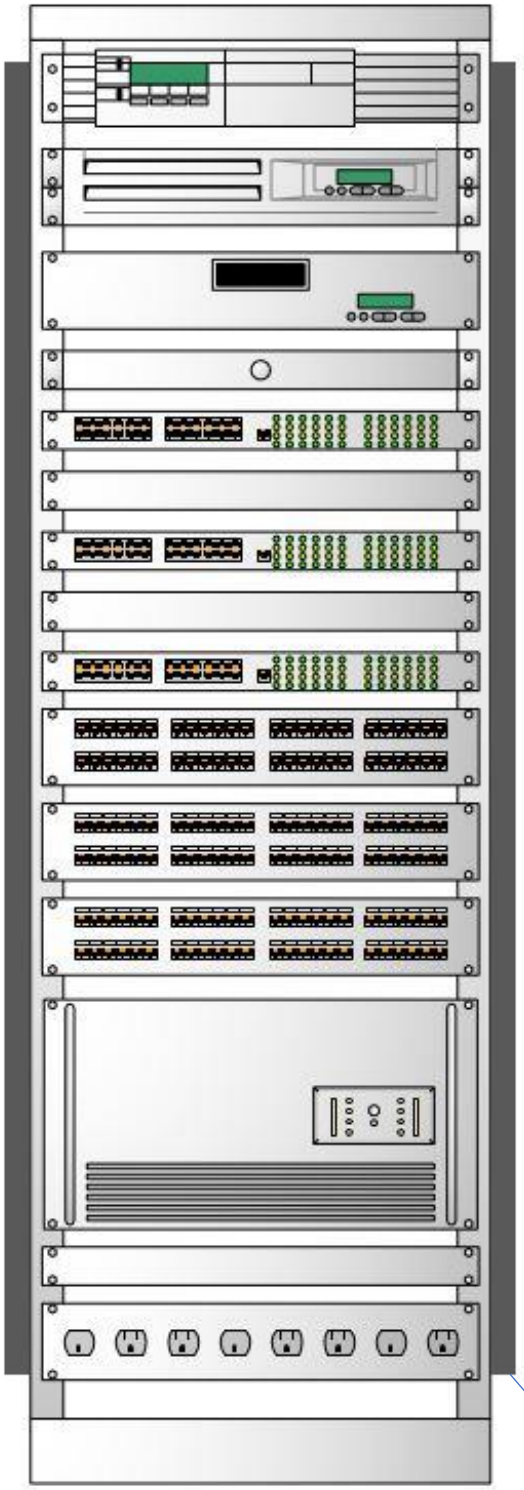
2.6 Server Rack Diagram (36U)



Sophos XG 550 Rev.2 Firewall (2U)

Dell R440 Server (1U)

Hikvision DS-9664NI-I8 64 Channel NVR (2U)

Cisco AIR-CT3504-K9 Wireless Controller (1U

Cisco WS-C3850-48T Multilayer Switch (1U)

Cable Management (1U)

Cisco WS-C3850-48T Multilayer Switch (1U)

Cable Management (1U)

Cisco WS - C2960L-24PS-LL Layer 2 Switch (1U)

48 Port Patch Panel (2U)

24 Port Patch Panel (1U)

48 Port Patch Panel (2U)

APC Smart-UPS SRT 8000VA (6U)

Cable Management (1U)

KMC 8 Outlet Power Strip (1U)

Vertical Cable Organizer

Total Power Consumption of the Server Rack

Above APC Smart-UPS is suitable for all the devices in the rack. Following calculations are represent the total power consumption of each rack mounted device.

Device	**Max Power (W)**
Cisco WS-C3850-48T Switch	350
Cisco WS-C3850-48T Switch	350
Dell R440 Server	550
Sophos XG 550 Rev.2	83
Cisco AIR-CT3504-K9	115
Hikvision DS-9664NI-I8 NVR	200
Total Power Consumption	**1648**

According to above calculations, the total power consumption is 1648W(~1700 watts). The best practice is adding more 50% of oversizing capacity to total power.

