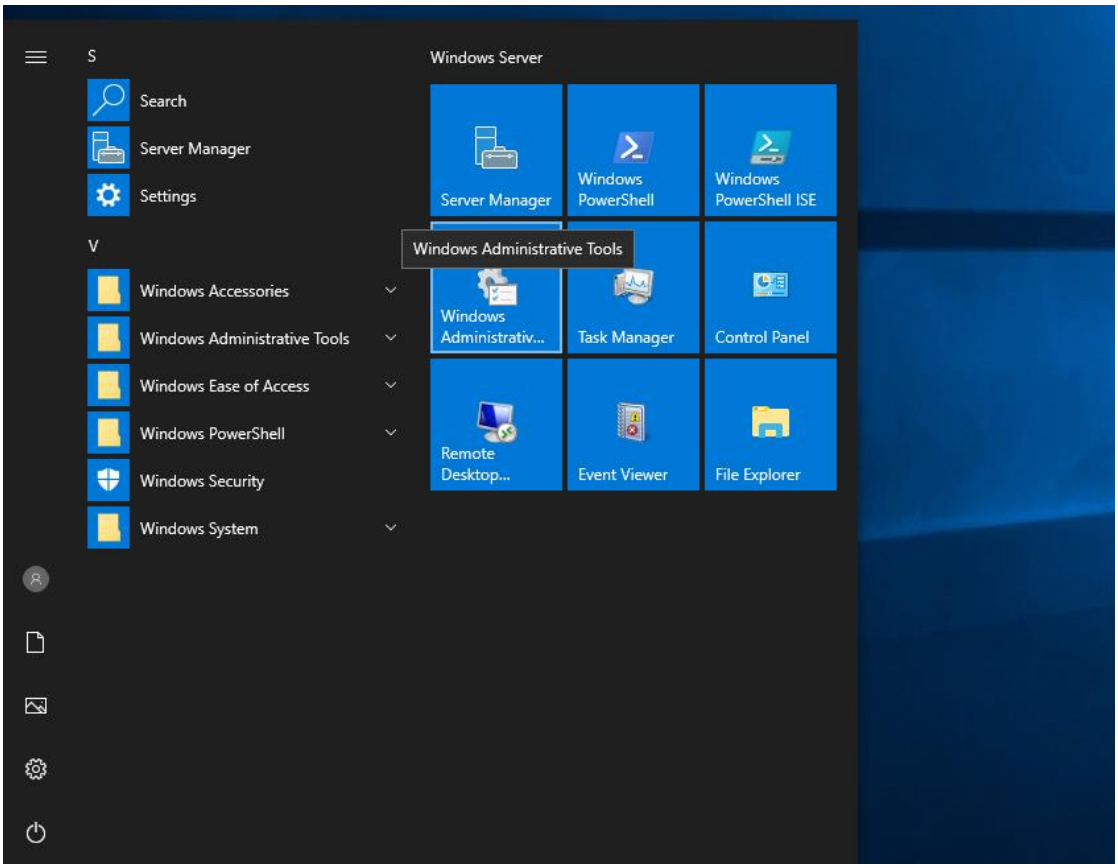


Review your selections and click **Next** and click install (Once finished, the computer will reboot automatically).

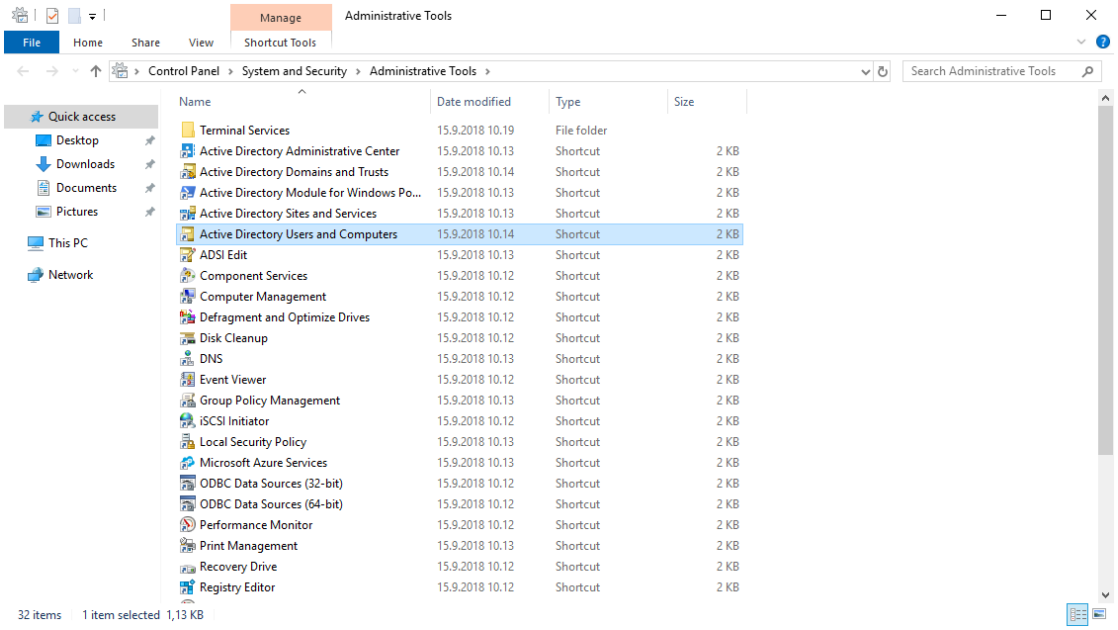


Now the domain is ready, it needs to create a user to enable a computer on the network to join it.

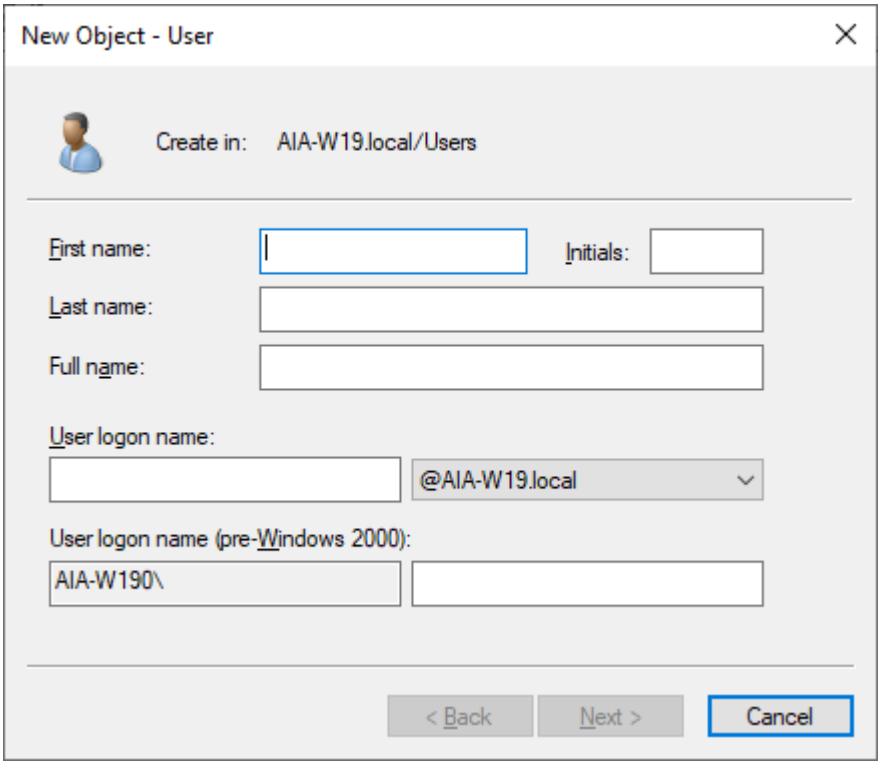
Open **Administrative Tools** from your start menu.

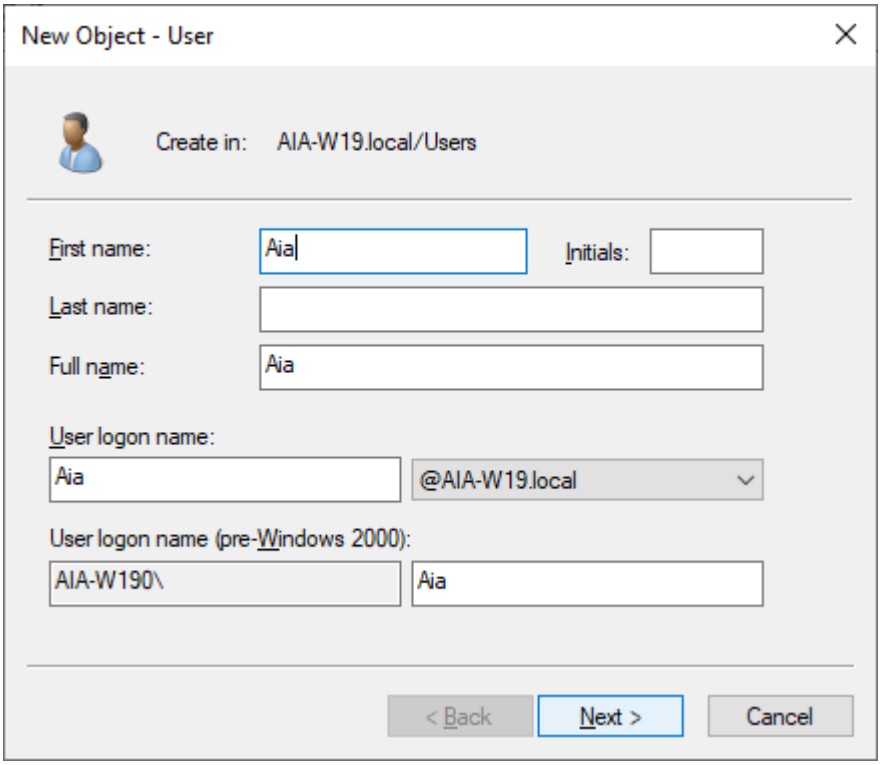


Open **Active Directory Users and Computers**.

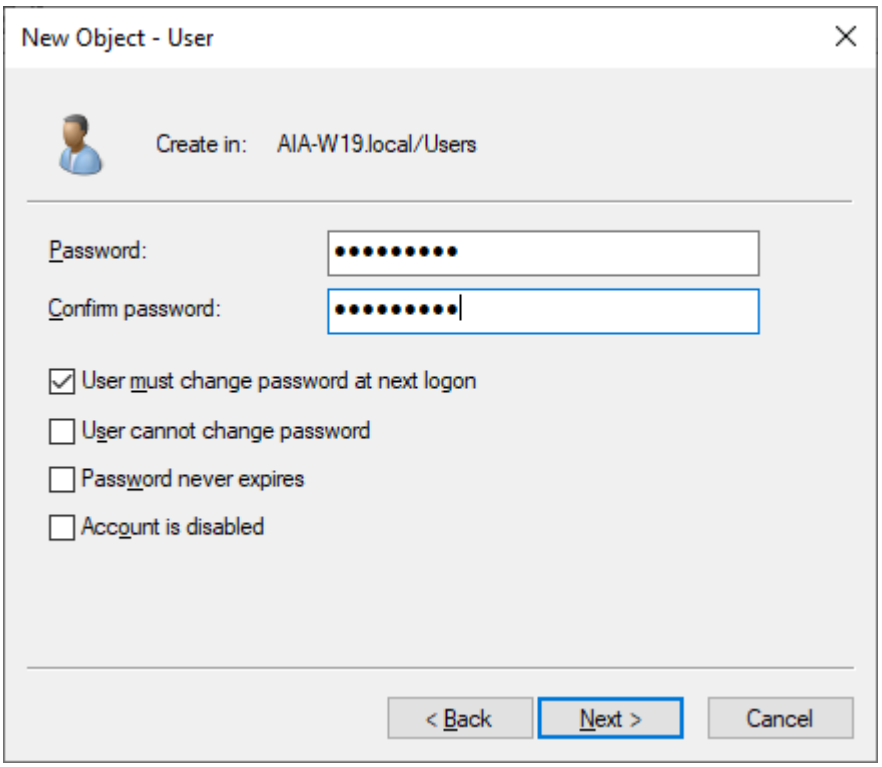


Go to the **Users** folder under your domain name from the left pane, right-click and choose **New > User**.

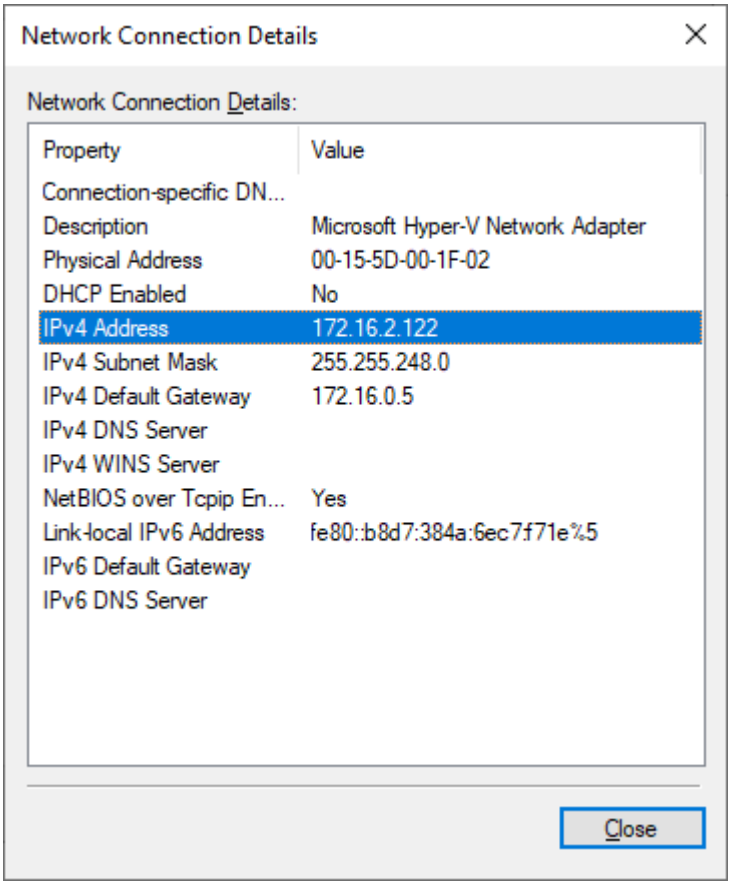




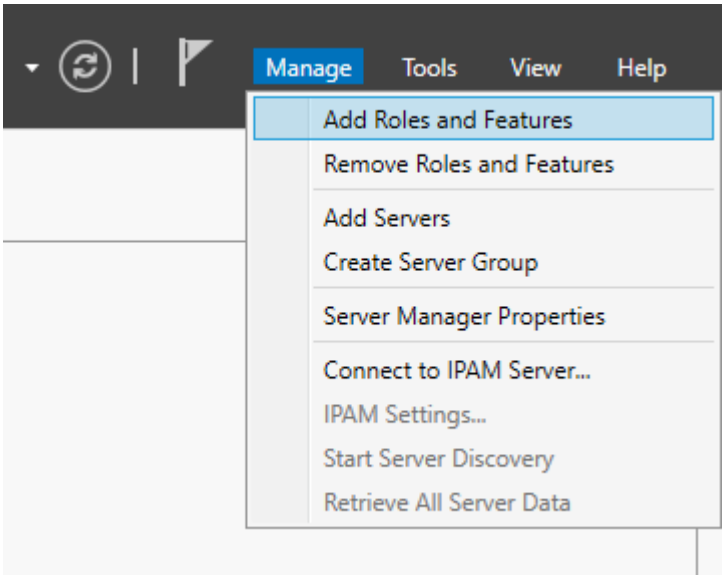
Enter a password and retype it



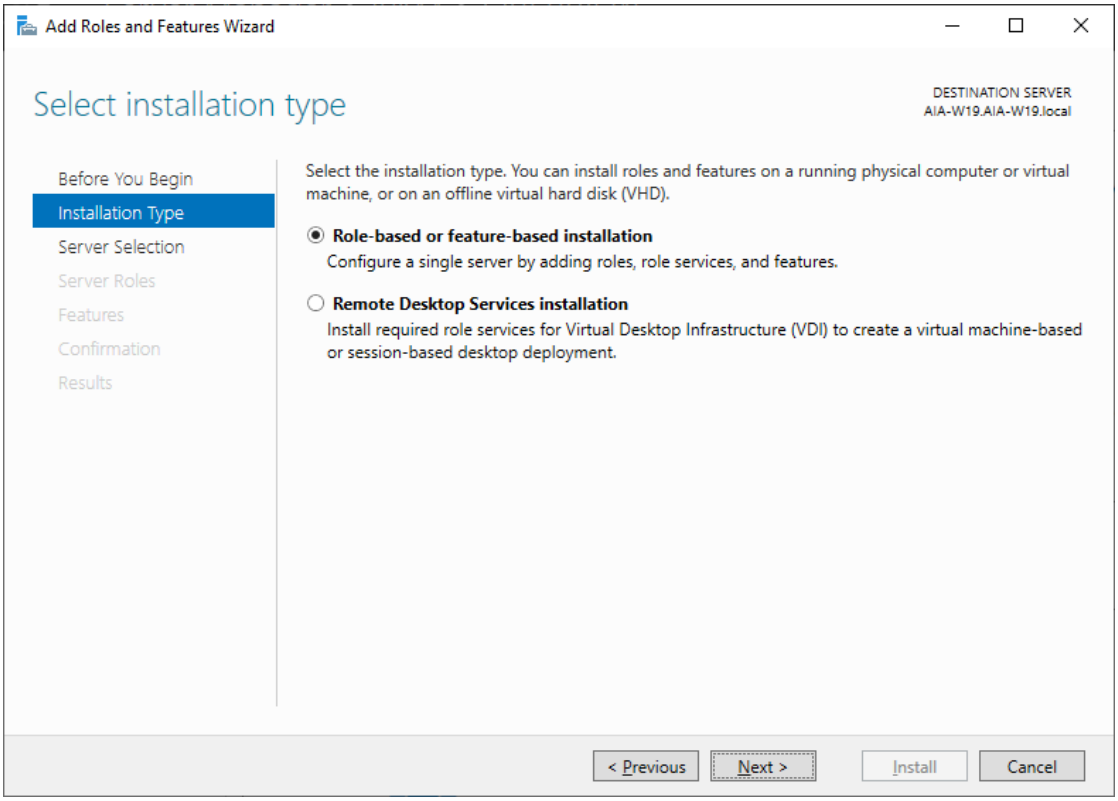
Right-click on your network icon at the clock area and then click **Open Network and Sharing Center**.



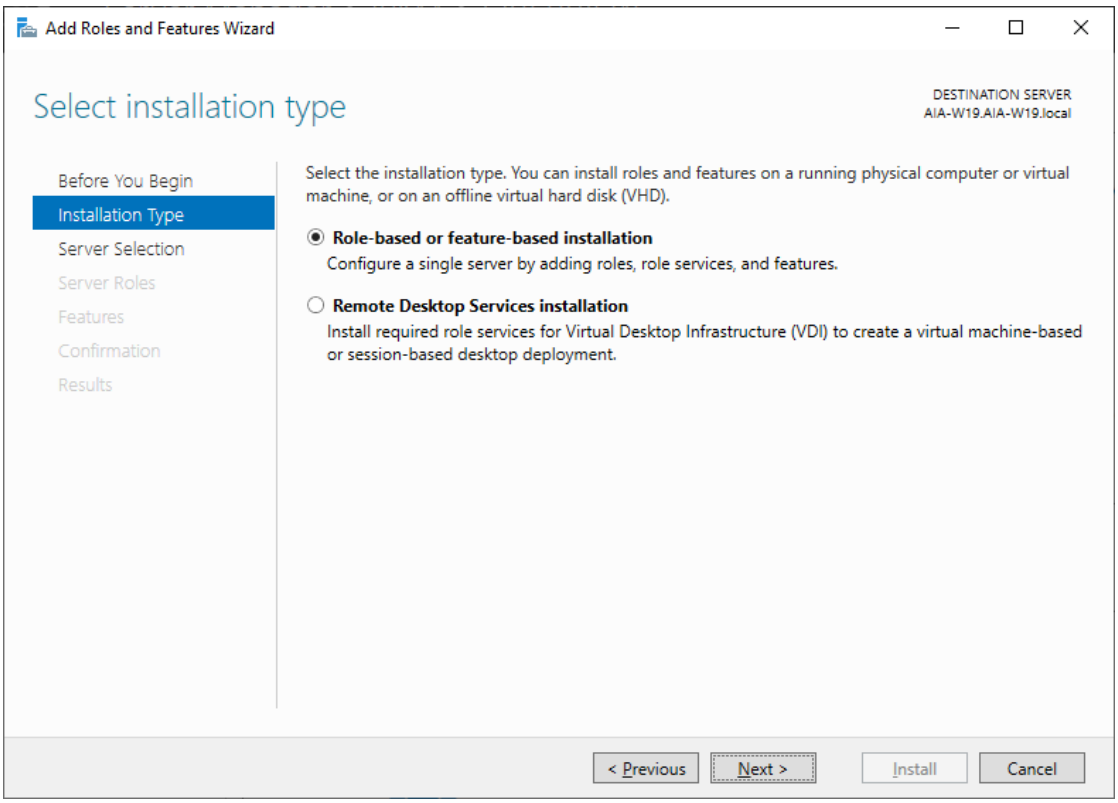
Open the server manager, select Add Role and Features



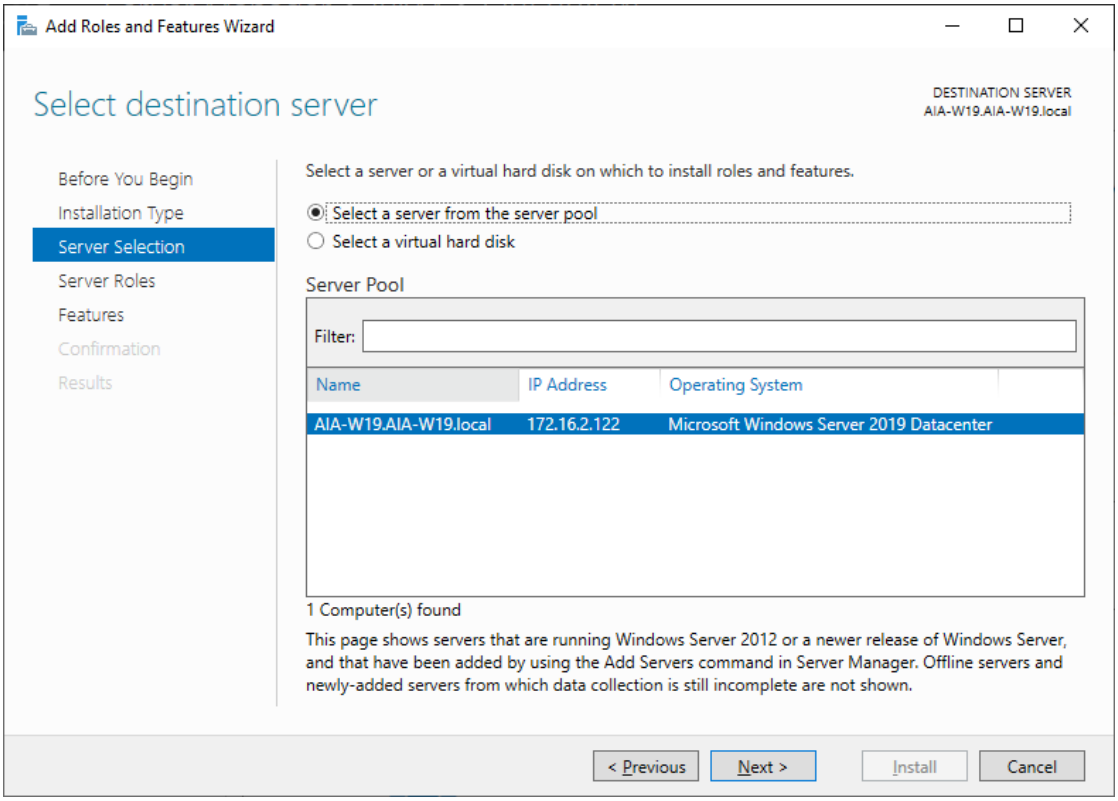
On the Before You Begin screen select next



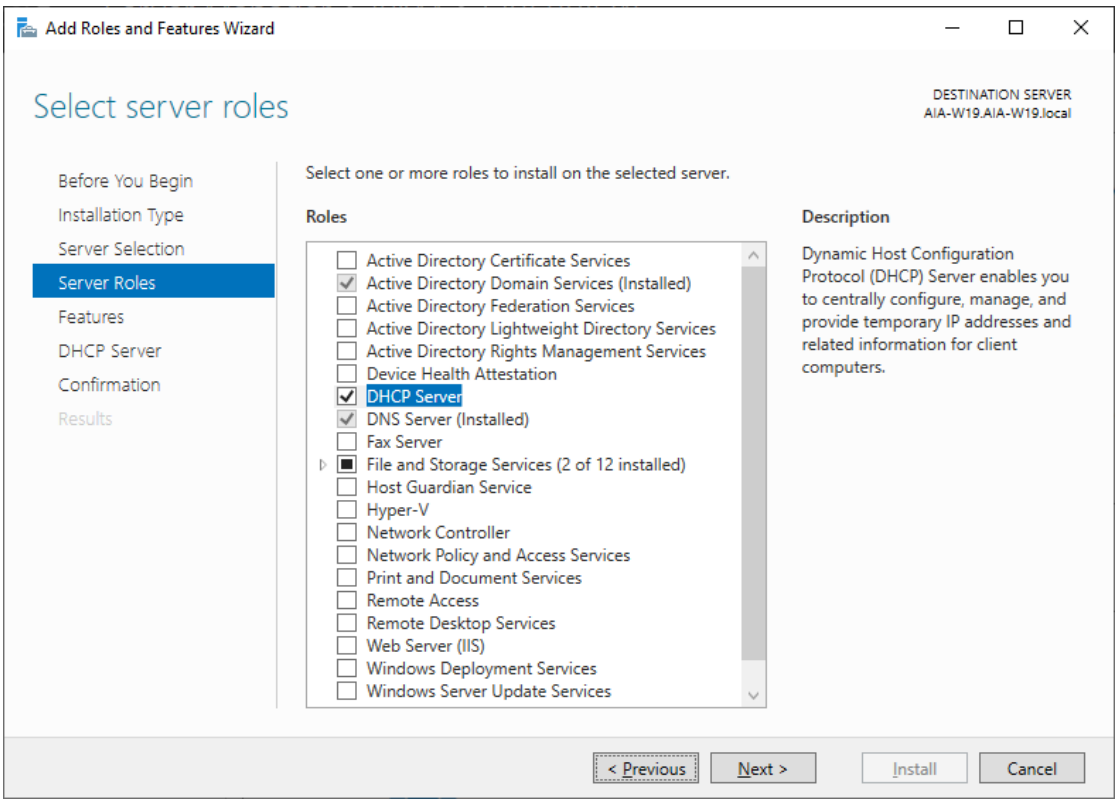
Select Role-based or feature-based installation and click the next button.



Select the server that we want to install the role on and click the next button

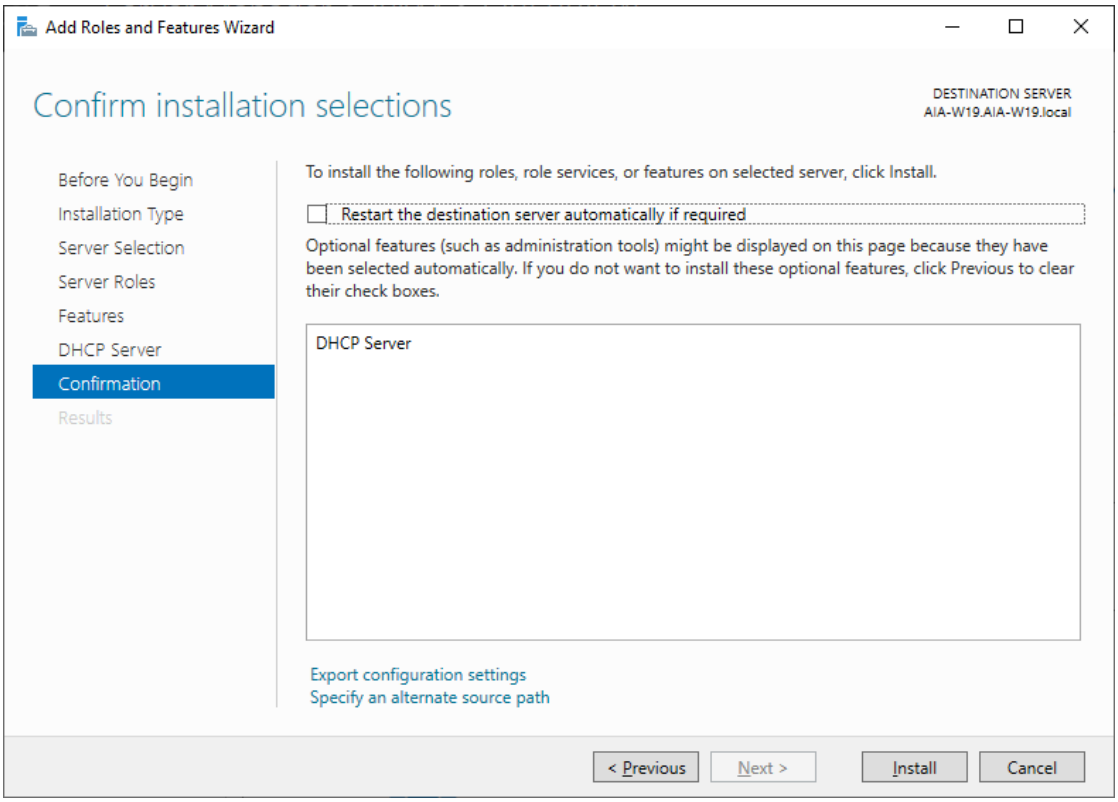


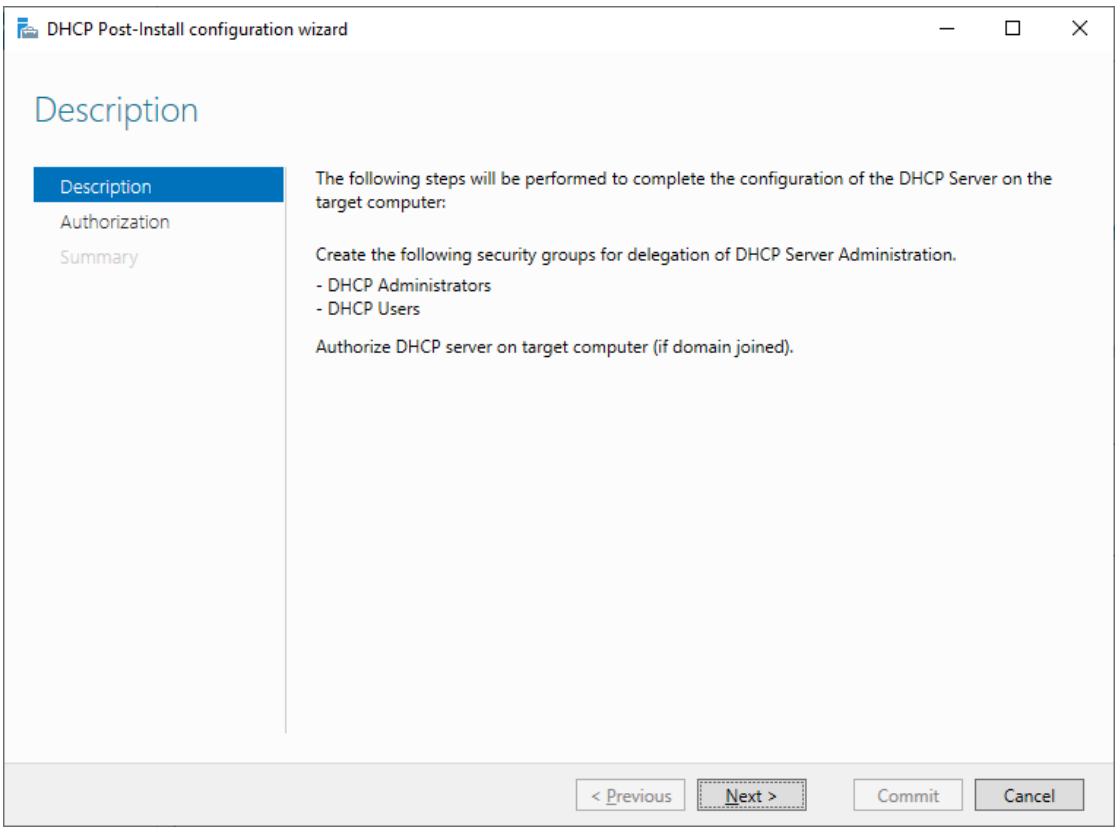
On the next screen tick Active Directory Domain Services and DHCP Server.

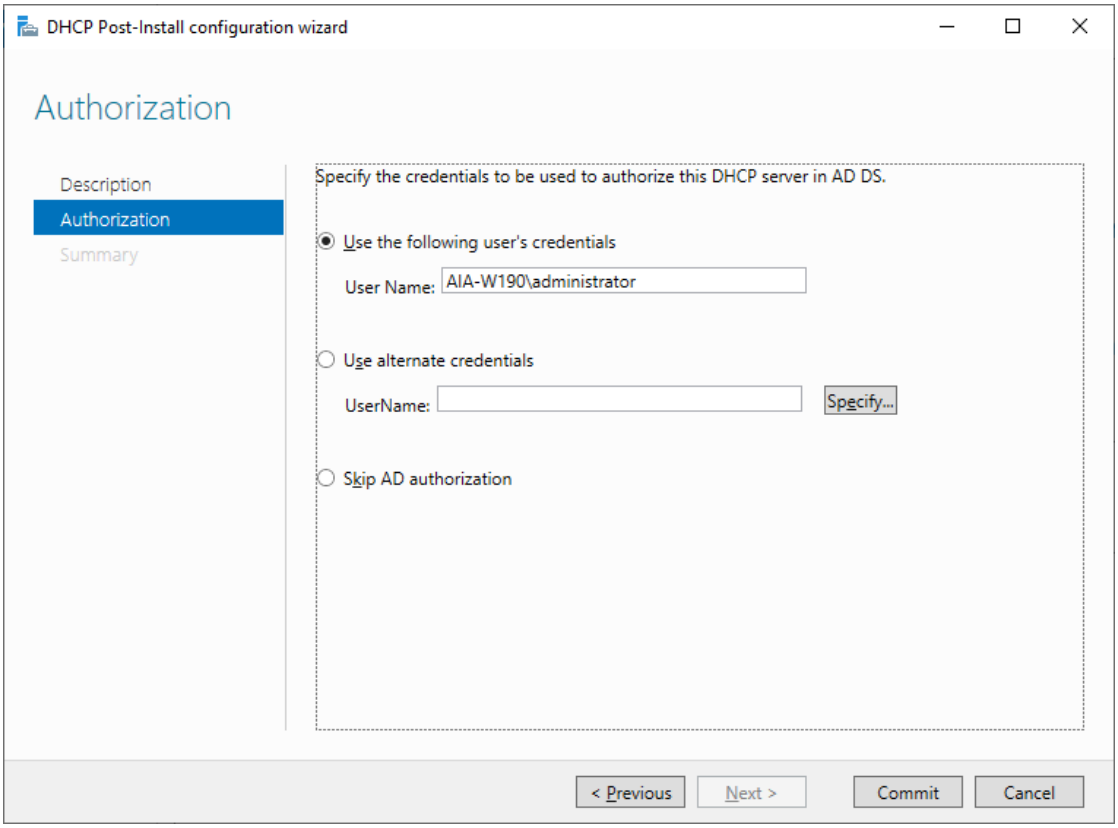


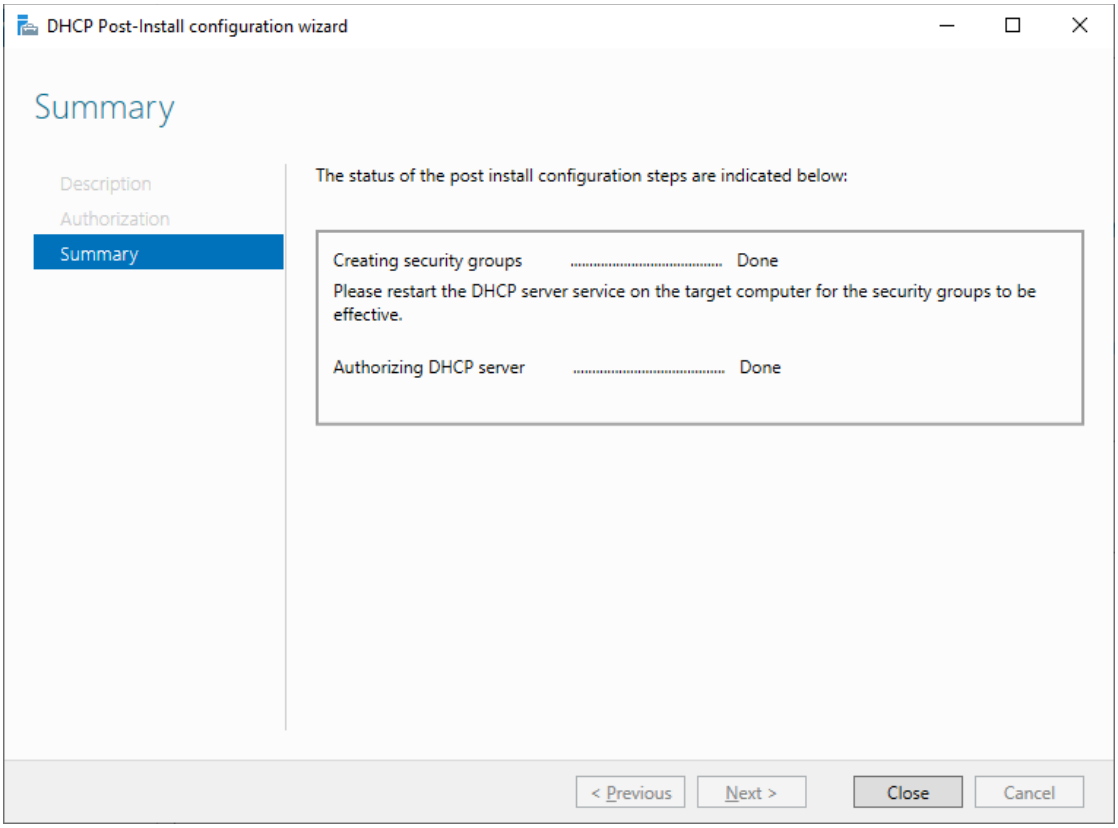
The Active Directory had installed already. On the next screens leave the default settings and select next and then install. Once the installation of DHCP and Active Directory roles is complete you will get a notification in the Server

Manager console to “Promote this server to a domain controller” and to “Complete DHCP configuration”. You can to run the “Promote this server to a domain controller” first, click on that.









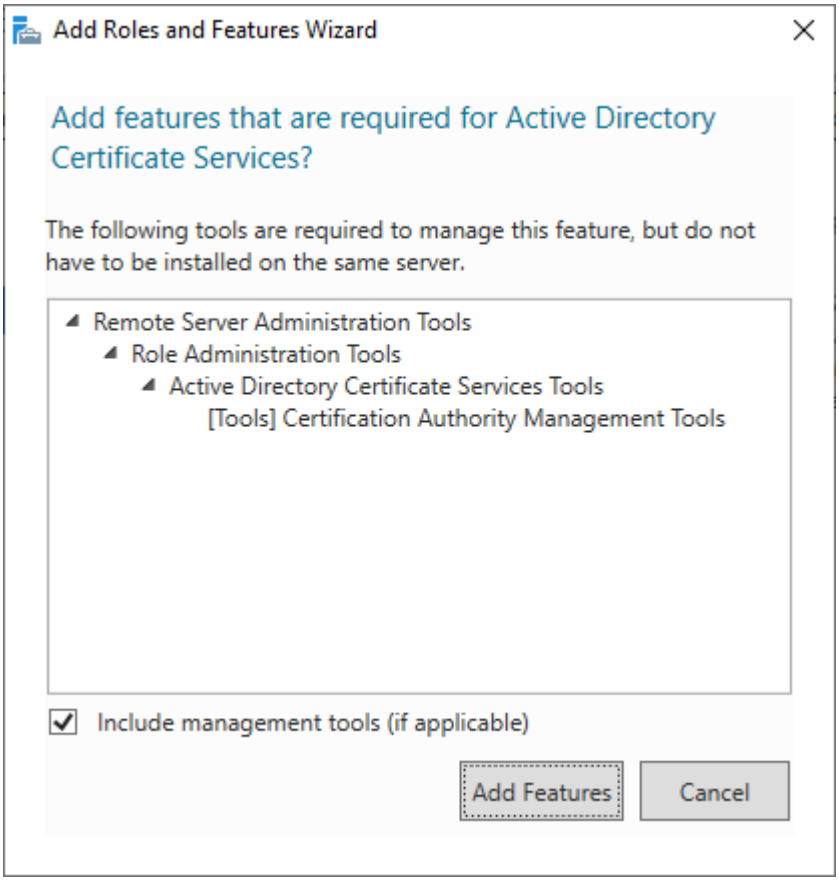
- **Smart Card authentication:**

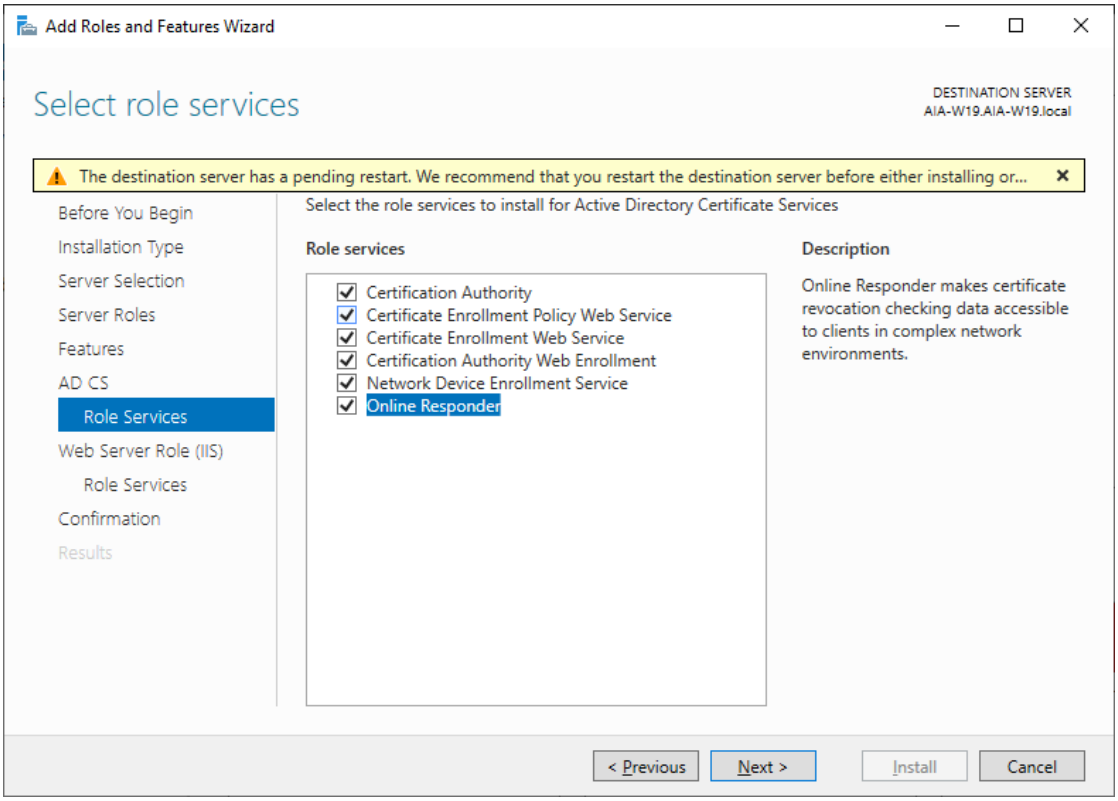
Smart cards are a key component of the public key infrastructure (PKI) that Microsoft is integrating into the Windows platform because smart cards enhance software-only solutions, such as client authentication, logon, and secure email. Smart cards are a point of convergence for public key certificates and associated keys because they:

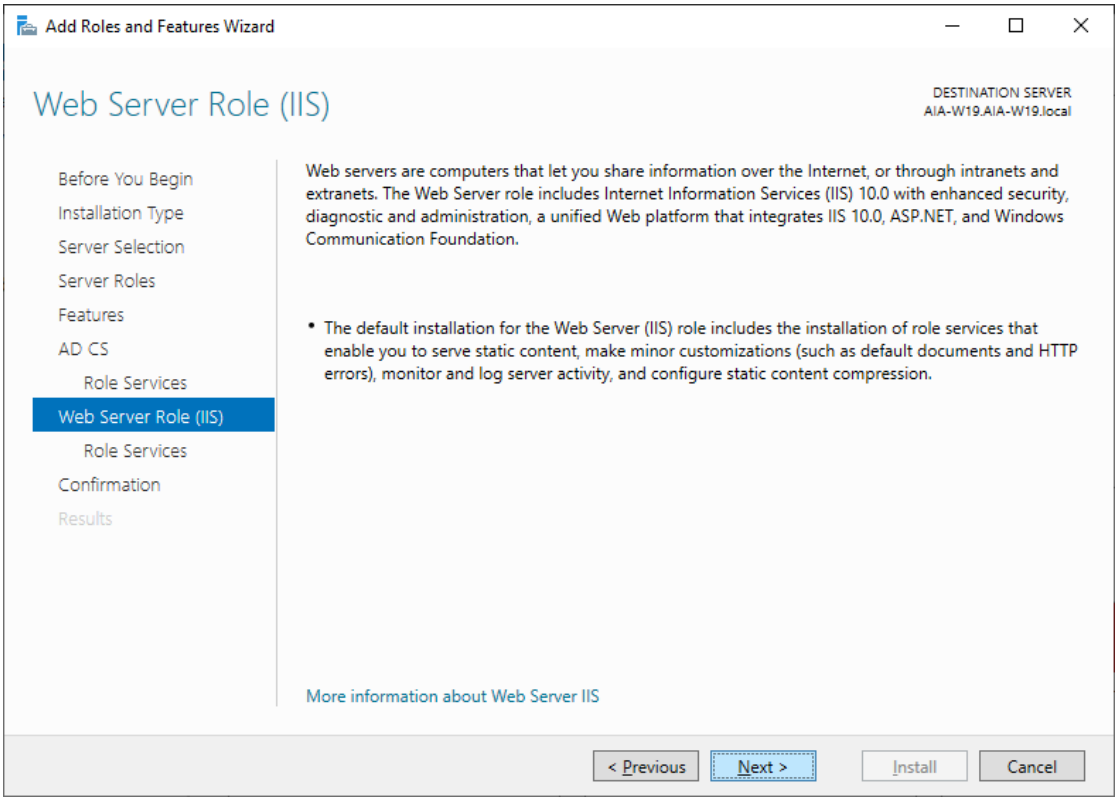
- Provide tamper-resistant storage for protecting private keys and other forms of personal information.
- Isolate security-critical computations, involving authentication, digital signatures, and key exchange from other parts of the system that don't have a need to know.
- Enable portability of credentials and other private information between computers at work, at home, or on the road.

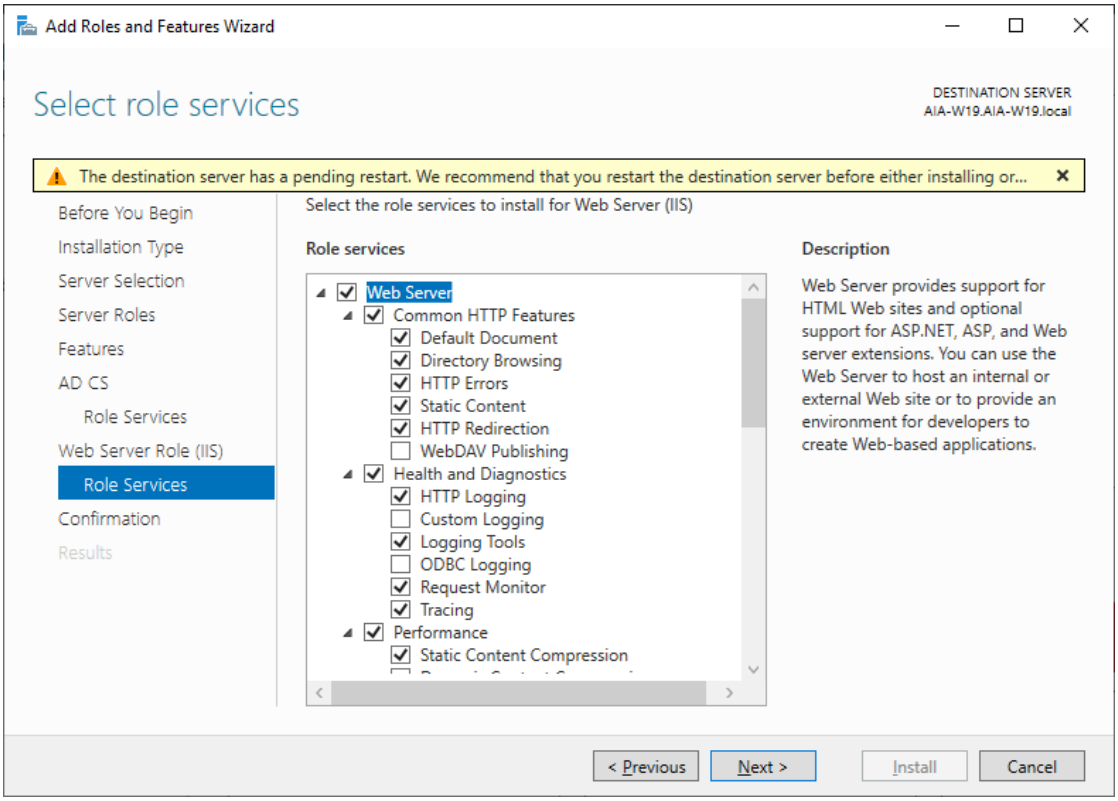
Configure Certificate Authority Templates:

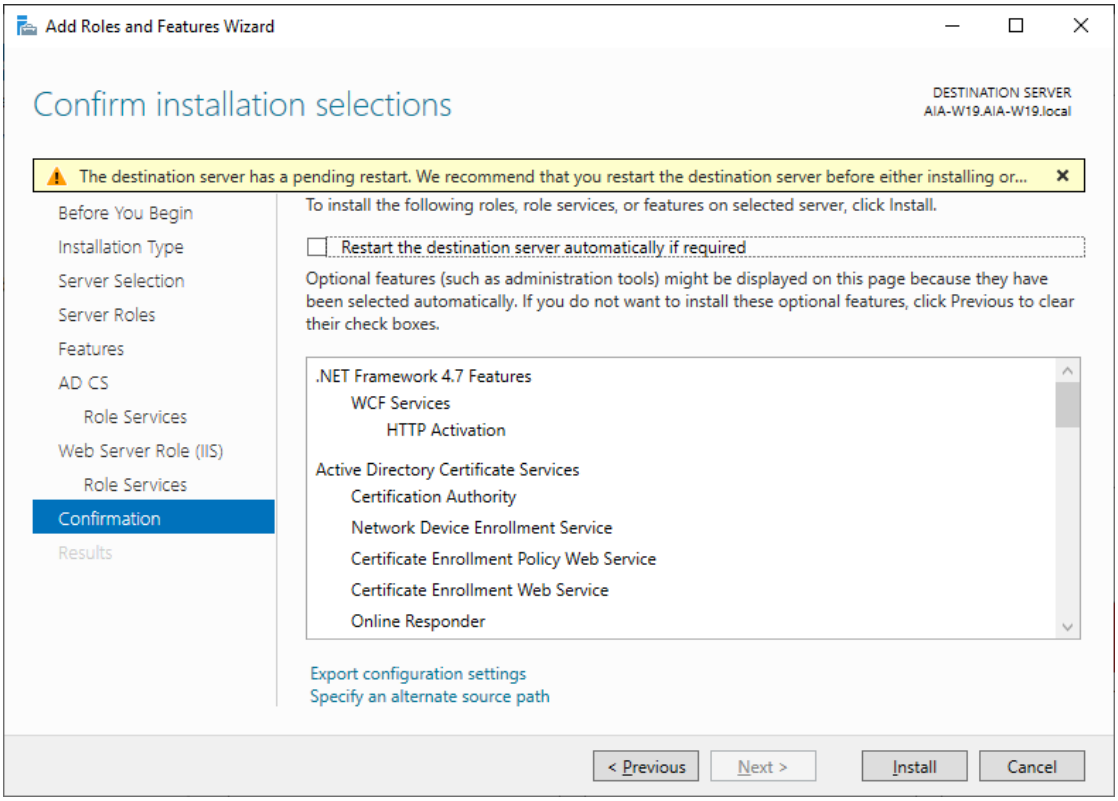
First of all we need to add Certificate Authority role and feature.

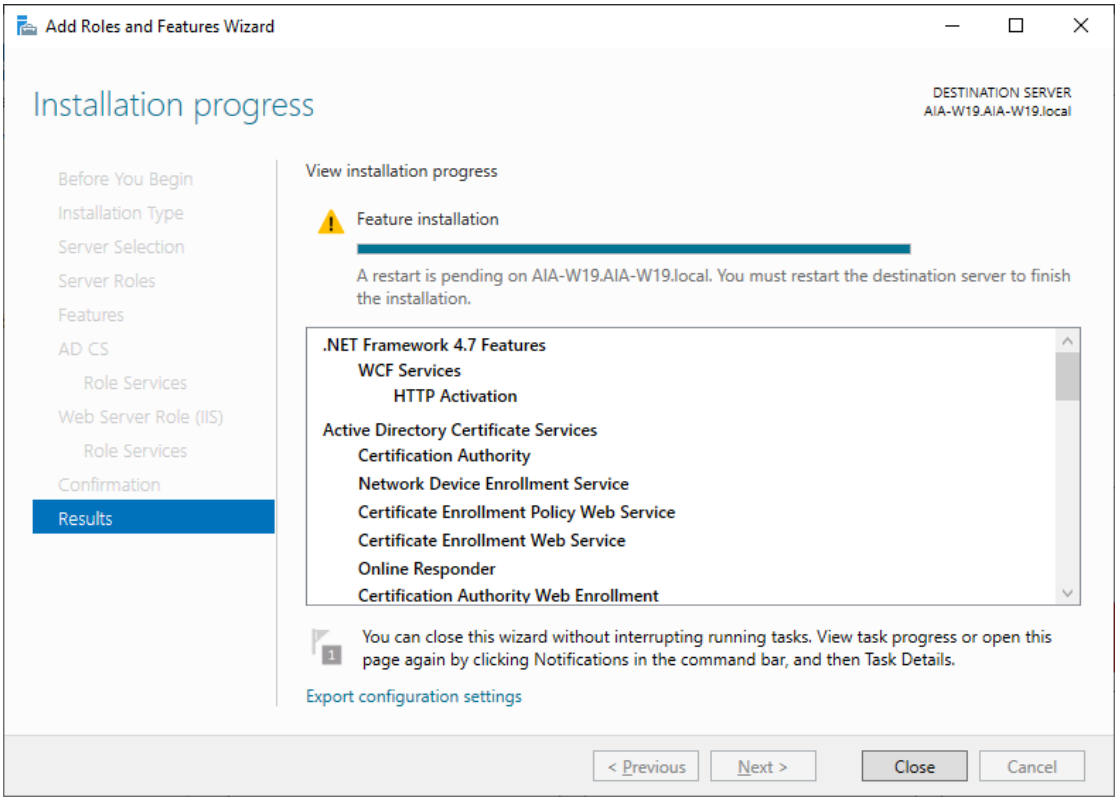



Add Roles and Features Wizard
Select role services
DESTINATION SERVER
AIA-W19.AIA-W19.local
The destination server has a pending restart. We recommend that you restart the destination server before either installing or...
Before You Begin
Installation Type
Server Selection
Server Roles
Features
AD CS
Role Services
Web Server Role (IIS)
Role Services
Confirmation
Results
Select the role services to install for Active Directory Certificate Services
Role services
Certification Authority
Certificate Enrollment Policy Web Service
Certificate Enrollment Web Service
Certification Authority Web Enrollment
Network Device Enrollment Service
Online Responder
Description
Online Responder makes certificate revocation checking data accessible to clients in complex network environments.
< Previous
Next >
Install
Cancel

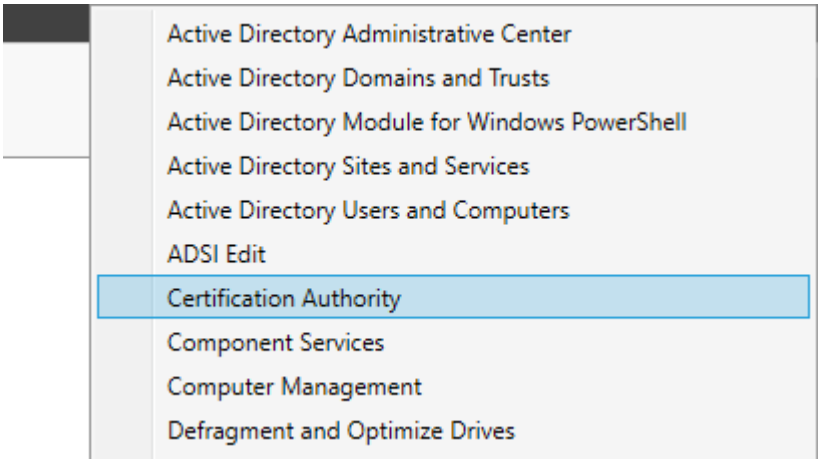

Add Roles and Features Wizard
Web Server Role (IIS)
DESTINATION SERVER
AIA-W19.AIA-W19.local
Before You Begin
Installation Type
Server Selection
Server Roles
Features
AD CS
Role Services
Web Server Role (IIS)
Role Services
Confirmation
Results
Web servers are computers that let you share information over the Internet, or through intranets and extranets. The Web Server role includes Internet Information Services (IIS) 10.0 with enhanced security, diagnostic and administration, a unified Web platform that integrates IIS 10.0, ASP.NET, and Windows Communication Foundation.
The default installation for the Web Server (IIS) role includes the installation of role services that enable you to serve static content, make minor customizations (such as default documents and HTTP errors), monitor and log server activity, and configure static content compression.
More information about Web Server IIS
< Previous
Next >
Install
Cancel


Add Roles and Features Wizard
Select role services
DESTINATION SERVER
AIA-W19.AIA-W19.local
The destination server has a pending restart. We recommend that you restart the destination server before either installing or...
Before You Begin
Installation Type
Server Selection
Server Roles
Features
AD CS
Role Services
Web Server Role (IIS)
Role Services
Confirmation
Results
Select the role services to install for Web Server (IIS)
Role services
Web Server
Common HTTP Features
Default Document
Directory Browsing
HTTP Errors
Static Content
HTTP Redirection
WebDAV Publishing
Health and Diagnostics
HTTP Logging
Custom Logging
Logging Tools
ODBC Logging
Request Monitor
Tracing
Performance
Static Content Compression
Description
Web Server provides support for HTML Web sites and optional support for ASP.NET, ASP, and Web server extensions. You can use the Web Server to host an internal or external Web site or to provide an environment for developers to create Web-based applications.
< Previous
Next >
Install
Cancel

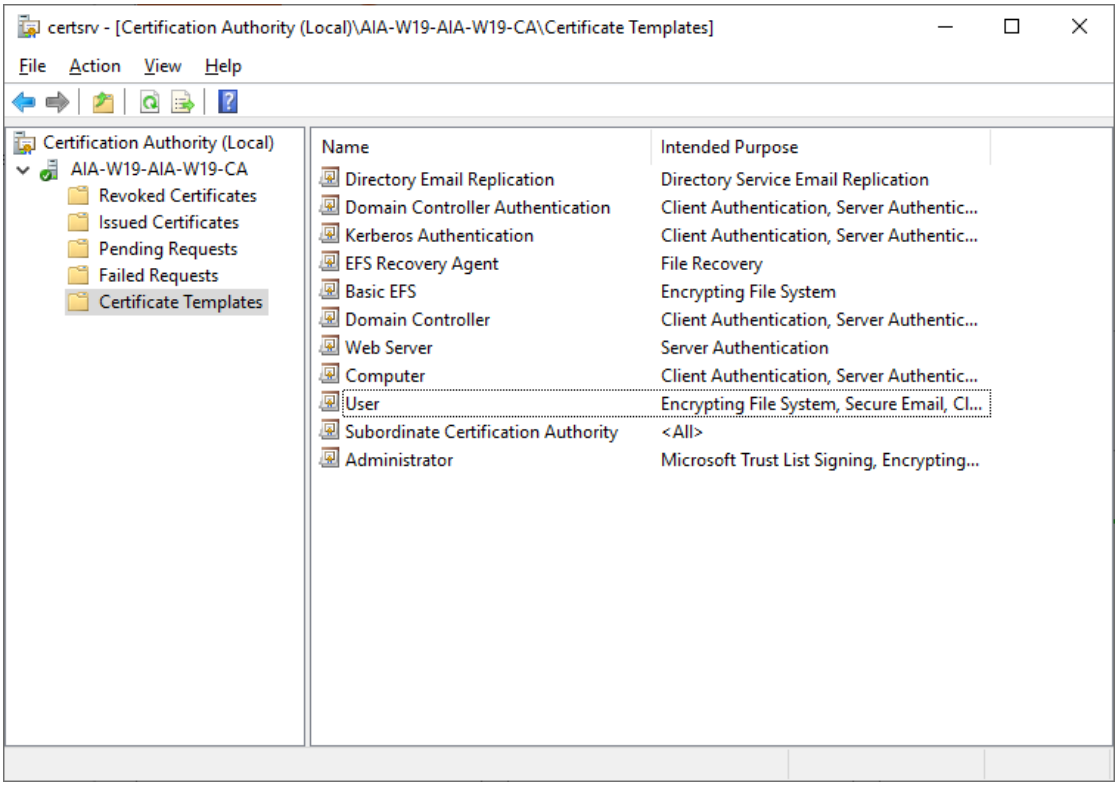

Add Roles and Features Wizard
Confirm installation selections
DESTINATION SERVER
AIA-W19.AIA-W19.local
The destination server has a pending restart. We recommend that you restart the destination server before either installing or...
Before You Begin
Installation Type
Server Selection
Server Roles
Features
AD CS
Role Services
Web Server Role (IIS)
Role Services
Confirmation
Results
To install the following roles, role services, or features on selected server, click Install.
Restart the destination server automatically if required
Optional features (such as administration tools) might be displayed on this page because they have been selected automatically. If you do not want to install these optional features, click Previous to clear their check boxes.
.NET Framework 4.7 Features
WCF Services
HTTP Activation
Active Directory Certificate Services
Certification Authority
Network Device Enrollment Service
Certificate Enrollment Policy Web Service
Certificate Enrollment Web Service
Online Responder
Export configuration settings
Specify an alternate source path
< Previous
Next >
Install
Cancel



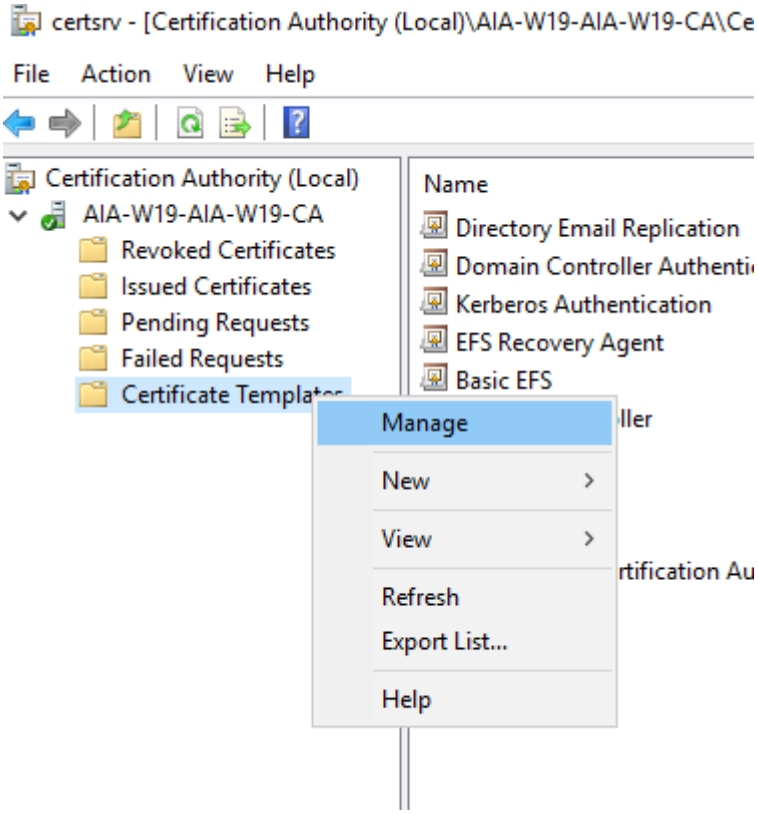
In the Server Manager, choose Tools, then Certification Authority.



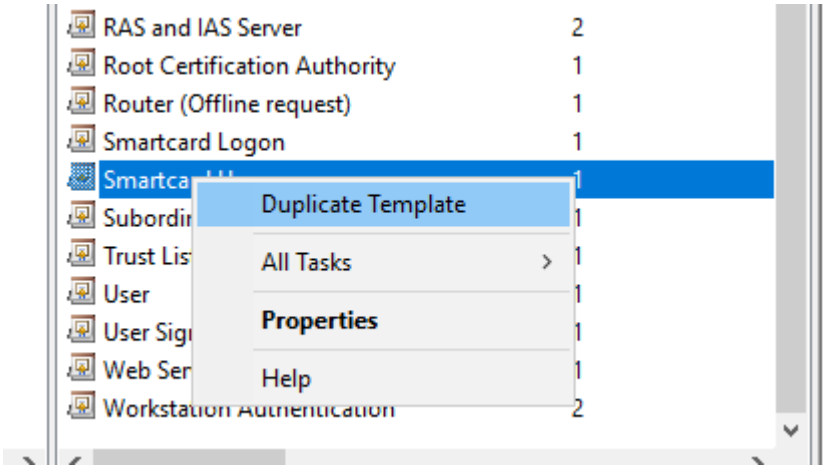
Expand the server name to reveal Certificate Folders.



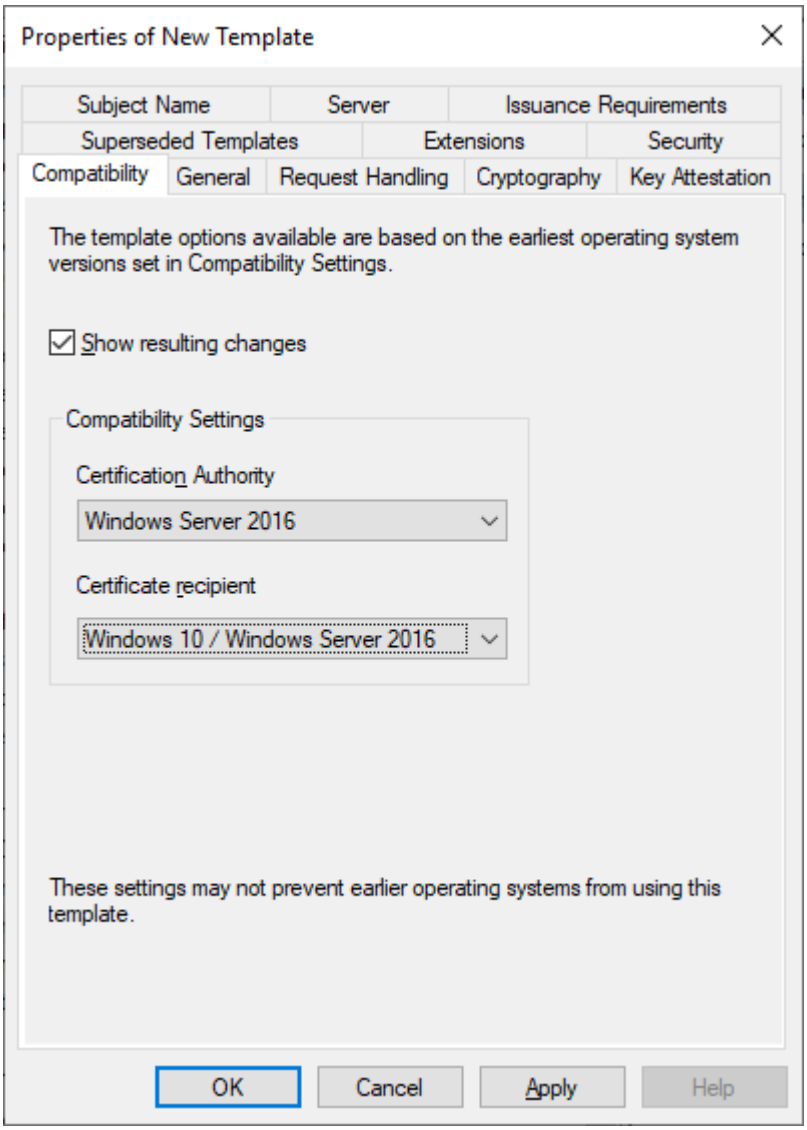
Right click the Certificate Templates folder and choose Manage.



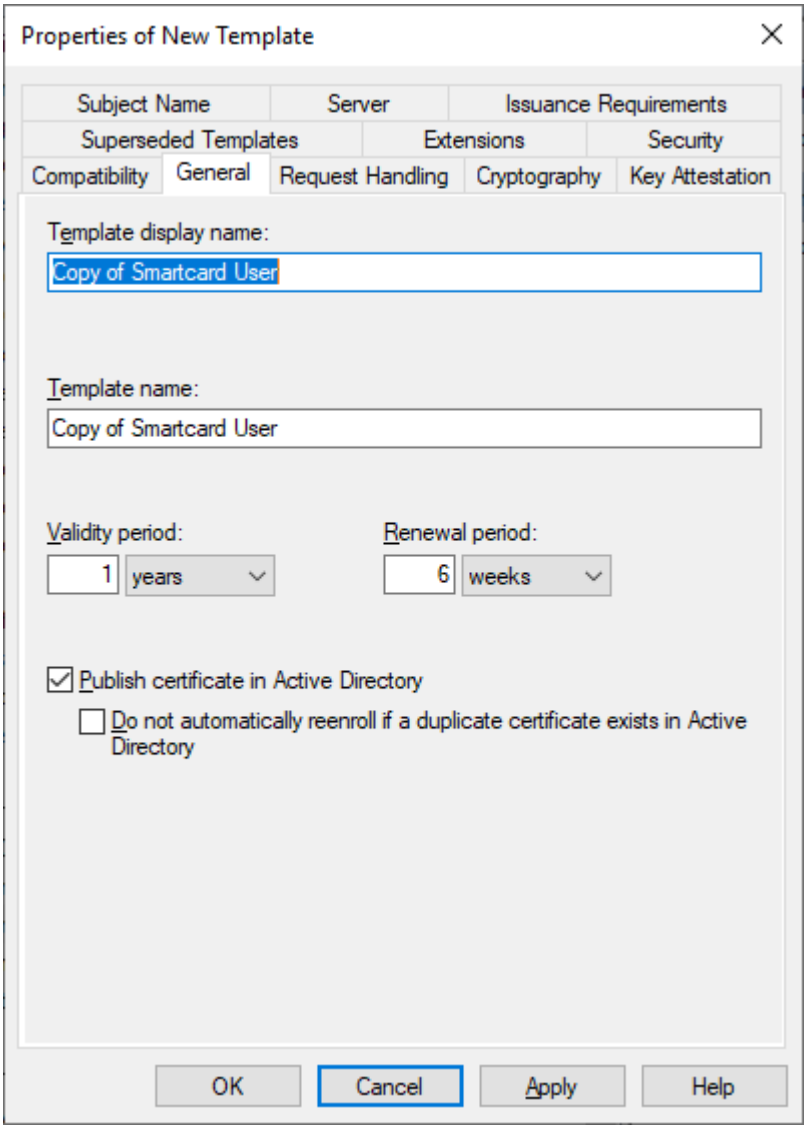
A new window opens with a list of templates in the middle pane. Right click the Smart Card User template and select Duplicate Template. The Smart Card User template is a general use template that enables computer logon, as well as signing and encryption. If only smart card logon is needed, we can instead select the “Smart Card Logon” template.



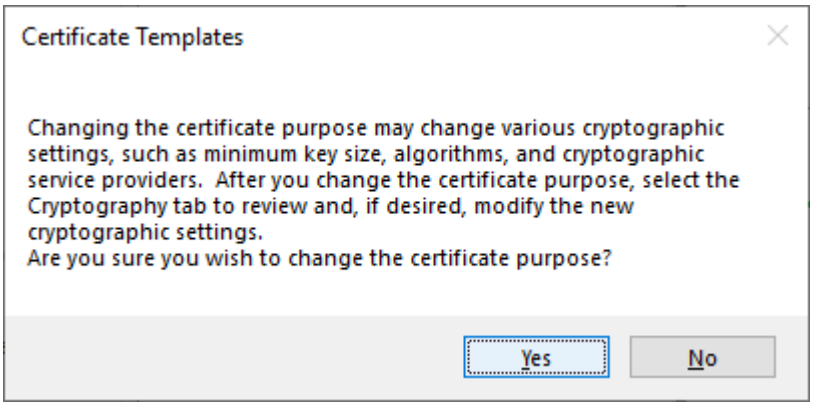
Next, adjust the properties of the new template. Under the Compatibility tab, Windows Server 2016 settings .



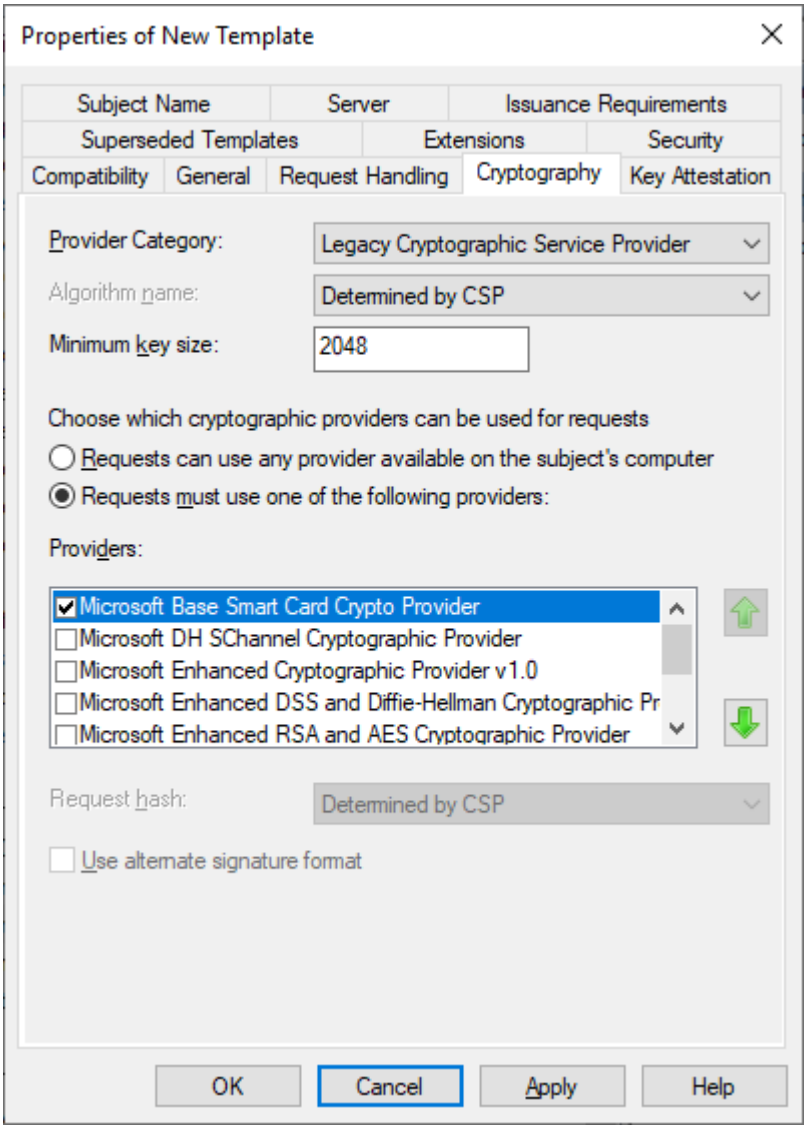
Under the General tab, rename the template.



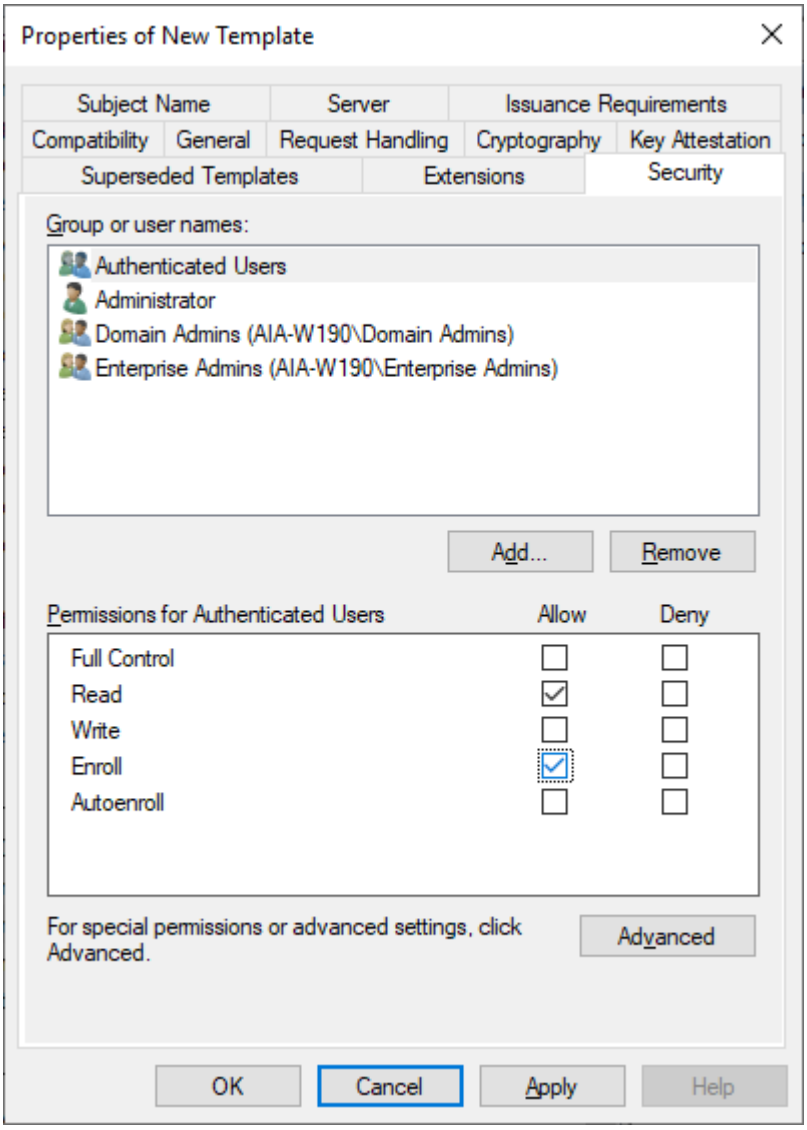
Under the Request Handling tab, select Purpose: "Signature and smartcard logon".



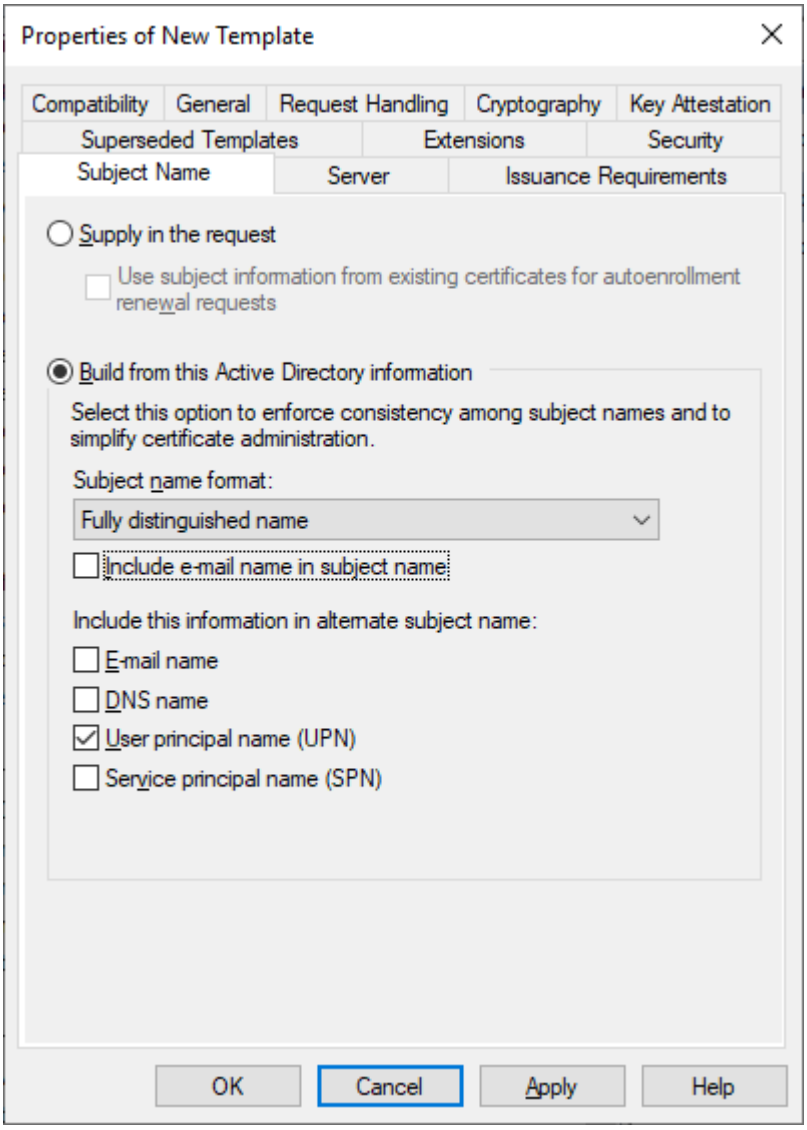
Under the Cryptography tab, change the minimum key size to 2048, select "Requests must use one of the following providers", and check Microsoft Base Smart Card Crypto Provider. This will ensure that the smart card is used for storing the certificate and keys.



Under the Security tab, be sure the Enroll ability is set for the group or users who will be setting up the smart cards for logon (use the Add button to add groups or individual users).

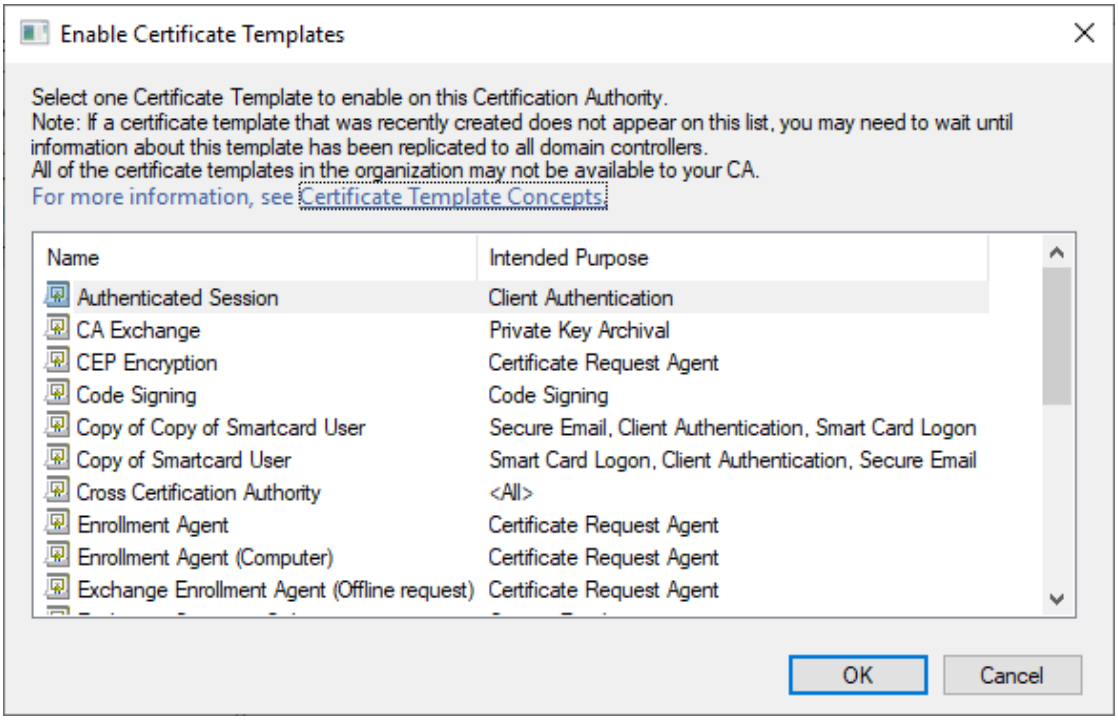


f the users do not have email addresses in their User Properties, **and if you will not be using these certificates to sign emails**, under the Subject Name tab, deselect "Include e-mail name in subject name" and "E-mail name"



Click OK to save the template. Close that window.

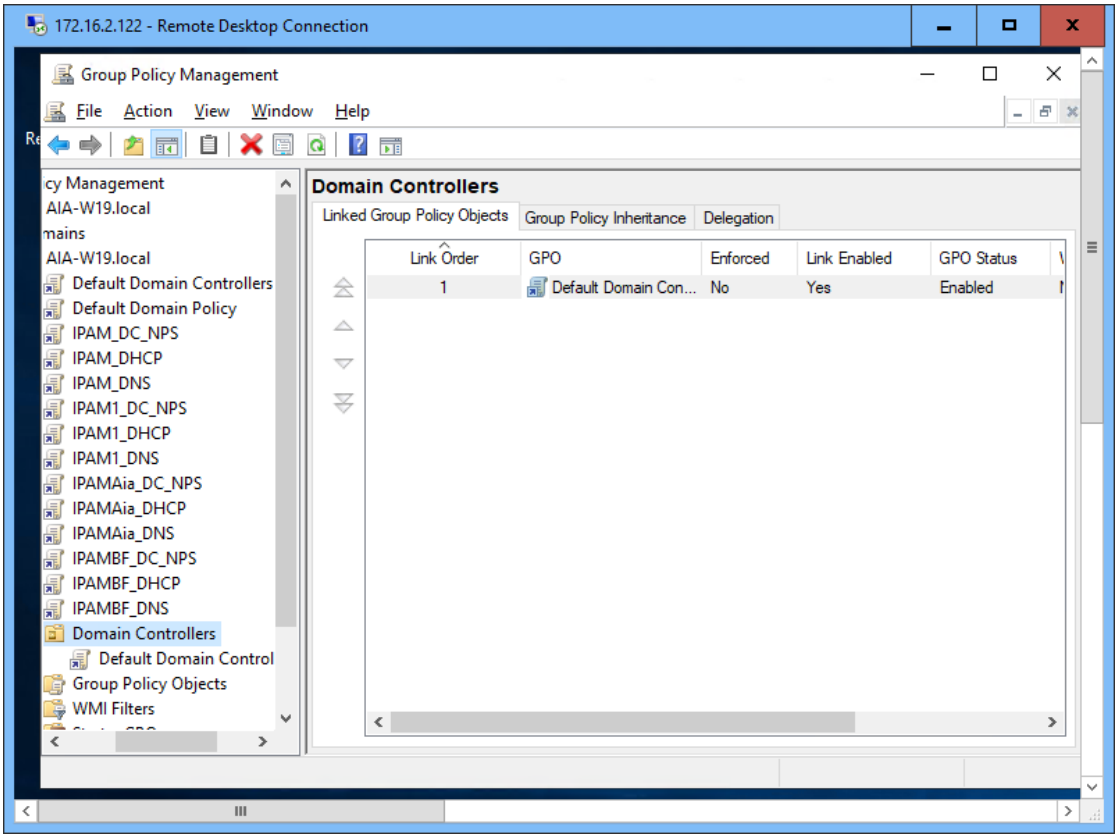
The Certificates Template folder contains all the templates assigned to the CA. Some templates are assigned to the CA by default, the new template needs to be issued to be added to the Certification Authority templates. Right click the Certificate Templates folder, choose New, then Certificate Template to Issue.



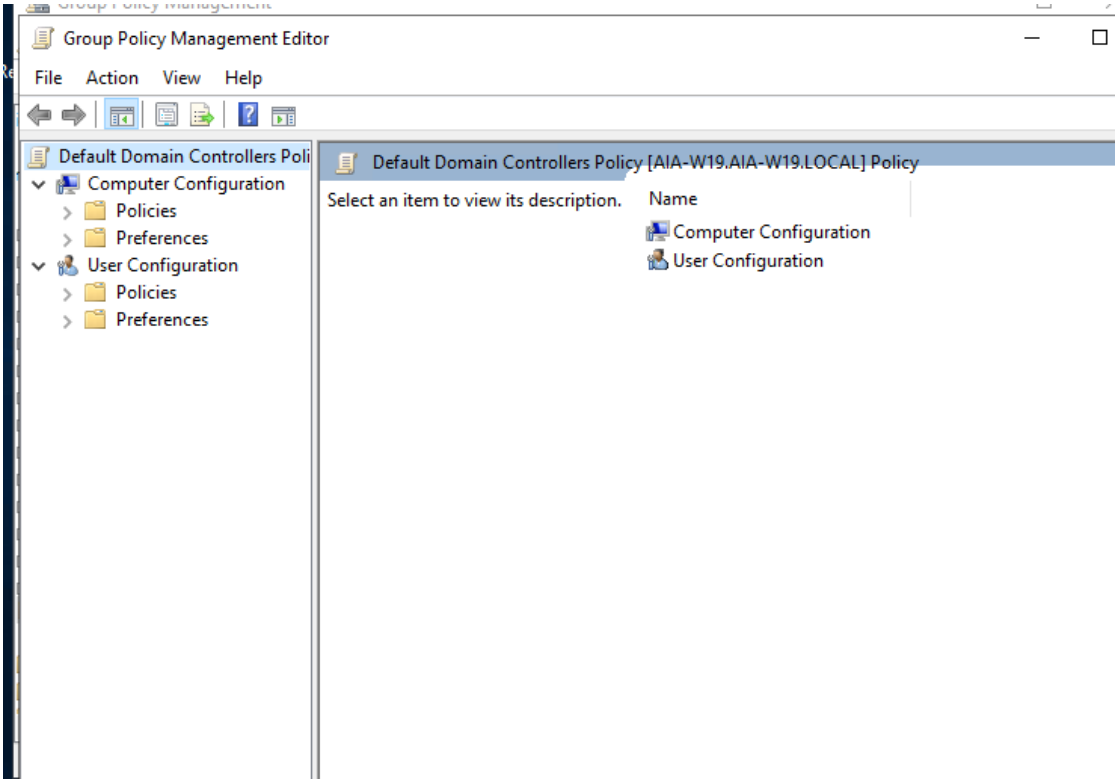
- **Dynamic access control: File shares, Reimagined:**

Dynamic Access Control integrates claims into Windows authentication so that users and devices can be described not only by the security groups they belong to, but also by claims such as users in different sections.
Claims are Active Directory attributes defined to be used with Central Access Policies. The claims can be set for both users and devices. Microsoft added a new container to the Active Directory Administrative Center to implement this new feature.

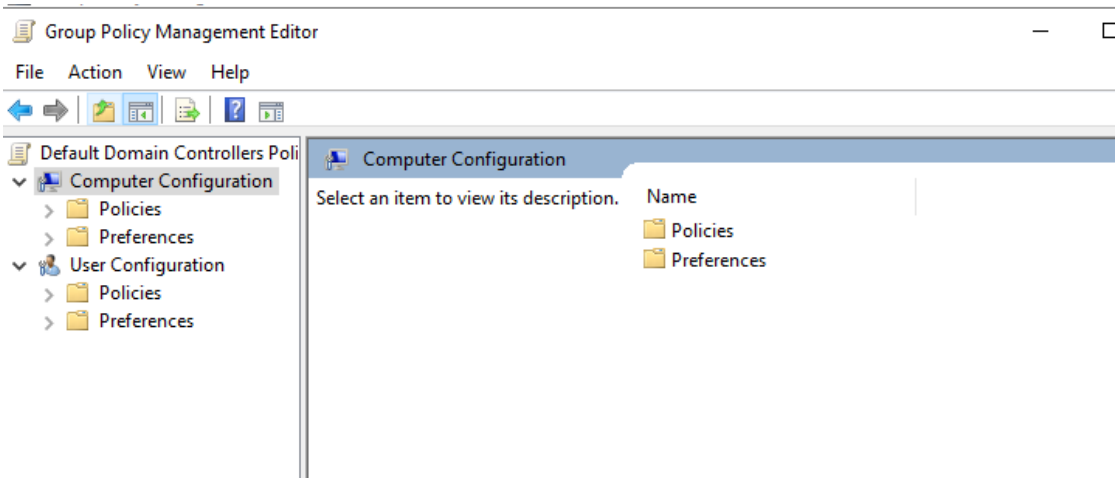
Open the Group Policy Management Console, click **ITCamp.Local**, and then double-click **Domain Controllers**.

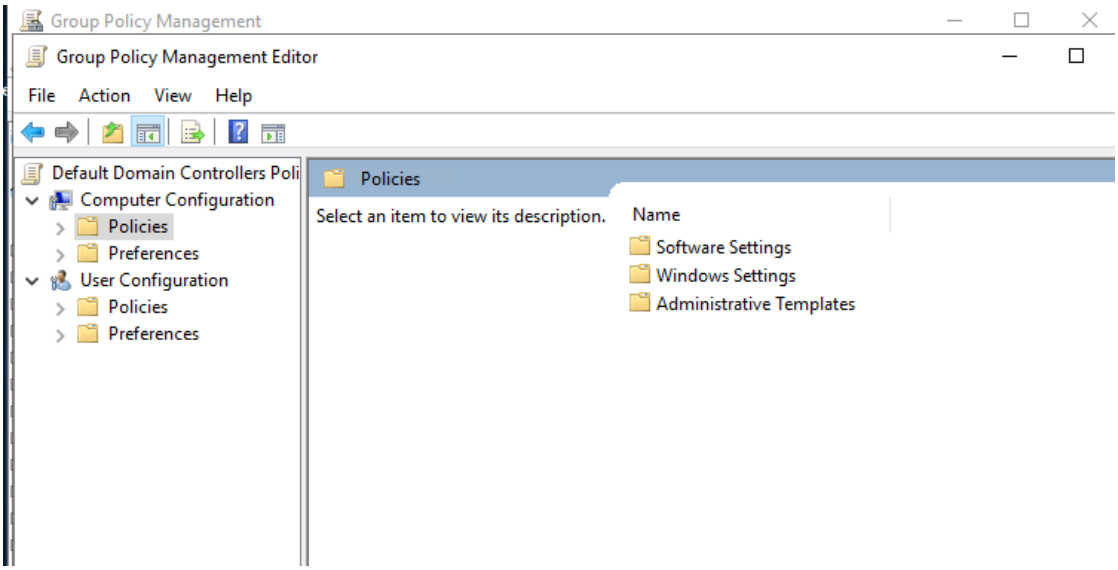


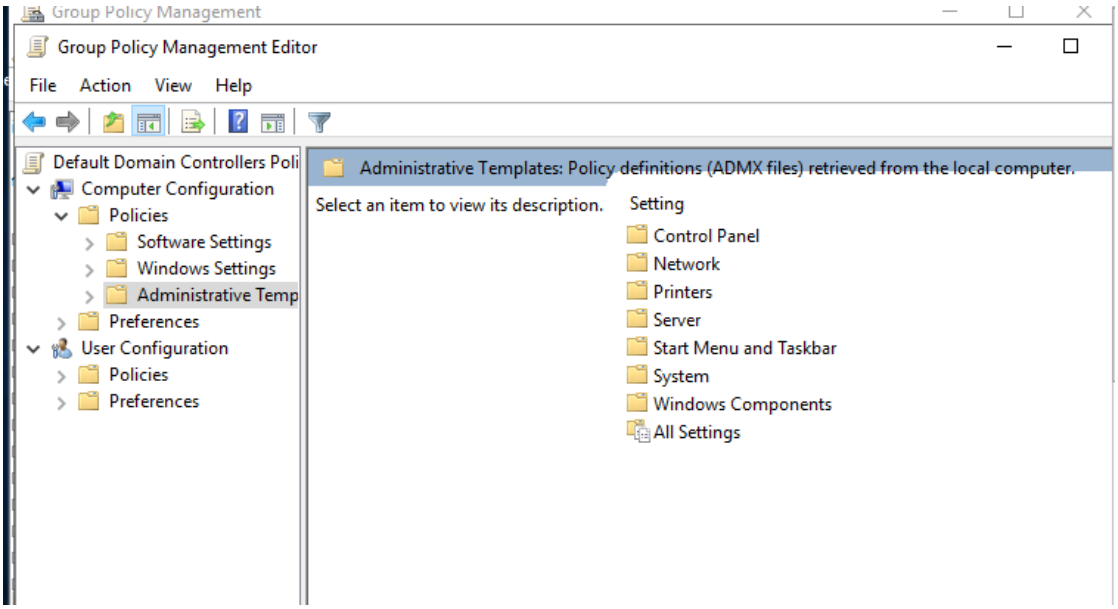
Right-click **Default Domain Controllers Policy**, and select **Edit**.

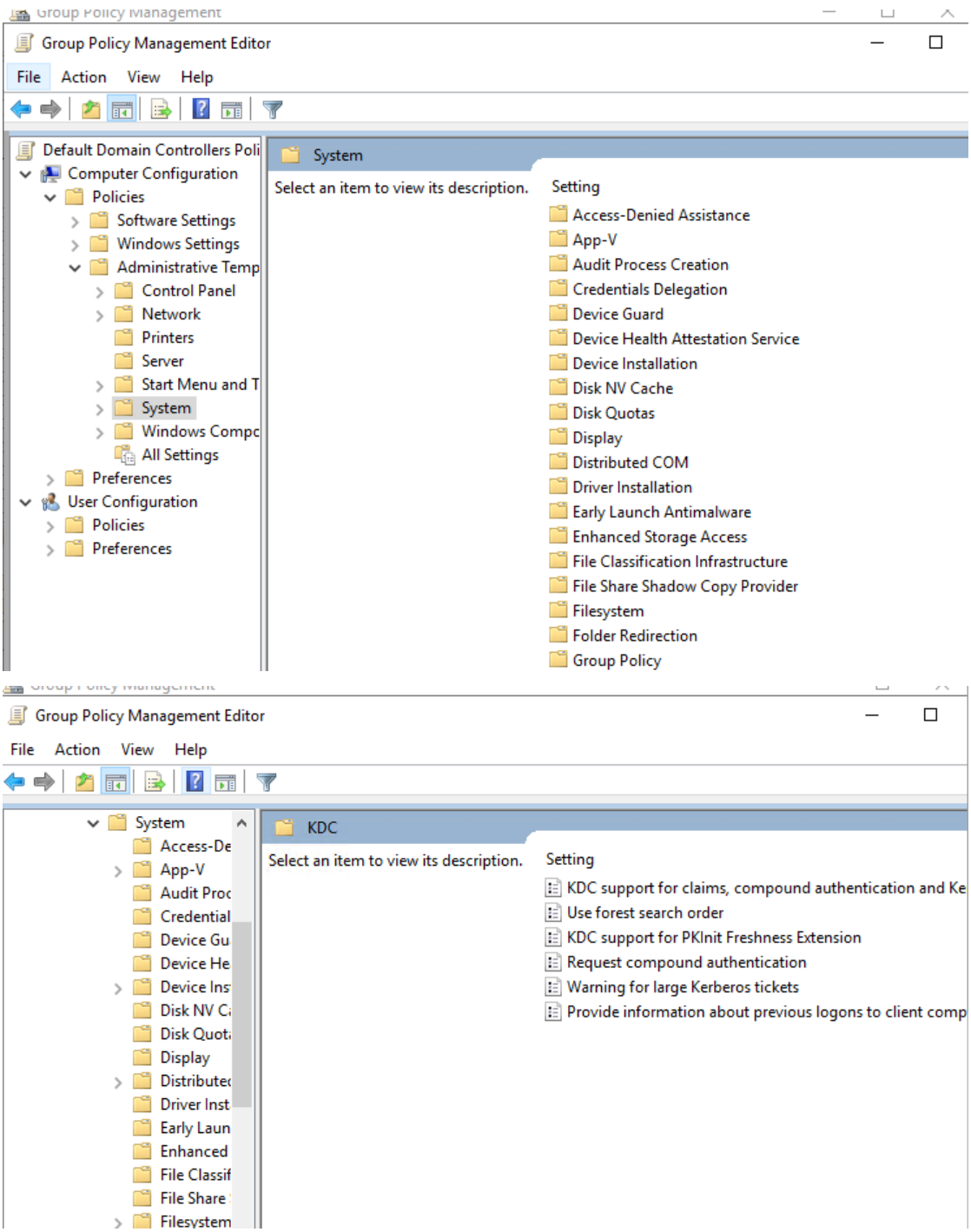


In the Group Policy Management Editor window, double-click **Computer Configuration**, double-click **Policies**, double-click **Administrative Templates**, double-click **System**, and then double-click **KDC**.

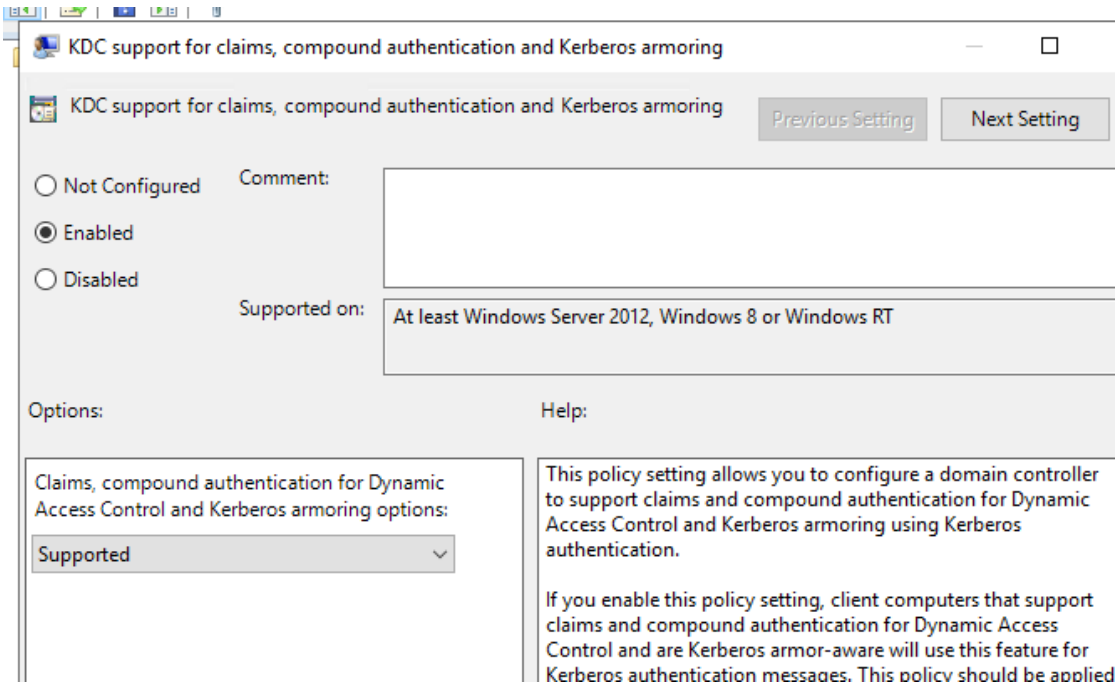

Group Policy Management Editor
File Action View Help
Default Domain Controllers Poli
Computer Configuration
Policies
Preferences
User Configuration
Policies
Preferences
Computer Configuration
Select an item to view its description.
Name
Policies
Preferences


Group Policy Management
Group Policy Management Editor
File Action View Help
Default Domain Controllers Poli
Computer Configuration
Policies
Preferences
User Configuration
Policies
Preferences
Policies
Select an item to view its description.
Name
Software Settings
Windows Settings
Administrative Templates


Group Policy Management
Group Policy Management Editor
File Action View Help
Default Domain Controllers Poli
Computer Configuration
Policies
Software Settings
Windows Settings
Administrative Temp
Preferences
User Configuration
Policies
Preferences
Administrative Templates: Policy definitions (ADMX files) retrieved from the local computer.
Select an item to view its description.
Setting
Control Panel
Network
Printers
Server
Start Menu and Taskbar
System
Windows Components
All Settings

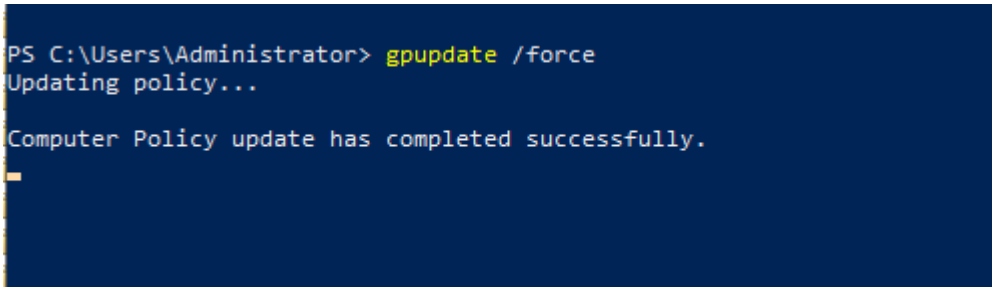


Double-click **KDC support for claims, compound authentication, and Kerberos armoring** and select the option next to **Enabled**. You need to enable this setting to use Central Access Policies.



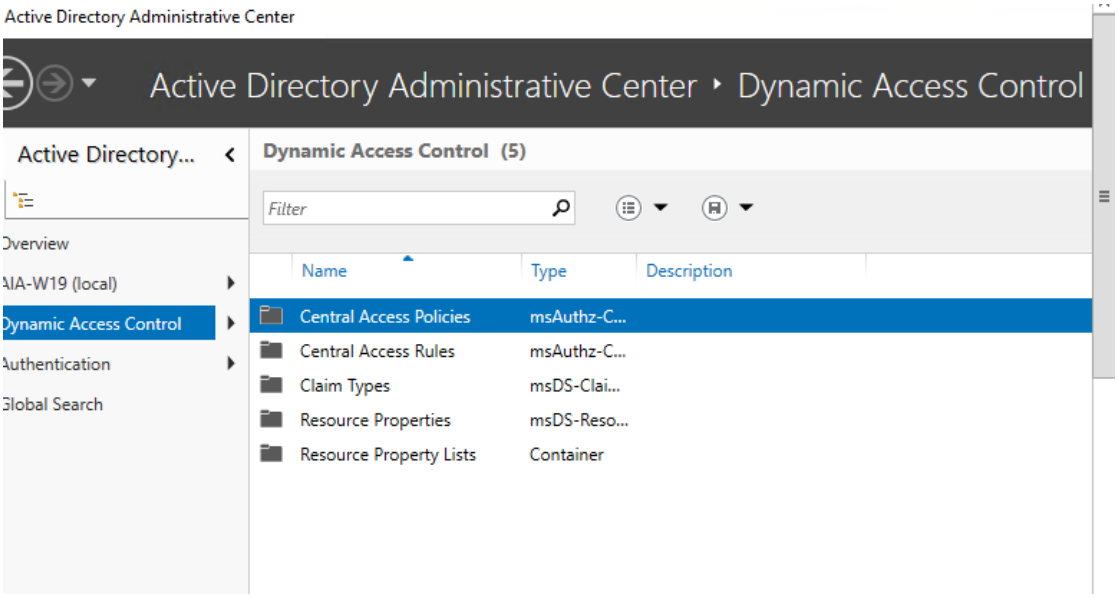
Open an elevated command prompt, and run the following command:

```
gpupdate /force
```

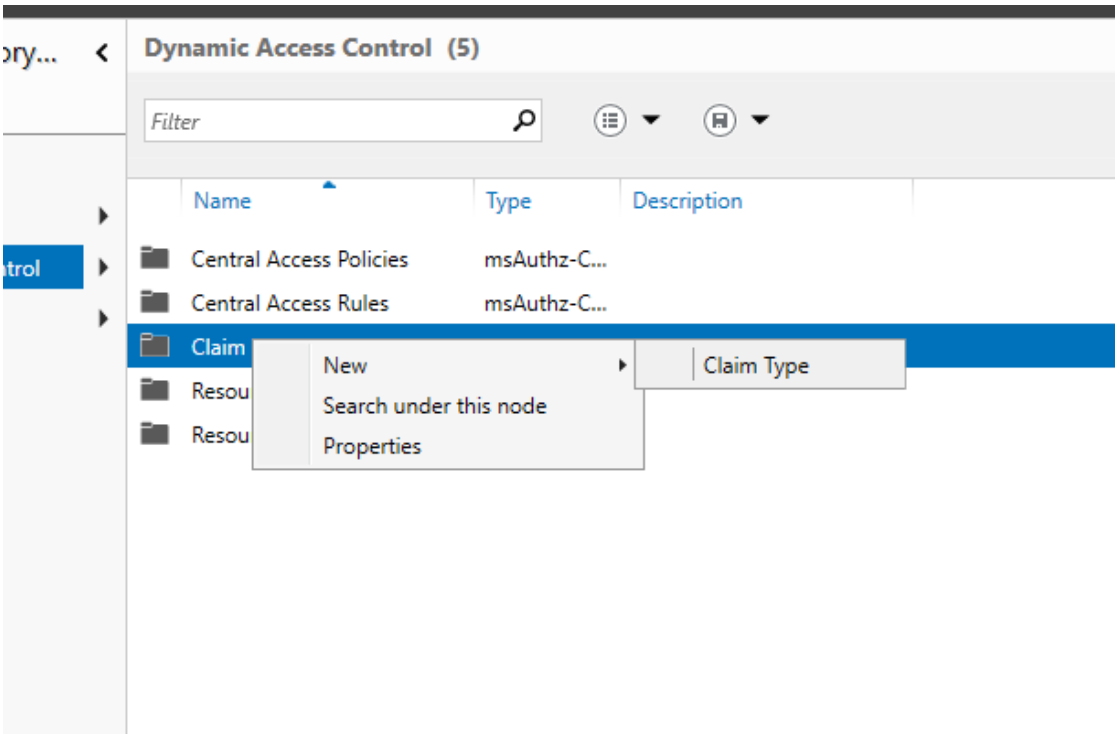


Now we will configure the Claim Type for Users. We will add existing Active Directory attributes to the list of attributes that we can use when evaluating dynamic access control.