For example, if your current configuration adds up to 1700 watts of power draw, a 50% oversizing will make sure the recommended units can support your current draw (1700 watts) + 50% of this draw (850 watts) for any future expansions.

Therefore, the total power consumption is = **2250 watts**

Design for about 30 minutes of runtime at the highest realistic load we can estimate. 10 minutes should still be enough time for the generator to come up or to cover an automated shutdown.

2.7 Server Room Specifications

A server room is a room used to store, power and operate computer servers and their associated components. This room is part of a data center, which typical houses several physical servers lined up together in different form factors, such as rack mounted, or in tower or blade enclosures.

Server Room specification as follow:

Special Specifications:

- Room should have no windows.
- Ensure space is large enough for future growth
- Ceiling should be at least nine feet
- Should have drop ceiling return to exhaust heat

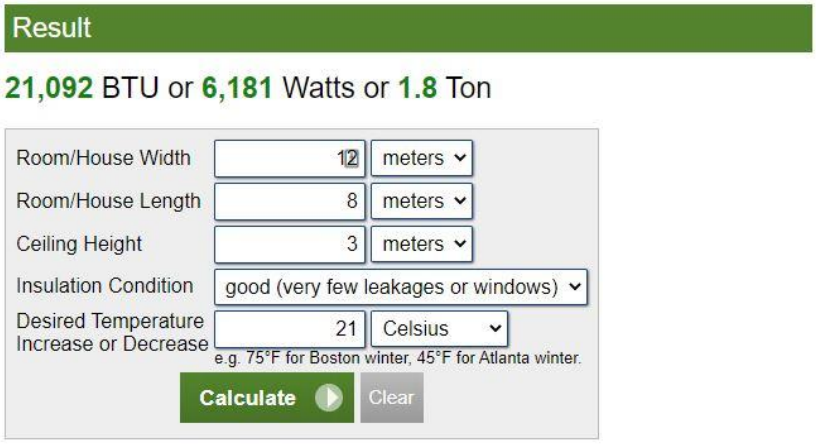
Equipment Specifications:

- Computer racks should have a clearance of at least 36 inches.
- All racks should have proper grounding and seismic bracing.
- Computing equipment should have a maximum electrical intensity of 300 watts per square foot.
- Server room should contain fire, smoke, water and humidity monitors.

Cooling Specifications:

- Ideal server room temperature is that it should be between 20 to 21 degrees Celsius.
- Use Air Conditioner for cooling the entire room.
- Plan for redundancy, do not rely on building cooling for back-up.

Server Room Air Conditioner BTU value Calculation



According to above result from calculator.net, 24000 BTU AC is enough for Server room cooling.