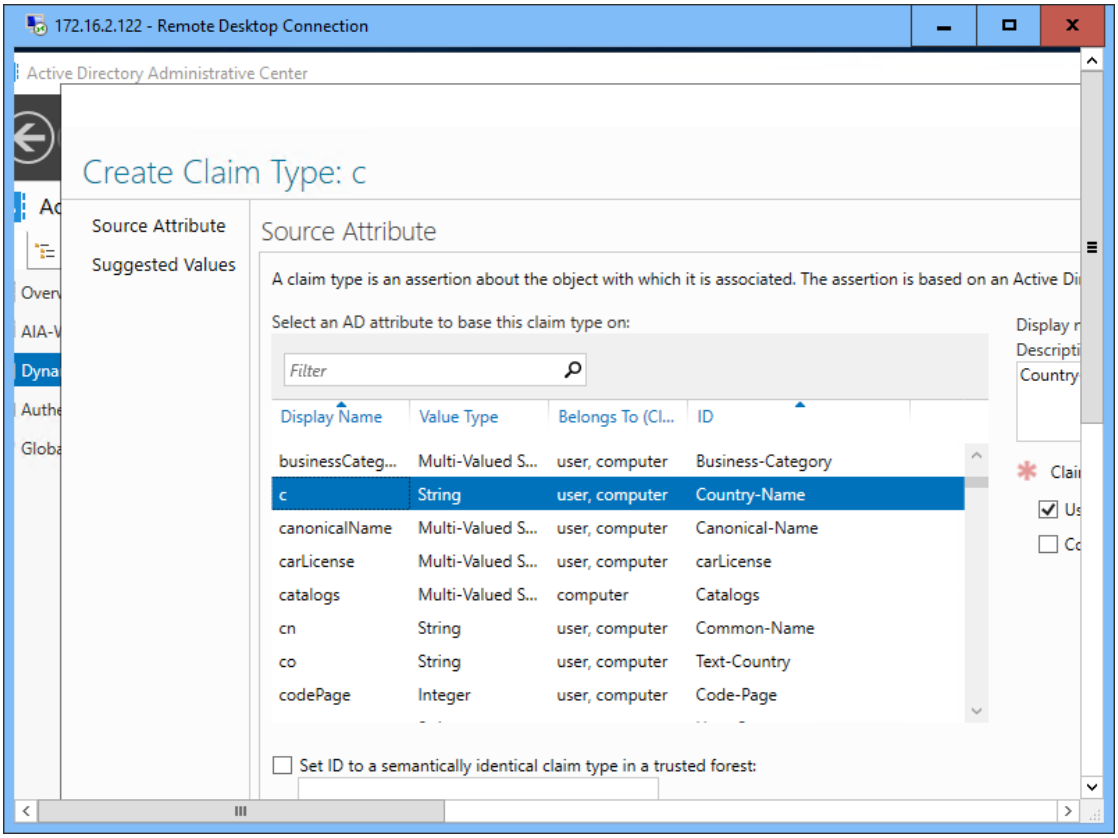
Open the **Active Directory Administrative Center** to start configuring the Dynamic Access Policy (DAP).



In the Claim Type Section, click "**New**" and "**Claim Type**" in the task pane

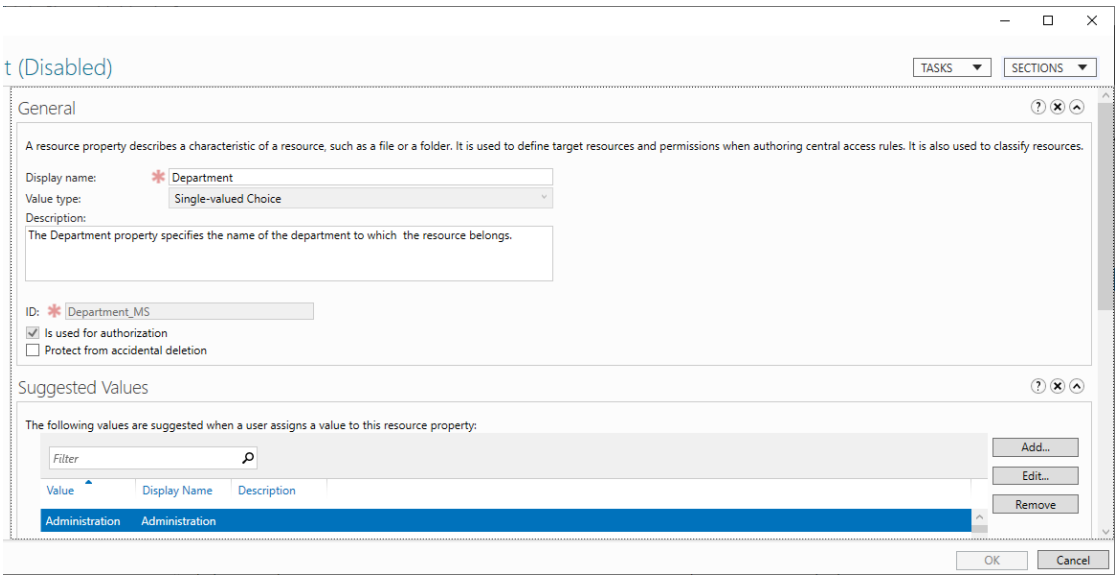


Select the attribute we want to use.

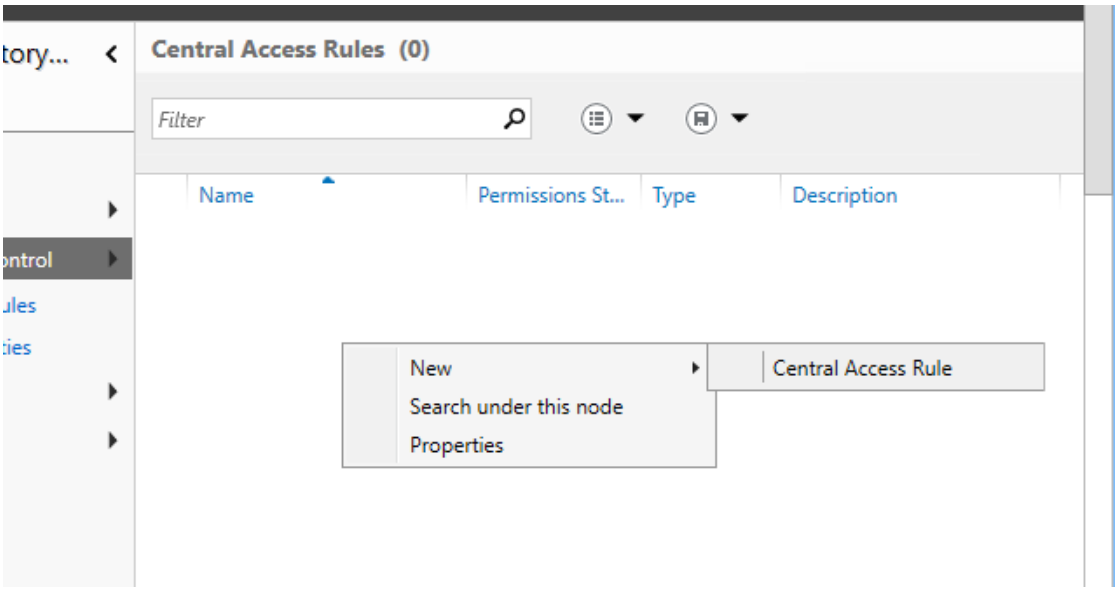


In this step, we will configure the properties which will be downloaded by file servers and used to classify files or directories or shares. The DAC rules will compare user attribute values with resource properties. We can enable existing properties or create new ones.

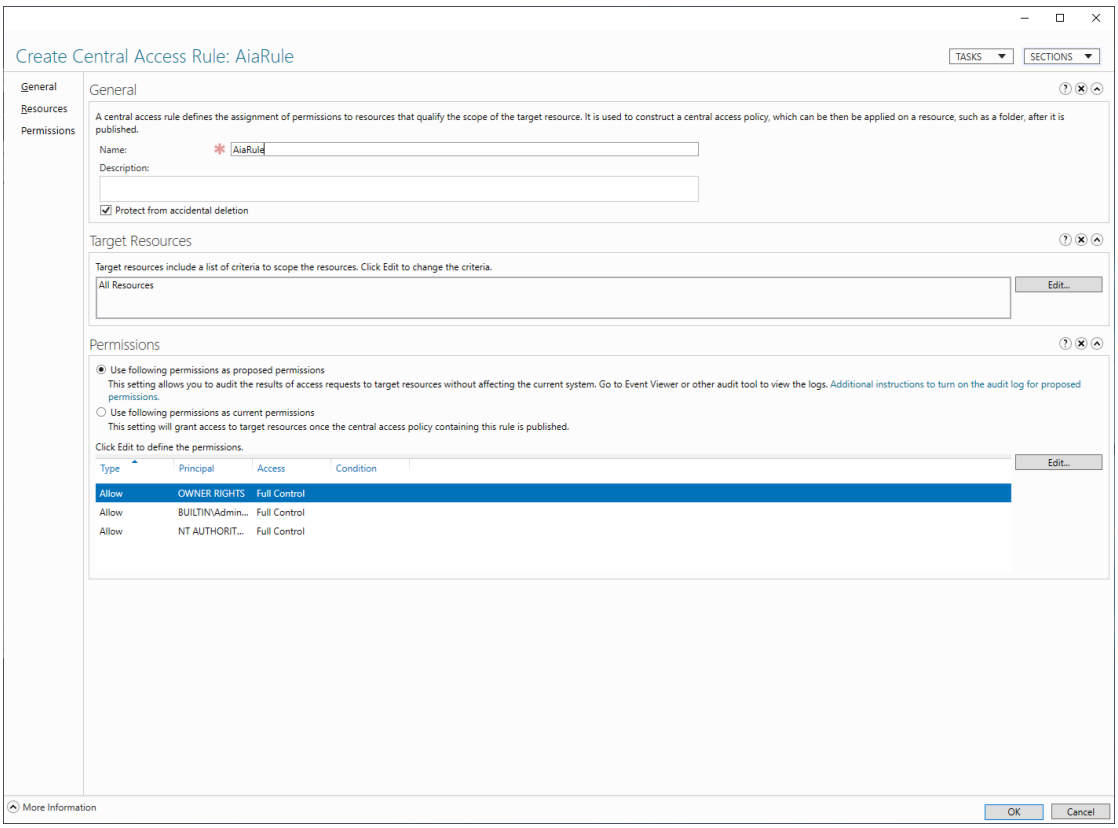
Click on resource property and here you can select the existing resource properties or also you can create the new ones, I have selected Department.



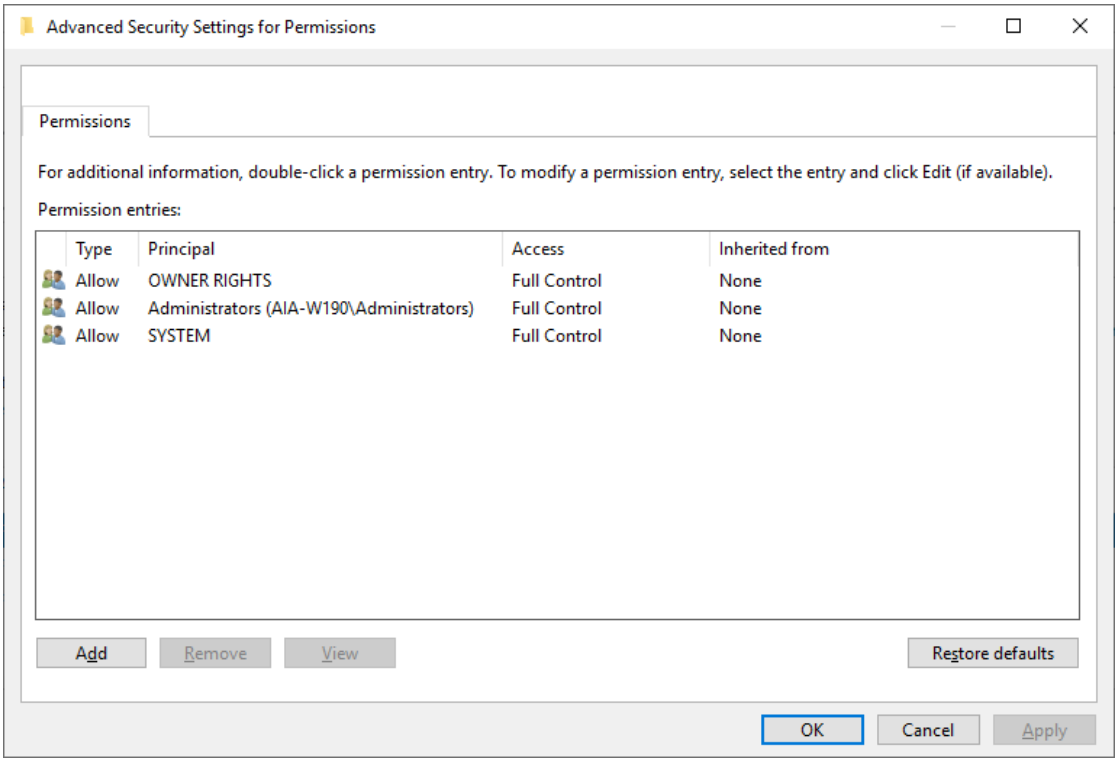
In the Central Access Rule section, click "New" and "Central Access Rule"



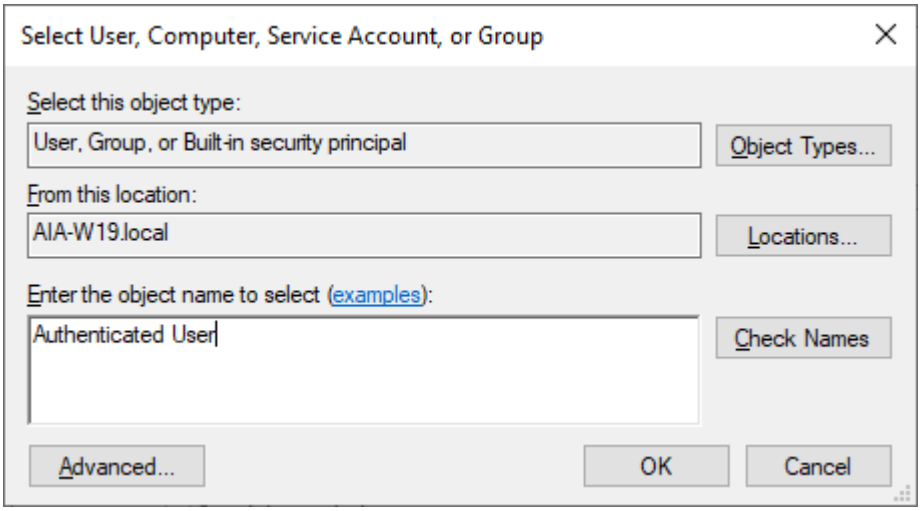
Give it a name in the Create Central Access Rule form.

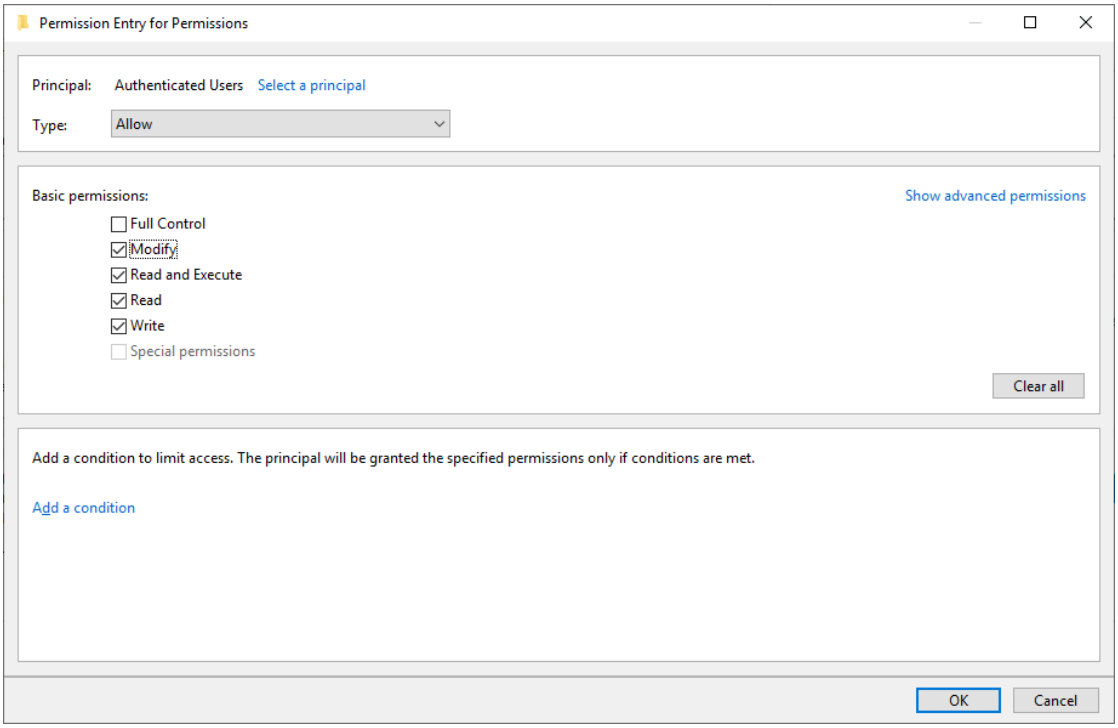


In the Permission section, click "Use Following Permissions" and click "Edit"



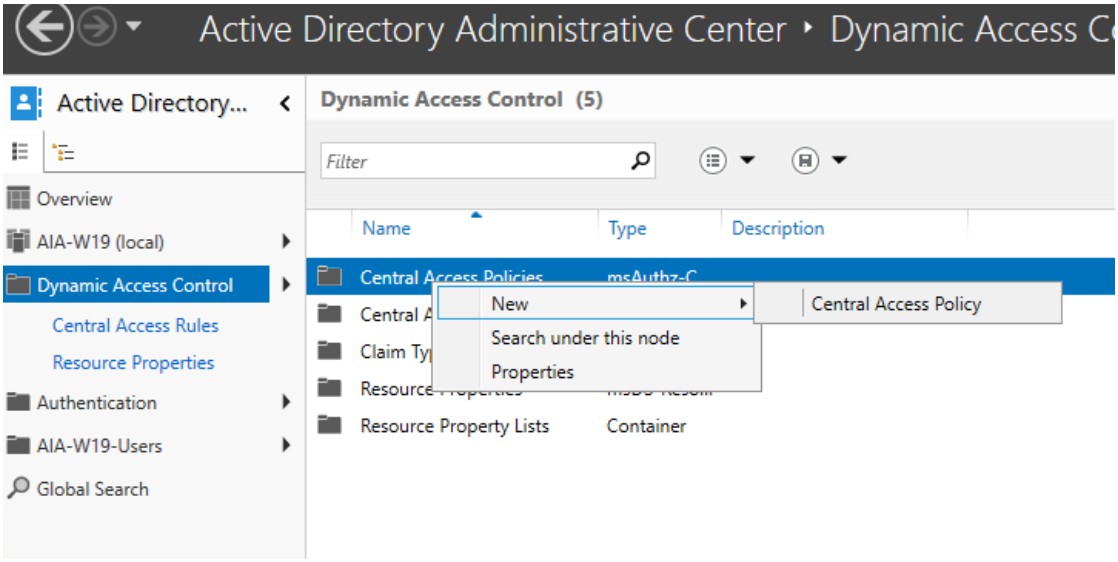
Click "Add" and in the following "permission Entry for Permissions" select The "Authenticated User" as the principal and set the following conditions.

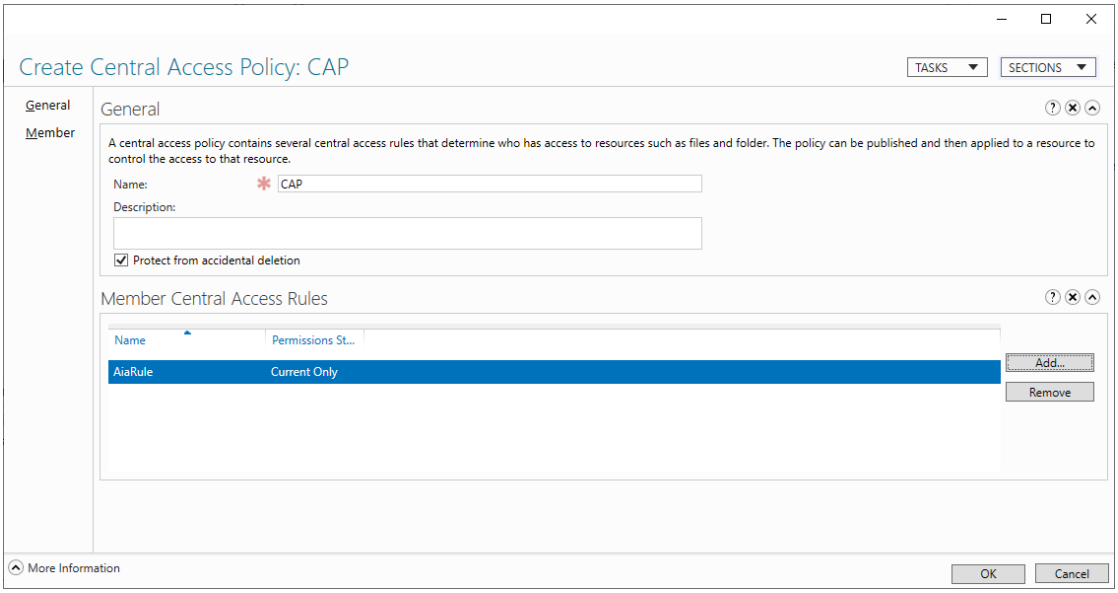




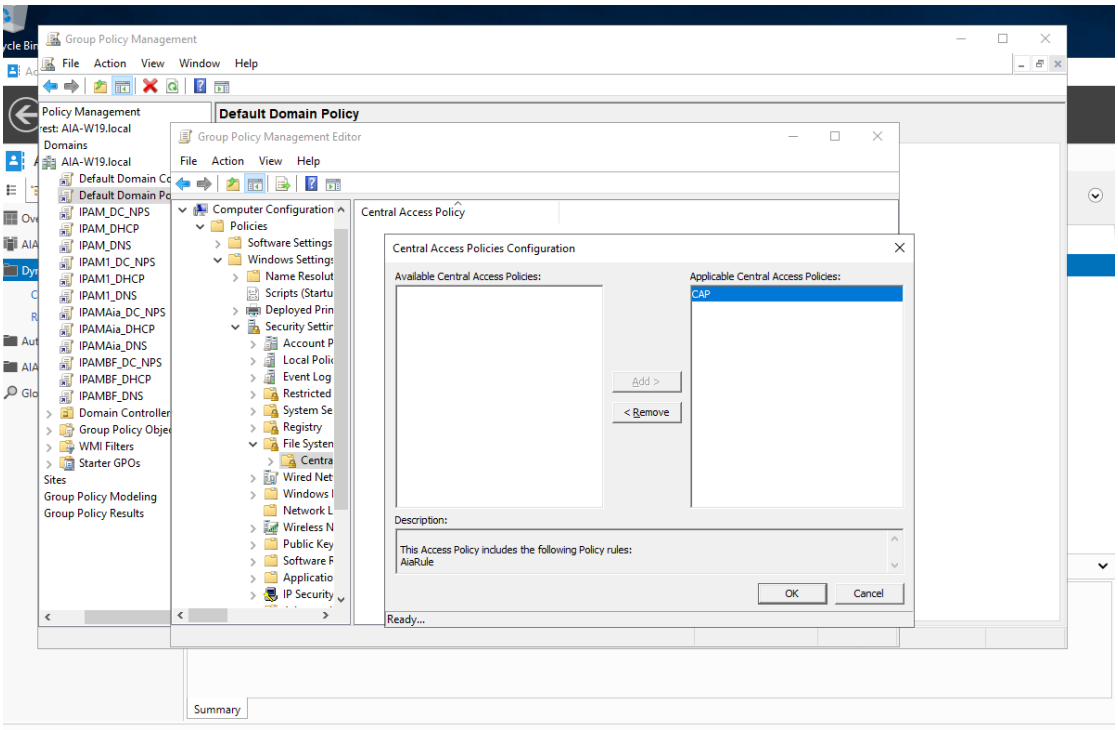
Click "OK" you are back to the DAC configuration screen.

In the Central Access Policy, click "New" and "Central Access Policy" and give the new policy a name in the "Create Central Access Policy" form. We named our CAP. We also need to Add the Central Access Rule you created earlier to the policy.

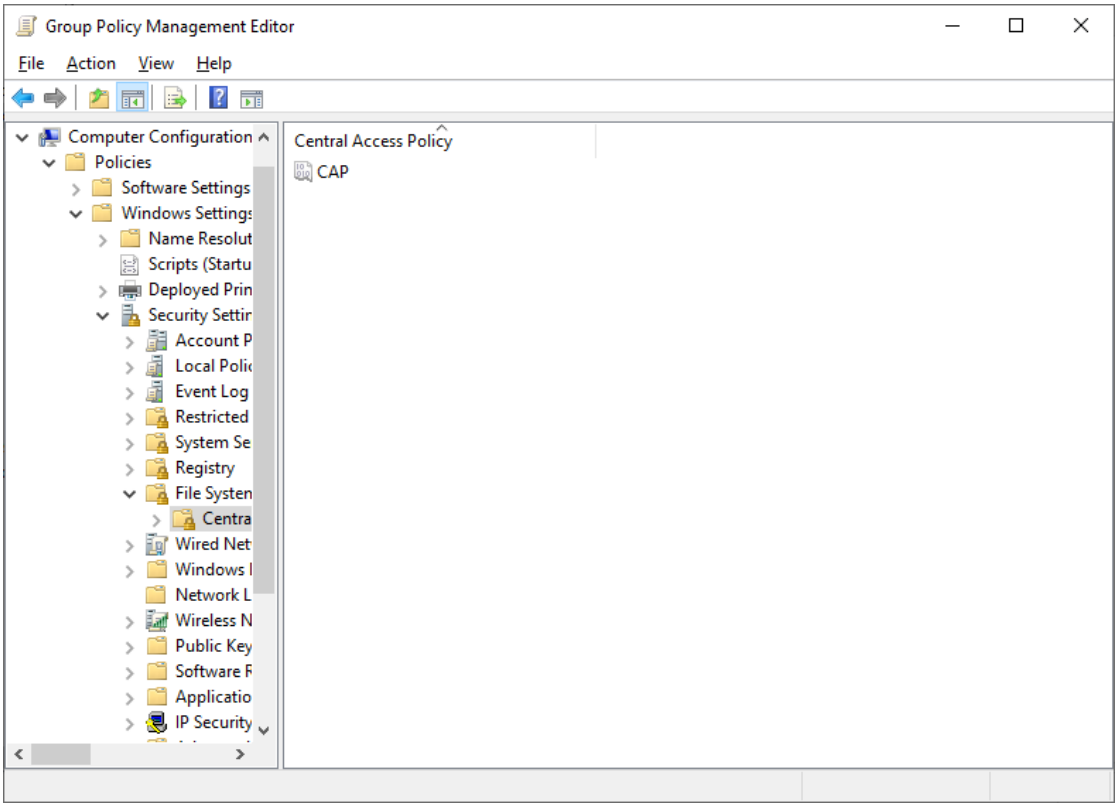




Once that is created we need to tell AD about the policy. In the "Group Policy Management Console" we edited the "Default domain policy" but you can apply a different policy as you see fit. And in the Computer Management→Policies→Windows Settings→Security settings→File System→Central Access Policy, right-click the right pane and select manage Central Access Policy.

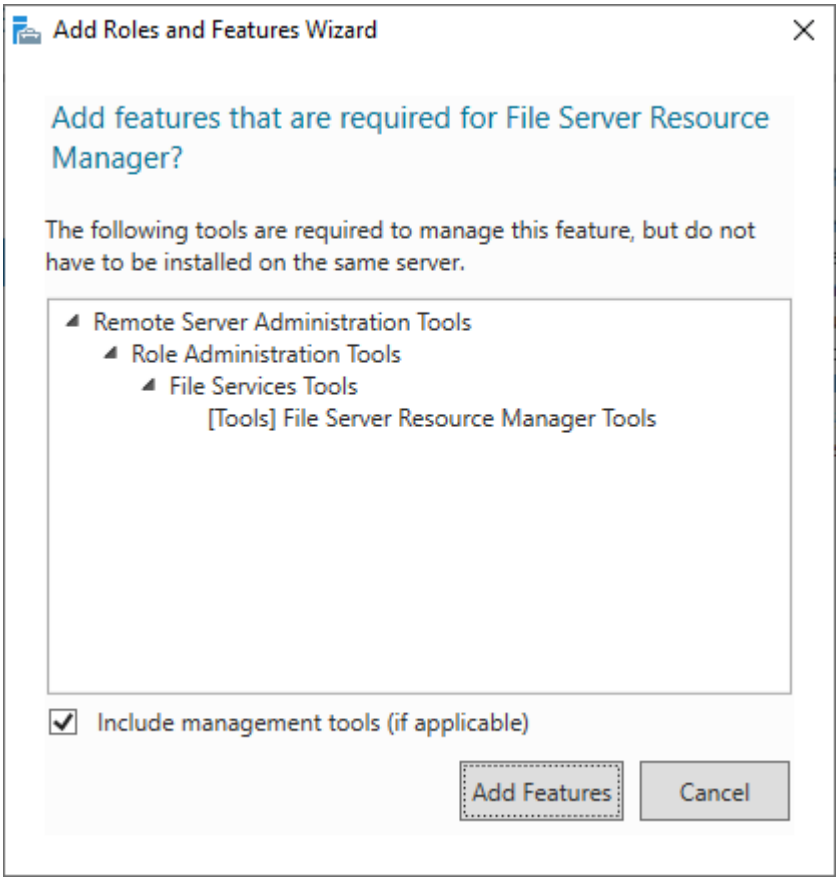


Add the Policy you created to the Applicable Central Access Policies.



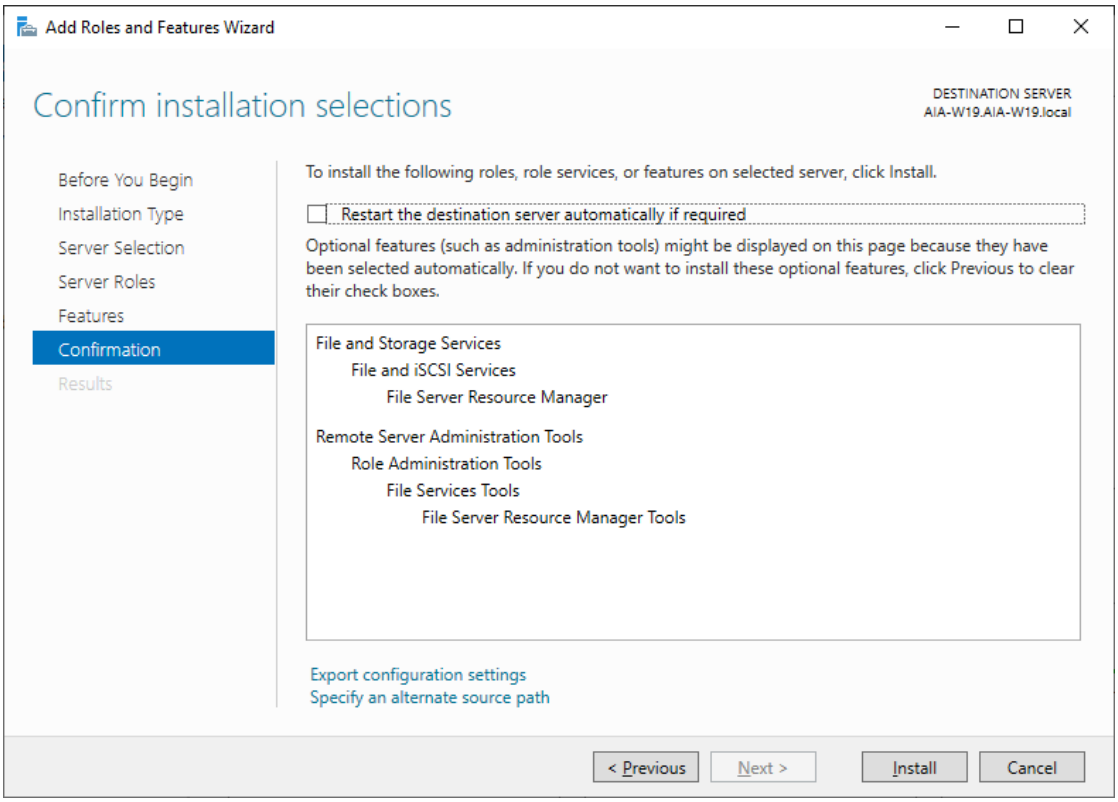
To configure the shares the File Server Resource Manager must be installed on the server that will be used as the files server. In our case the file server we are using is **AIA-W19.local**.

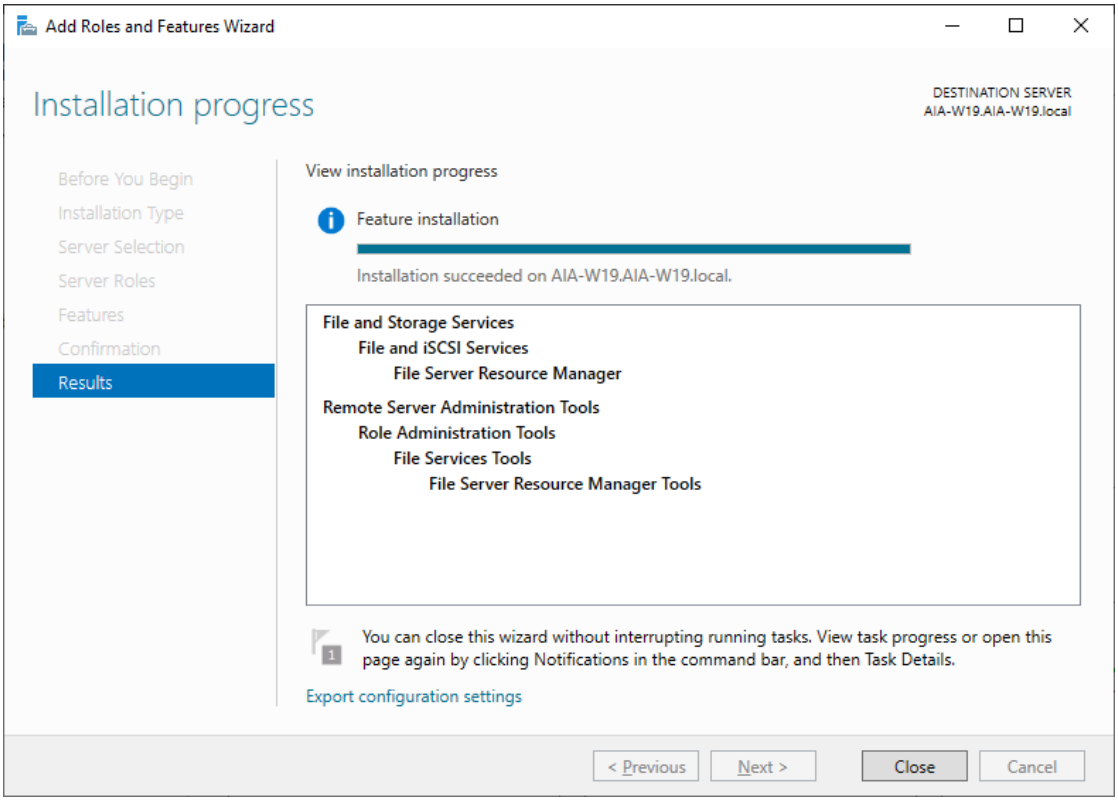
Logon **AIA-W19.local** as **AIA-W19\administrator,** in Server Manager, click **Add Roles and Features**. On the **Before you begin** page, click **Next**.
On the **Select Server Roles** page, expand **File and Storage Services**, select the check-box next to **File and iSCSI Services**, expand, and select **File Server Resource Manager**.



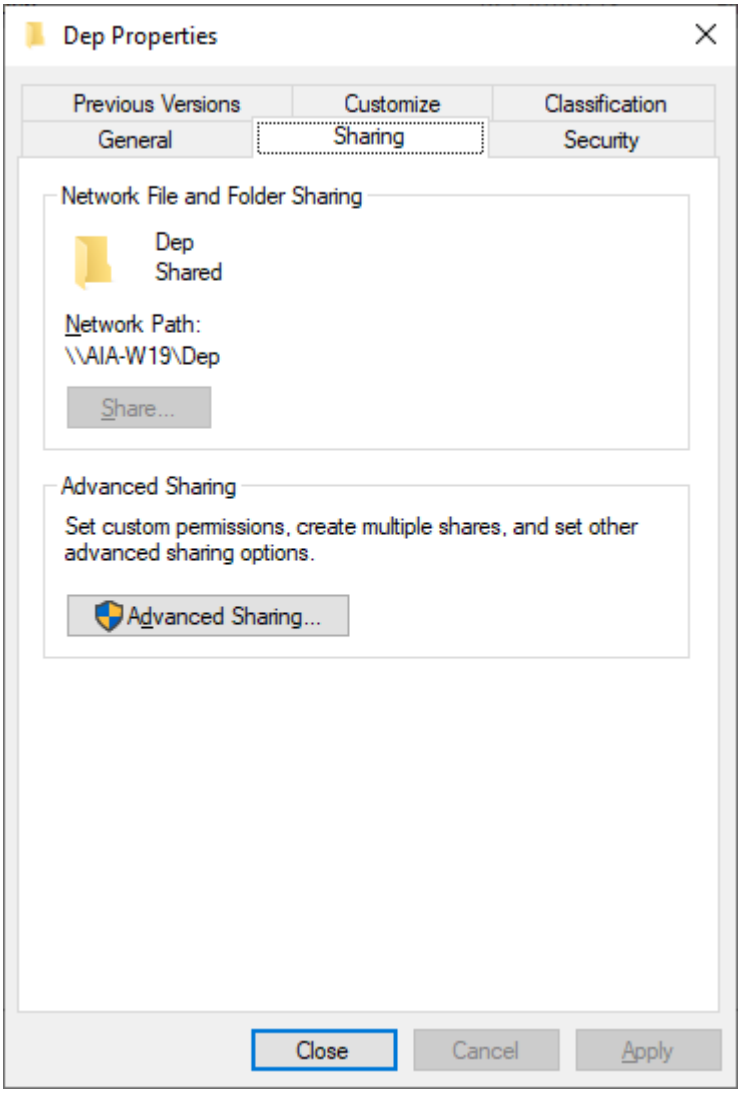
On the **Confirm installation selections** page, click **Install**.

On the **Installation progress** page, click **Close**

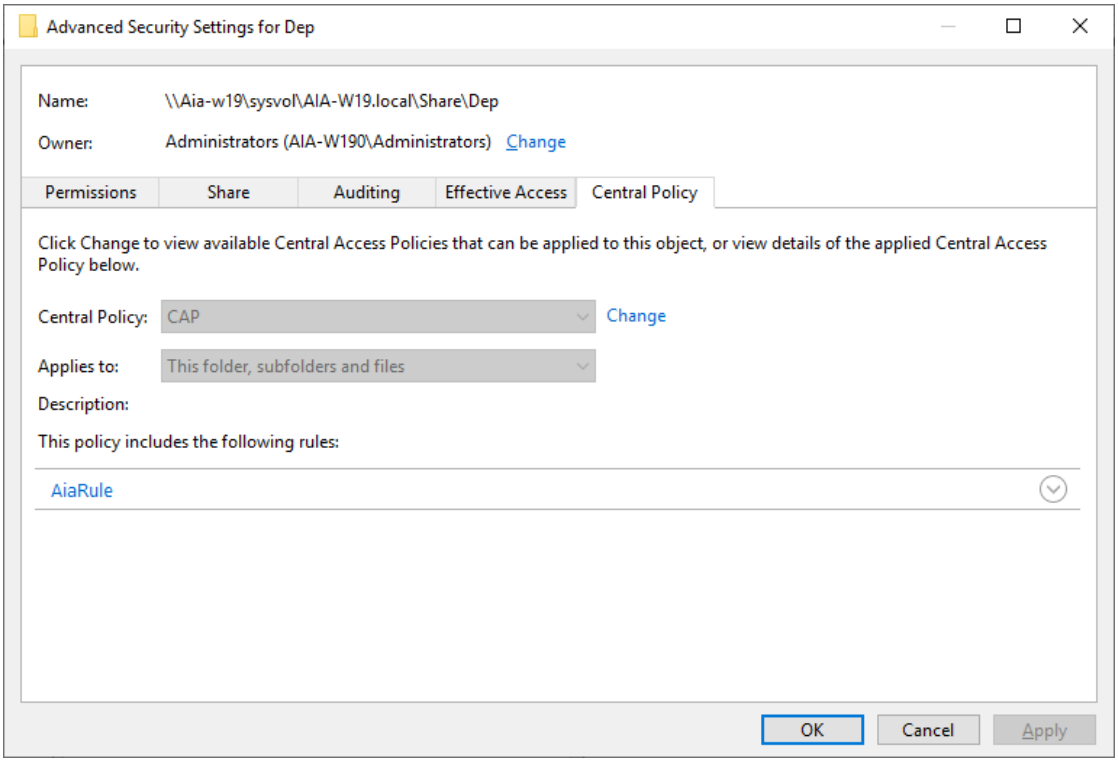




Now we will create a share files select all defaults to complete this part. Once the shares have been created, we need to go the location where the directory has been created and modify the properties of each folders.



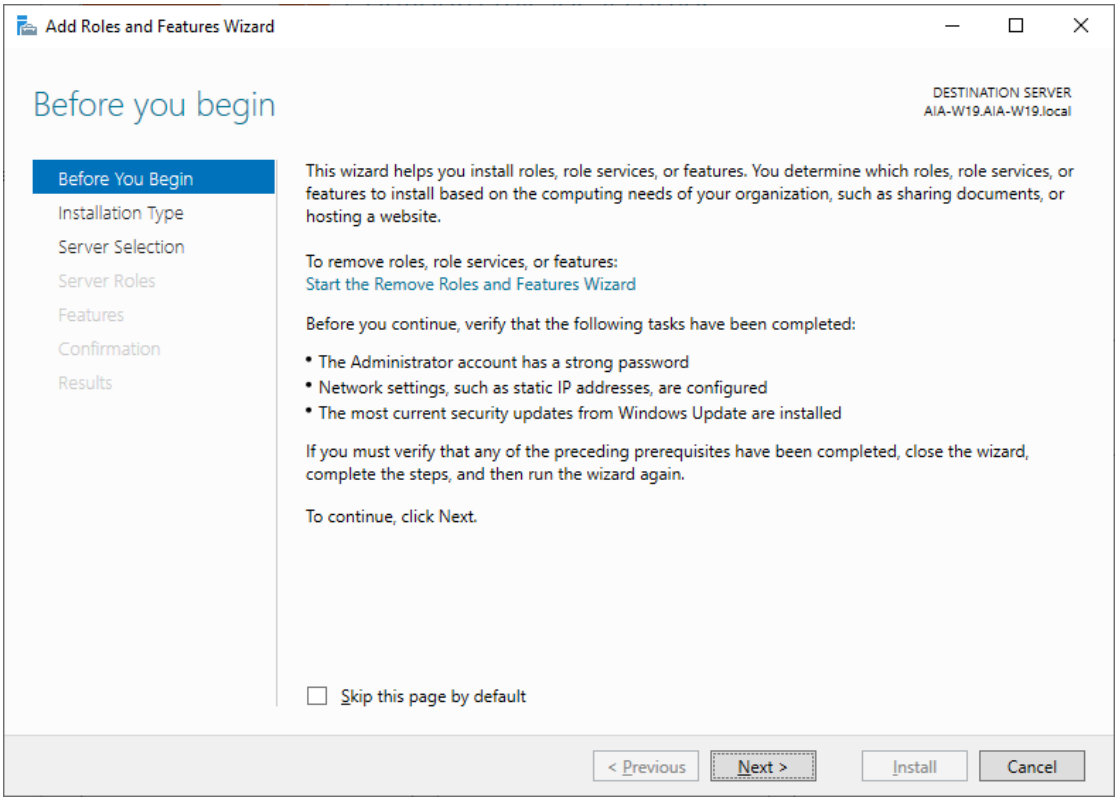
And in the advanced Security Settings, in the Central Policy Tab, change the "No central Access Policy" to "CAP" the policy we defined. You can test to see if everything worked well by using the effective Access tab.



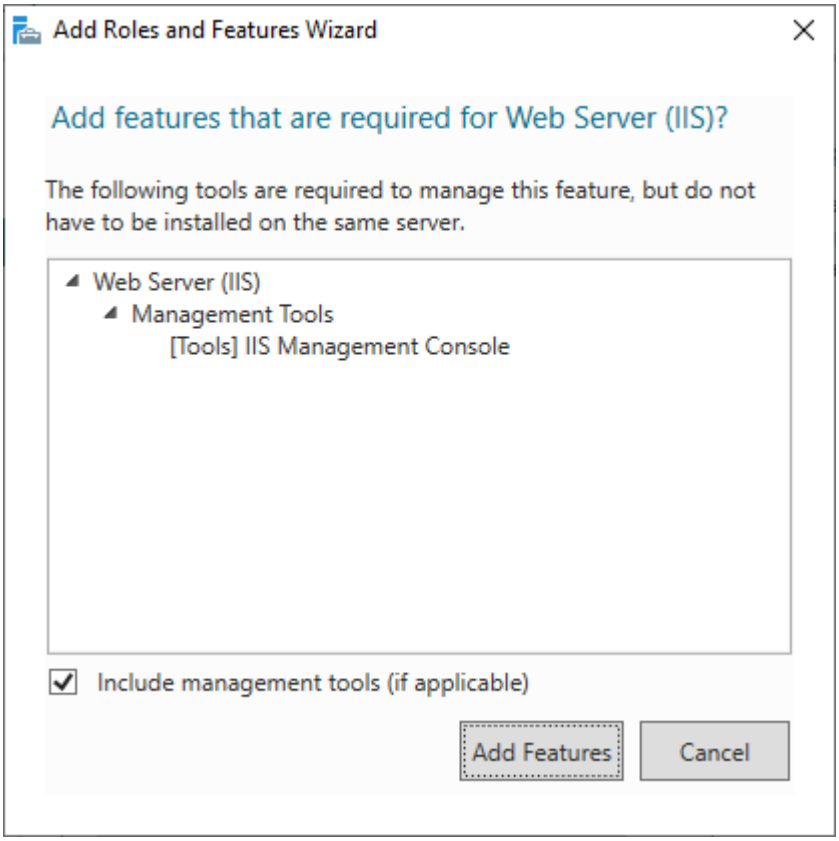
- **Web Server Management with IIS:**

Internet Information Services is a flexible, general purpose web server from Microsoft that runs on Windows systems to serve requested HTML pages or files. An IIS web server accepts requests from remote client computers and returns the appropriate response. It allows web servers to share and deliver information across local area networks and wide area networks.

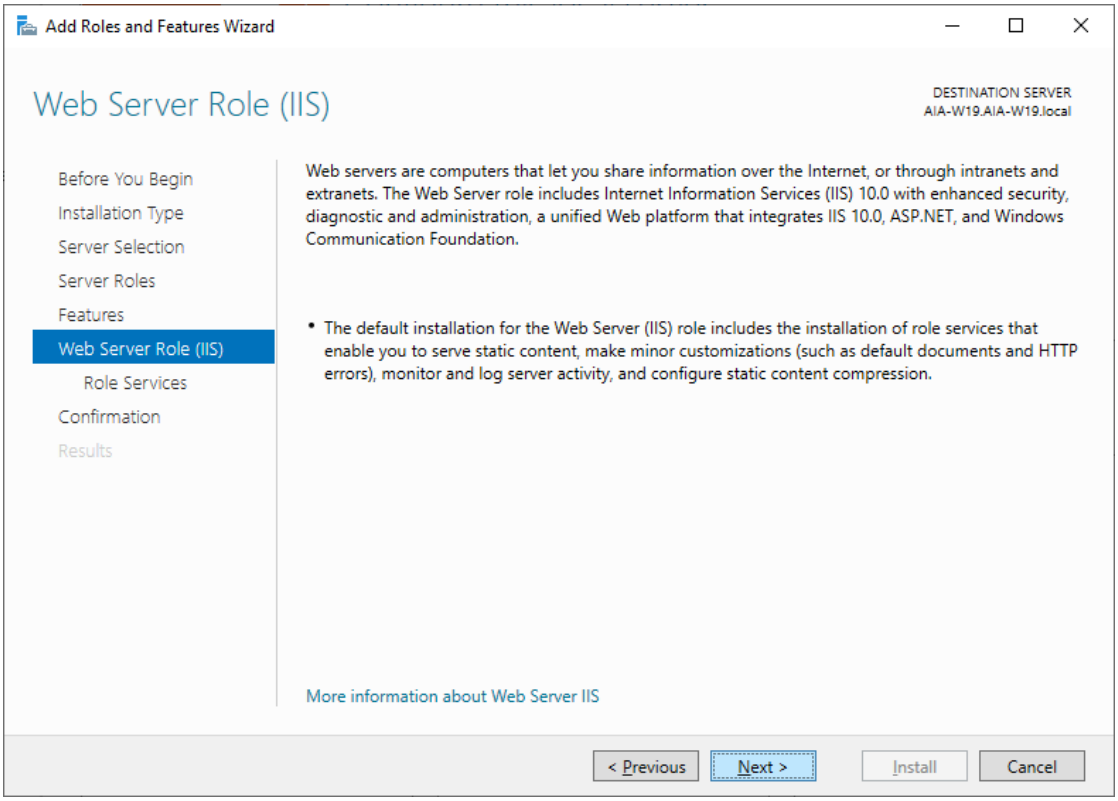
Open the *Server Manager* and click Add Roles and Features:

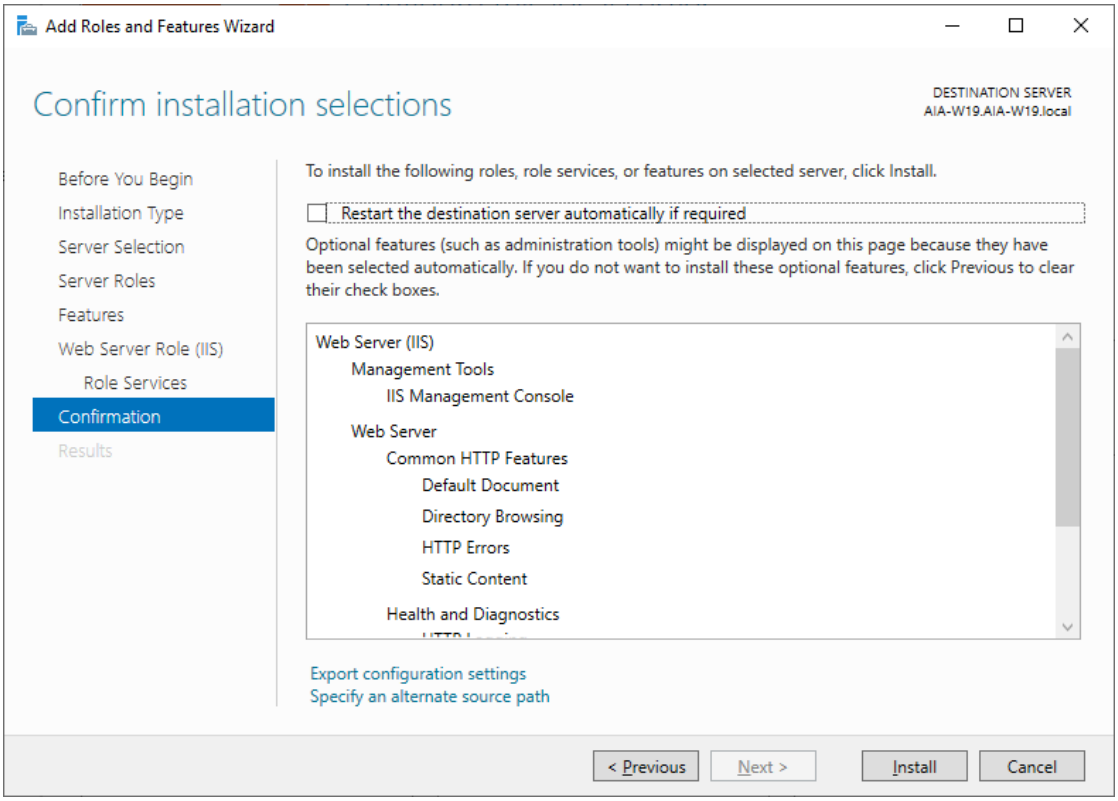


Select Web Server (IIS):

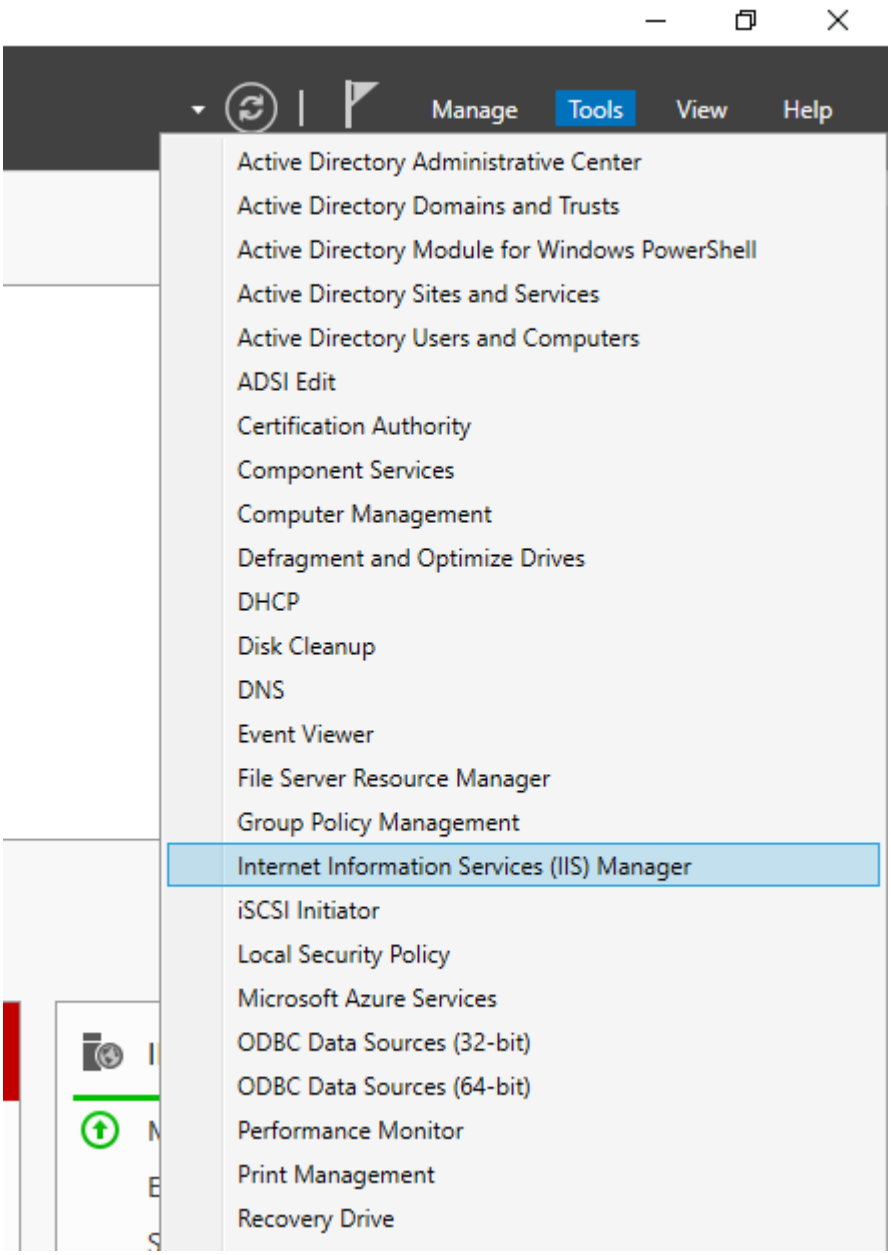


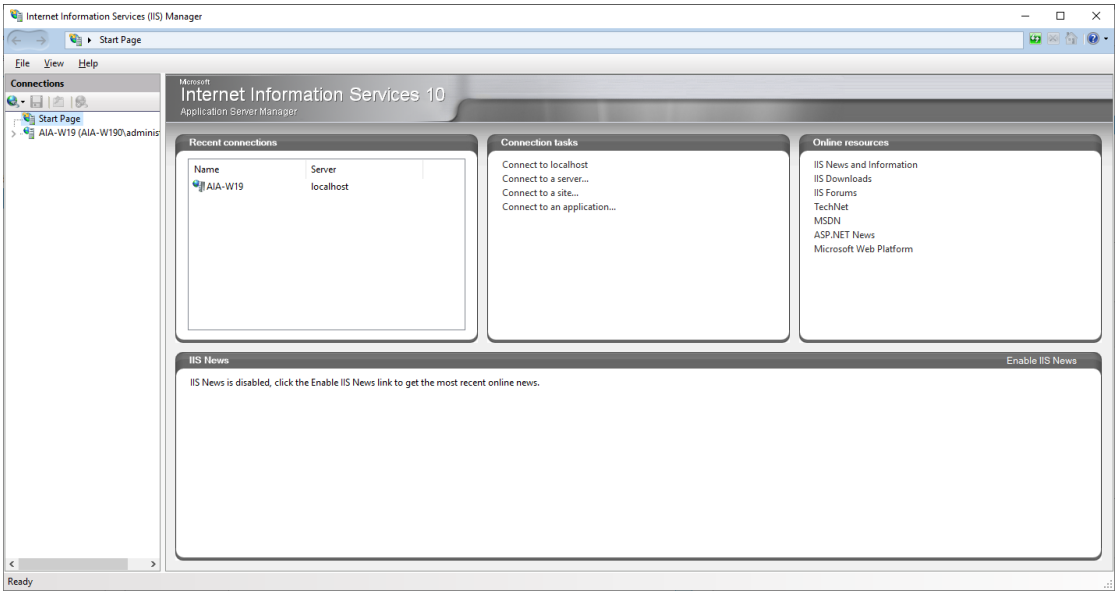
On the Role Services selection list, select all of the role services, and click Next to continue.



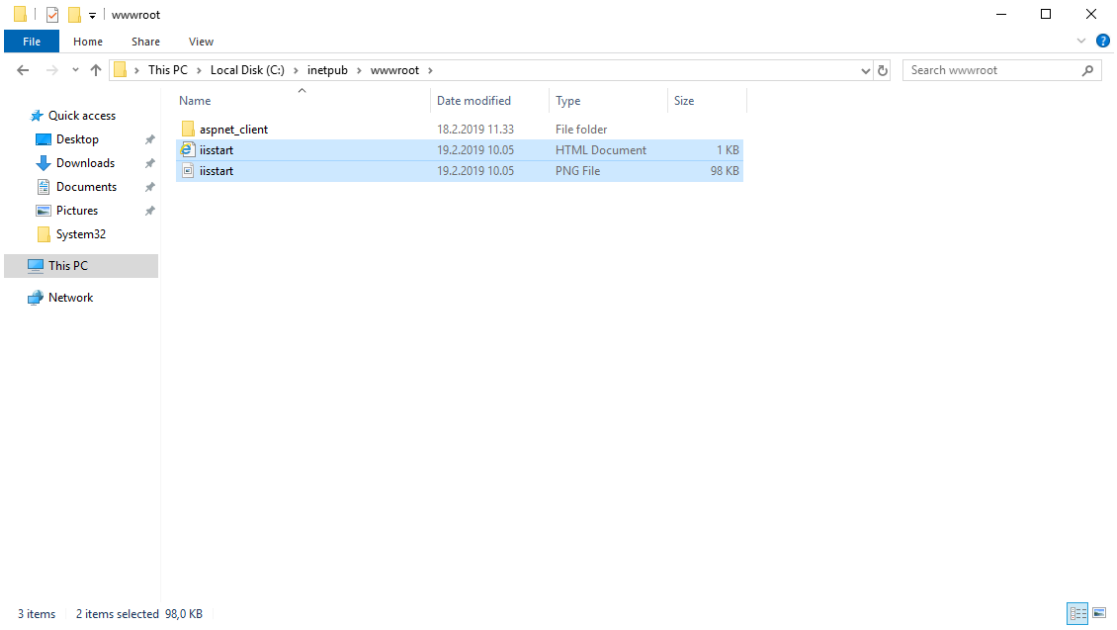


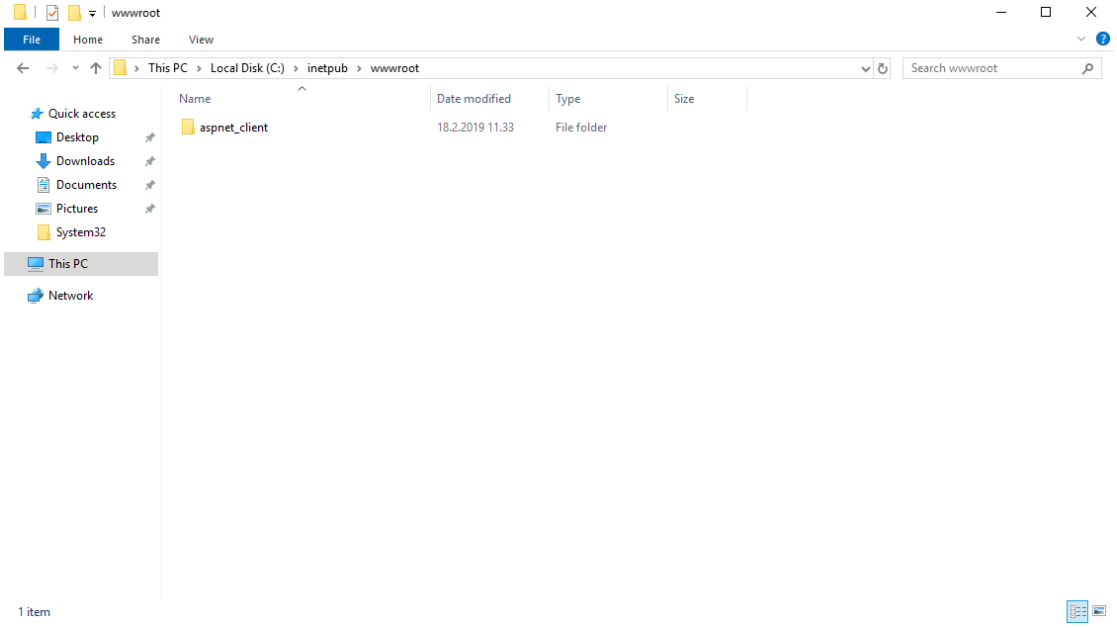
By clicking on Tools in the dashboard and selecting Internet Services Manager to check the default website that available in the server.

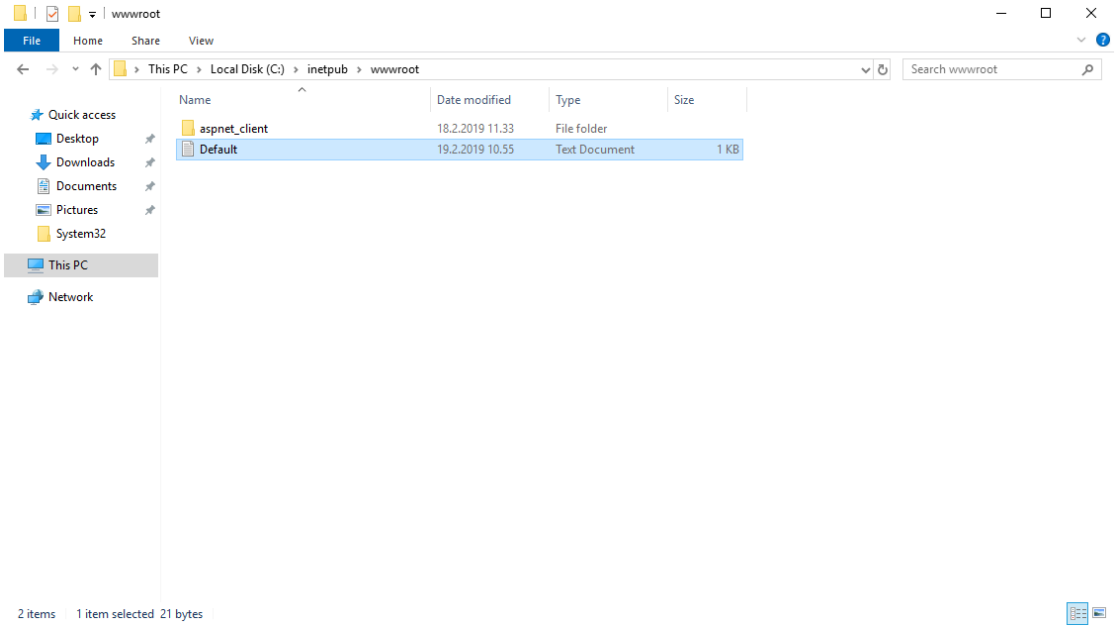

Manage
Tools
View
Help
Active Directory Administrative Center
Active Directory Domains and Trusts
Active Directory Module for Windows PowerShell
Active Directory Sites and Services
Active Directory Users and Computers
ADSI Edit
Certification Authority
Component Services
Computer Management
Defragment and Optimize Drives
DHCP
Disk Cleanup
DNS
Event Viewer
File Server Resource Manager
Group Policy Management
Internet Information Services (IIS) Manager
iSCSI Initiator
Local Security Policy
Microsoft Azure Services
ODBC Data Sources (32-bit)
ODBC Data Sources (64-bit)
Performance Monitor
Print Management
Recovery Drive


Internet Information Services (IIS) Manager
Start Page
File View Help
Connections
Start Page
AIA-W19 (AIA-W190\adminis
Internet Information Services 10
Application Server Manager
Recent connections
Name
Server
AIA-W19
localhost
Connection tasks
Connect to localhost
Connect to a server...
Connect to a site...
Connect to an application...
Online resources
IIS News and Information
IIS Downloads
IIS Forums
TechNet
MSDN
ASP.NET News
Microsoft Web Platform
IIS News
Enable IIS News
IIS News is disabled, click the Enable IIS News link to get the most recent online news.
Ready

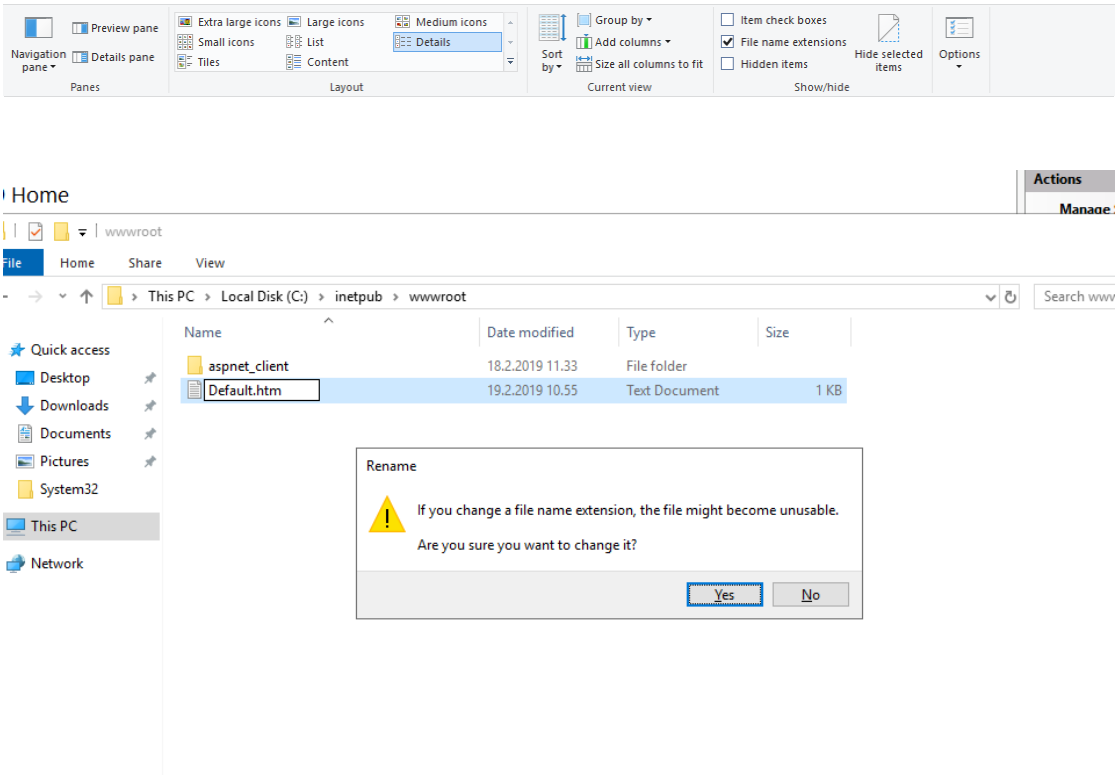
We will delete all the files in the file path and create a new text file.





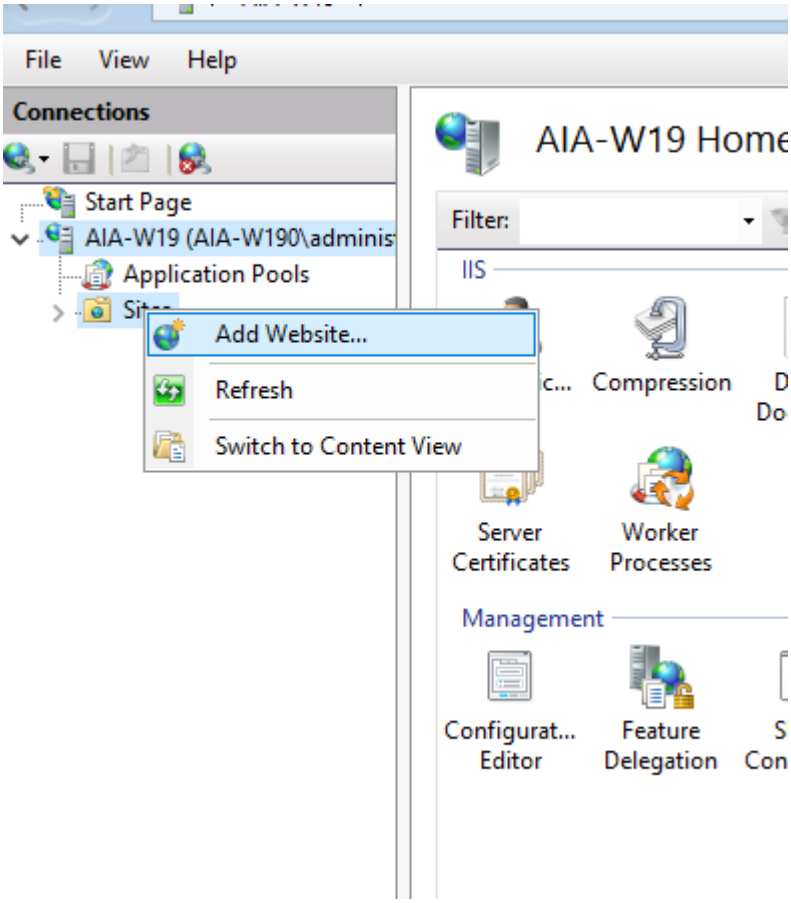


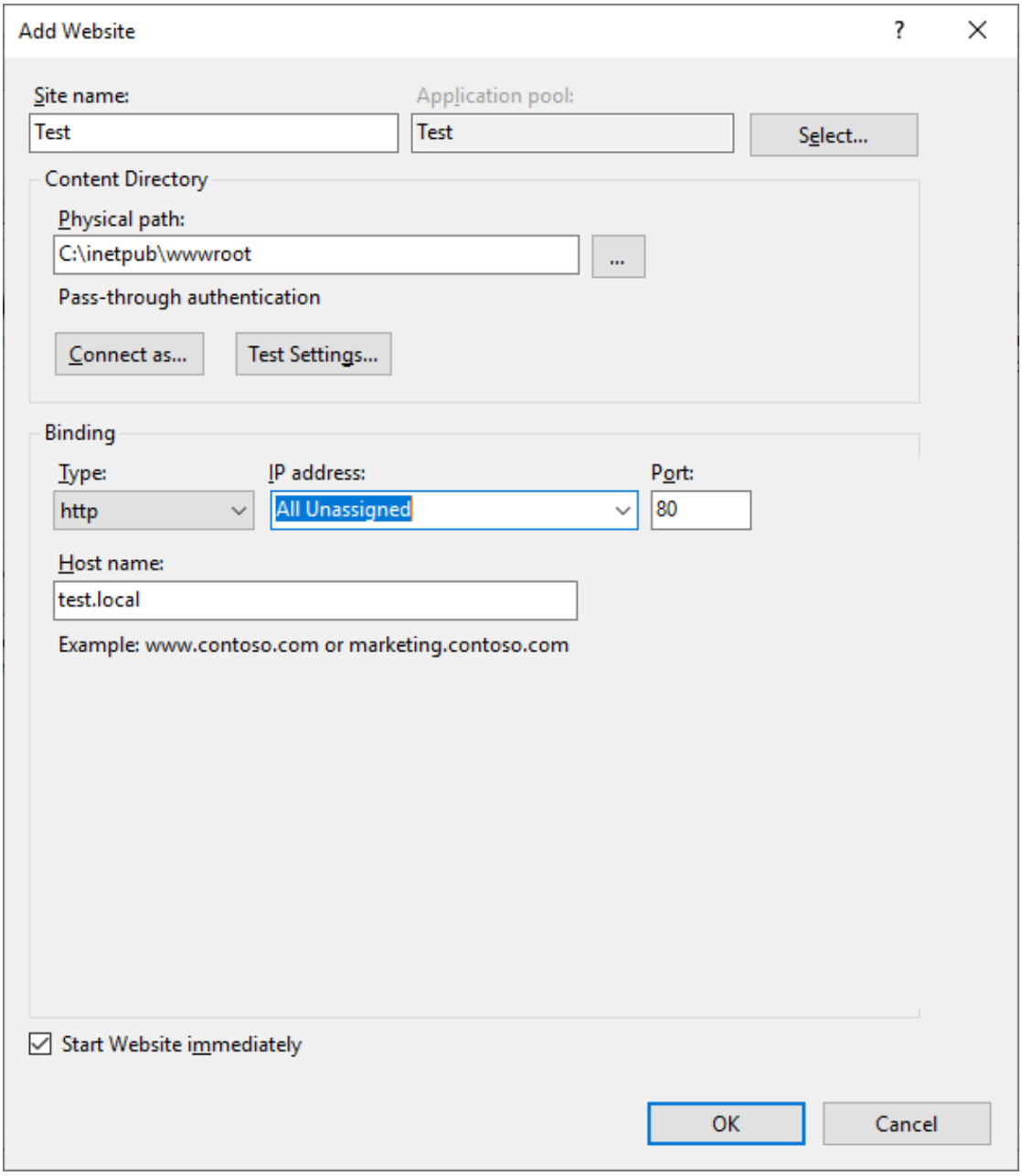
We need also to change the extension file by clicking on view and choose the extensions to change the file to HTML.



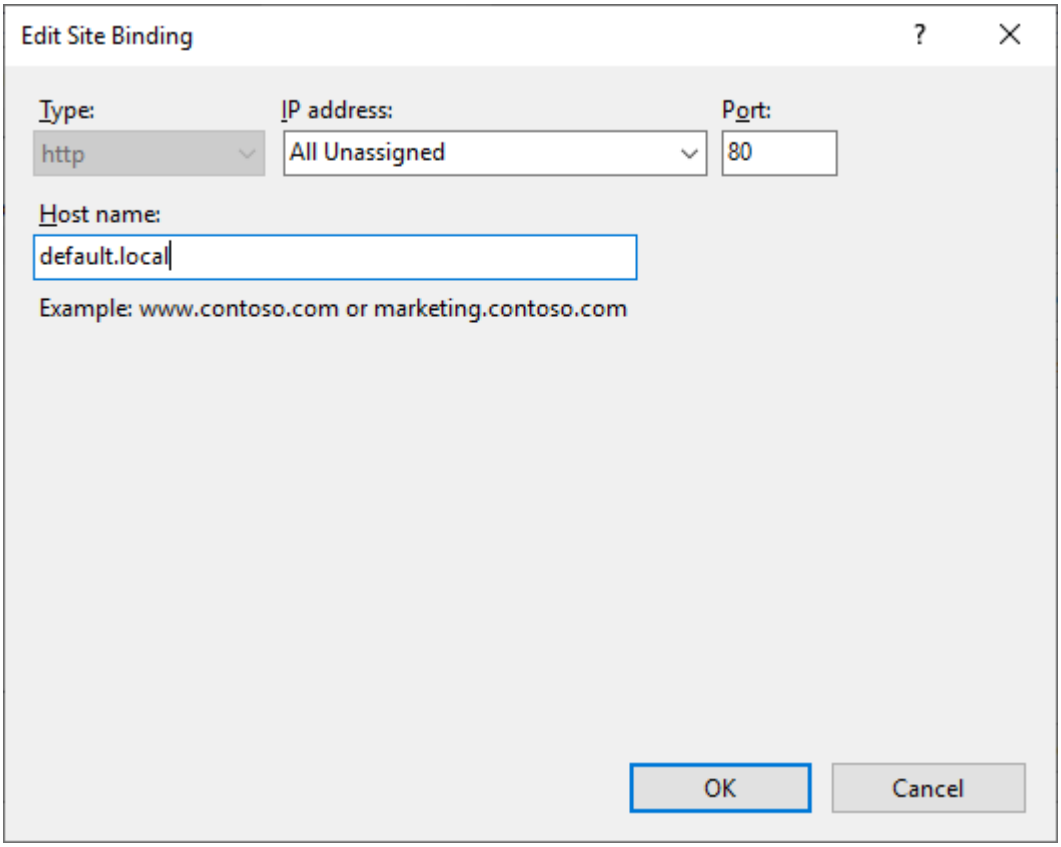
To test if it's working, by browsing using the IP address for the server.

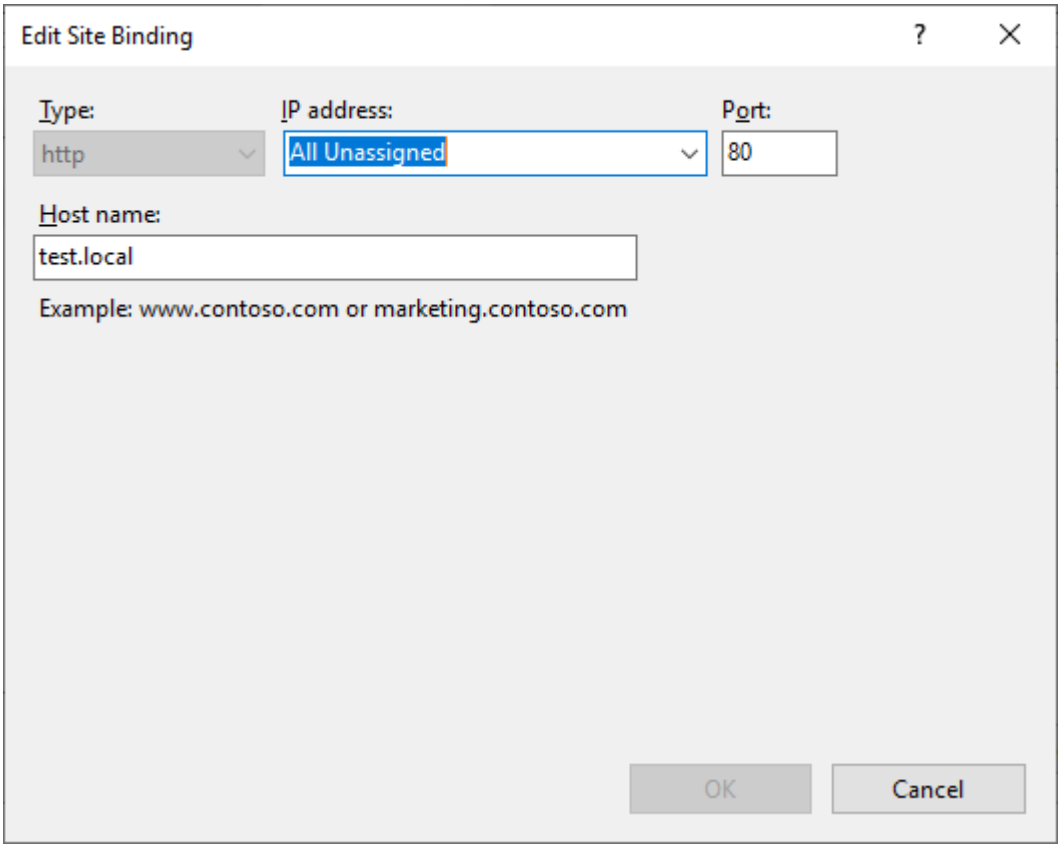
Also we can create a new website by right click on Sites and click create a new website





Now cause both of the websites will use the same IP address, so we can implement headers for each website to access the website with a shared IP and different name.


Edit Site Binding
Type:
http
IP address:
All Unassigned
Port:
80
Host name:
default.local
Example: www.contoso.com or marketing.contoso.com
OK
Cancel

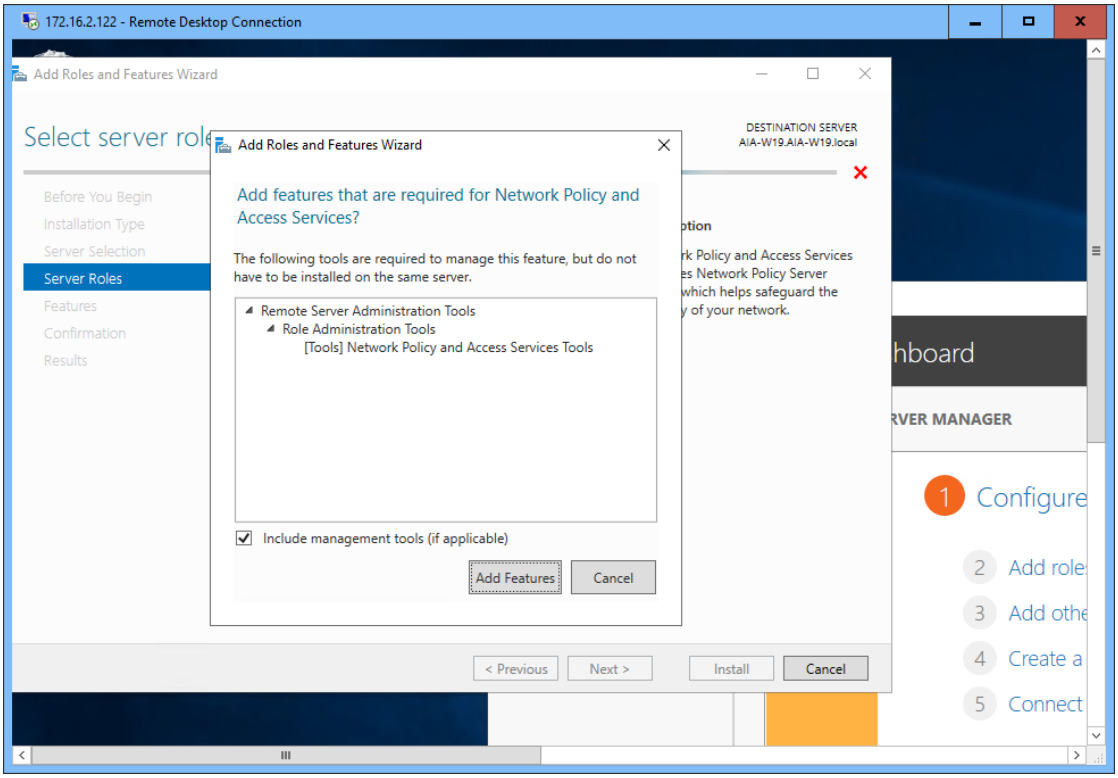

Edit Site Binding
Type:
http
IP address:
All Unassigned
Port:
80
Host name:
test.local
Example: www.contoso.com or marketing.contoso.com
OK
Cancel

➢ **VPNs:**

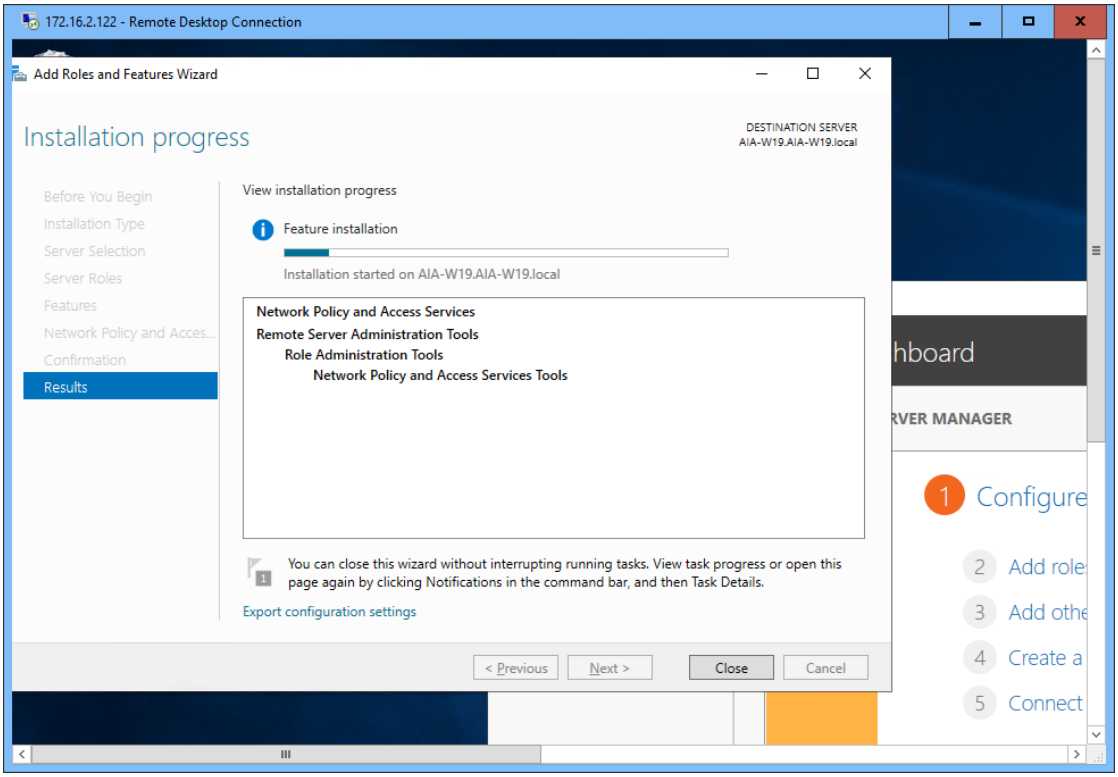
VPN used to provide access to a private network over a public network, the public network is often the Internet, but it could be leased lines that are shared by different companies. The VPN server has at least two network interface cards, one has public IP address and can be reached by user who access to the Internet. The other NIC has a private address connected to the internal network.

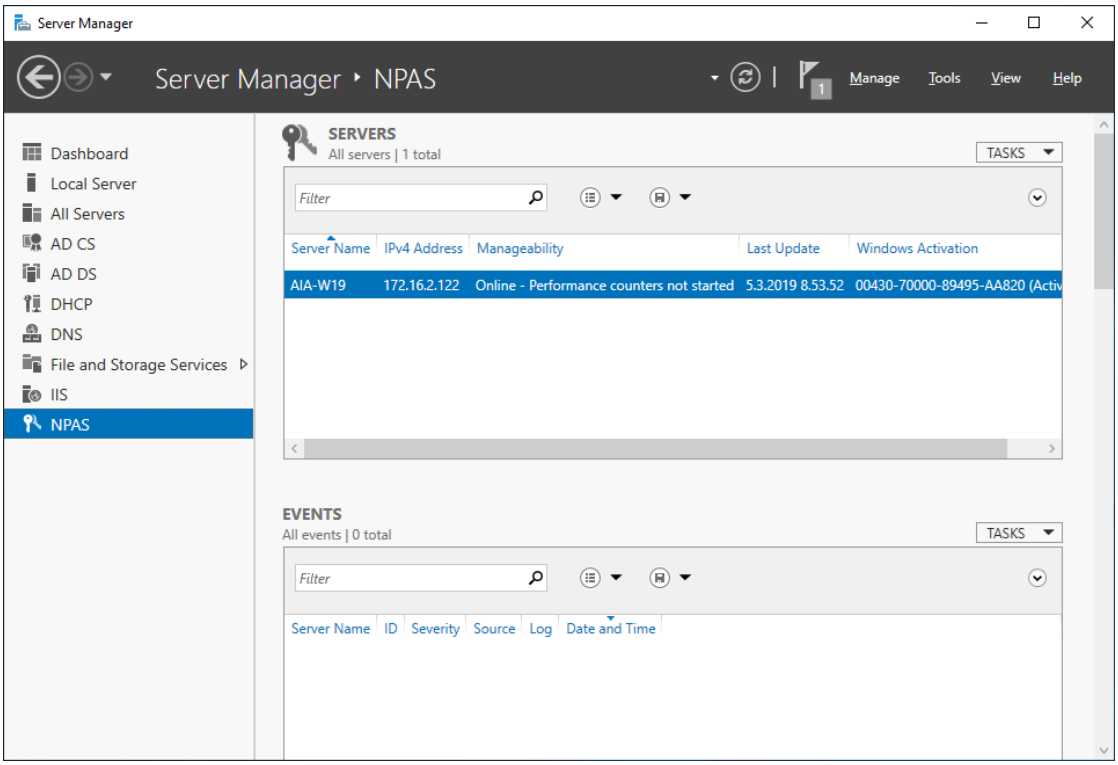
Installing the Network Policy and Access Services Role:

From the Server Manager ➢ Local Server ➢ Manage menu, choose the Add Roles and Features option. When we reach the Select Server Roles dialog box, scroll down until we find the Network Policy and Access Services option in the Roles list, and check the box beside it.



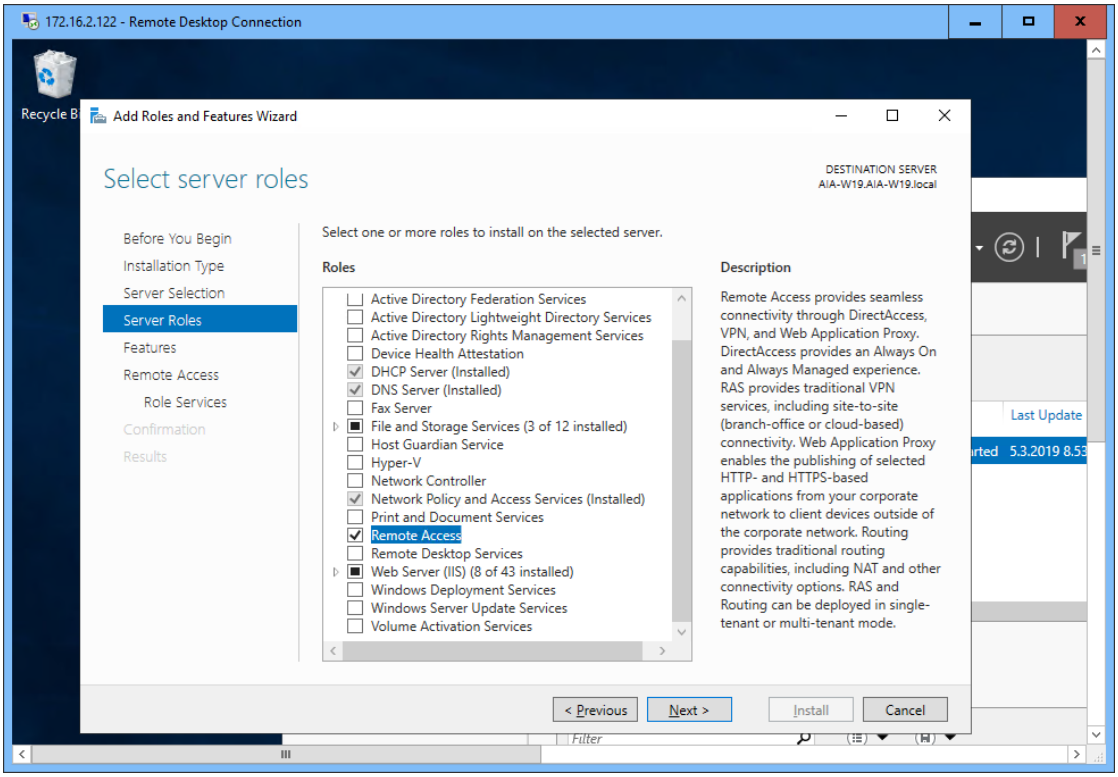
Add some required features here, such as the Remote Server Administration Tools (RSAT), so just click the Add Features button in the window that pops up.



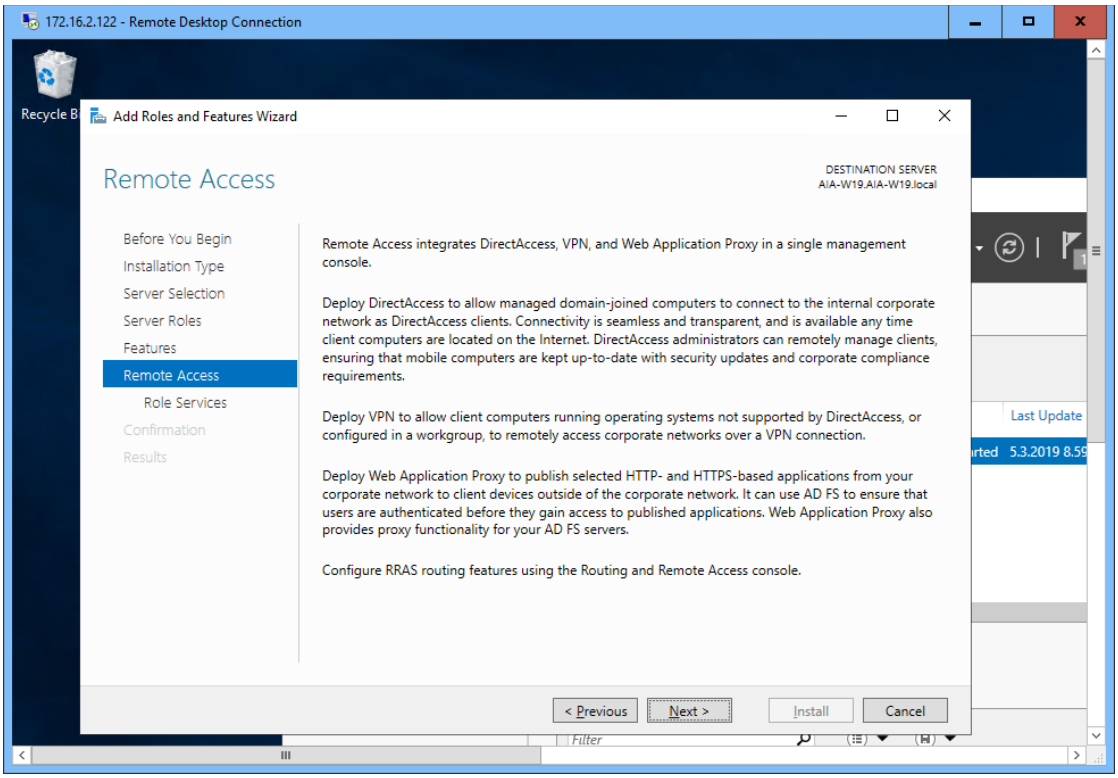


Installing the Remote Access Role:

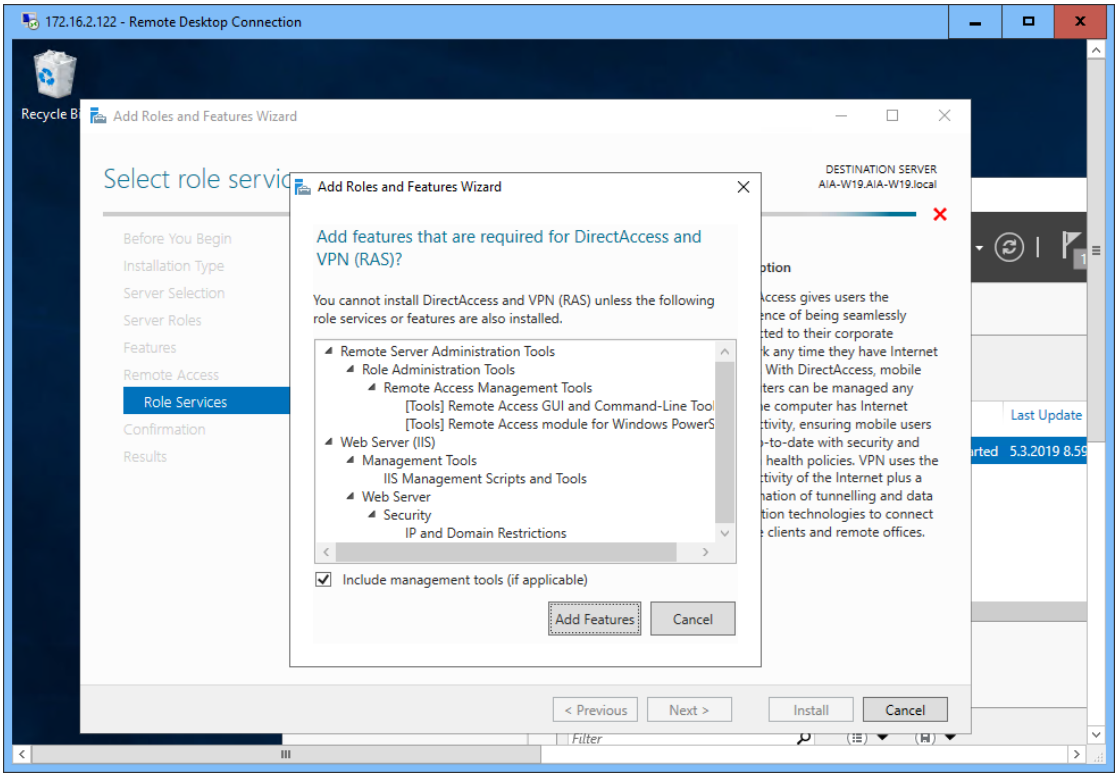
Server Manager ➢ Local Server ➢ Manage menu, choose the Add Roles and Features option. Scroll down to find Remote access option.



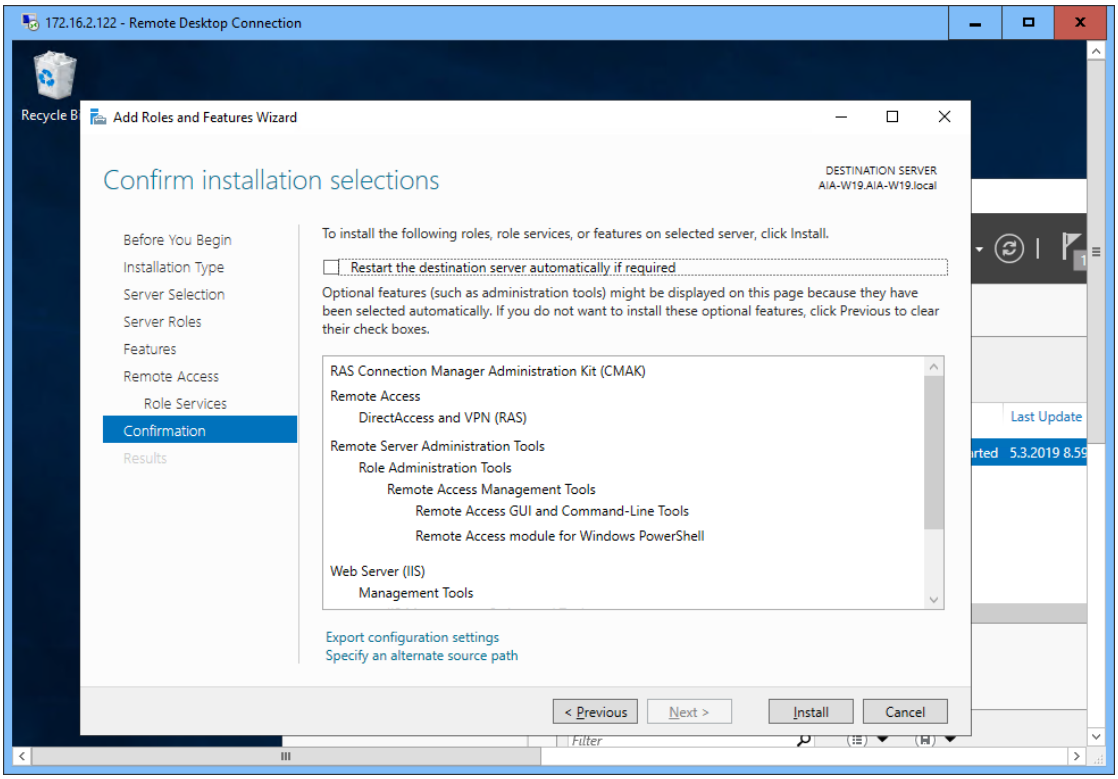
Add some required features here, such as the RAS Connection Manager Administration Kit (CMAK) and Web Server (IIS), so just click the Add Features button in the window that pops up.



Check the box beside DirectAccess and VPN (RAS); then click Next three times, leaving the Web Server Role (IIS) selections at their defaults.

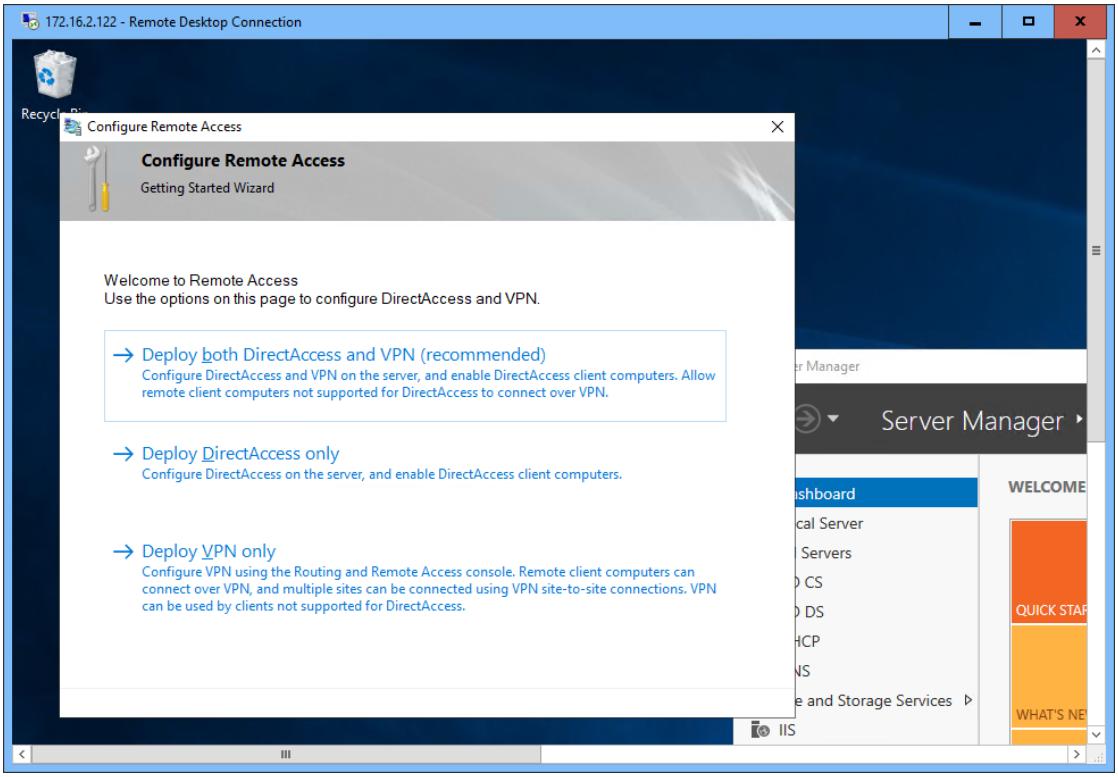


In the Confirm Installation Selections dialog box, ensure that your settings have been chosen correctly, and then click Install to begin.