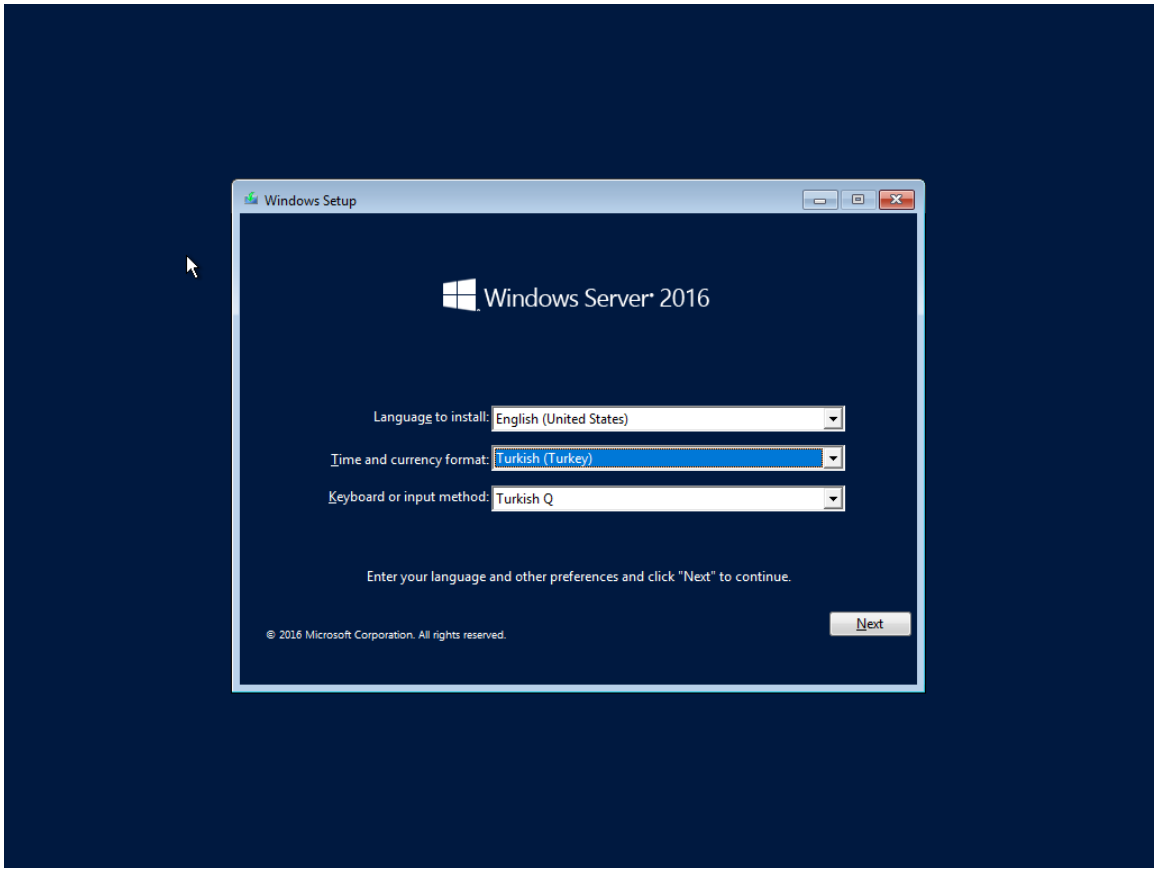
Electrical Systems Specifications:

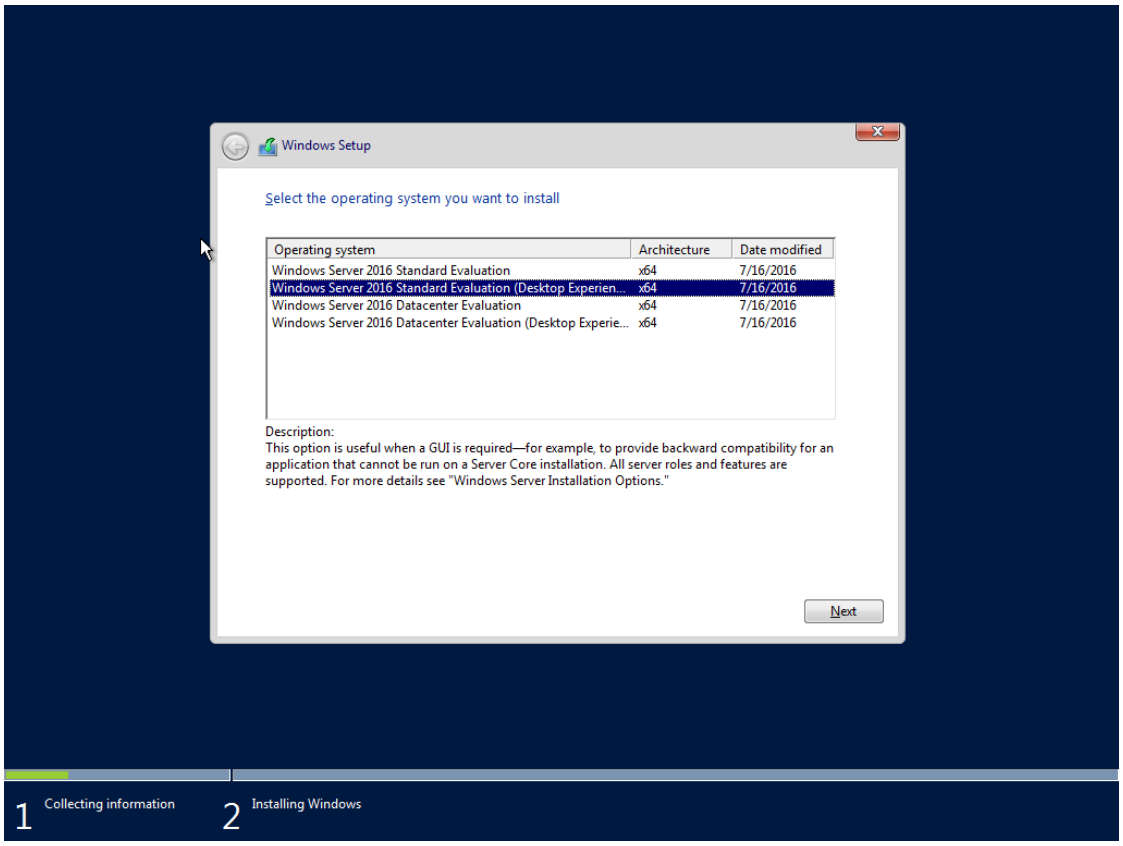
- Computer equipment and Server Room devices should have a separate UPS.
- Electrical systems should have an isolated ground, grounding grid and dedicated neutral.
- Separate back-up power should be available for entire rack mounted devices.
- The electrical system should have a shunt trip for purposes of emergency shutdown.