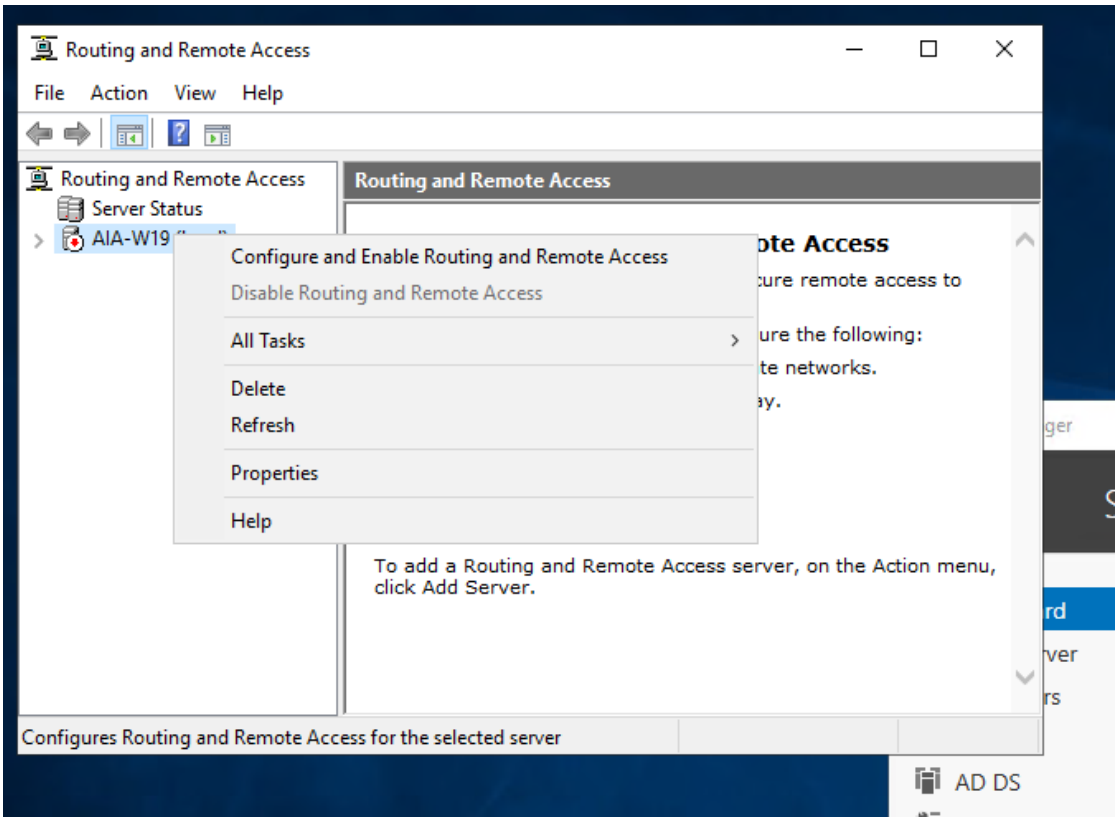


Configuring routing and remote access:

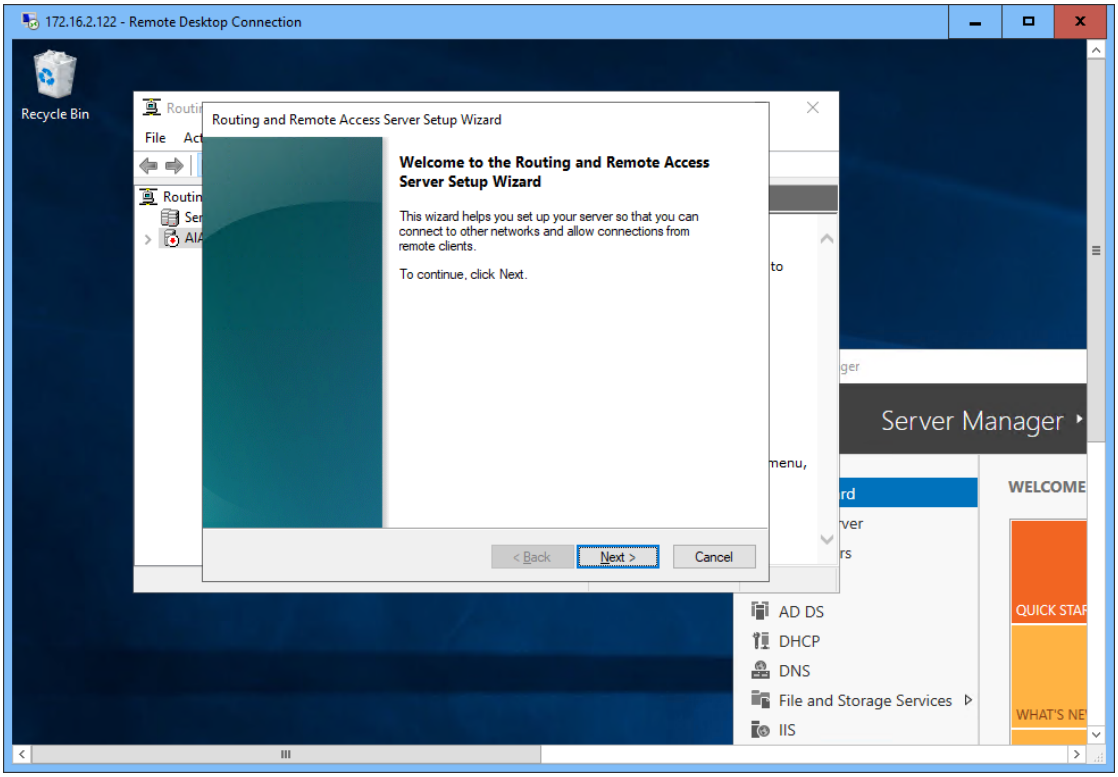
Select the Deploy VPN Only option.



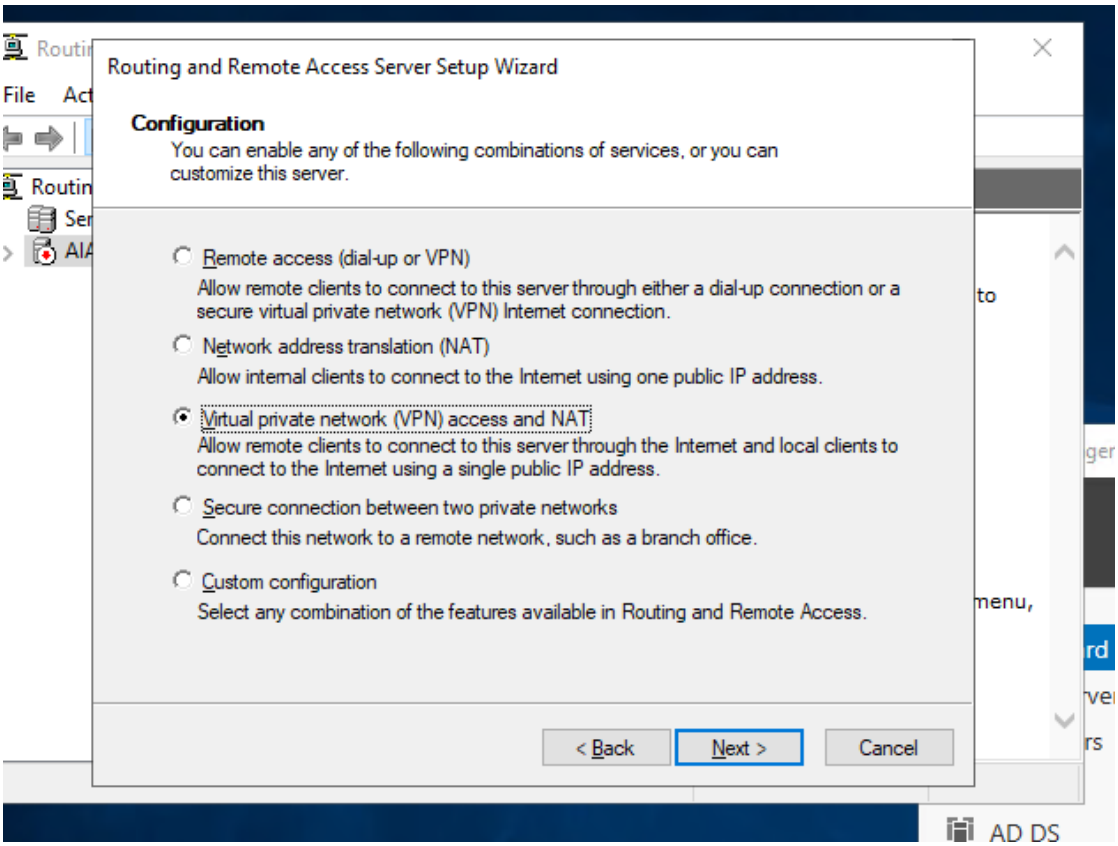
In the Routing and Remote Access snap-in, right-click your server name and then choose the Configure and Enable Routing and Remote Access option from the context menu.



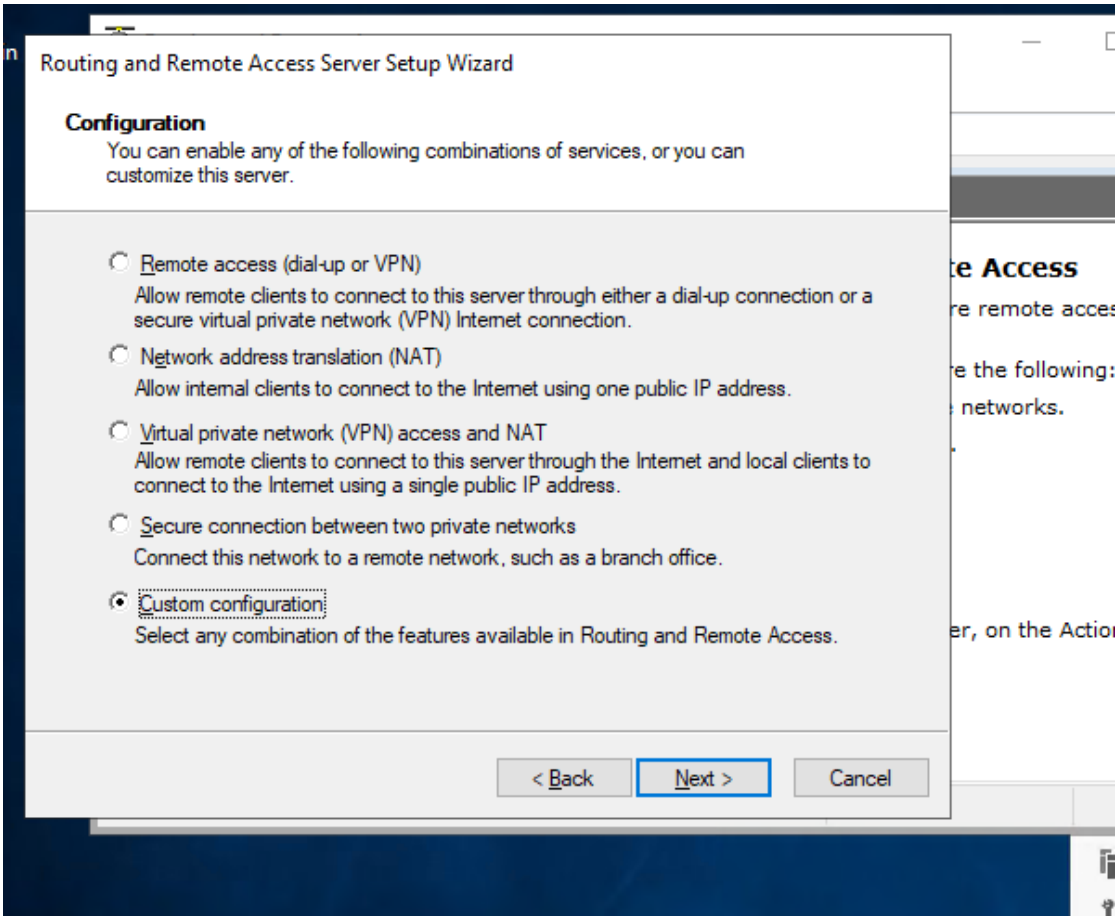
This opens the Routing and Remote Access Server Setup Wizard; click Next to continue.

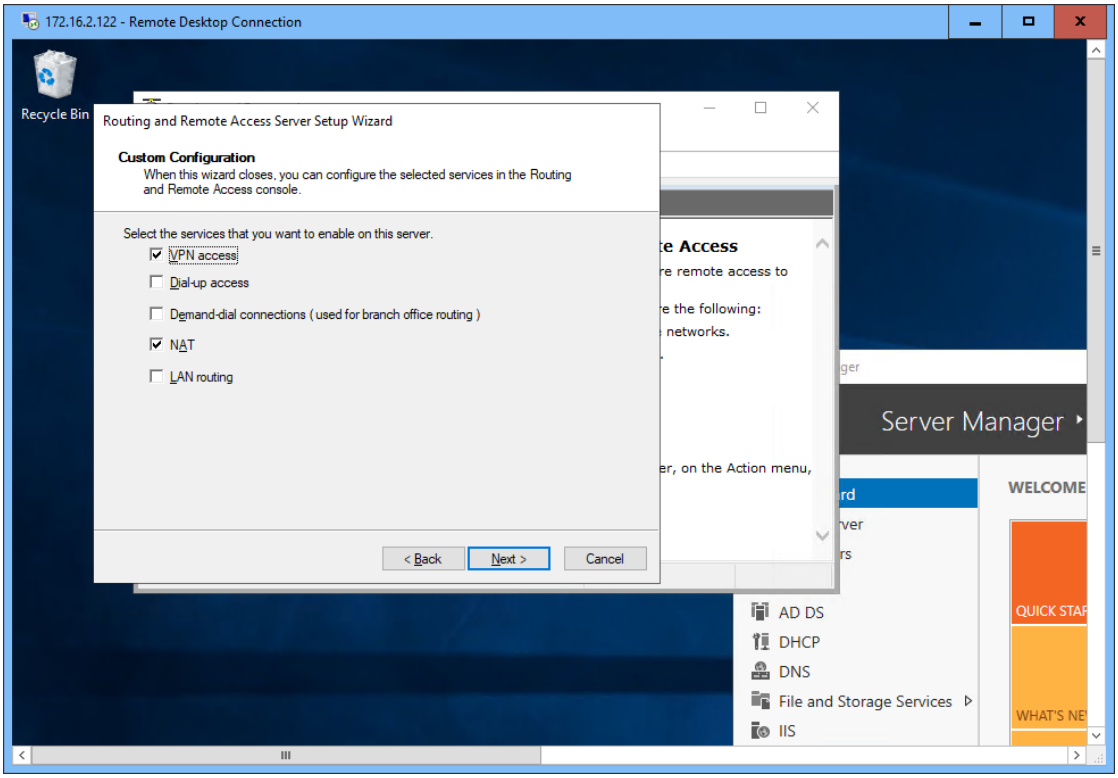


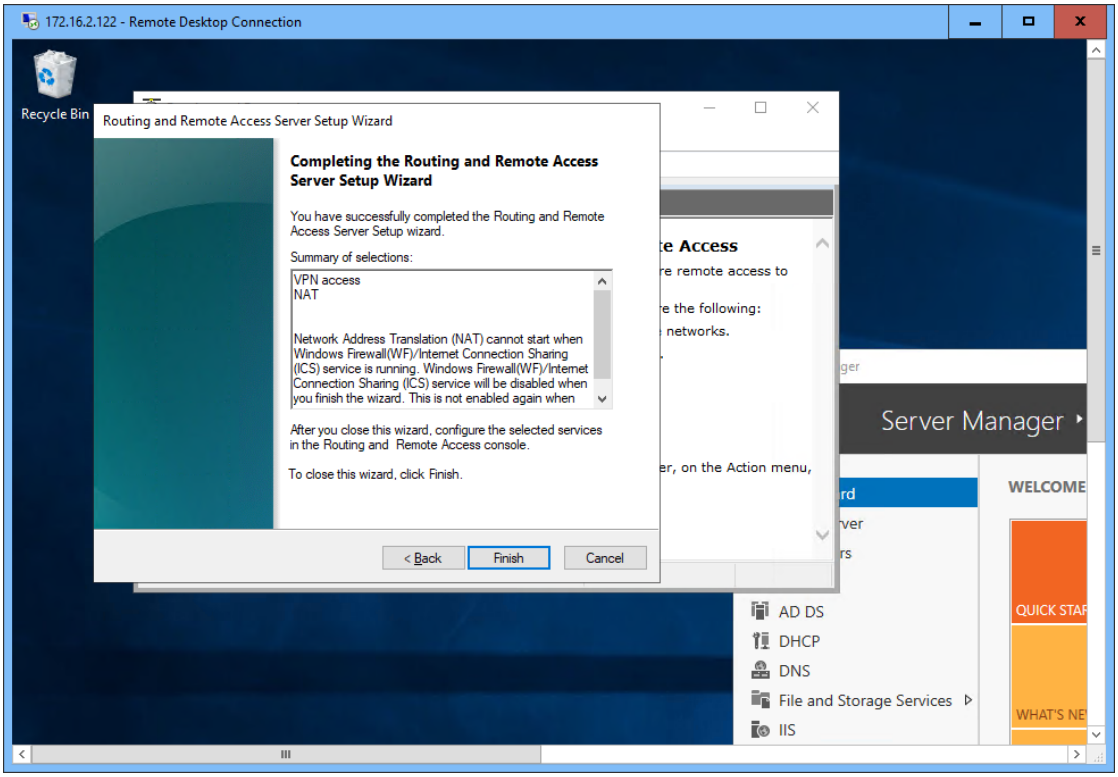
From the options presented in the Configuration dialog box, select “Virtual private network (VPN) access and NAT”; then click Next.

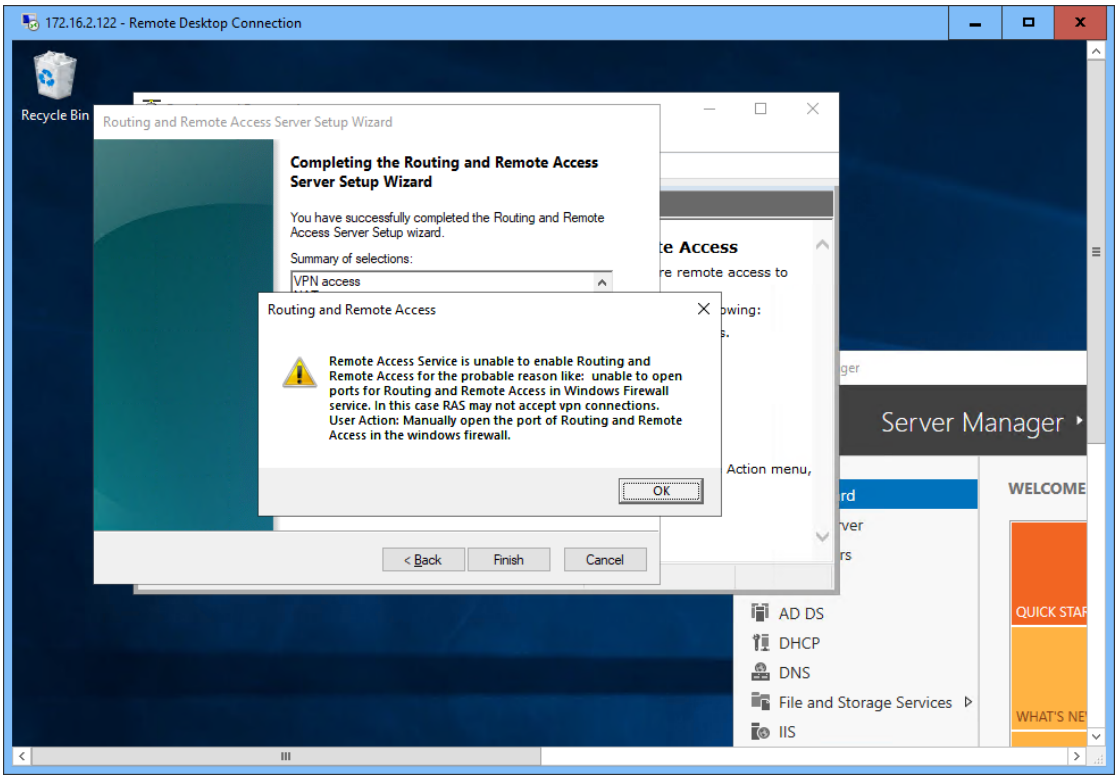


Because the server doesn’t have two NIC, we will choose the Custom configuration option to configure the VPN access and NAT.


Routing and Remote Access Server Setup Wizard
Configuration
You can enable any of the following combinations of services, or you can customize this server.
Remote access (dial-up or VPN)
Allow remote clients to connect to this server through either a dial-up connection or a secure virtual private network (VPN) Internet connection.
Network address translation (NAT)
Allow internal clients to connect to the Internet using one public IP address.
Virtual private network (VPN) access and NAT
Allow remote clients to connect to this server through the Internet and local clients to connect to the Internet using a single public IP address.
Secure connection between two private networks
Connect this network to a remote network, such as a branch office.
Custom configuration
Select any combination of the features available in Routing and Remote Access.
< Back
Next >
Cancel


172.16.2.122 - Remote Desktop Connection
Recycle Bin
Routing and Remote Access Server Setup Wizard
Custom Configuration
When this wizard closes, you can configure the selected services in the Routing and Remote Access console.
Select the services that you want to enable on this server.
VPN access
Dial-up access
Demand-dial connections (used for branch office routing)
NAT
LAN routing
< Back
Next >
Cancel
Server Manager
AD DS
DHCP
DNS
File and Storage Services
IIS



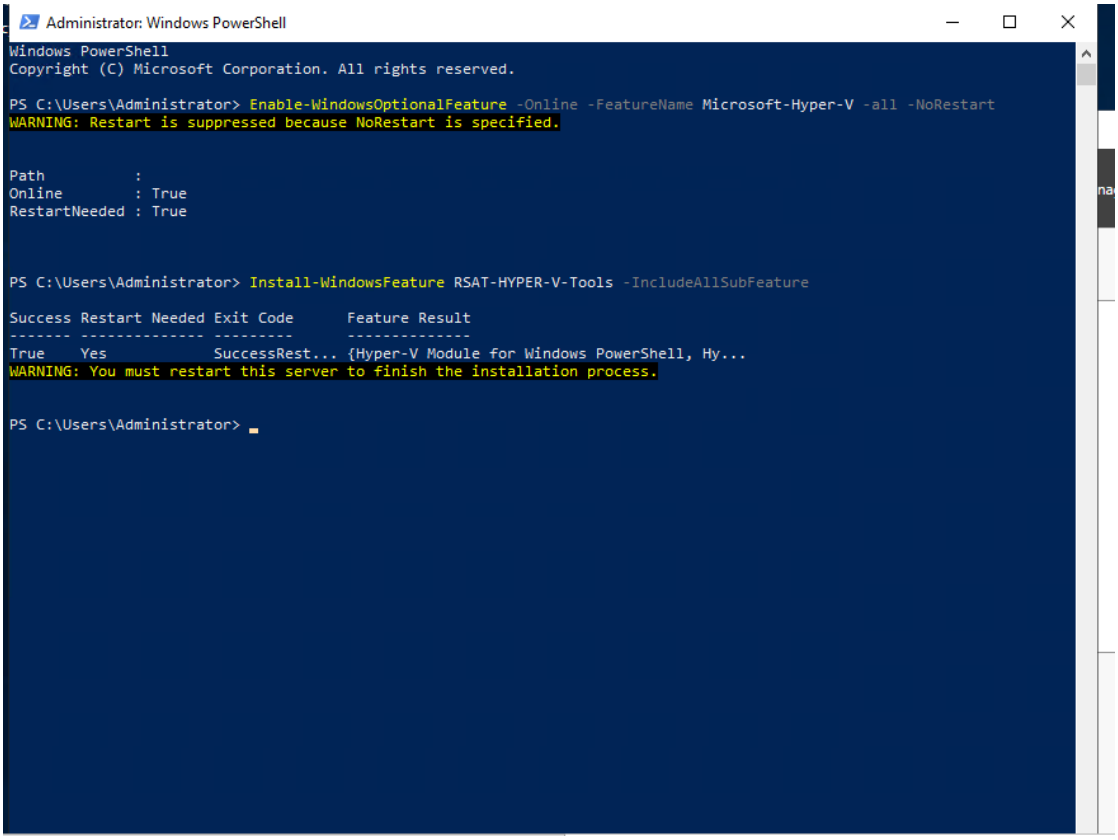


VPN configuration was a challenging section to configure it didn't went well, first of all the are no two network interfaces cards installed, the public IP was necessary to be configured to access the server remotely.

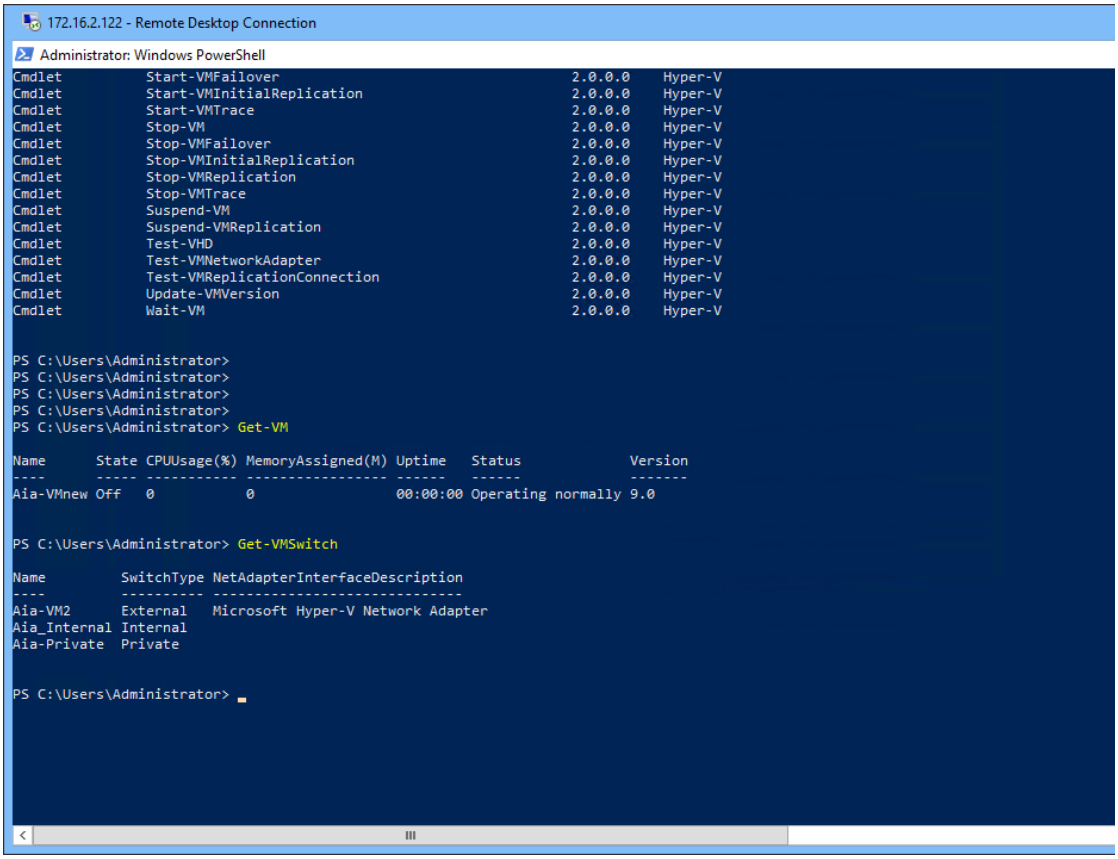
- **Server Virtualization with Hyper- V:**

The term virtualization is used for a lot of different things nowadays. It is used in association with applications, storage, network, servers, screen presentation, and so on. In this chapter, virtualization means the ability to run a full operating system on a software platform in such a way that the OS thinks it is running on a “real” computer.

Installing Hypver –V feature:



By configuring the VM and set up the network adapters same as we did in Lab 1 of Advanced Server Enterprises course.

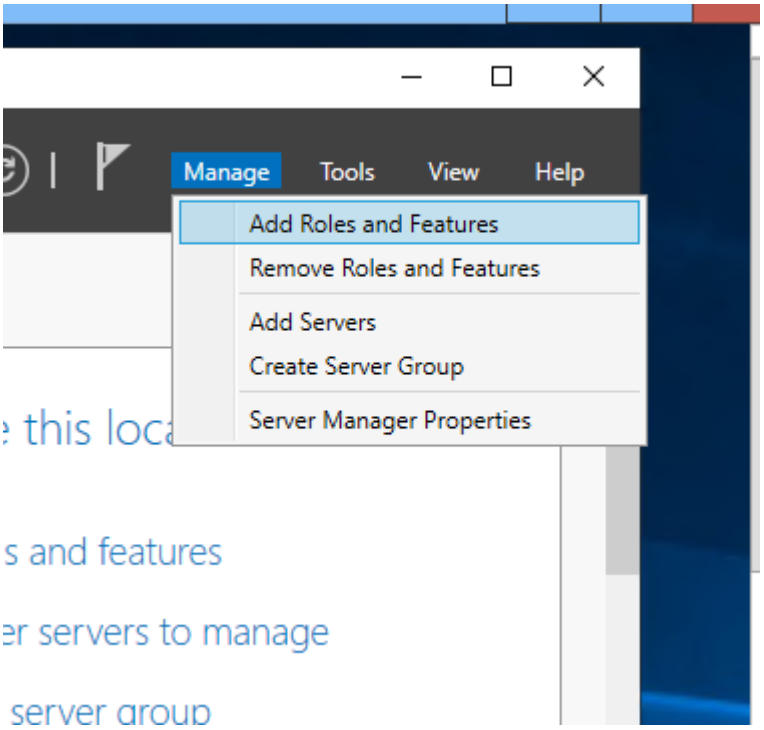


➢ Patch Management:

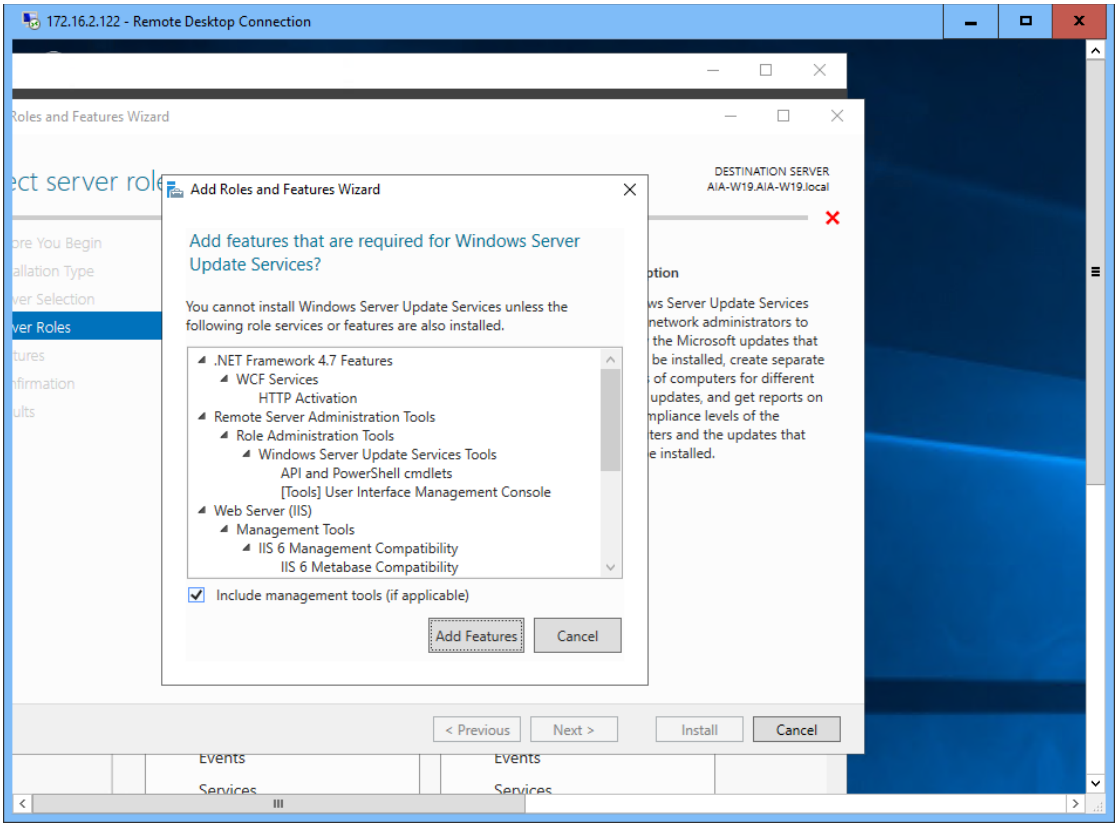
Patch management has been the process if minimizing the organization's threat and vulnerability surface by managing and deploying software updates, but over time it has moved to support feature updates and overall product updates. Updates can be deployed and managed by a number of different products and tools. Windows Server Updates Services (WSUS) its windows role that allows administrators to use the Server Management tool to configure and manage updates, the same rich reporting and status updates are included with some new features and changes to the past functionality.

Installing and configuring of Patch management:

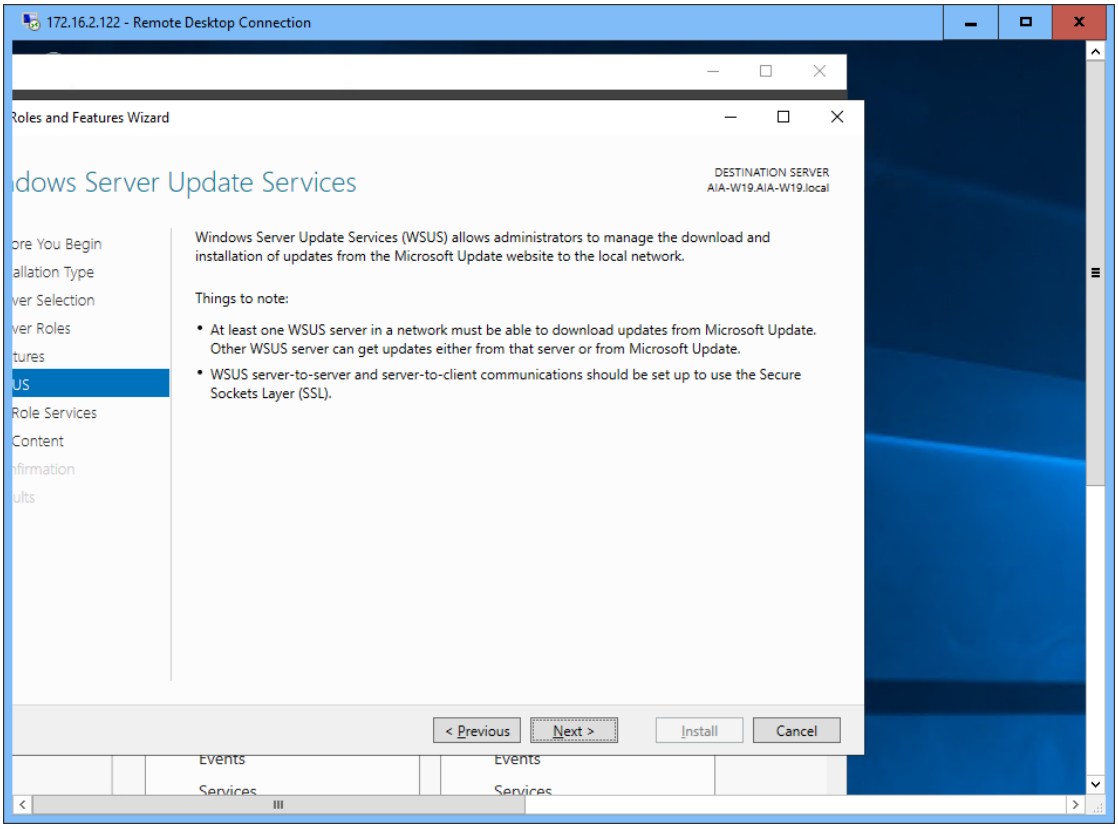
In **Server Manager**, click **Manage**, and then click **add Roles and Features**.

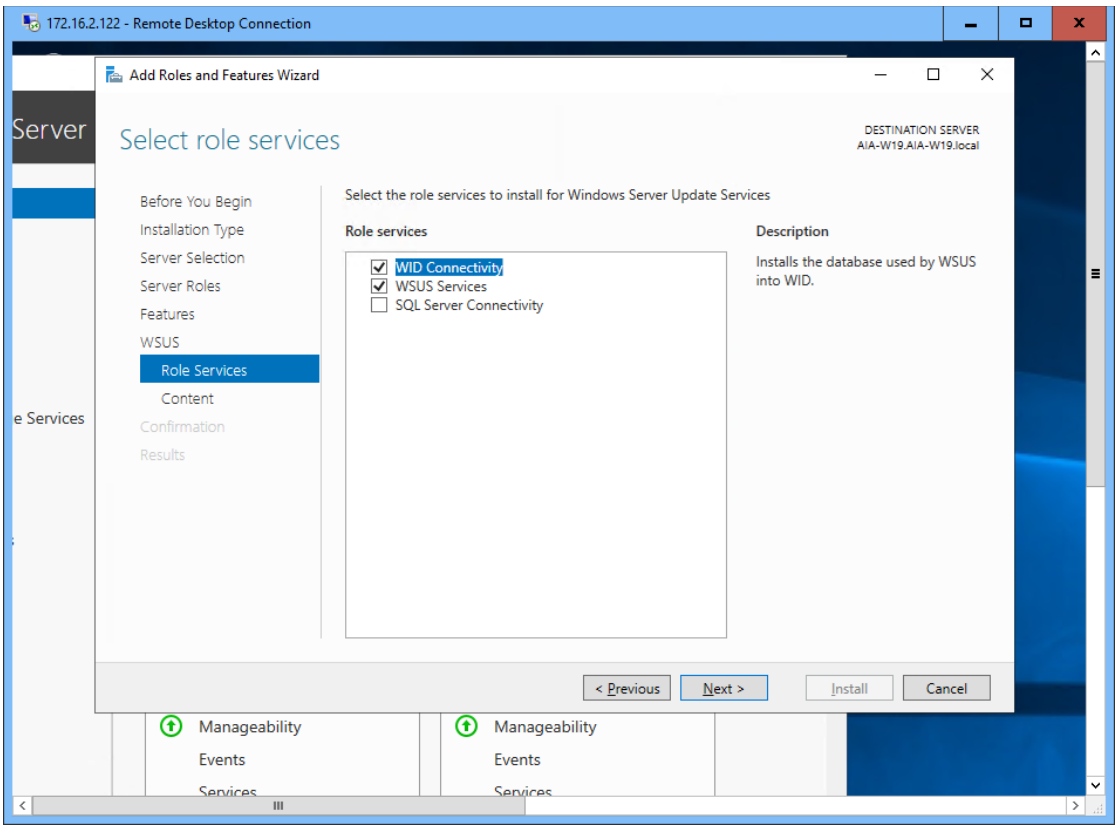


On the **Before you begin** page, click **Next**. On the **select server roles** page, select **Windows Server Update Services**. **Add features that are required for Windows Server Update Services** opens. Click **Add Features**, and then click **Next**.

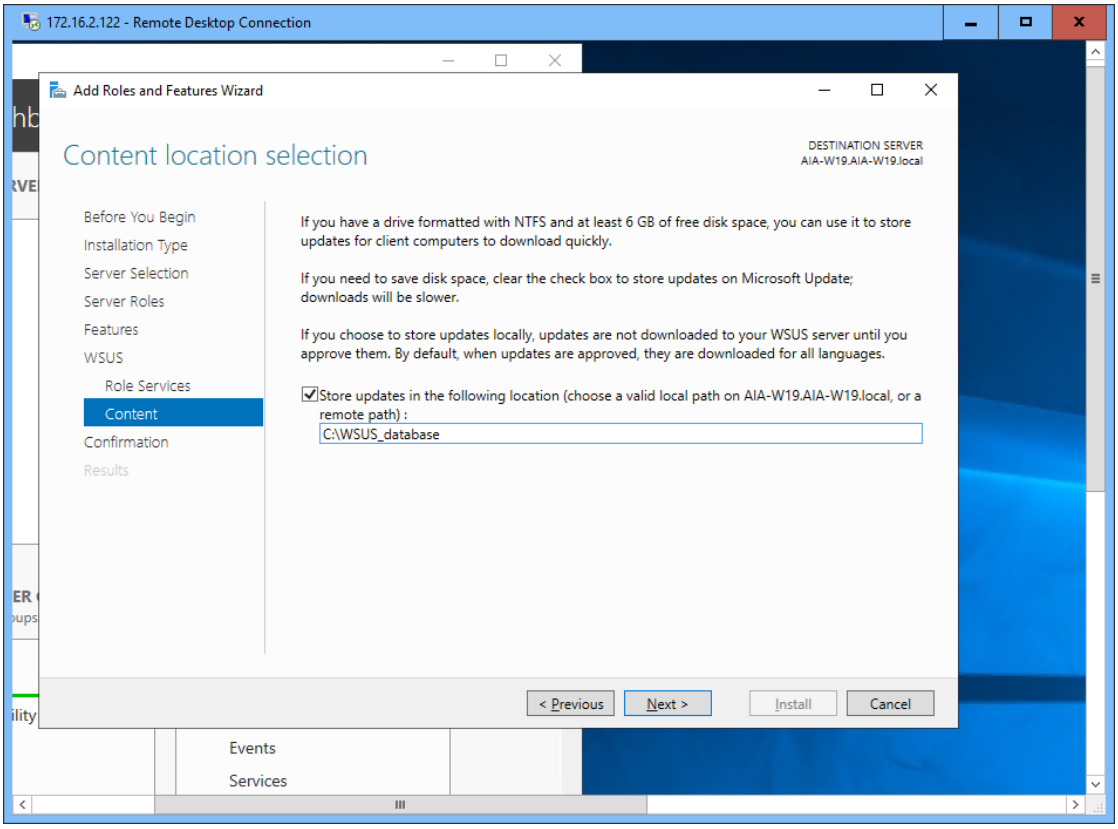


On the **select features**page. retain the default selections, and then click **Next**.

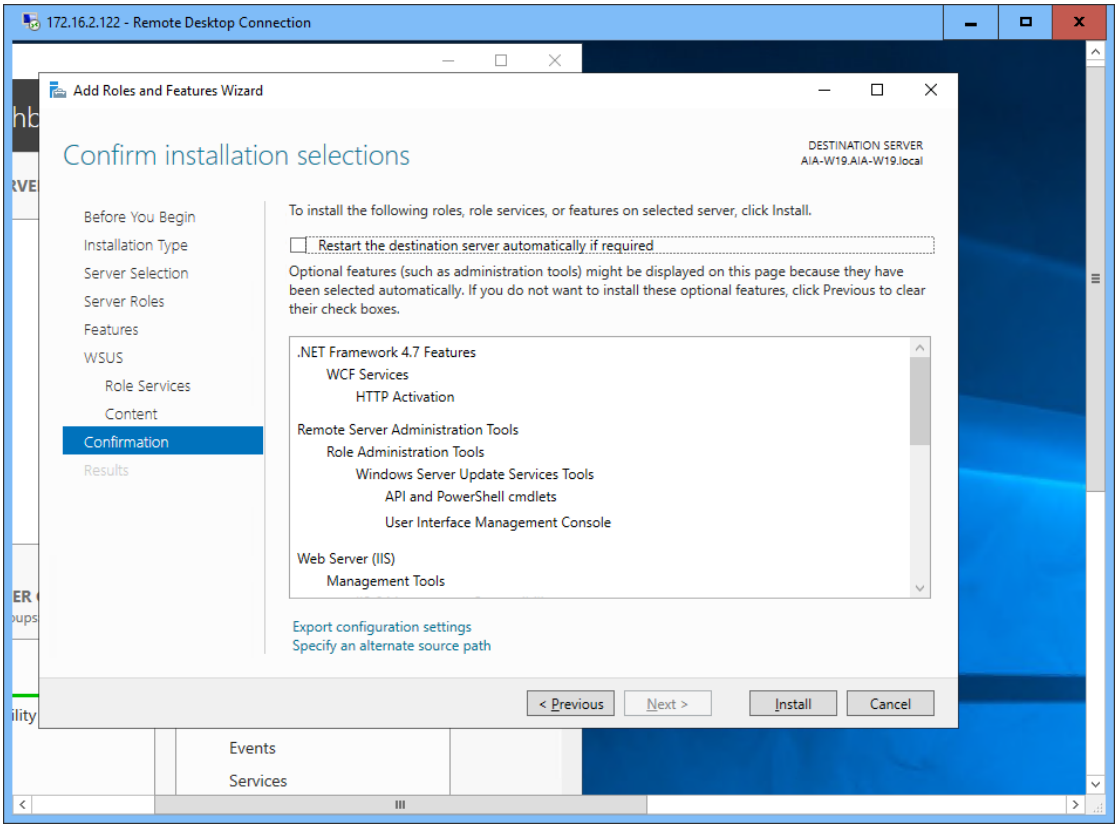




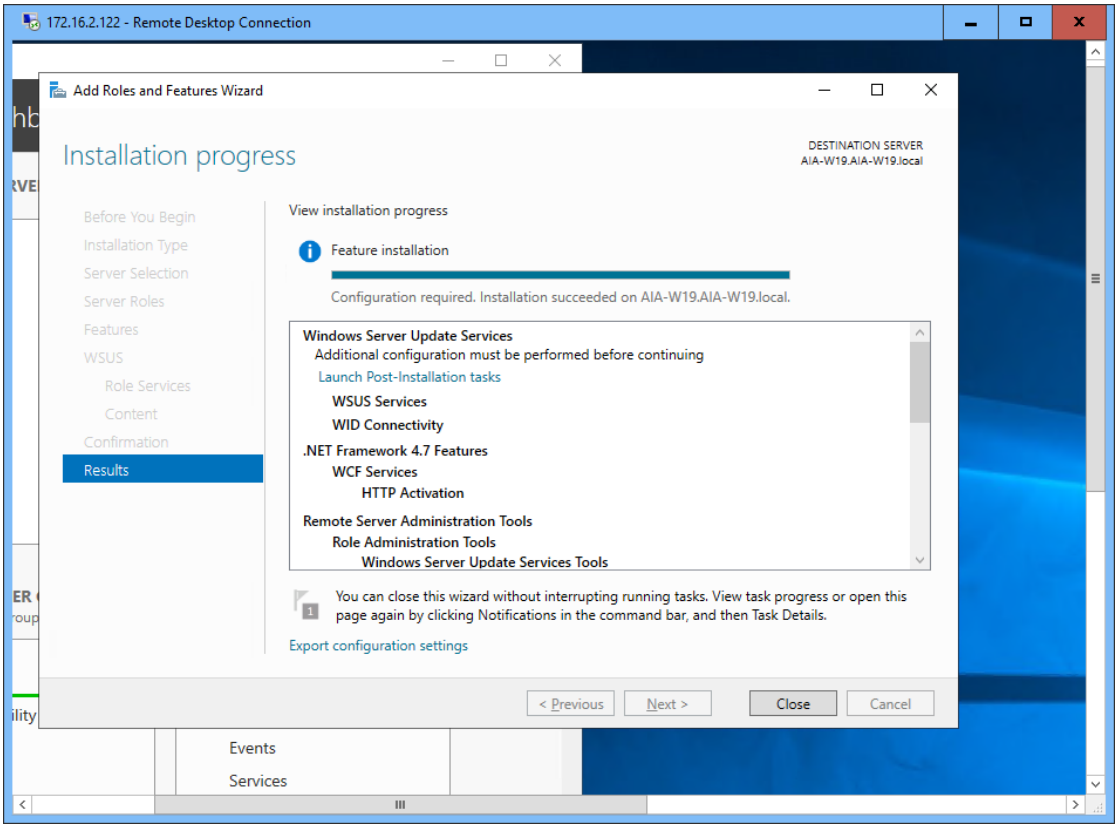
On the **Select Role Services** page, leave the default selections, and then click **Next**. On the **Content location selection** page, type a valid location to store the updates. for this purpose, and type **C:\WSUS_database** as the valid location.



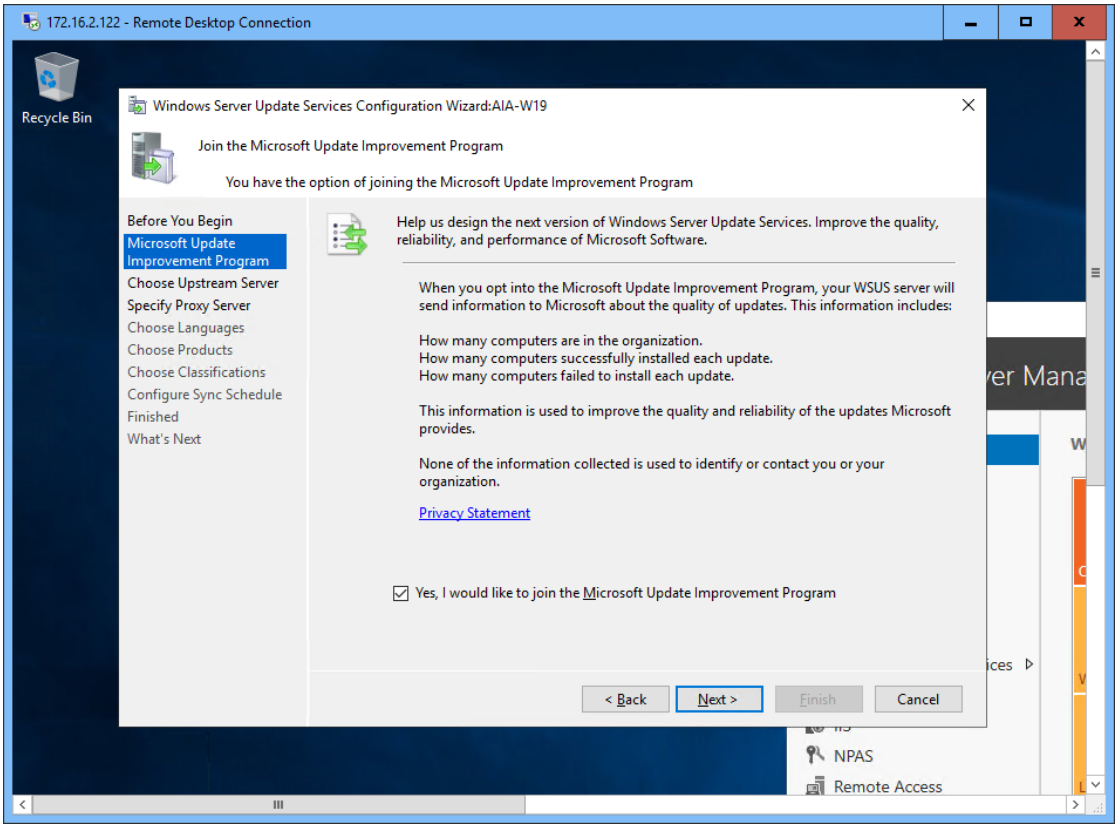
lick **Next**. The **Web Server Role (IIS)** page opens. Review the information, and then click **Next**. In **select the role services to install for Web Server (IIS)**, retain the defaults, and then click **Nex**



Once WSUS installation is complete, in the summary window on the **Installation progress** page, click **Launch Post-Installation tasks**. The text changes, requesting: **Please wait while your server is configured**. When the task has finished, the text changes to: **Configuration successfully completed**. Click **Close**.



The Windows Server Update Services Wizard opens. On the **Before you Begin** page, review the information, and then click **Next**.

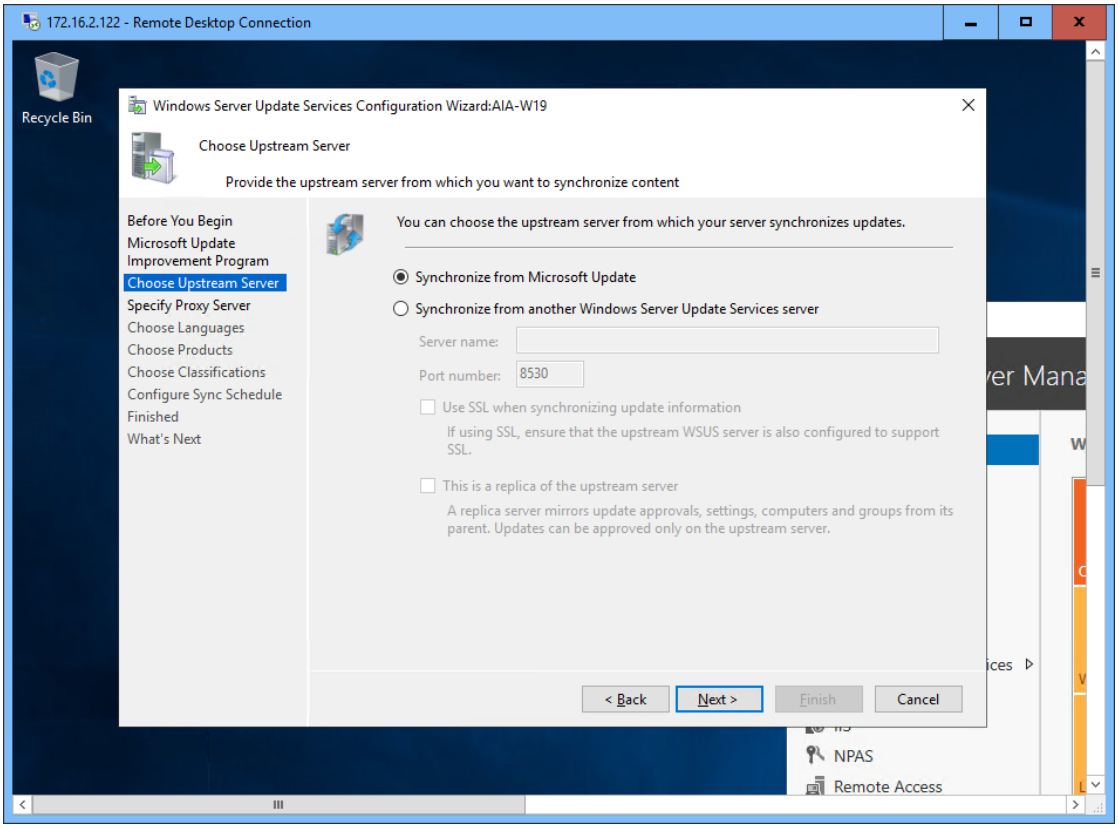


Read the instructions on the **Join the Microsoft Update Improvement Program** page and evaluate if you want to participate. If you want to participate in the program. retain the default selection, or clear the check box, and then click **Next**.

On the Choose Upstream Server page, there are two options:

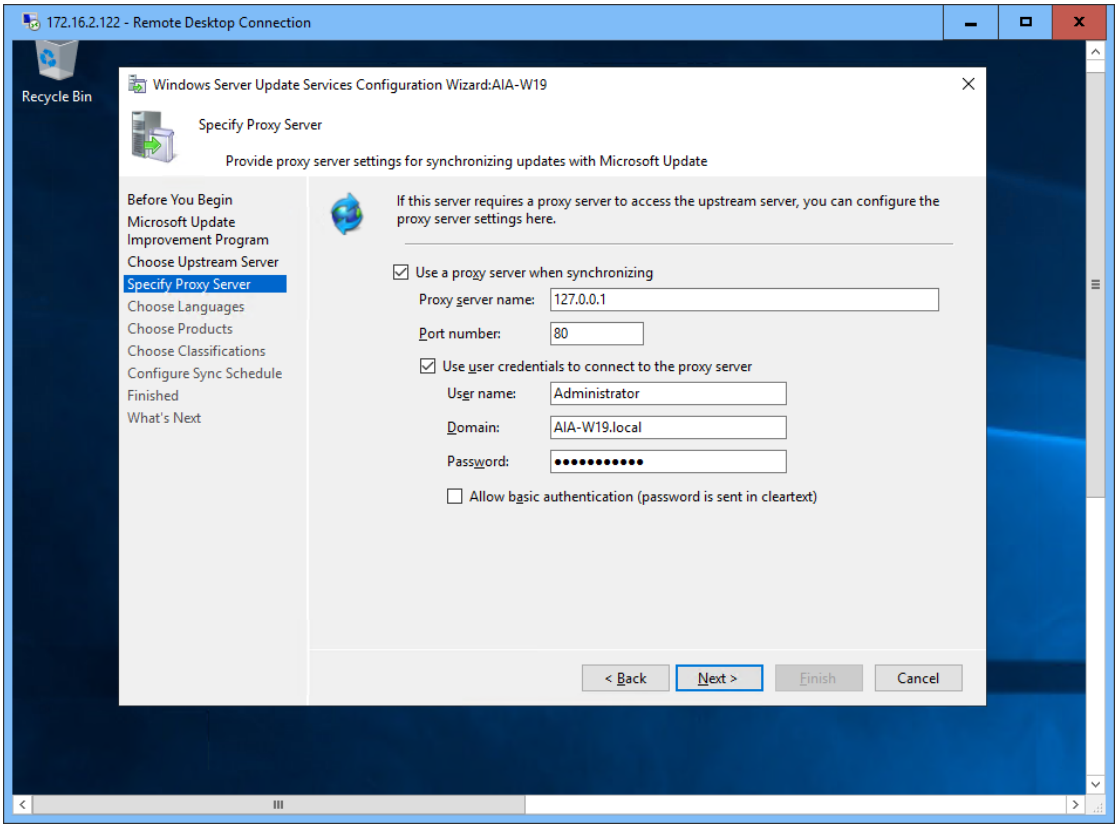
Synchronize the updates with Microsoft Update, Synchronize from another Windows Server Update Services server.

- if you choose to synchronize from another WSUS server, specify the server name and the port on which this server will communicate with the upstream server.
- To use SSL, select the **Use SSL when synchronizing update information** check box. The servers will use port 443 for synchronization. (Make sure that this server and the upstream server support SSL).
- if this is a replica server, select the **This is a replica of the upstream server** check box.

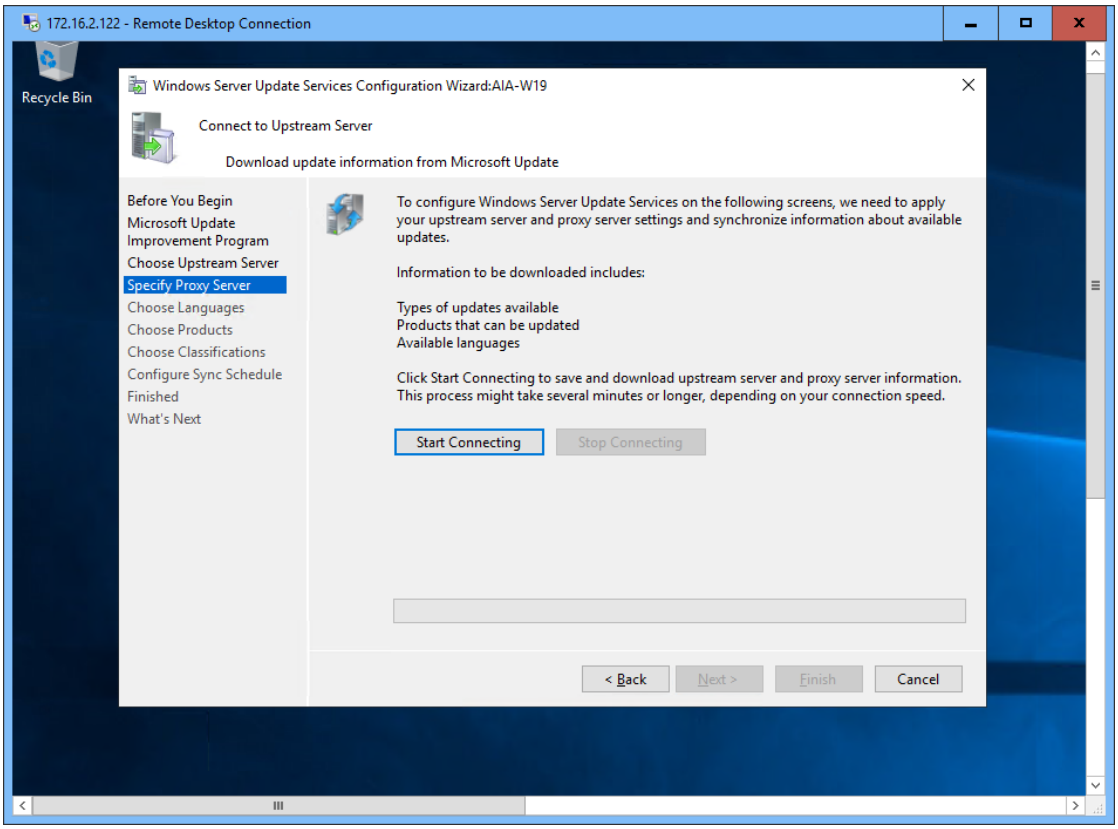


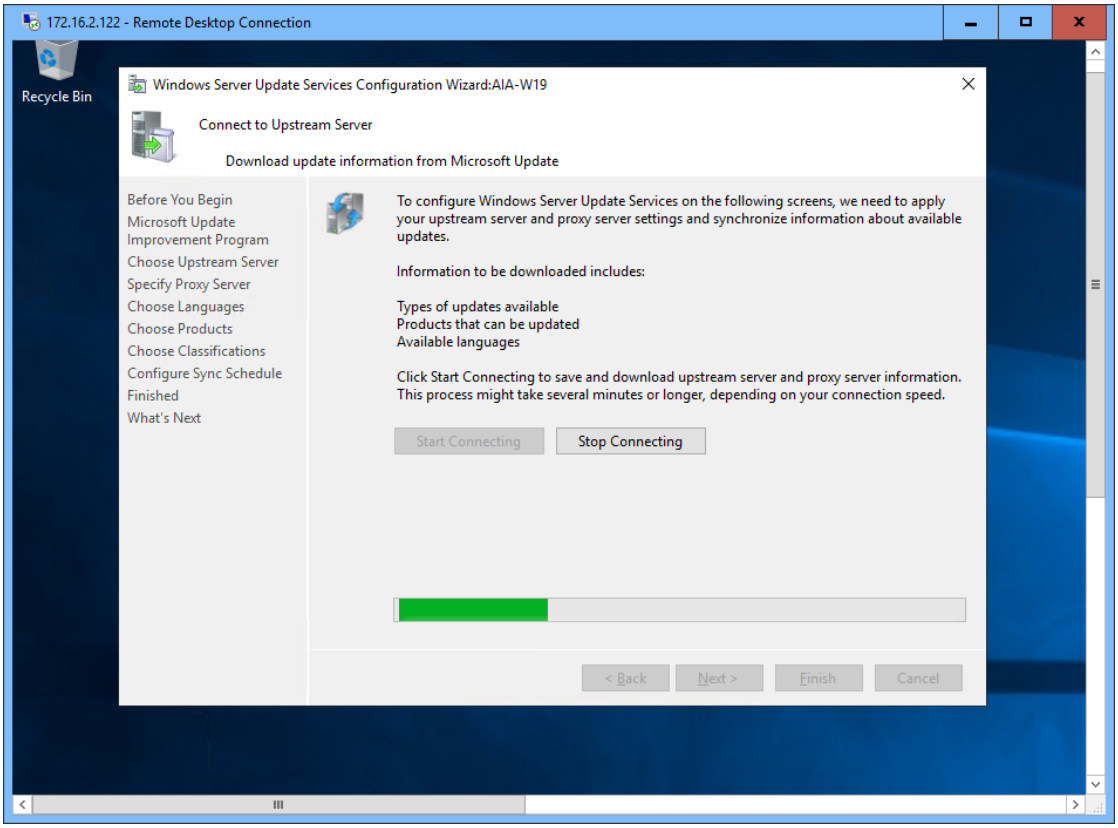
After selecting the proper options for your deployment, click **Next** to proceed.

On the **Specify Proxy Server** page, select the **Use a proxy server when synchronizing** check box, and then type the proxy server name and port number (port 80 by default) in the corresponding boxes.

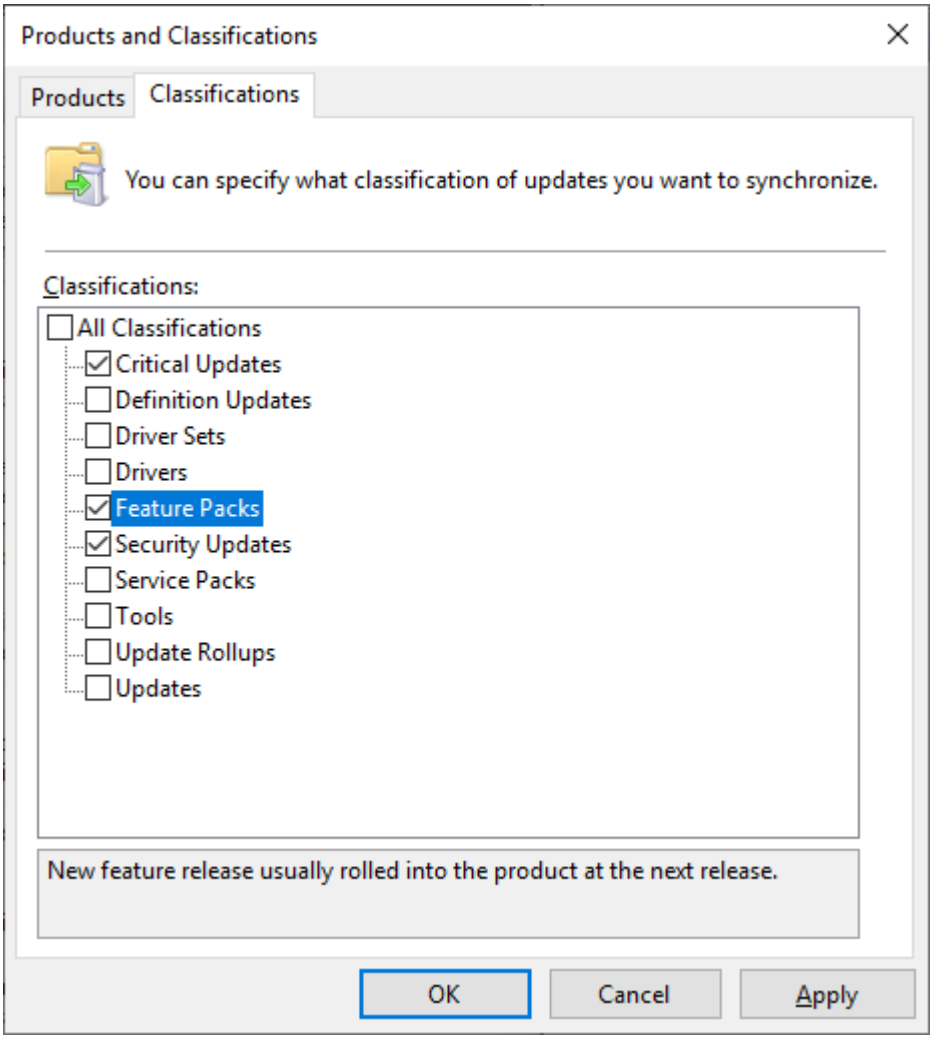


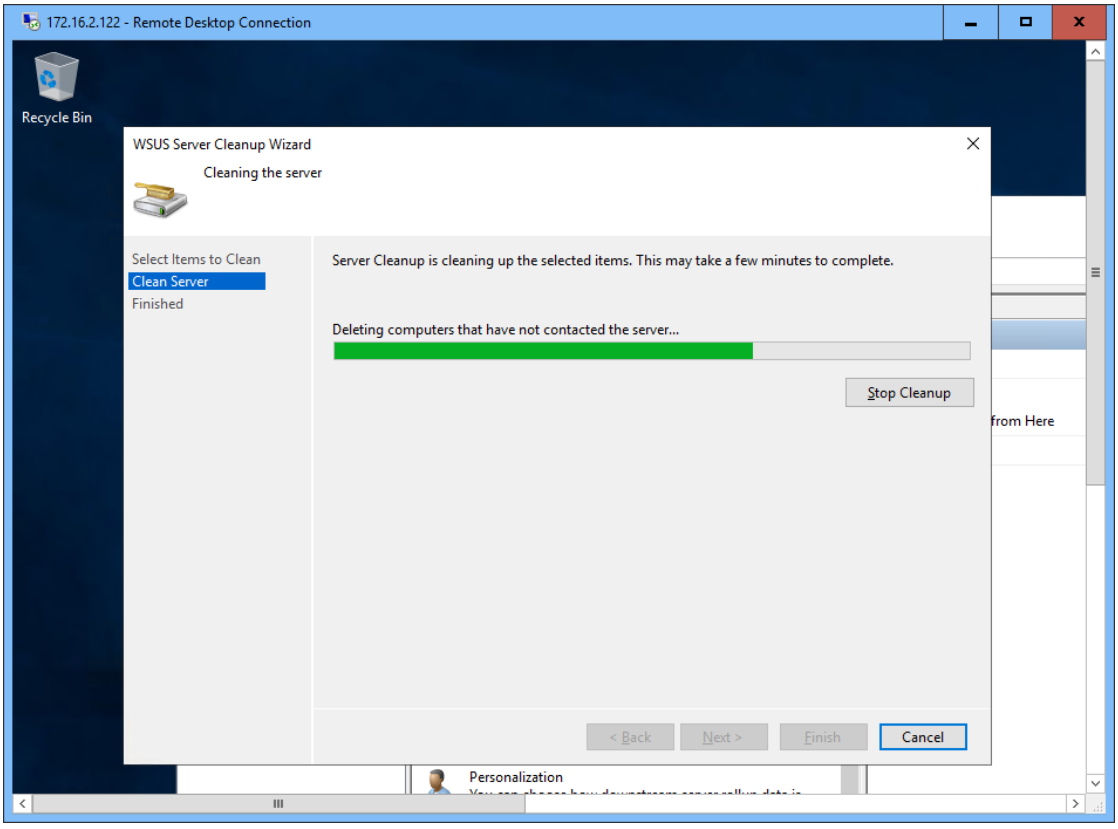
Click **Next**. On the **Connect to Upstream Server** page, click **start Connecting**.





On the **Choose Classifications** page, select the update classifications that you want to obtain. Choose all the classifications or a subset of them, and then click **Next**.


Products and Classifications
Products
Classifications
You can specify what classification of updates you want to synchronize.
Classifications:
All Classifications
Critical Updates
Definition Updates
Driver Sets
Drivers
Feature Packs
Security Updates
Service Packs
Tools
Update Rollups
Updates
New feature release usually rolled into the product at the next release.
OK
Cancel
Apply


172.16.2.122 - Remote Desktop Connection
Recycle Bin
WSUS Server Cleanup Wizard
Cleaning the server
Select Items to Clean
Clean Server
Finished
Server Cleanup is cleaning up the selected items. This may take a few minutes to complete.
Deleting computers that have not contacted the server...
Stop Cleanup
< Back
Next >
Finish
Cancel
Personalization

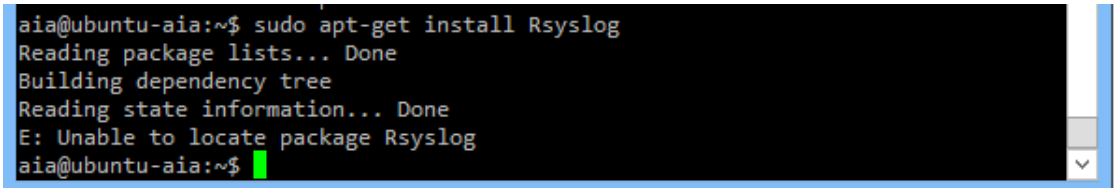
3.2 Linux Server configuration

- **Enabling system logging with rsyslog**

Rsyslogd daemon is the system logging daemon, it accepts log messages from a variety of other programs and writes them to the appropriate log files. It's better than having every program write directly to its own log file because it enables the administrator to centrally manage how log files are handled.
With remote logging, if the system on the network is broken into, the cracker can't delete or modify the log files because those files are stored on a sperate computer, it's important to remember that those log messages are not encrypted by default.

The Rsyslog daemon is installed automatically in most Linux distributions, but if not, we must execute the following commands:

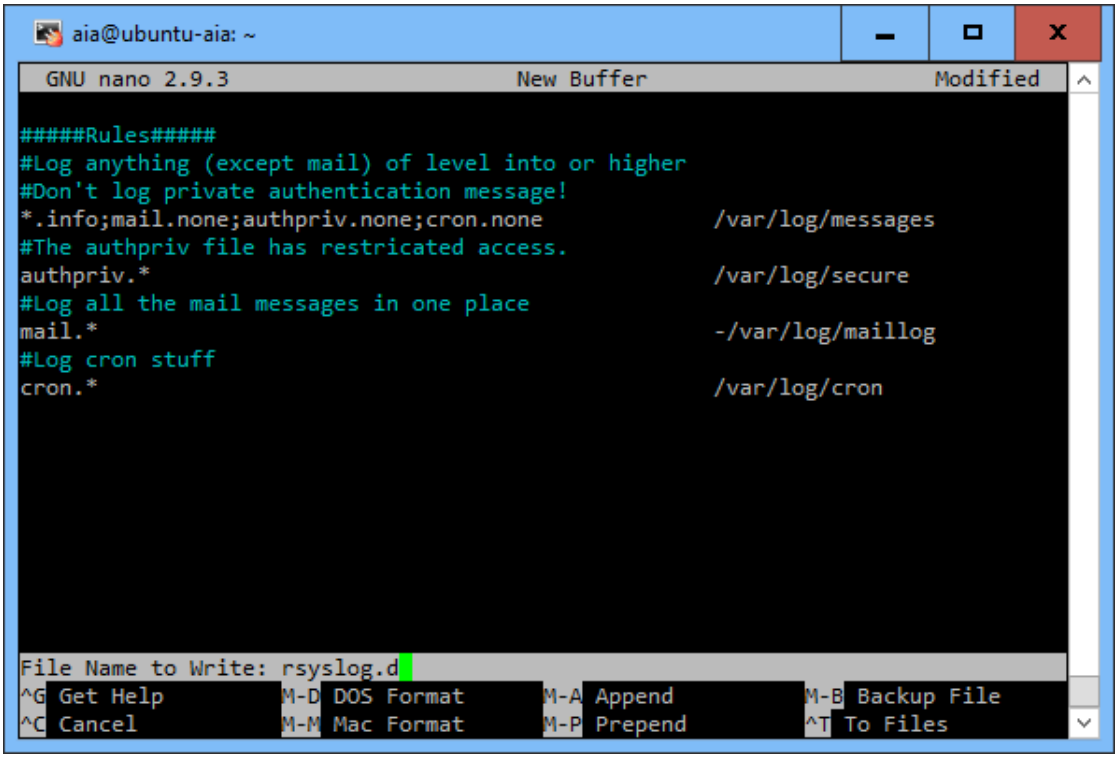
```
sudo apt-get install Rsyslog
```



To configure a rsyslog program to be run in server mode, we must edit the configuration file in the /etc/rsyslog.conf directory.

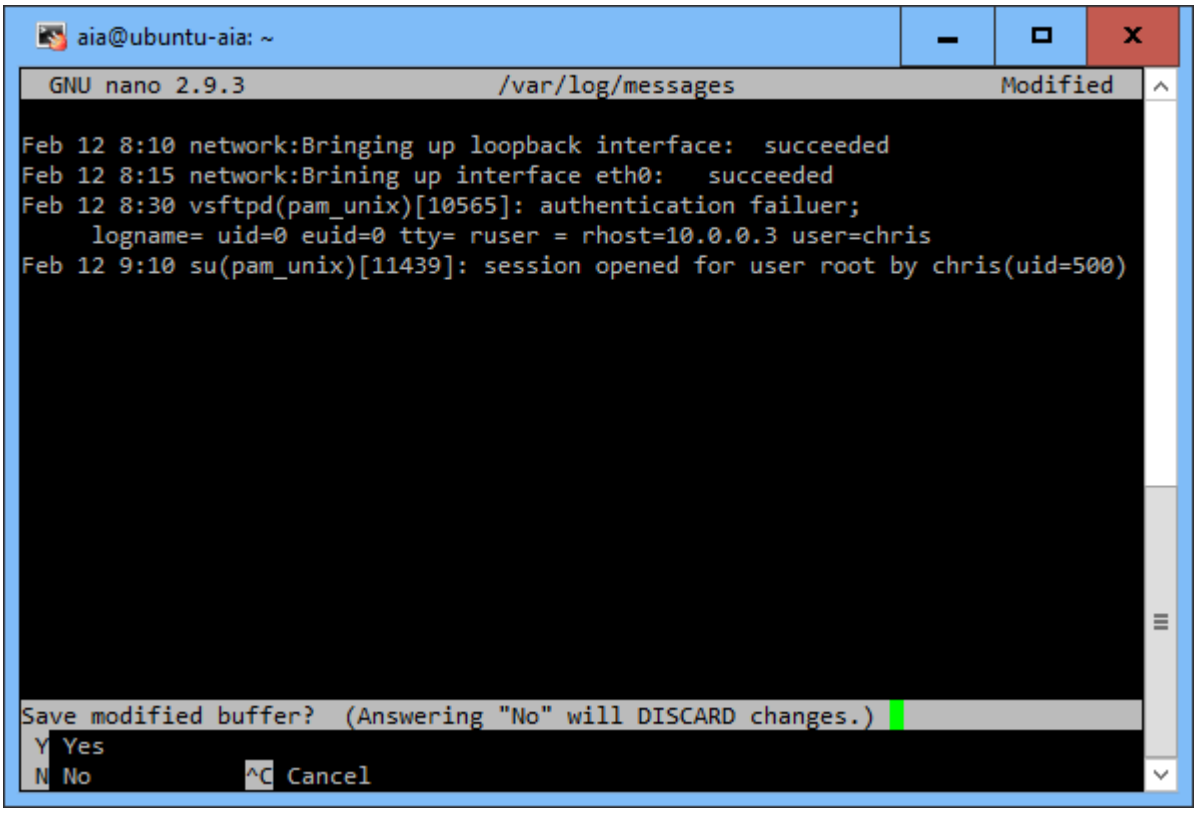
```
sudo nano /etc/rsyslog.conf
```

sudo nano /etc/rsyslog.d



The first entry shows that info level messages from all services (*) are matched by that rule, with the exception of messages from mail, authpriv and cron services . They are all matched messages are directed to the /var/log/message file.

The mail, authpriv and cron services each have their own log files .



The message in the /var/log/messages file are divided into five main parts:

- The date and time that the message was logged
- The name of the computer that message came from
- The program or service name to which message pertains
- The process number
- The actual text message

Sending up and using a loghost with rsyslogd:

On the client side:

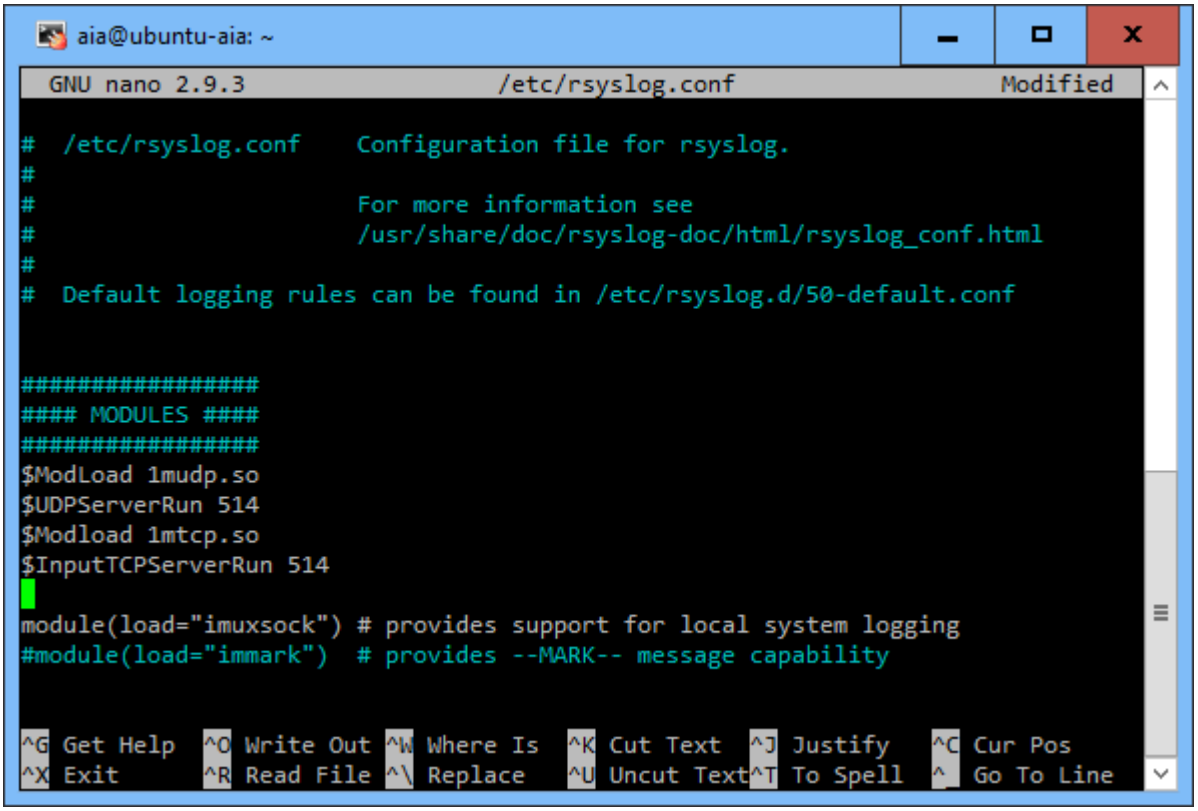
Instead of a file, start by replacing the log file name with the @ character followed by the name of the loghost.

sudo nano /etc/rsyslog.conf

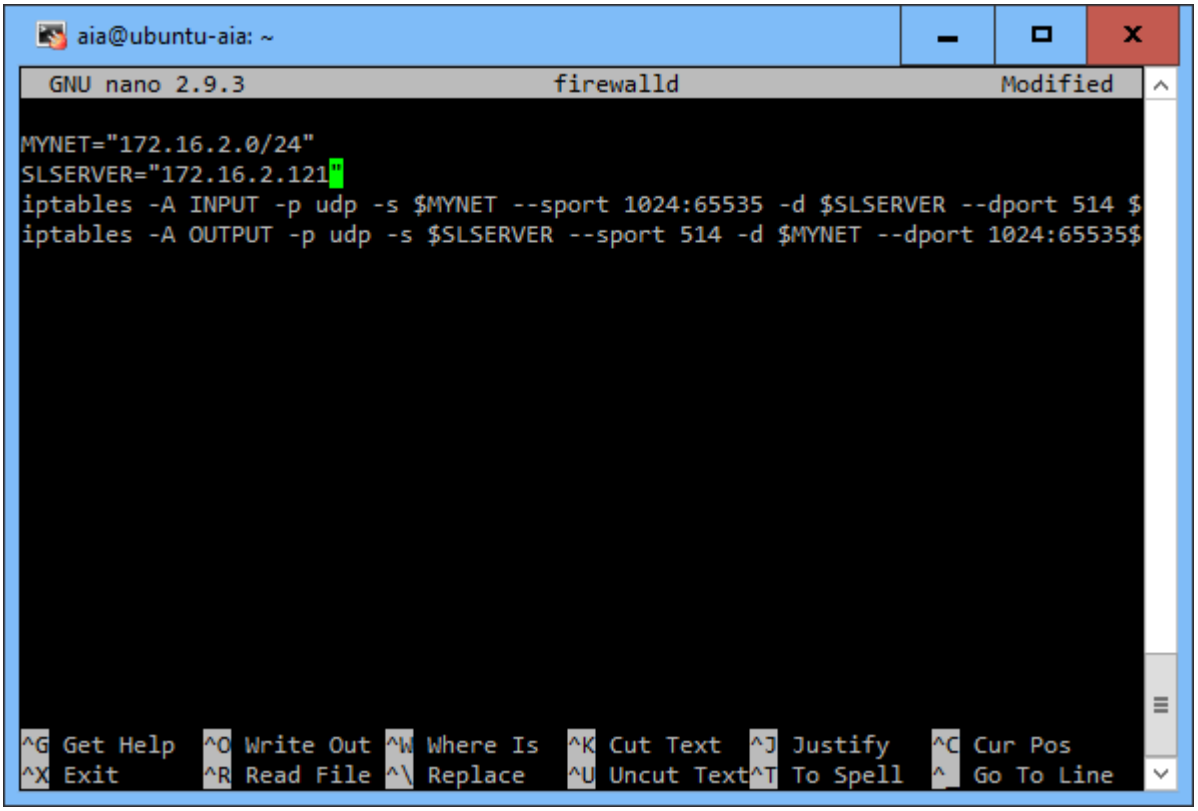
```
# Log anything (except mail) of level info or higher.
# Don't log private authentication messages!
*.info;mail.none;news.none;authpriv.none;
cron.none  /var/log/messages
*.info;mail.none;news.none;authpriv.none;
cron.none  @loghost
# The authpriv file has restricted access.
authpriv.*
/var/log/secure authpriv.*                    @loghost
# Log all the mail messages in one place.
mail.*                          -/var/log/maillog
mail.*                          @loghost
```

On the loghost side:

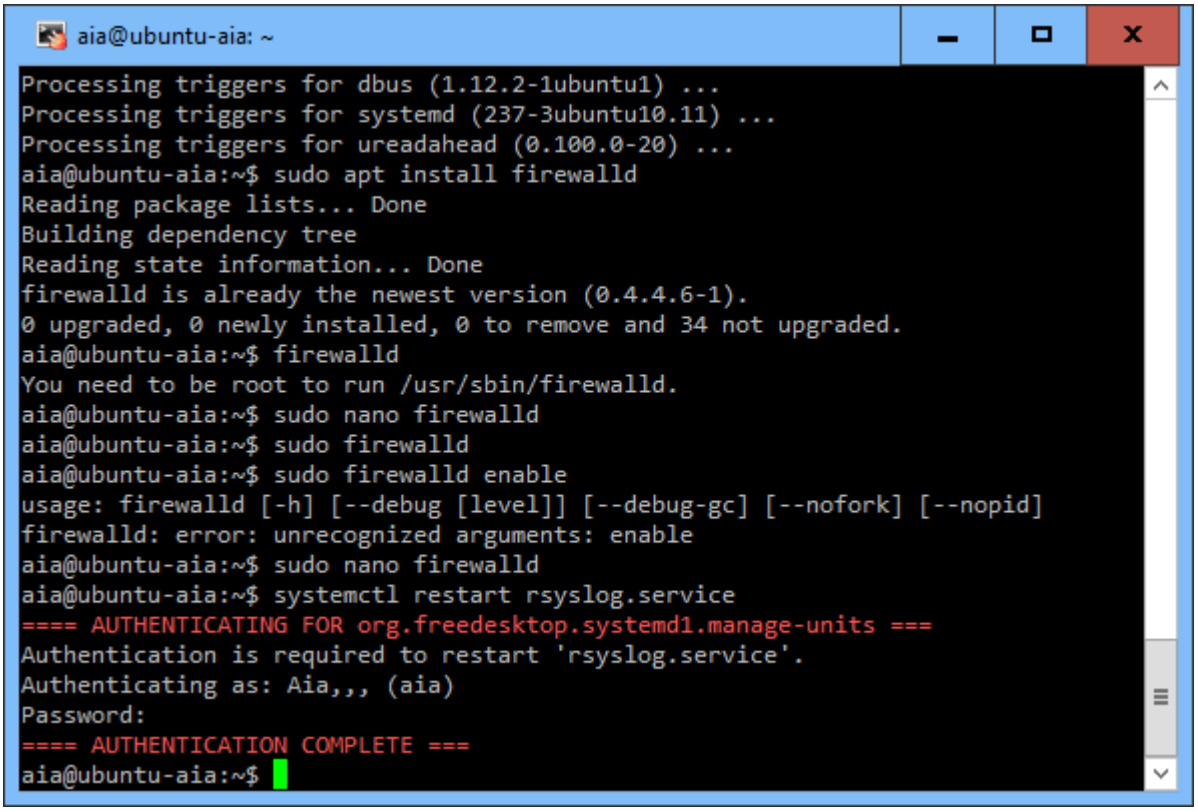
■ Edit the /etc/rsyslog.conf fi le on the loghost system and uncomment the lines that enable the rsyslogd daemon to listen for remote log messages. Uncomment the f i rst two lines to enable incoming UDP log messages on port 514 (default); uncomment the two lines after that to allow messages that use TCP protocol (also port 514): $ModLoad imudp.so $UDPServerRun 514 $ModLoad imtcp.so $In-putTCPServerRun 514



■ Open your fi rewall (iptables or firewalld) to allow new messages to be directed to your loghost.

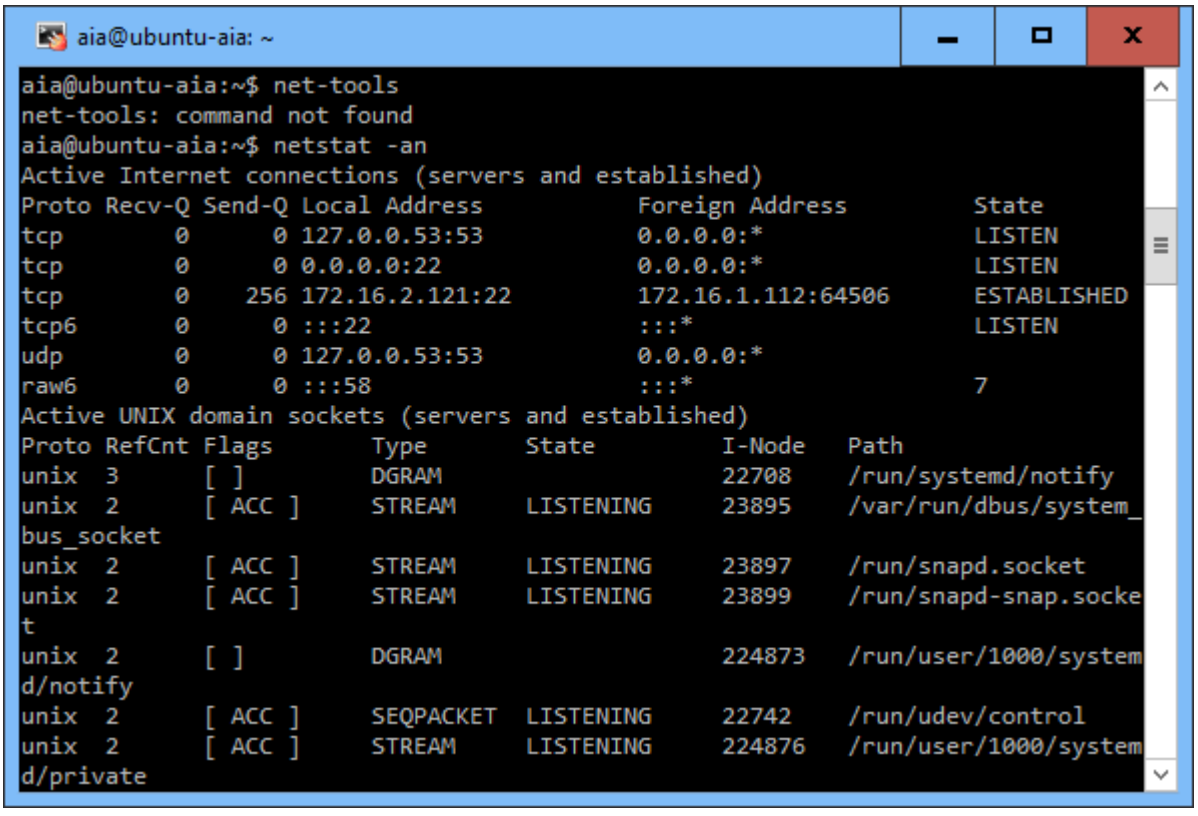


■ Restart the rsyslog service (service rsyslog restart or systemctl restart rsyslog.service).



■ If the service is running, you should be able to see that the service is listening on the ports you enabled (UDP and/or TCP ports 514). Run the netstat command as follows to see that the rsyslogd daemon is listening on IPv4 and IPv6 ports 514 for both UDP and TCP services:

$ netstat -an

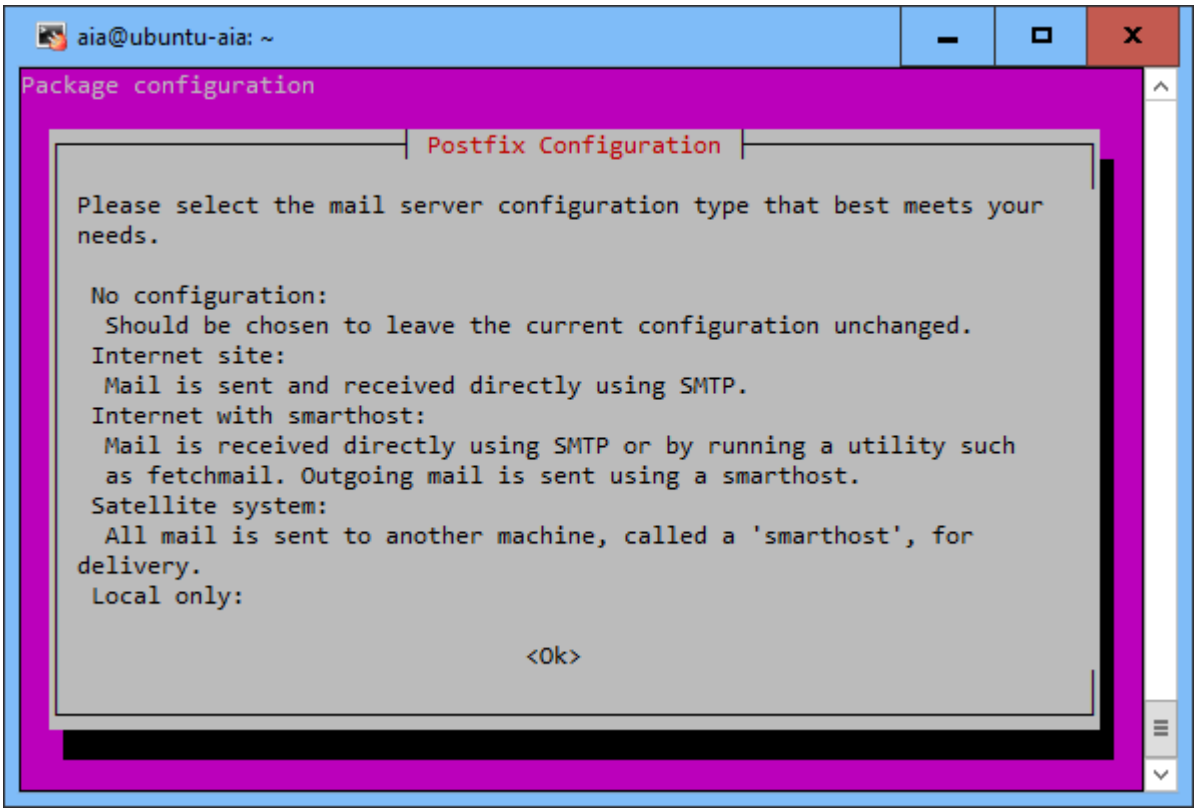


Watching logs with logwatch:

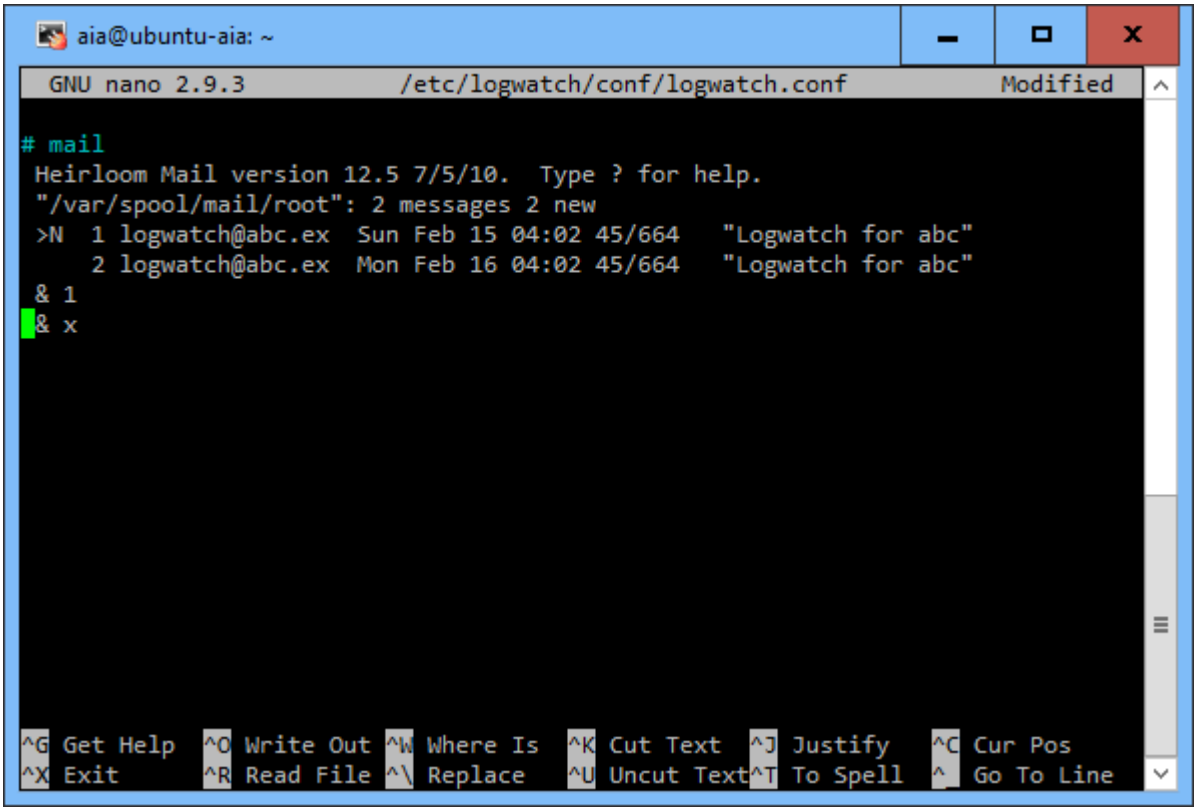
The logwatch service runs in most Linux systems that do system logging with rsyslog . Because logs on busy systems can become very large over time, it doesn't take long for there to be too many messages for a system administrator to watch every message in every log. To install the logwatch facility:

```
sudo apt-get install logwatch
```

The logwatch service runs from a cron job (01logwatch) placed in /etc/cron.daily . The /etc/logwatch/conf/logwatch.conf file holds local settings. The default options used to gather log messages are set in the /usr/share/logwatch/default.conf/logwatch.conf file.



for other settings to change (such as detail level or the time range for each report).



- **Administering Netwroking:**

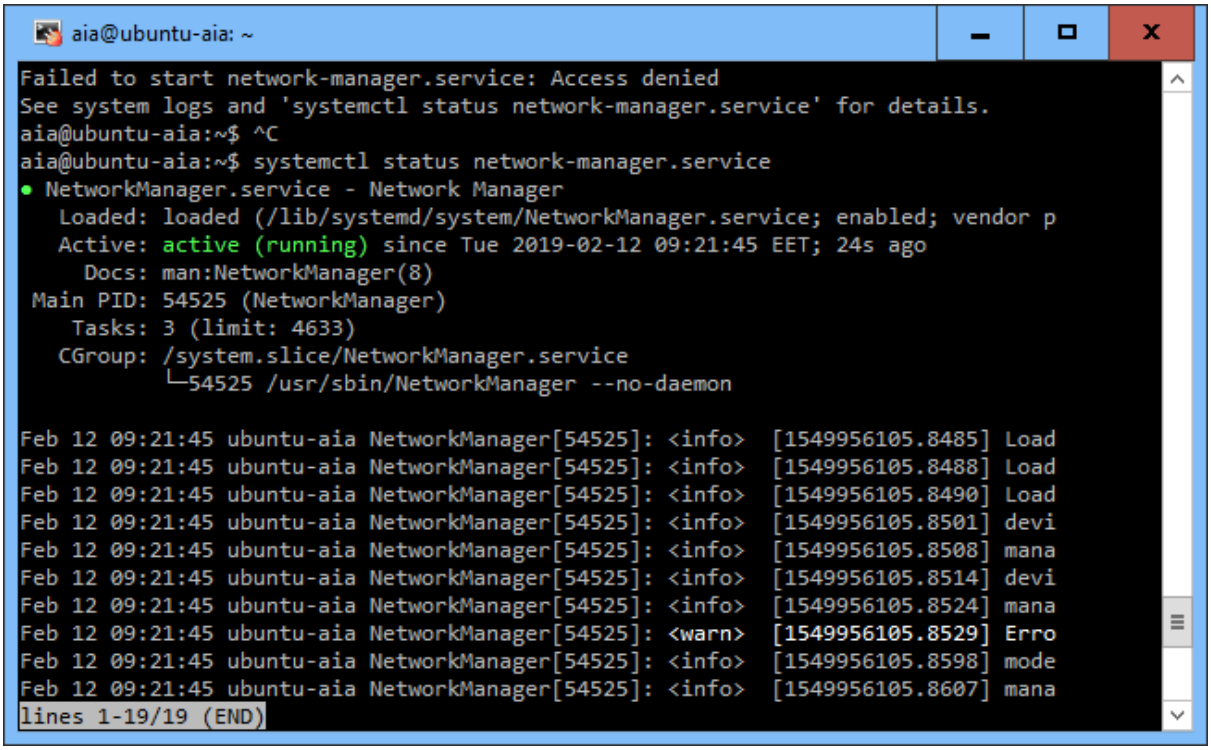
use the nmtui or system-config-network commands to confi gure basic networking with a menu-based interface from a shell.

It require installing network manager to access the network configuration by the command:

sudo apt install network-manager

```
service network-manager start
```

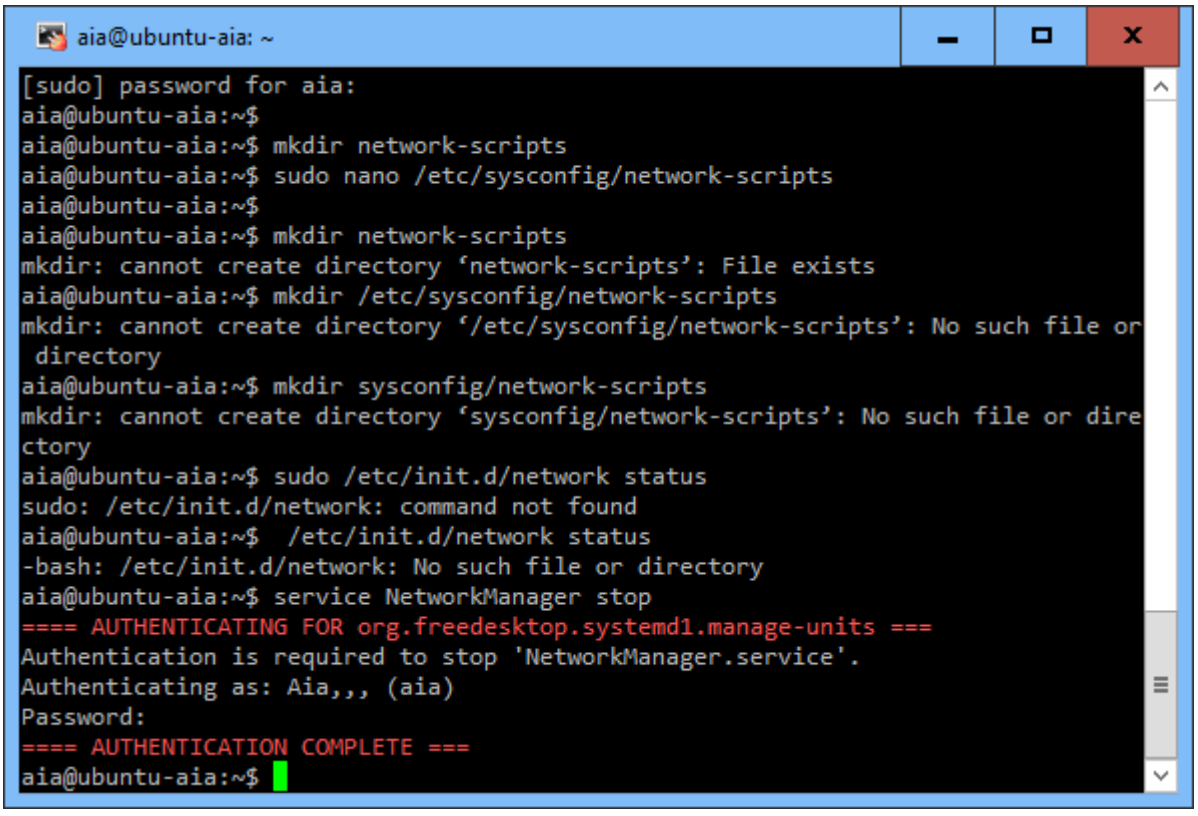
As root it appears that the network-manager start running



To turn NetworkManager off (immediately and permanently) on a RHEL 6 or older Fedora system:

#service NetworkManager stop

Ensure that the Network Manager service is stopped using the `service` command.



#service network restart

```
sudo service network-manager restart
```

- Ensure that the network manager service is disable using the `chkconfig` command.

  #chkconfig NetworkManager off

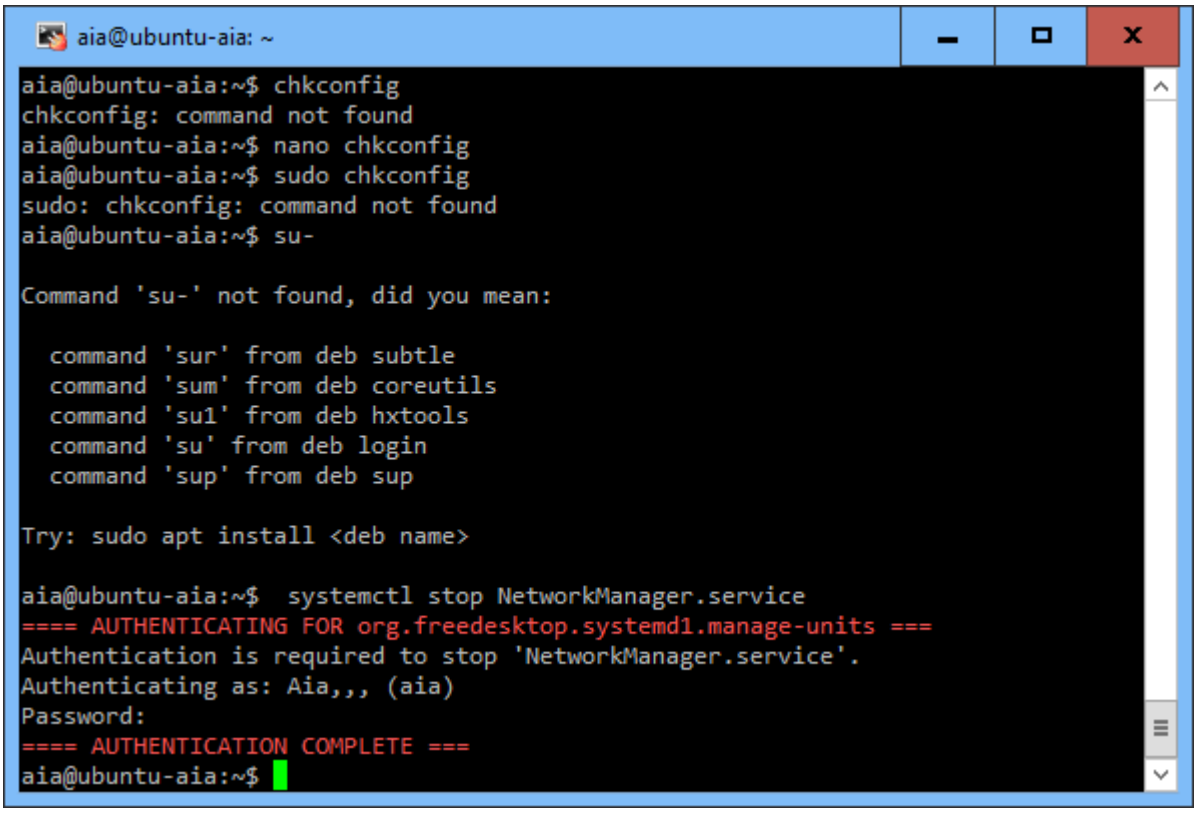
  first it needs to install chkconfig tool by using the following command:

  sudo apt-get install chkconfig

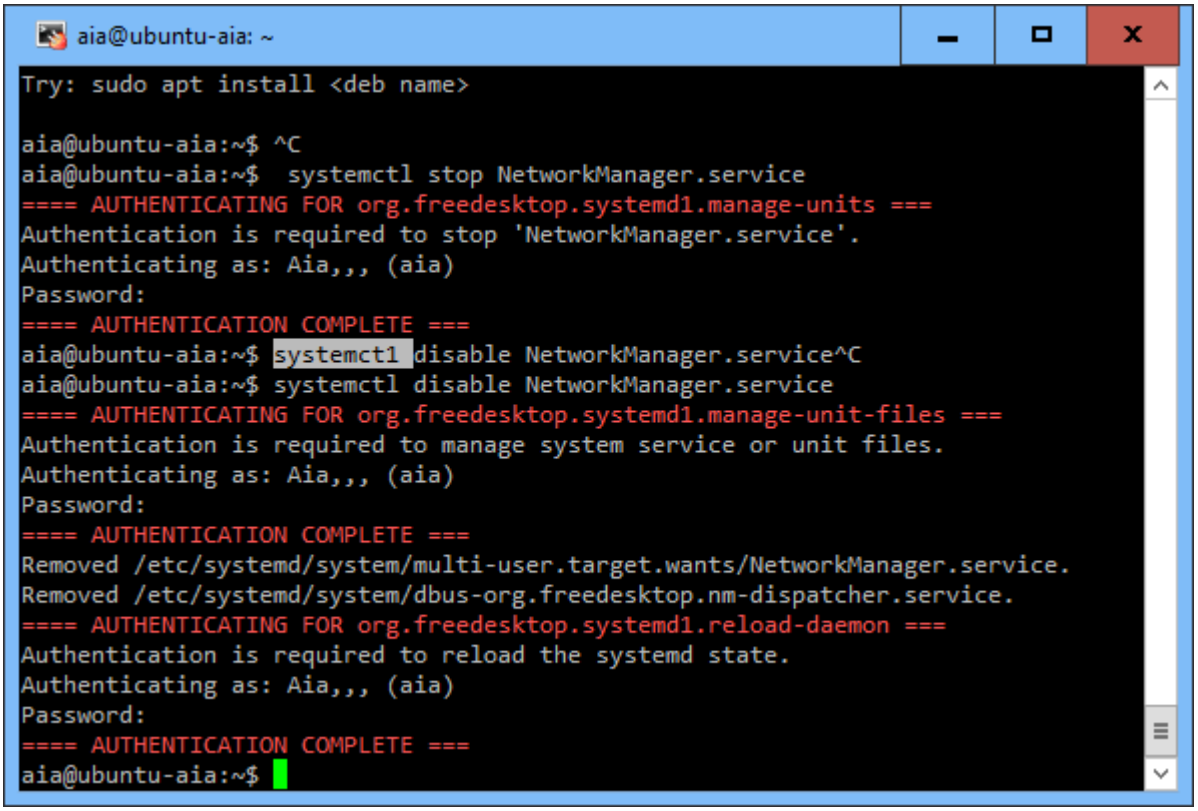
  #chkconfig network on

  For RHEL 7 and newer Fedora systems that use the systemctl command to start, stop, enable, and disable services.

  #systemctl stop NetworkManager.service

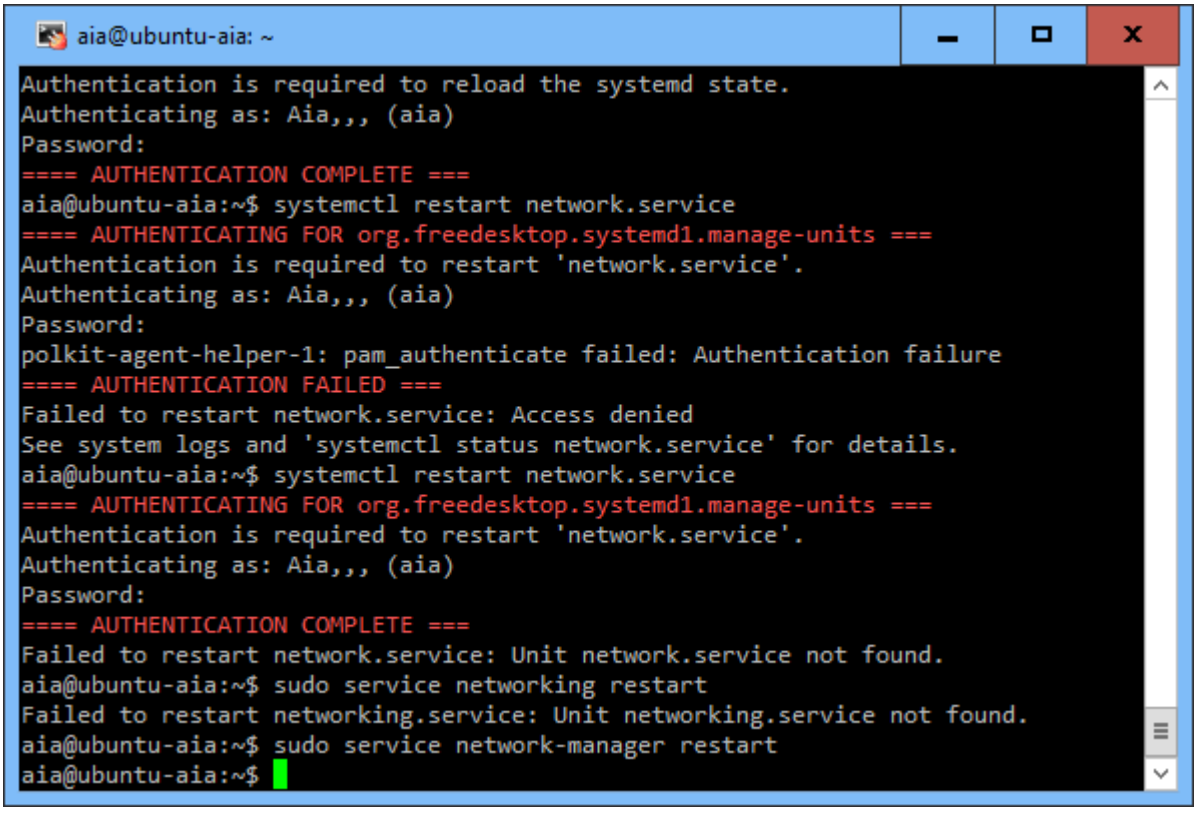


  #systemctl disable NetworkManager.service



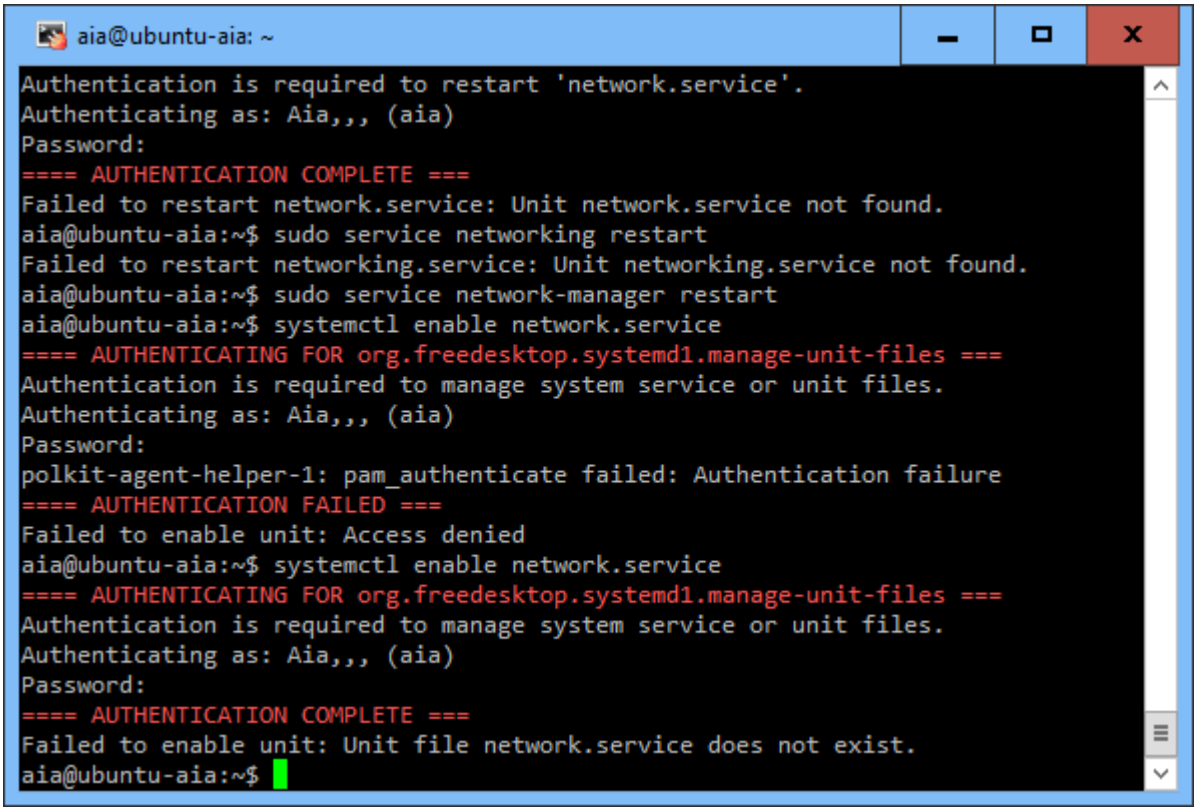
#systemctl restart network.service it didn't work, there is other command it managed to configure.

#sudo service network-manager restart

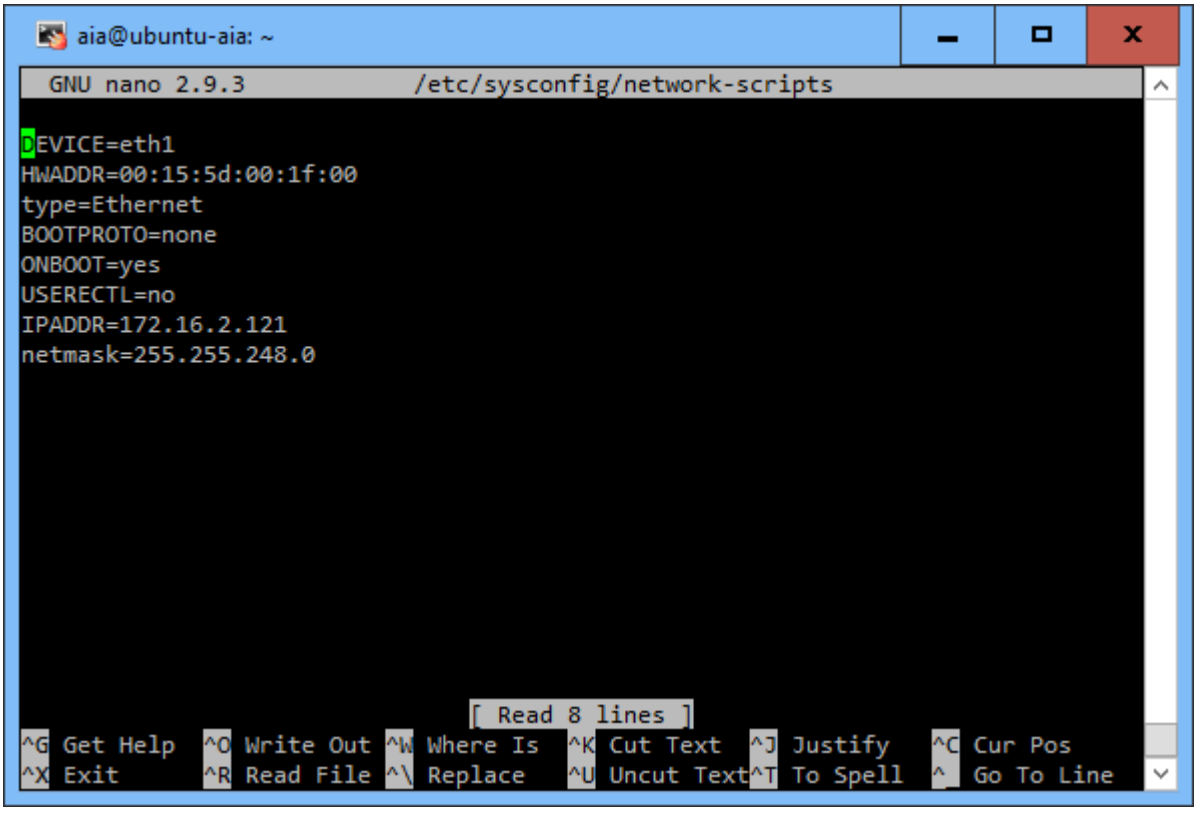


To enable the network service using the command:

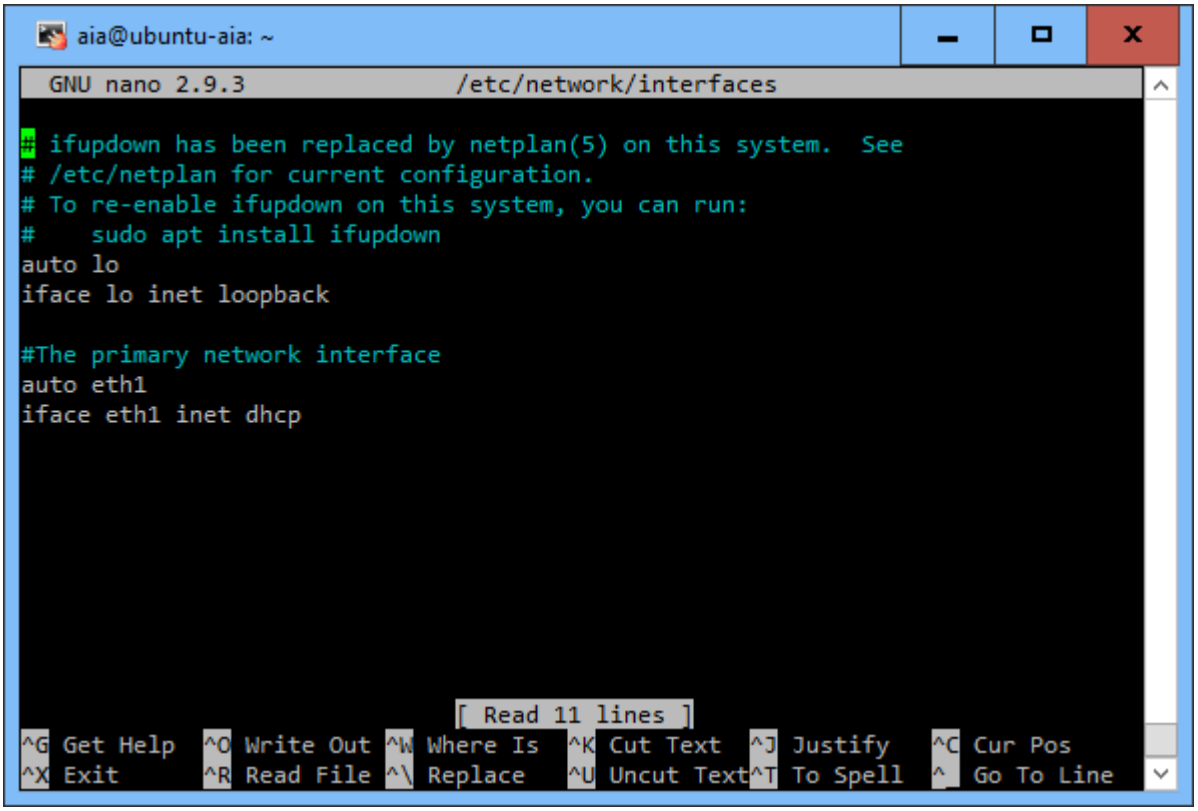
#systemctl enable network.service



It is safely to use the sections to help directly edit network configuration files. ifcfg-eth1 file might look like for a wired Ethernet interface that uses static IP addresses:



To configure your Ubuntu distribution to be a DHCP client, you need to modify the **/etc/network/interfaces** file. You will need to add the following line to the file:



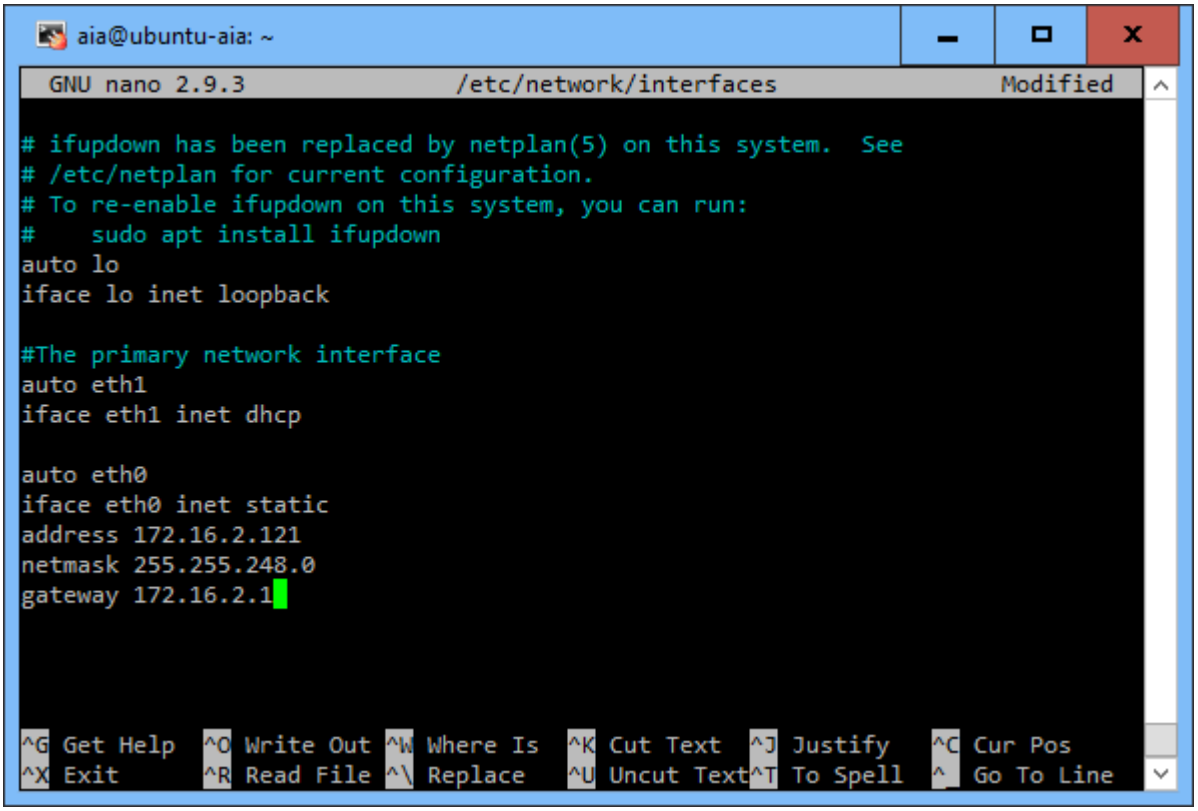
The system should now request network parameters from the DHCP server when booting.

To run the DHCP process manually, you can use the *dhclient* command.

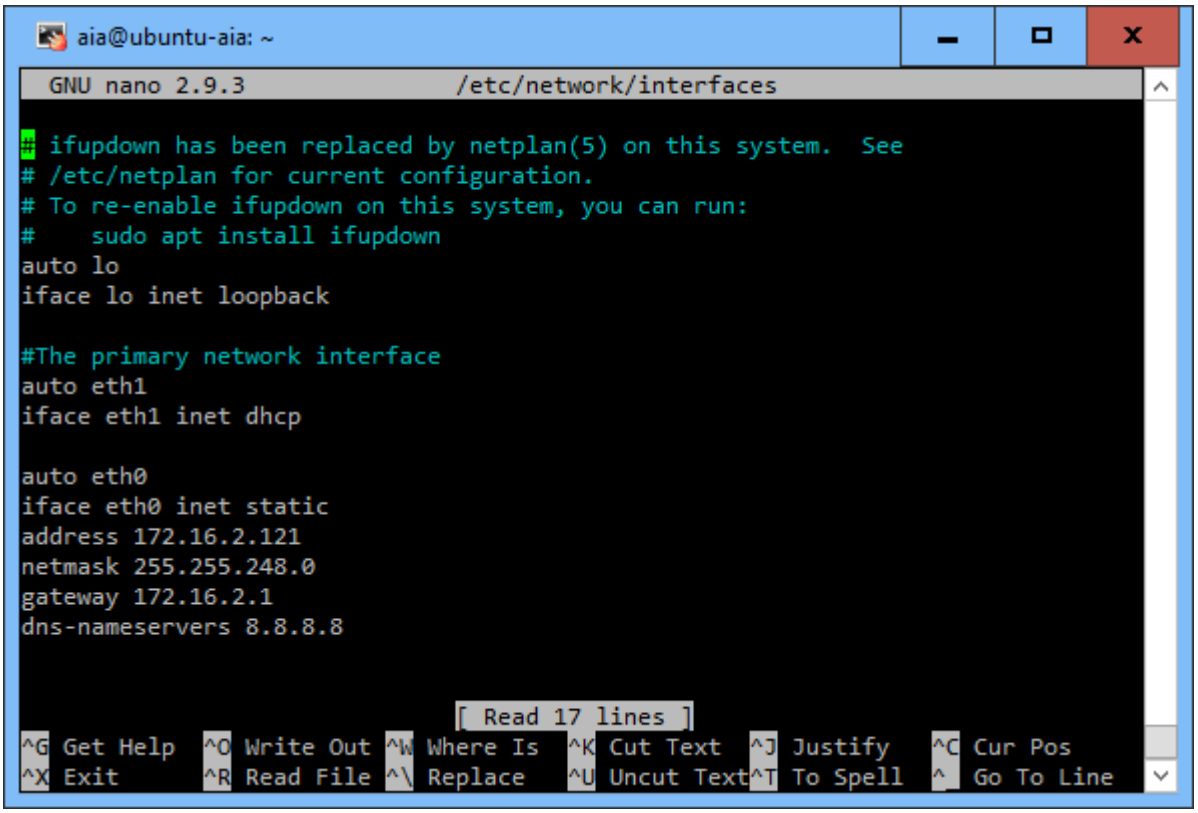
sudo dhclient -r eth1

Configuring DNS settings:

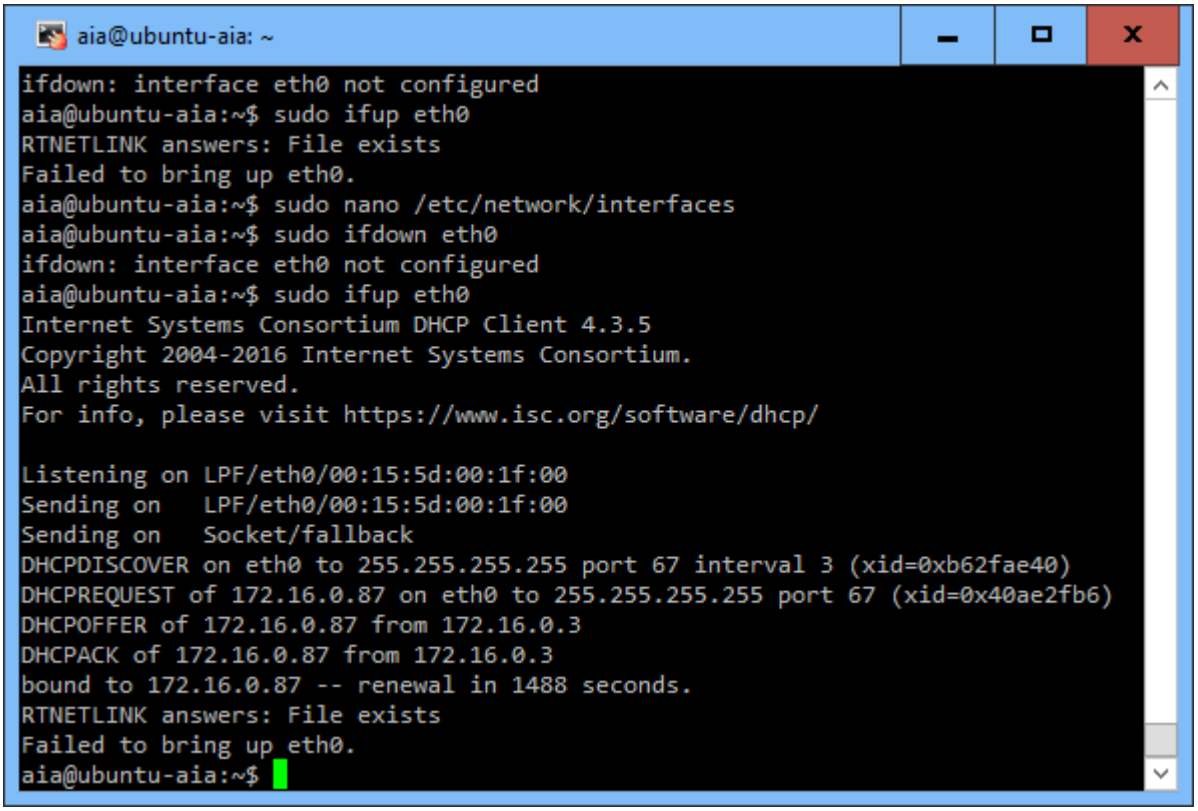
To enable name resolution, you need to configure your Linux system to use DNS servers. To do this in Ubuntu, open the **/etc/network/interfaces** configuration file in a text editor



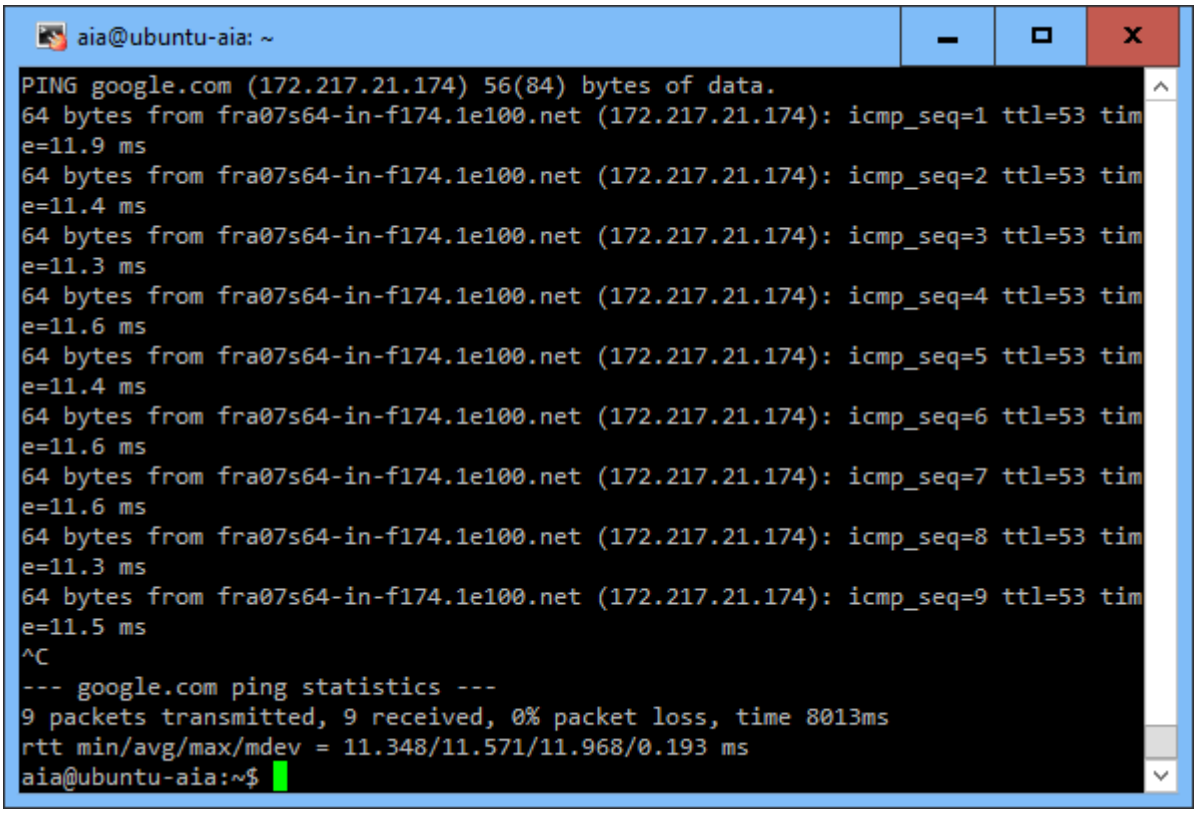
This file is used to configure your network settings manually. The first Ethernet interface is usually identified as **eth0**. To configure a DNS server, add the **dns-nameservers IP_ADDRESS**
The line **dns-nameservers 8.8.8.8** sets up a DNS server with the IP address of **8.8.8.8** as our DNS server (it is a public DNS server from Google). To configure multiple DNS servers, just add spaces between them: **dns-nameservers IP_ADDRESS1 IP_ADDRESS2 IP_ADDRESS3**



sudo ifup eth0 commands to apply the changes:



By testing the DNS name resolution ping to google.com

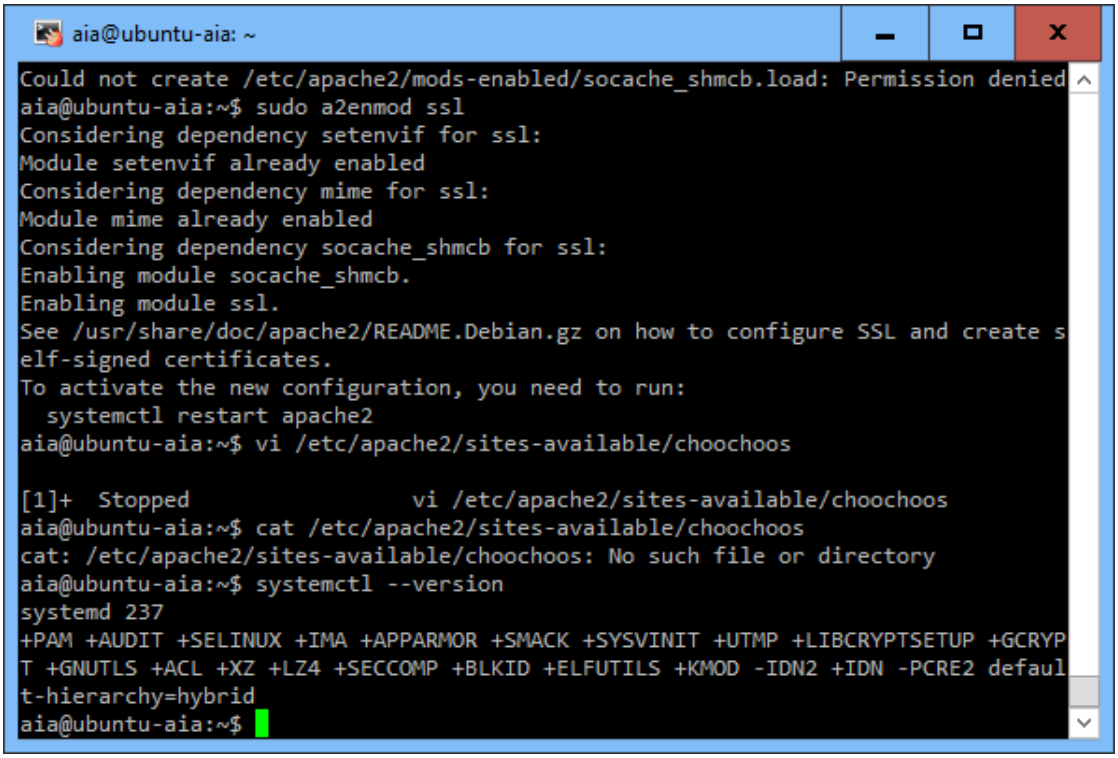


- **Starting and Stopping Service:**

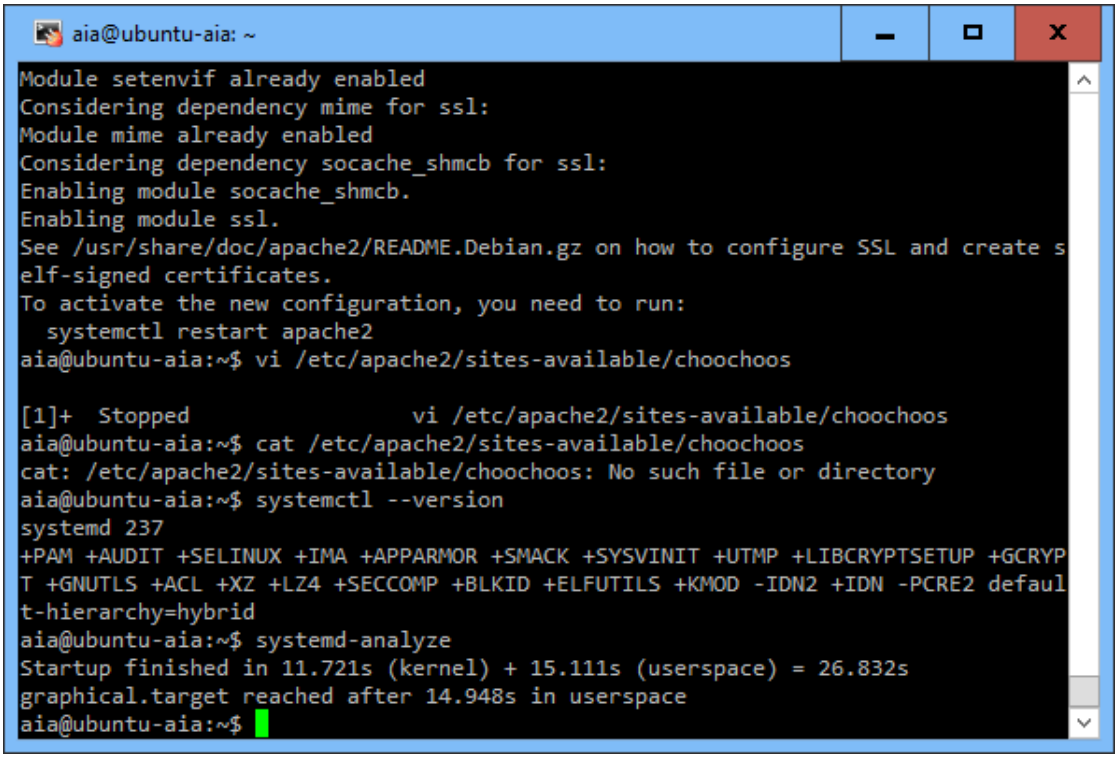
systemd is the new way of running services on Linux. systemd has a superceded sysvinit. systemd brings faster boot-times to Linux and is now, a standard way to manage Linux services. While stable, systemd is still evolving. systemd as an init system, is used to manage both services and daemons that need status changes after the Linux kernel has been booted. By status change starting, stopping, reloading, and adjusting service state is applied.

Check the version of systemd currently running on our server.

```
$ systemctl --version
```



Fully updated at the time of this writing systemd version 237 is the current stable version.

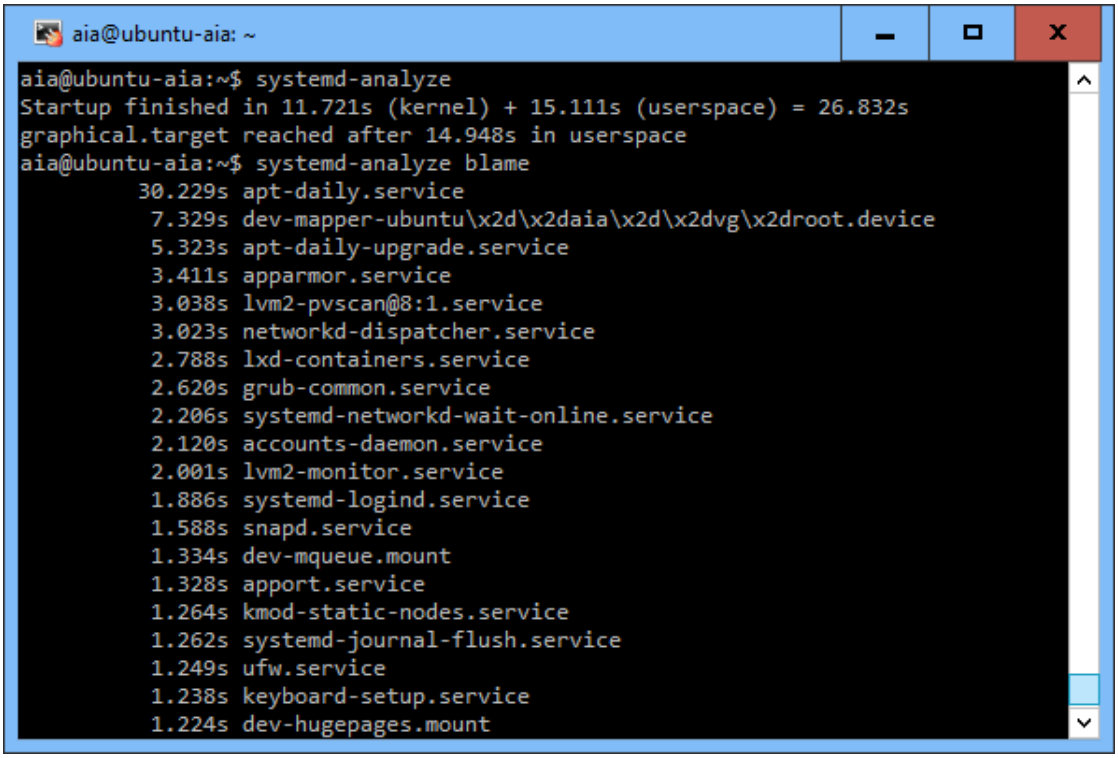



```
$ systemd-analyze
```

We can also analyze the last server boot time with *systemd-analyze*

When the system boot times are slower, we can use the *systemd-analyze blame* command.

```
$ systemd-analyze blame
```



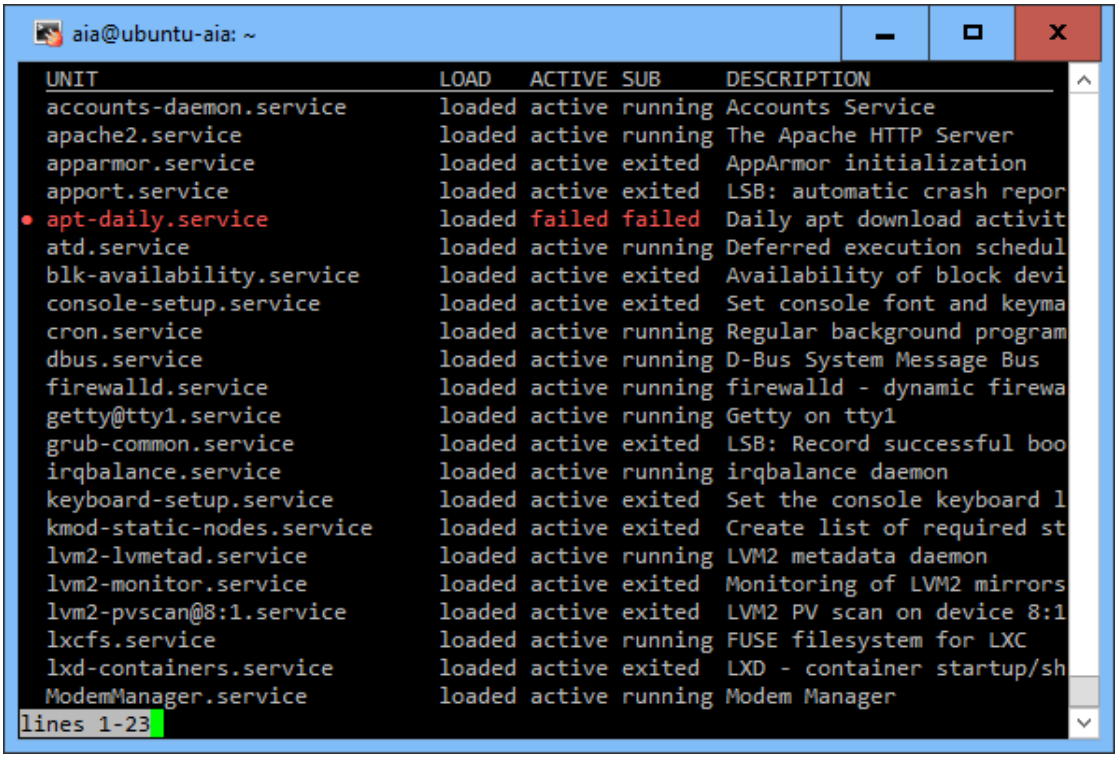
When working with *systemd*, it is important to understand the concept of *units*. **Units** are the resources *systemd* knows how to interpret. Units are categorized into 12 types:

- .service
- .socket
- .device
- .mount
- .automount
- .swap
- .target
- .path
- .timer
- .snapshot
- .slice
- .scope

Manage Service with systemctl:

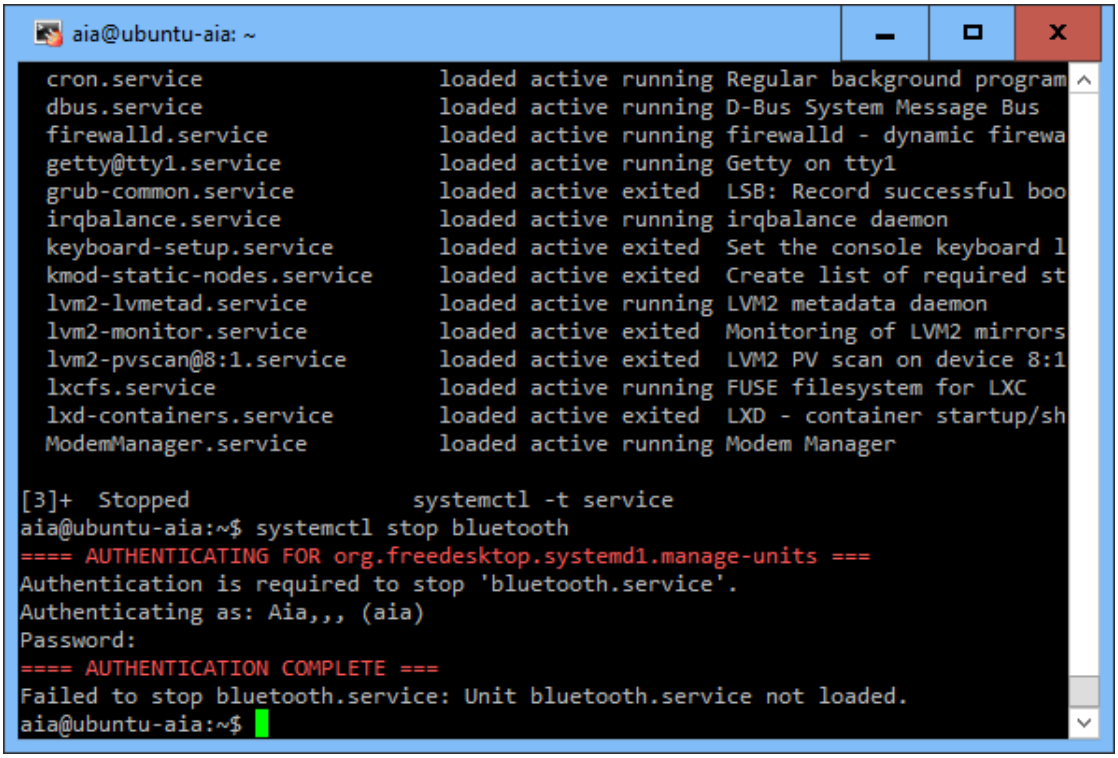
Starting the service

```
$ systemctl -t service
```



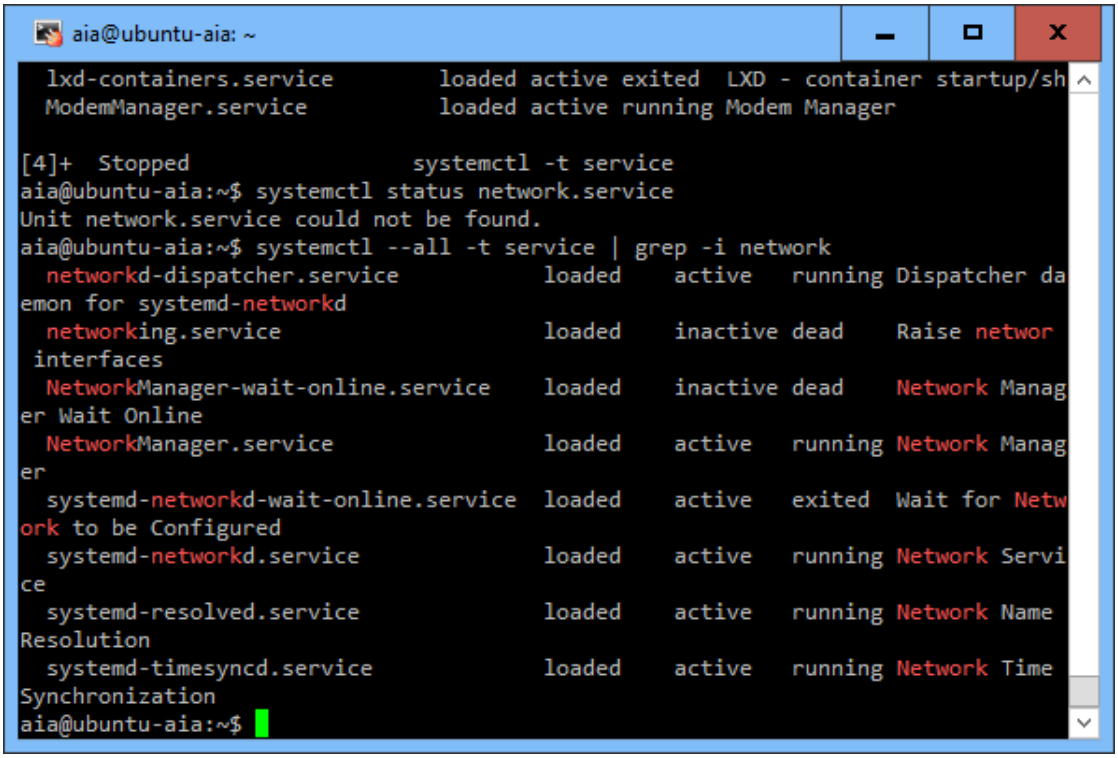
Stopping the service

```
$ systemctl stop Bluetooth
```



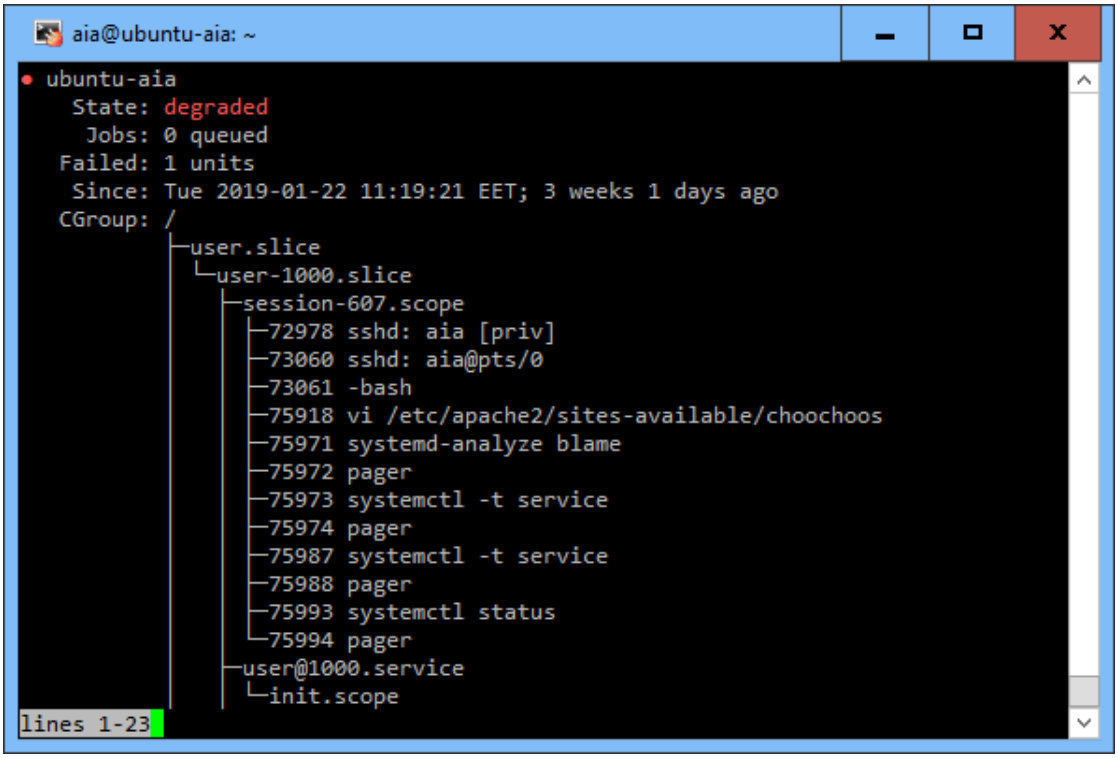
Show us the current status of the *networking* service. If we want to see all the services related to networking

```
$ systemctl --all -t service | grep -i network
```

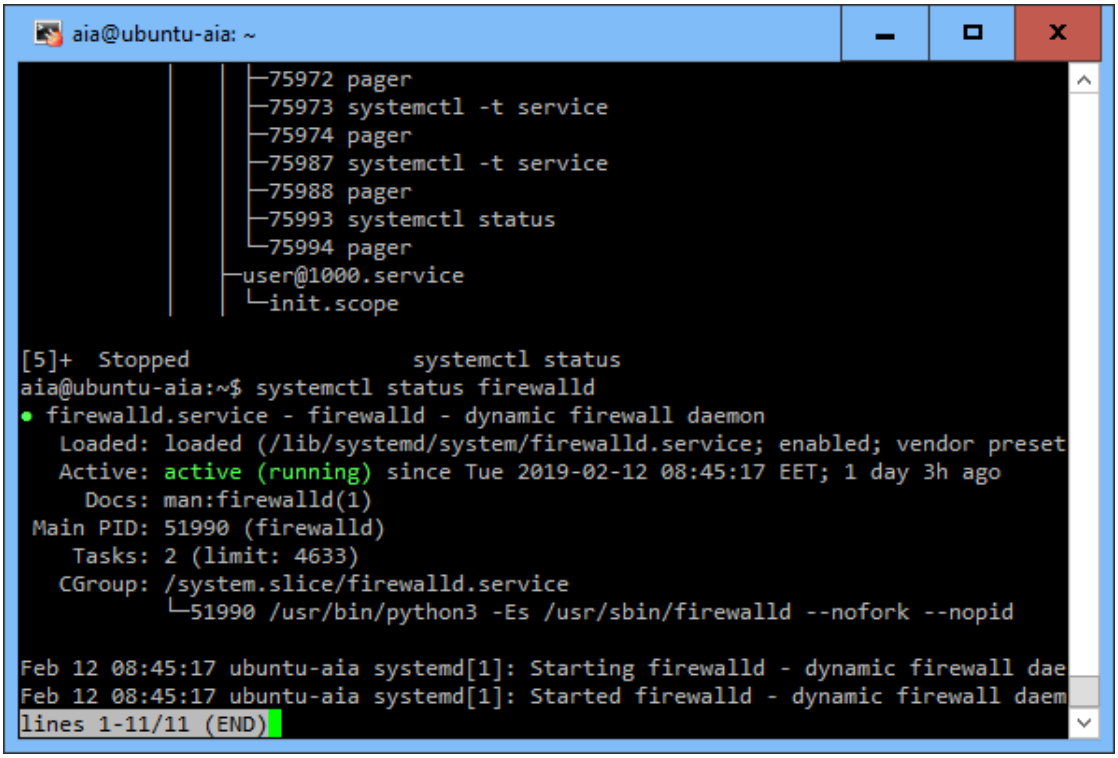


Status is most simple form it can be used for checking the system status:

$systemctl status



$ systemctl status firewalld



➢ **Configuring a Web Server:**

The server takes the requested file or page from you and maps it to the corresponding file from the server. The server sends the file back to the browser with some information such as its MIME type, the length of the content and some other useful information. Sometimes the requested file is a static page like HTML pages or dynamic pages like PHP, Java, Perl or any other server-side language.

we will use **Apache server** for several reasons:

- It is stable.
- It is flexible.
- It is secure.

HTTP:

When you request a file or a page from a web server, the client at first connects to the server on port 80. After successful connection, the client then sends HTTP commands (also methods) to the server. This command includes a request header which includes information about the client.

Installing Apache Web server:

sudo apt-get install http

sudo apt-get install apache2

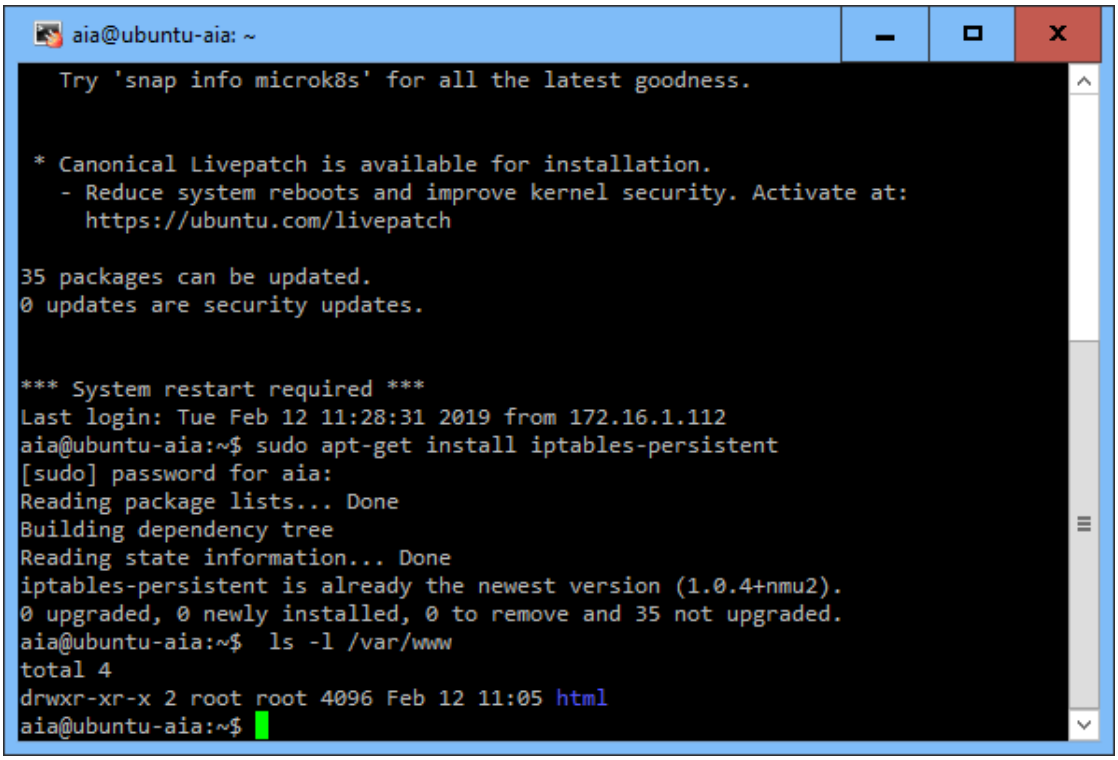
If we are using a firewall like iptables, you should add a role for port 80.

sudo apt-get install iptables-persistent

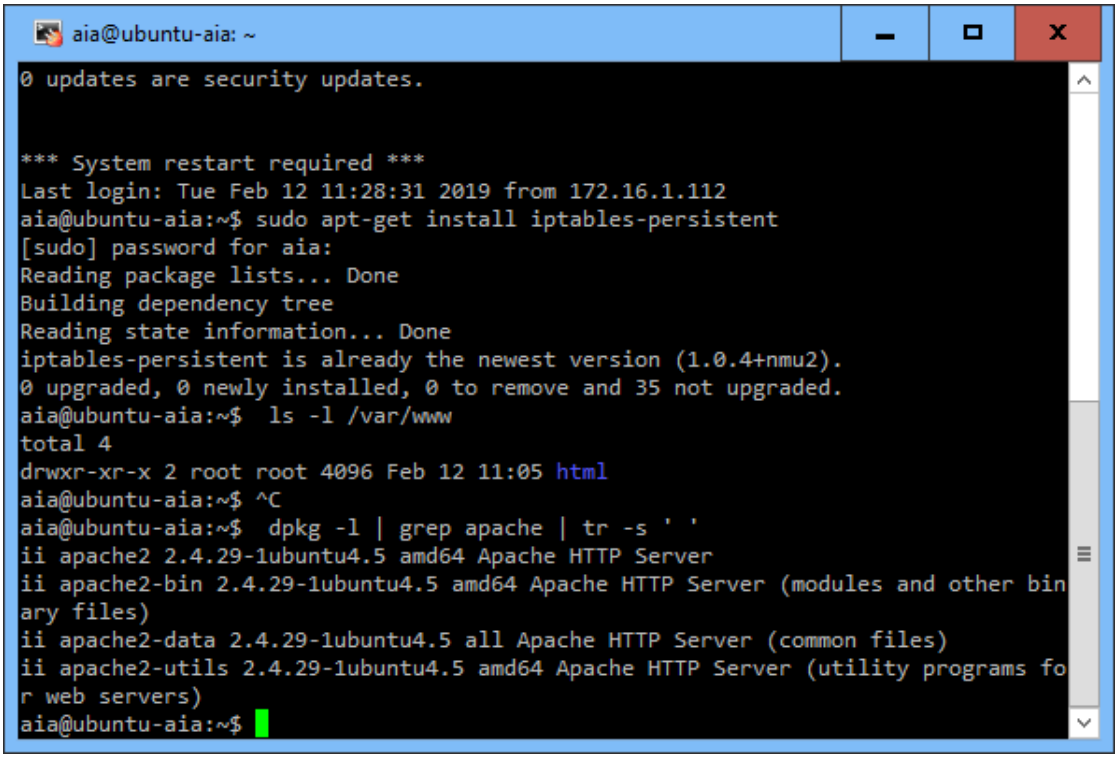
first we need to upgrade iptables persistent

This command shows that apache2 have been installed:

$ ls -l /var/www



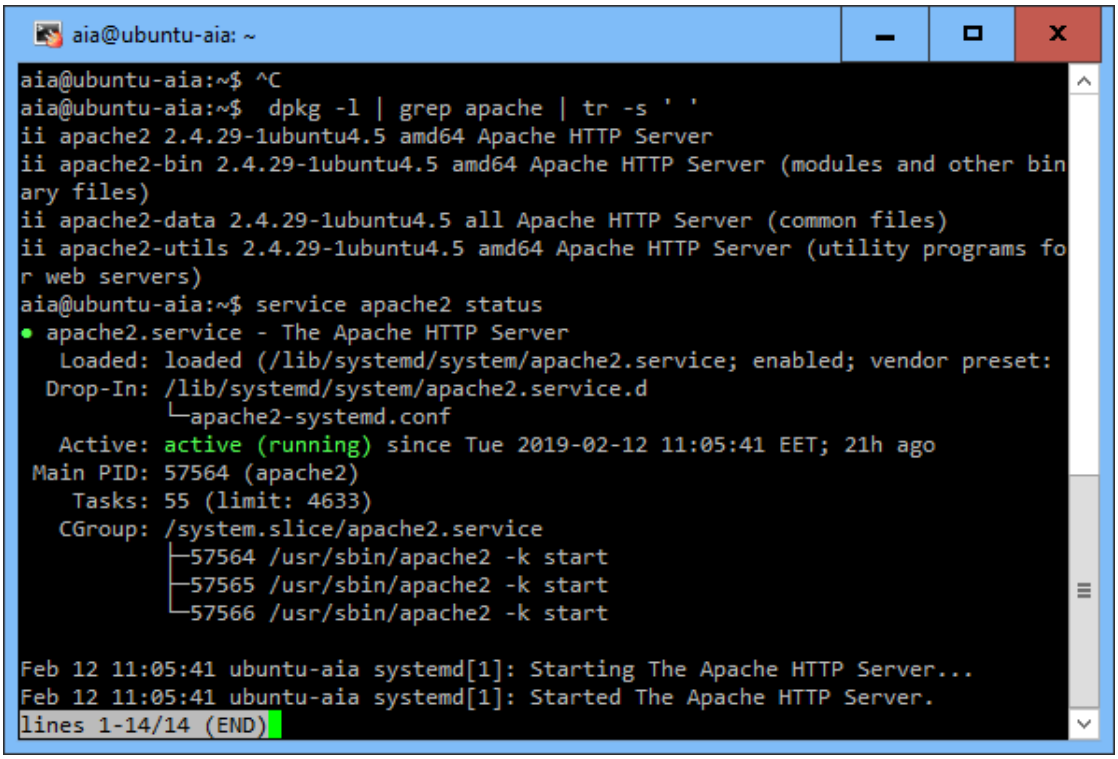
$ dpkg -l | grep apache | tr -s ' '



Running apache:

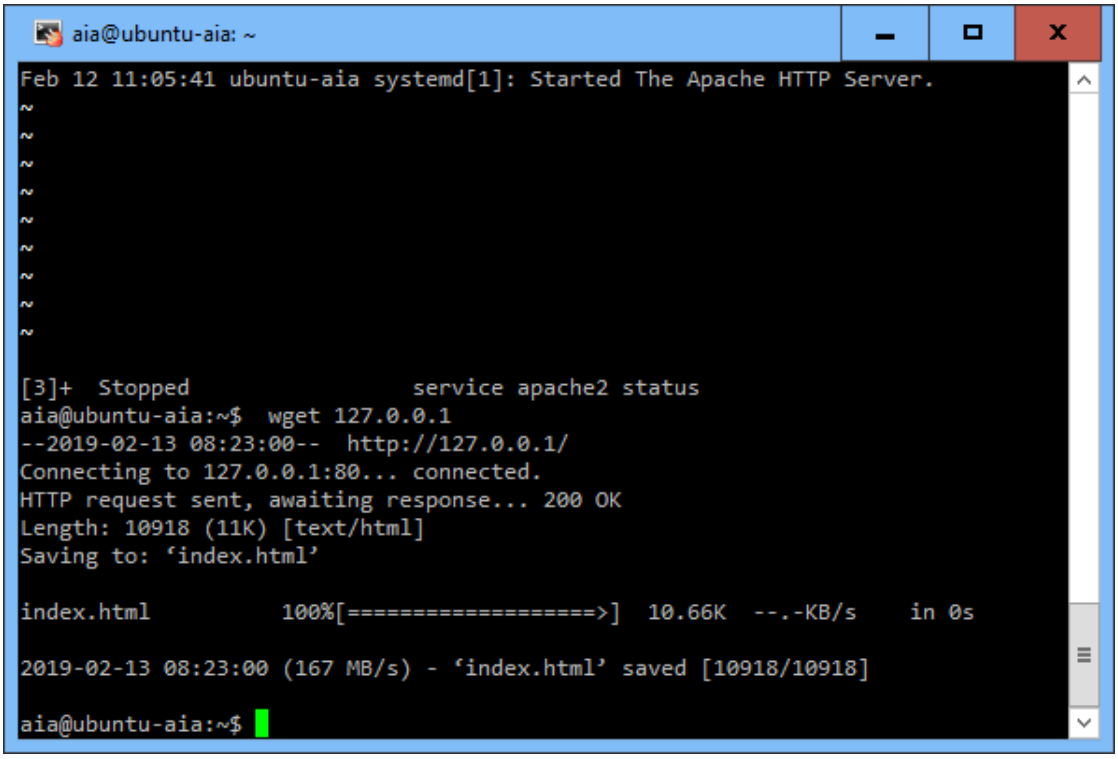
This command is used to check the status of the service.

$ service apache2 status

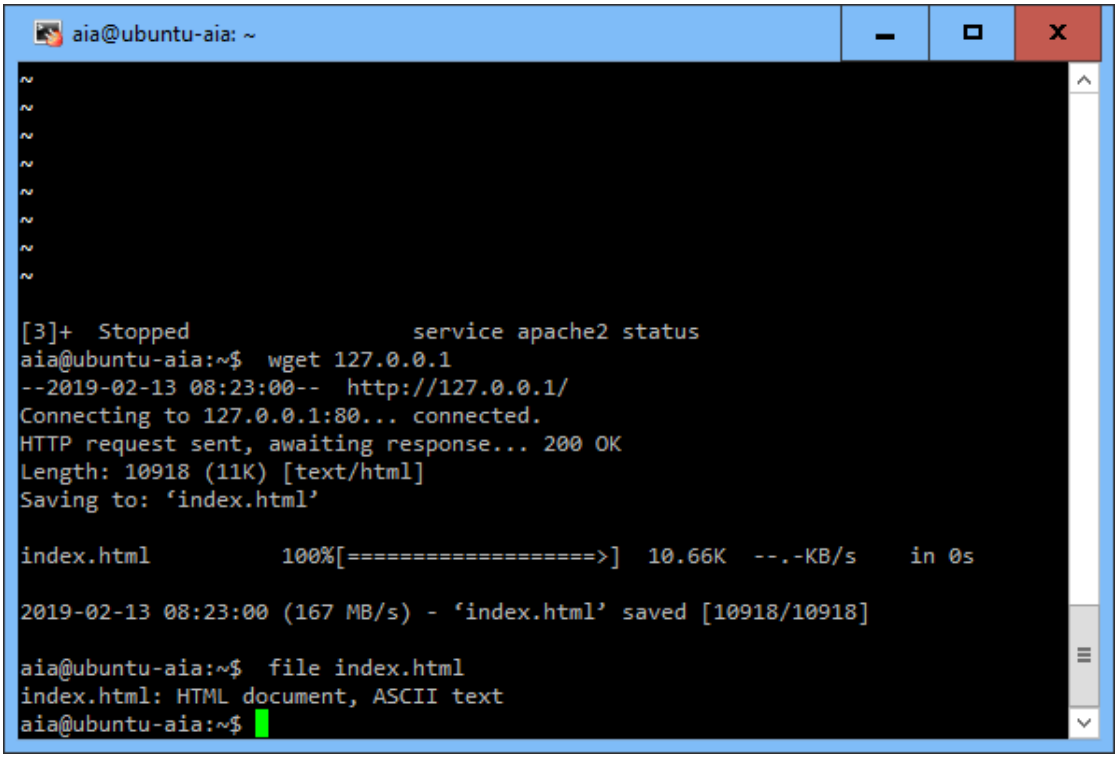


Use wget and file to verify that your web server serves an html document

$ wget 127.0.0.1

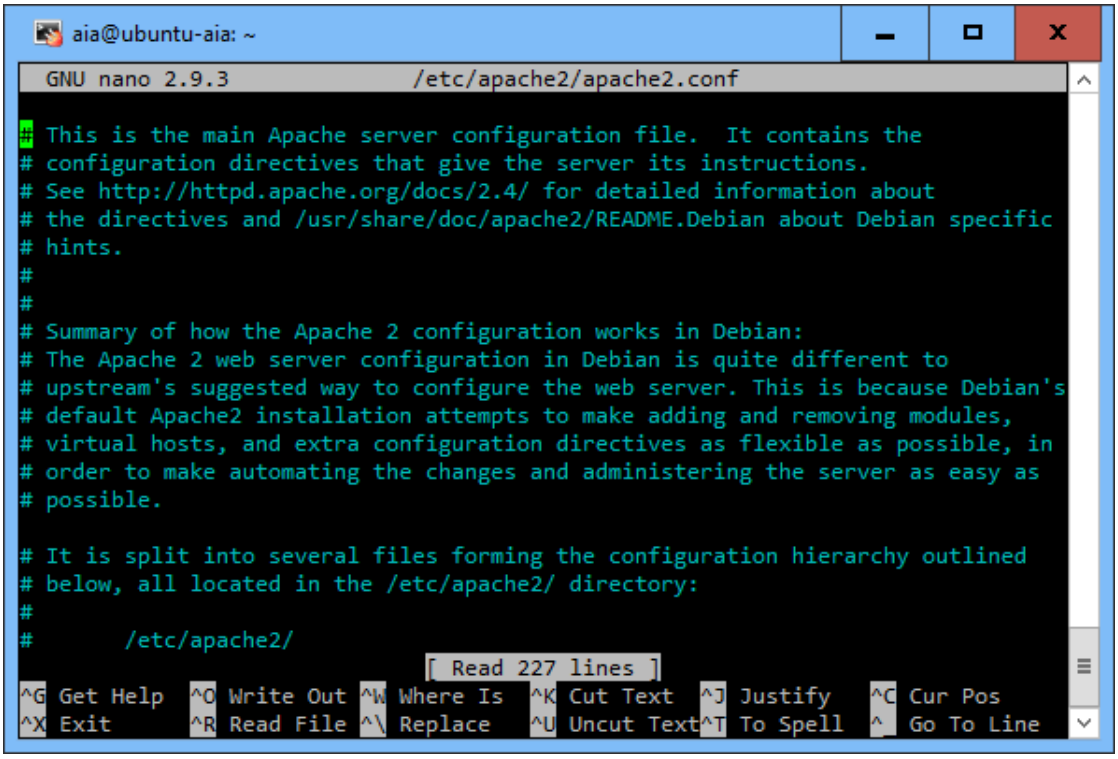


$ file index.html



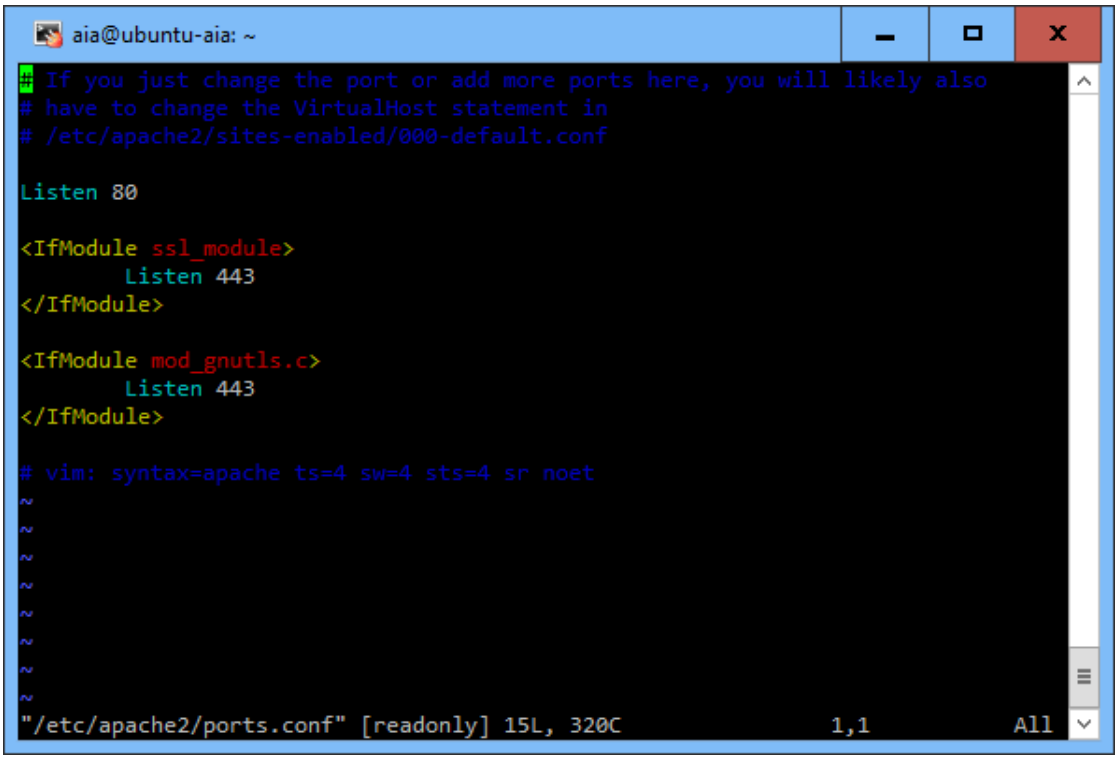
To avoid the 'could not reliably determine the fqdn' message when restarting apache.

```
$ sudo nano /etc/apache2/apache2.conf
```



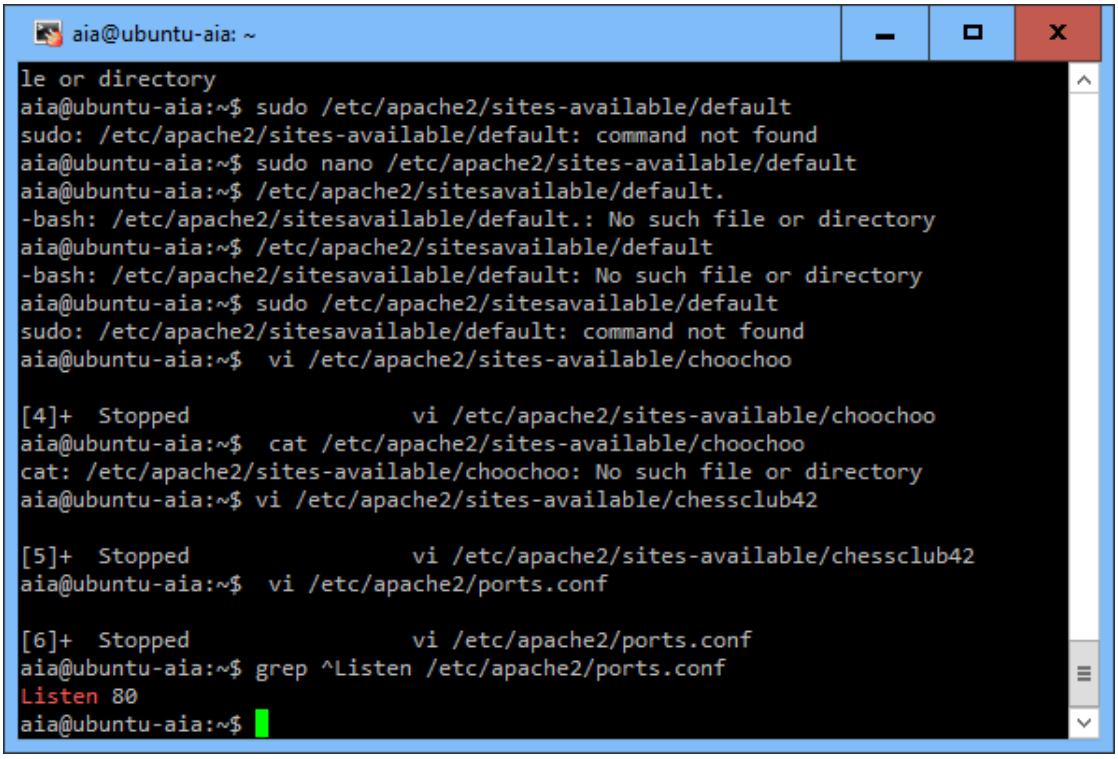
To enable the port on apache in the ports.conf file. Open this file with vi and add the lines to listen on the extra ports.

$ vi /etc/apache2/ports.conf



Verify with grep that the Listen directives are added correctly.

$ grep ^Listen /etc/apache2/ports.conf



- **Configuring a FTP Server:**

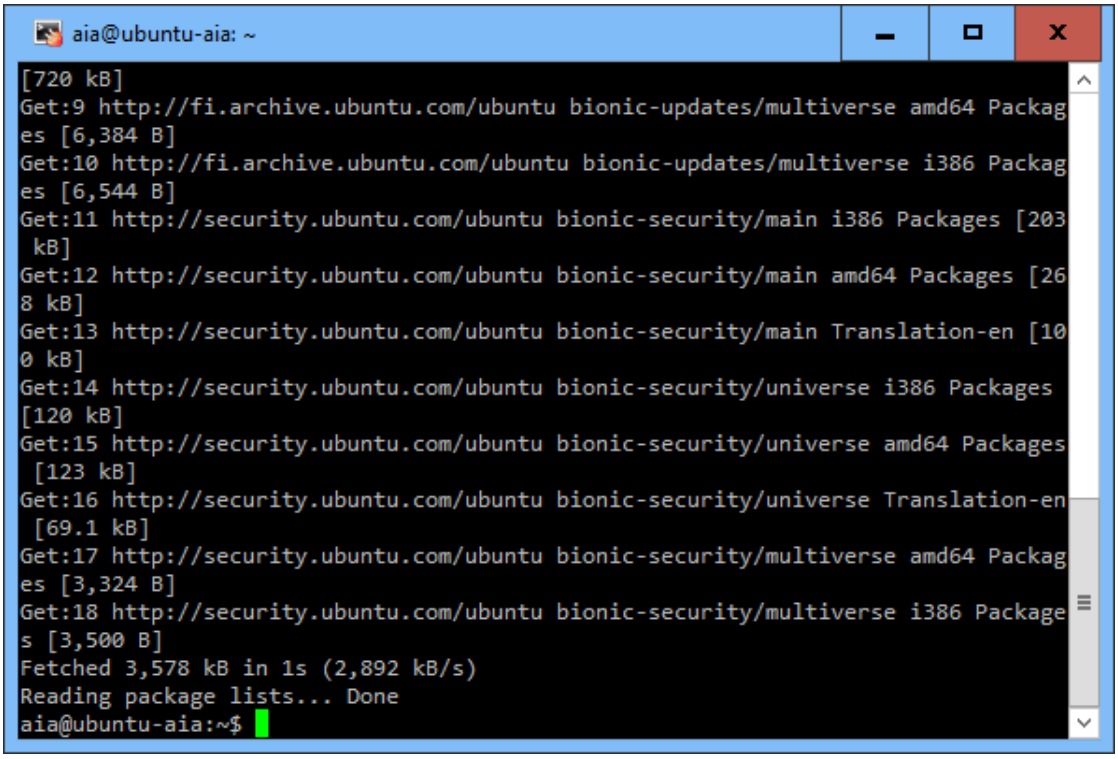
  FTP stand for **F**ile **T**ransfer **P**rotocol. As the name suggest this network protocol allows you to transfer files or directories from one host to another over the network whether it is your LAN or Internet. Main features of vsFTPd are: Virtual IP configurations, Virtual users, Standalone or inetd operation, Powerful per-user configurability, Bandwidth throttling, Per-source-IP configurability, Per-source-IP limits, IPv6 andEncryption support through SSL integration.

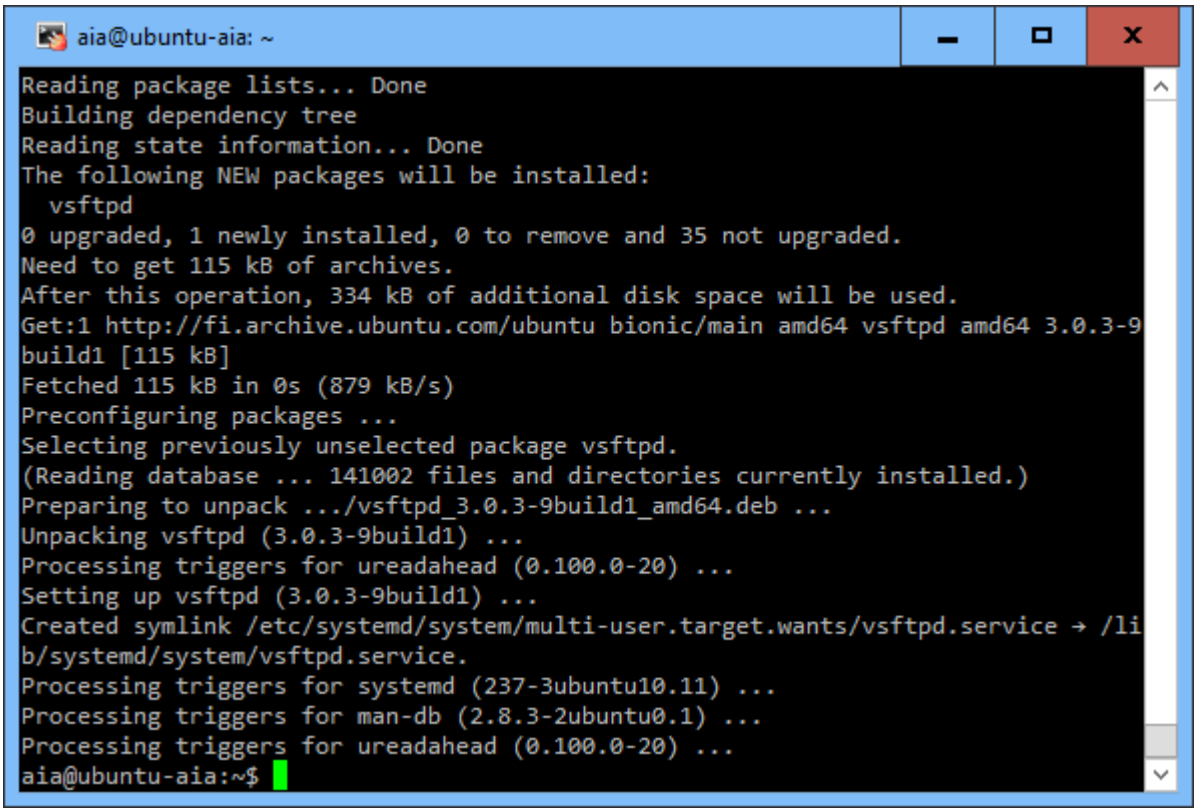
  Installing of FTP server in Ubuntu:

  ```
  $ sudo apt-get install vsftpd
  ```

  We need to update the system package sources list and then install **VSFTPD**

  ```
  $ sudo apt-get update
  ```



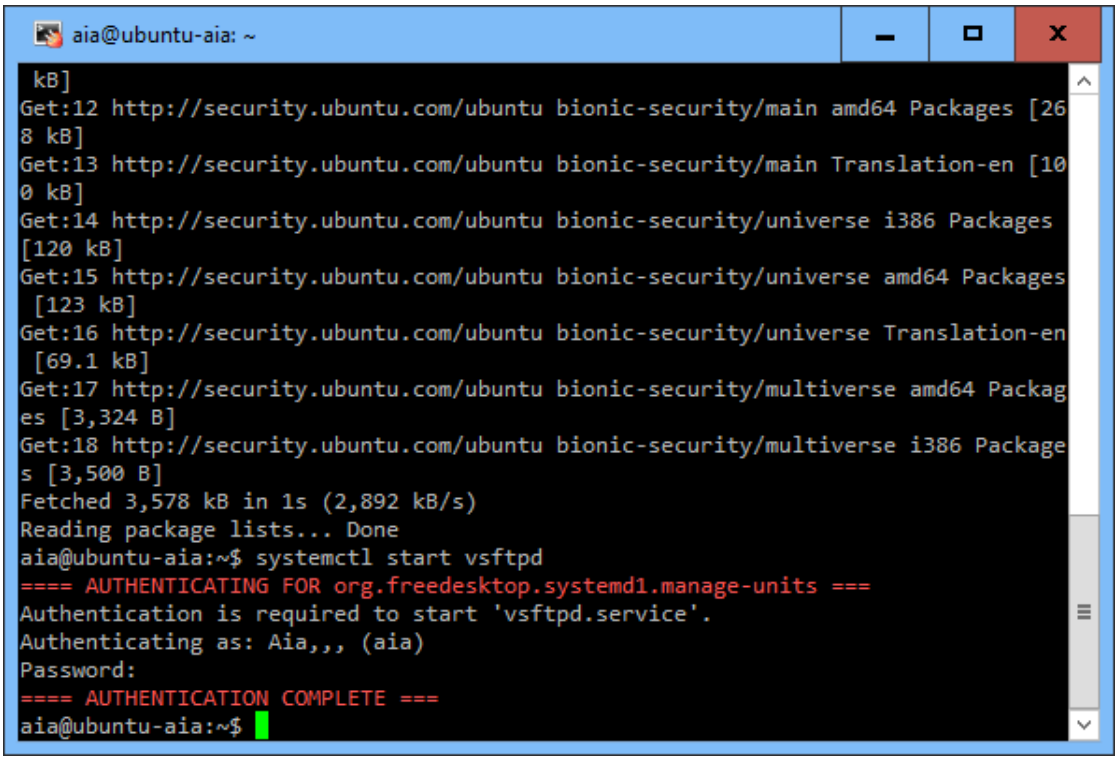


The vsftpd service starts the vsftpd daemon, which runs in the background.

```
$ sudo service vsftpd start
```

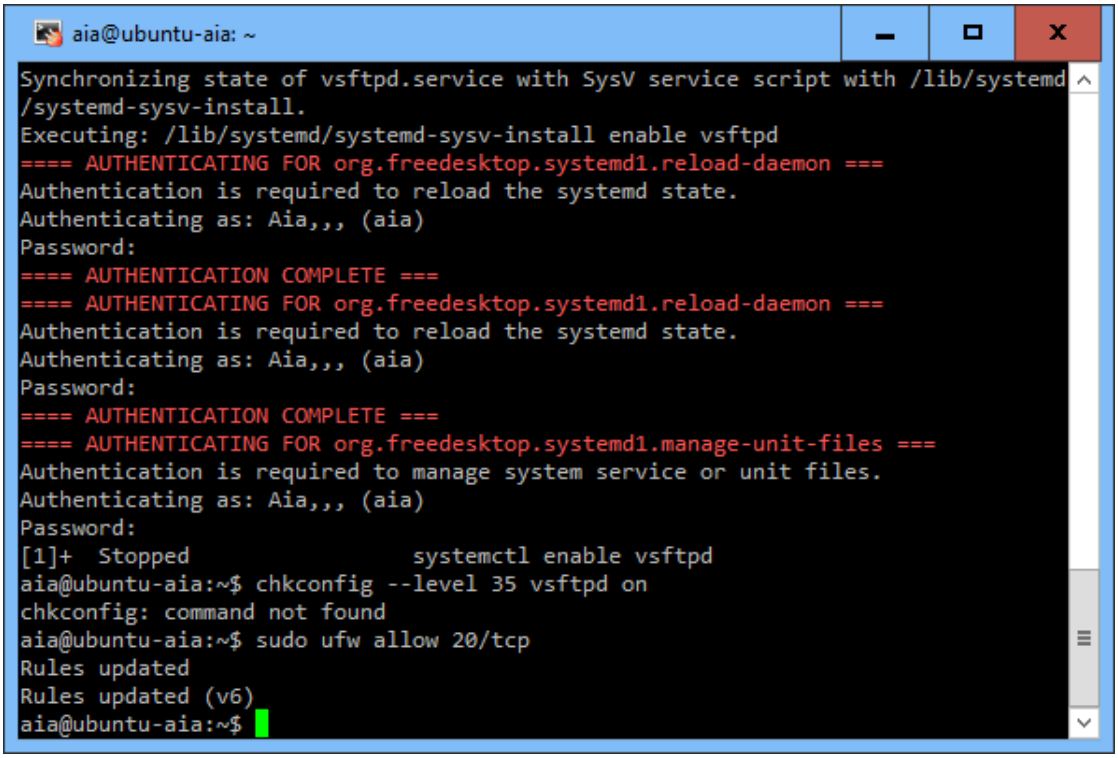
The above syntax applies to all other commands so simply replace start with a command you wish to execute.

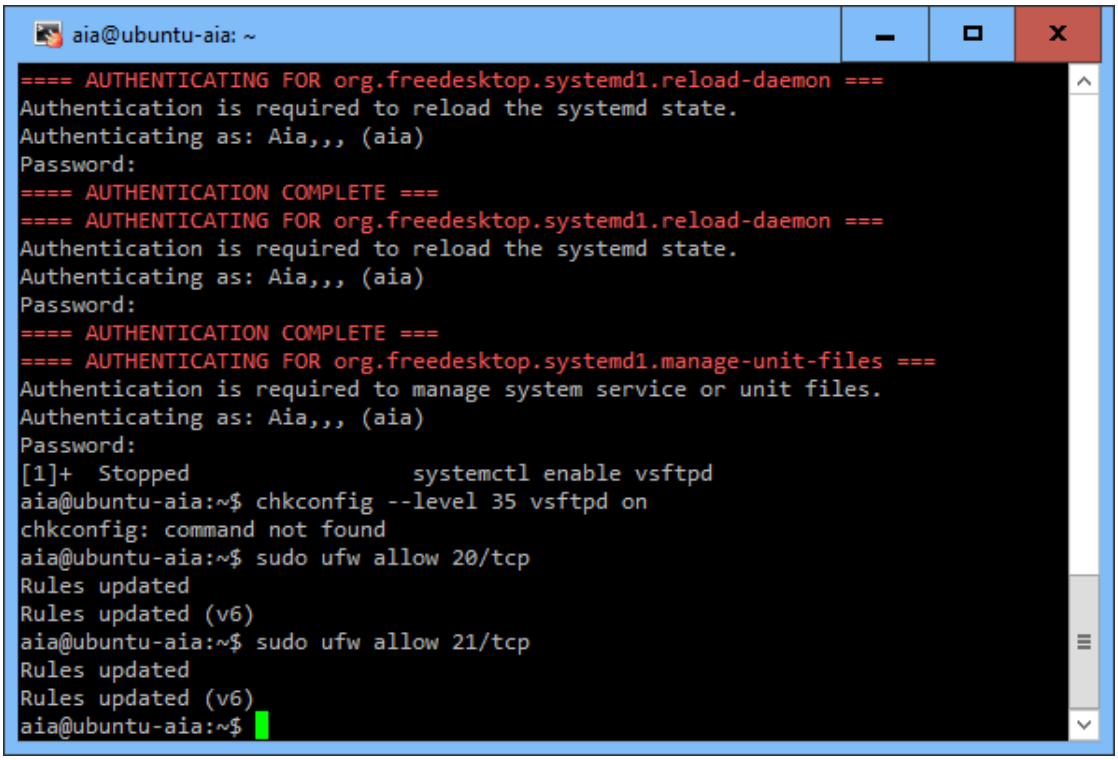
Once the installation completes, the service will be disabled initially, therefore, we need to start it manually for the mean time and also enable it to start automatically from the next system boot:

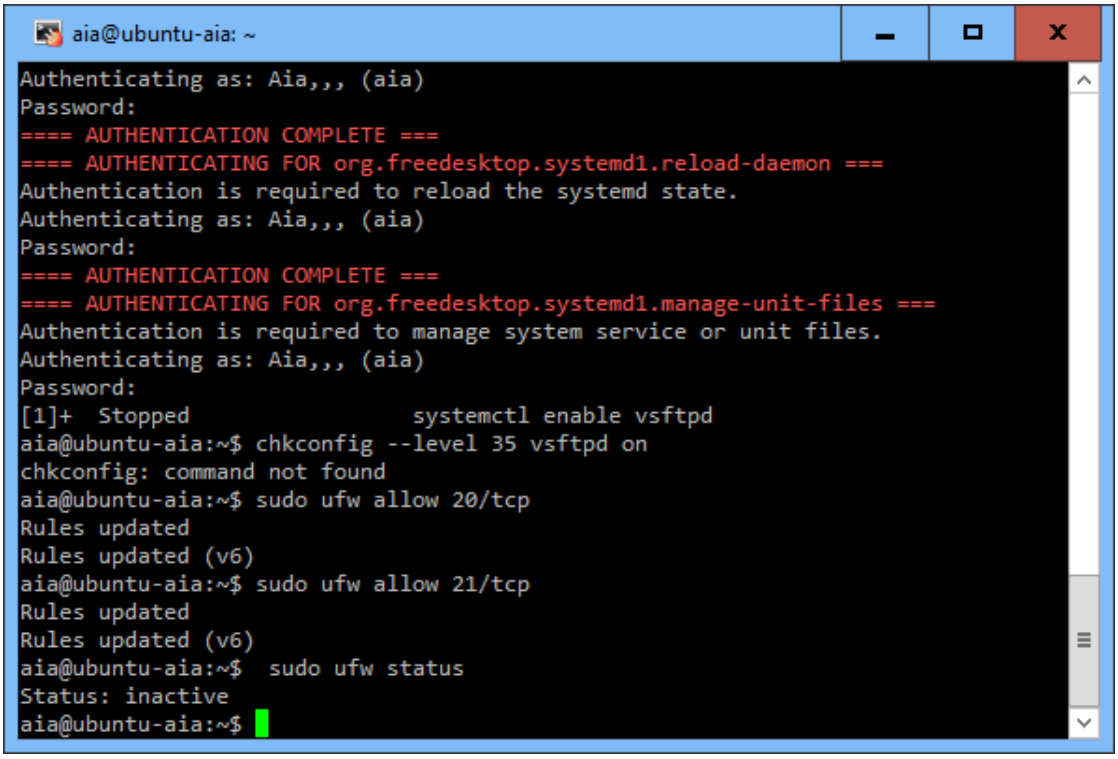


If the firewall enables on the server, it needs to open ports 21 and 20 where the FTP daemons are listening, in order to allow access to FTP services from remote machines and then add the new firewall rules

```
$ sudo ufw allow 20/tcp
$ sudo ufw allow 21/tcp
$ sudo ufw status
```

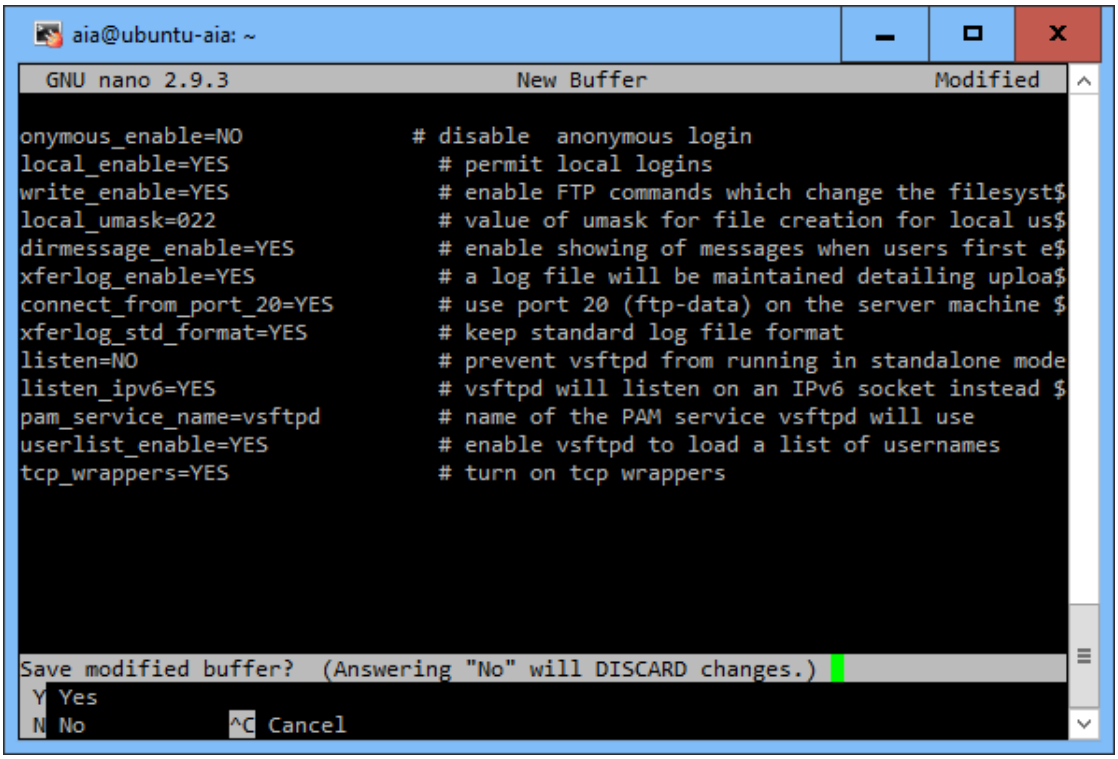

aia@ubuntu-aia: ~
Synchronizing state of vsftpd.service with SysV service script with /lib/systemd
/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable vsftpd
==== AUTHENTICATING FOR org.freedesktop.systemd1.reload-daemon ===
Authentication is required to reload the systemd state.
Authenticating as: Aia,,, (aia)
Password:
==== AUTHENTICATION COMPLETE ===
==== AUTHENTICATING FOR org.freedesktop.systemd1.reload-daemon ===
Authentication is required to reload the systemd state.
Authenticating as: Aia,,, (aia)
Password:
==== AUTHENTICATION COMPLETE ===
==== AUTHENTICATING FOR org.freedesktop.systemd1.manage-unit-files ===
Authentication is required to manage system service or unit files.
Authenticating as: Aia,,, (aia)
Password:
[1]+ Stopped systemctl enable vsftpd
aia@ubuntu-aia:~$ chkconfig --level 35 vsftpd on
chkconfig: command not found
aia@ubuntu-aia:~$ sudo ufw allow 20/tcp
Rules updated
Rules updated (v6)
aia@ubuntu-aia:~$


aia@ubuntu-aia: ~
==== AUTHENTICATING FOR org.freedesktop.systemd1.reload-daemon ===
Authentication is required to reload the systemd state.
Authenticating as: Aia,,, (aia)
Password:
==== AUTHENTICATION COMPLETE ===
==== AUTHENTICATING FOR org.freedesktop.systemd1.reload-daemon ===
Authentication is required to reload the systemd state.
Authenticating as: Aia,,, (aia)
Password:
==== AUTHENTICATION COMPLETE ===
==== AUTHENTICATING FOR org.freedesktop.systemd1.manage-unit-files ===
Authentication is required to manage system service or unit files.
Authenticating as: Aia,,, (aia)
Password:
[1]+ Stopped systemctl enable vsftpd
aia@ubuntu-aia:~$ chkconfig --level 35 vsftpd on
chkconfig: command not found
aia@ubuntu-aia:~$ sudo ufw allow 20/tcp
Rules updated
Rules updated (v6)
aia@ubuntu-aia:~$ sudo ufw allow 21/tcp
Rules updated
Rules updated (v6)
aia@ubuntu-aia:~$

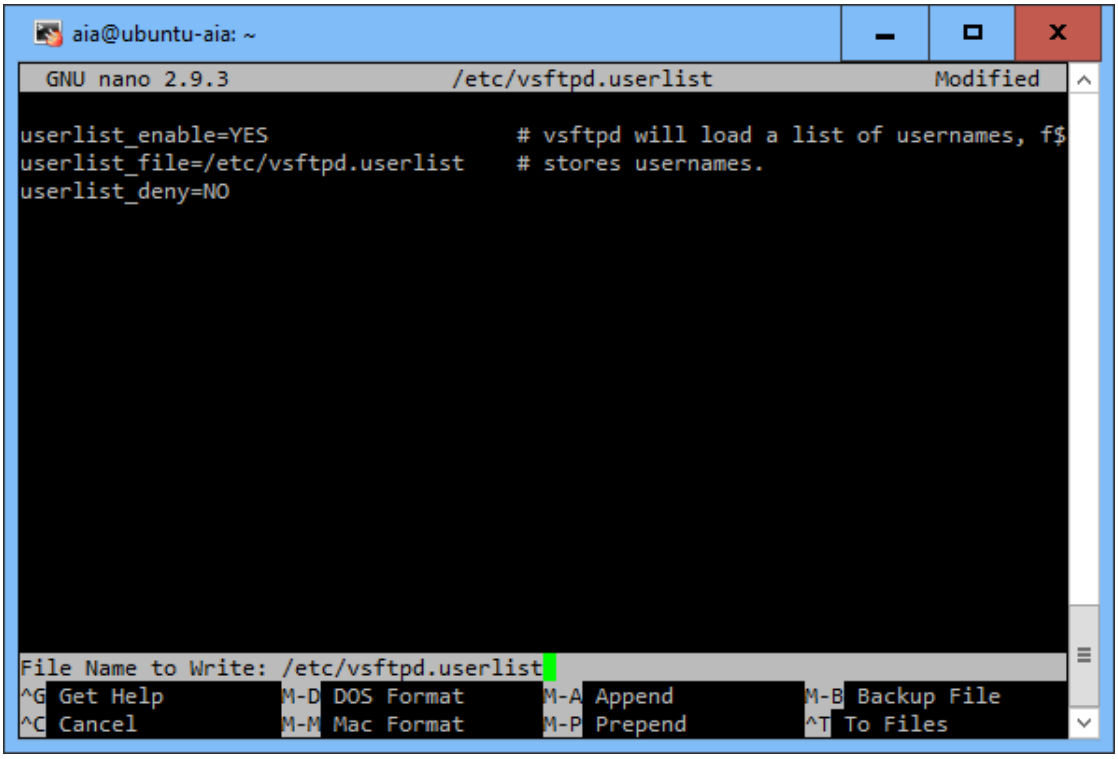


Configuring and securing VsFTP server :

Now we will perform a few configurations to setup and secure our FTP server, first we will create a backup of the original config file **/etc/vsftpd/vsftpd.conf**



Configure **VSFTPD** to allow/deny FTP access to users based on the user list file **/etc/vsftpd.userlist**.



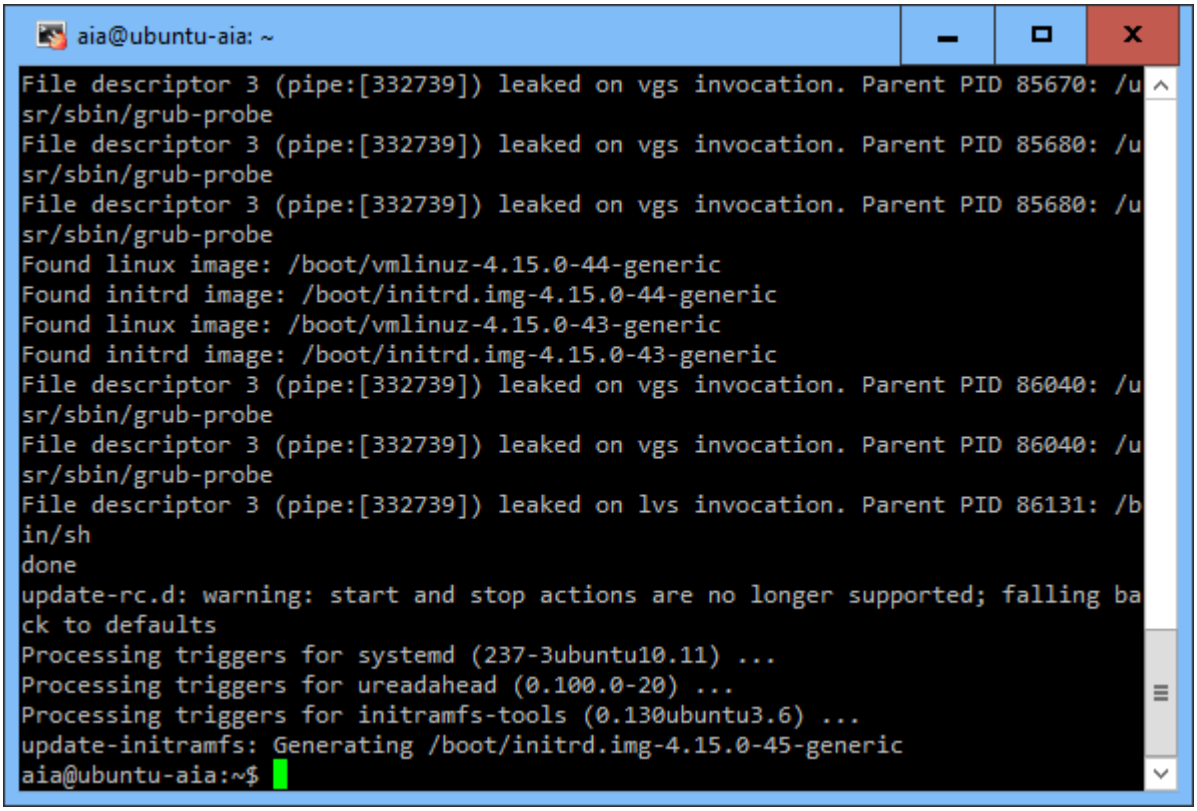
- **Enhancing Linux Security with SELinux:**

Designed by NSA, Security-enhanced Linux (SELinux) is an implementation of a mandatory access control mechanism. This mechanism is in the Linux kernel, checking for allowed operations after standard Linux discretionary access controls are checked.

SELinux is implement in the Linux kernel using the LSM (Linux Security Modules) framework. The SELinux operates in one of these modes: permissive, disabled or enforcing.

Installing the SELinux package:

```
$ Sudo apt-get install selinux
```

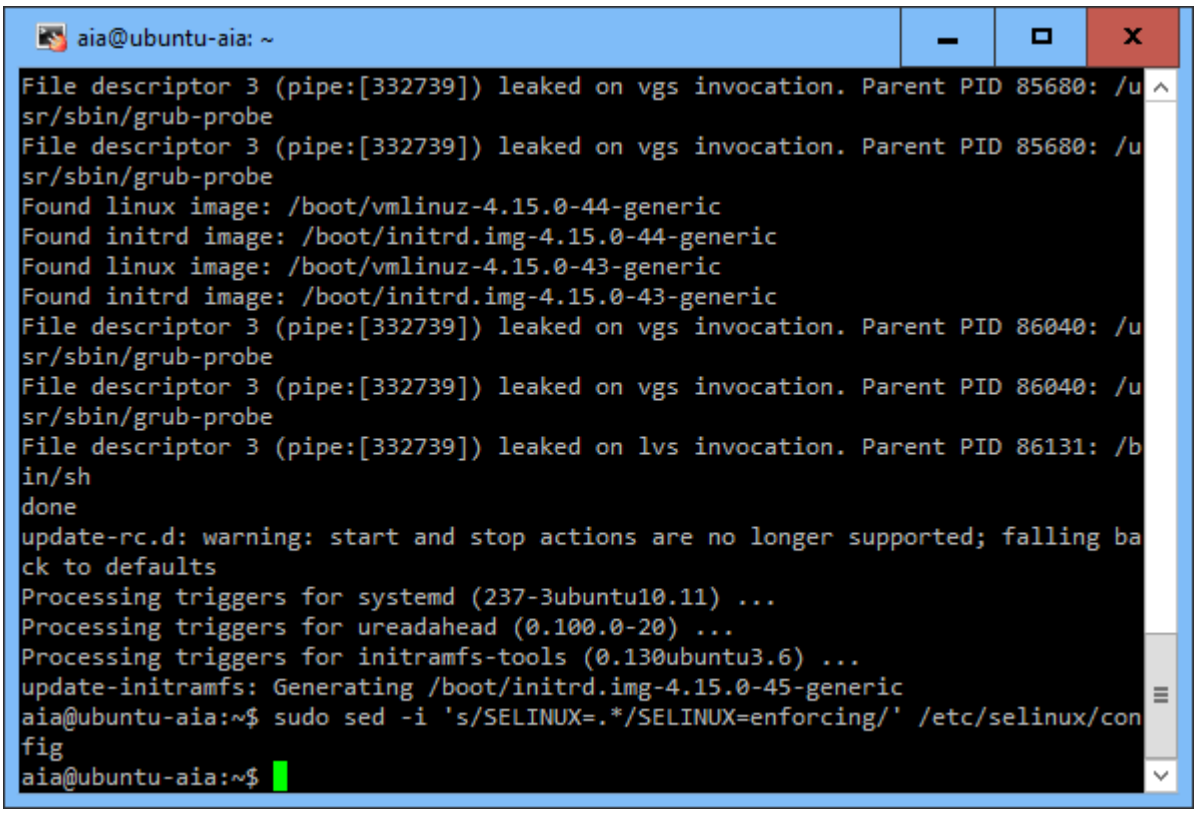


Change the SELinux mode in /etc/selinux/config:

1. Enforcing:

It turn on and all the security policy rules and enforced.

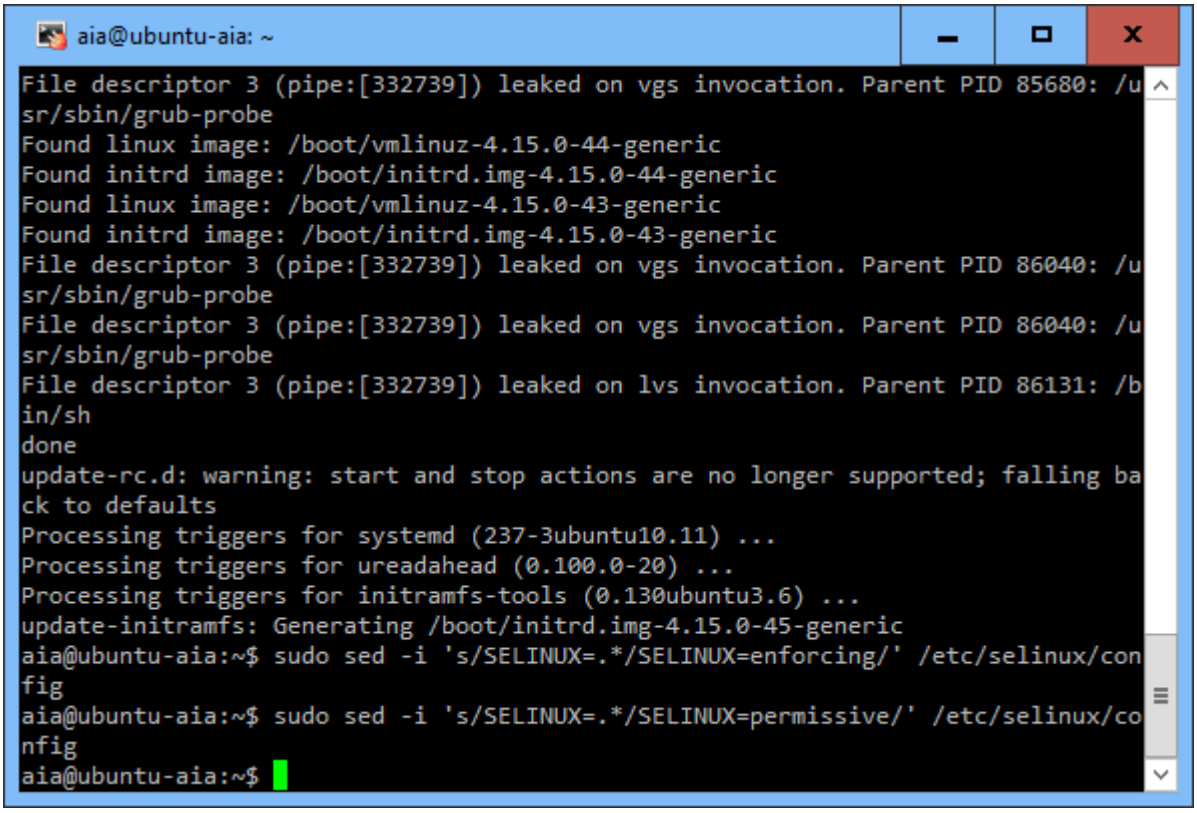
```
# sudo sed -i 's/SELINUX=.*/SELINUX=enforcing/' /etc/selinux/config
```



1. Permissive:

It’s used for auditing the current SELinux policy rules, testing new applications to see what effect SELinux policy rules will have on them, testing new SELinux policy rules to see what effect the new rules will have on current services and applications , and troubleshooting why a particular service or application is no longer working properly under SELinux.

```
# sudo sed -i 's/SELINUX=.*/SELINUX=permissive/' /etc/selinux/config
```



4. CONCLUSION

The aim of this project is to have a smart remote serve that can be connecting the administrators out of the private network with high security and authentication.

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