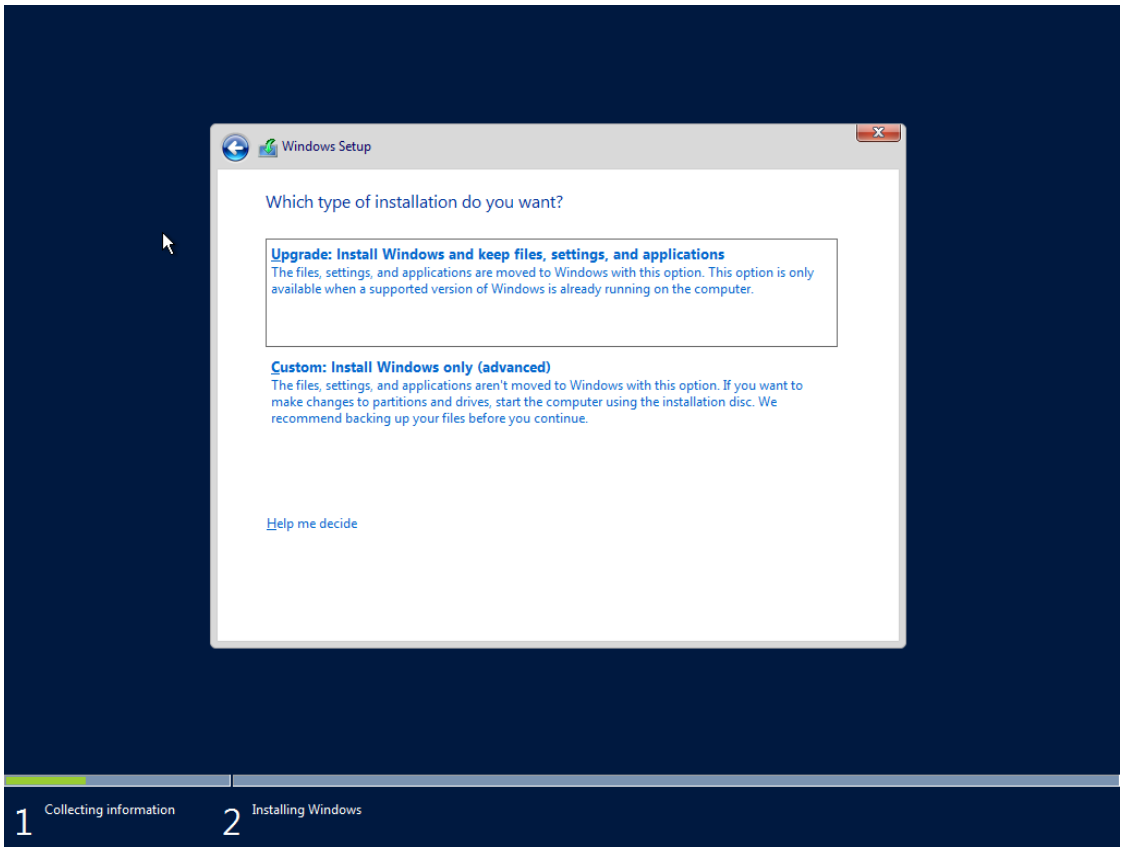
3. Implementation

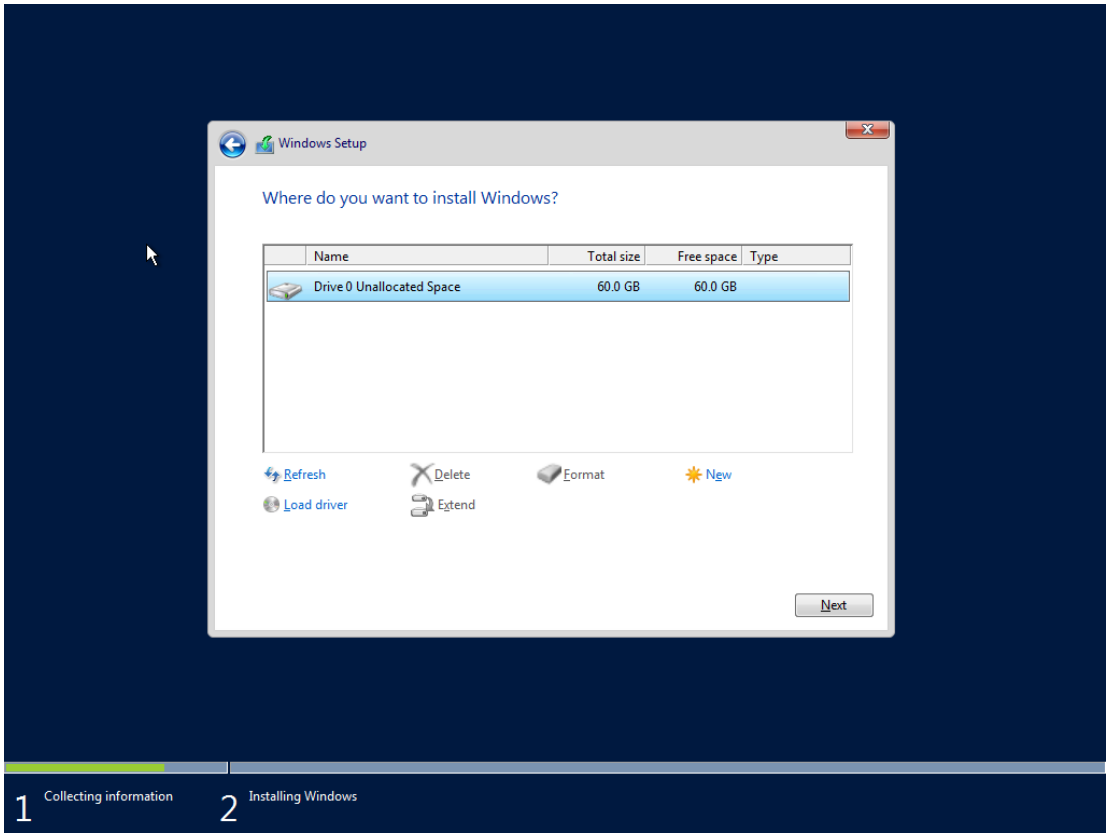
3.1 Install & Configure the Server

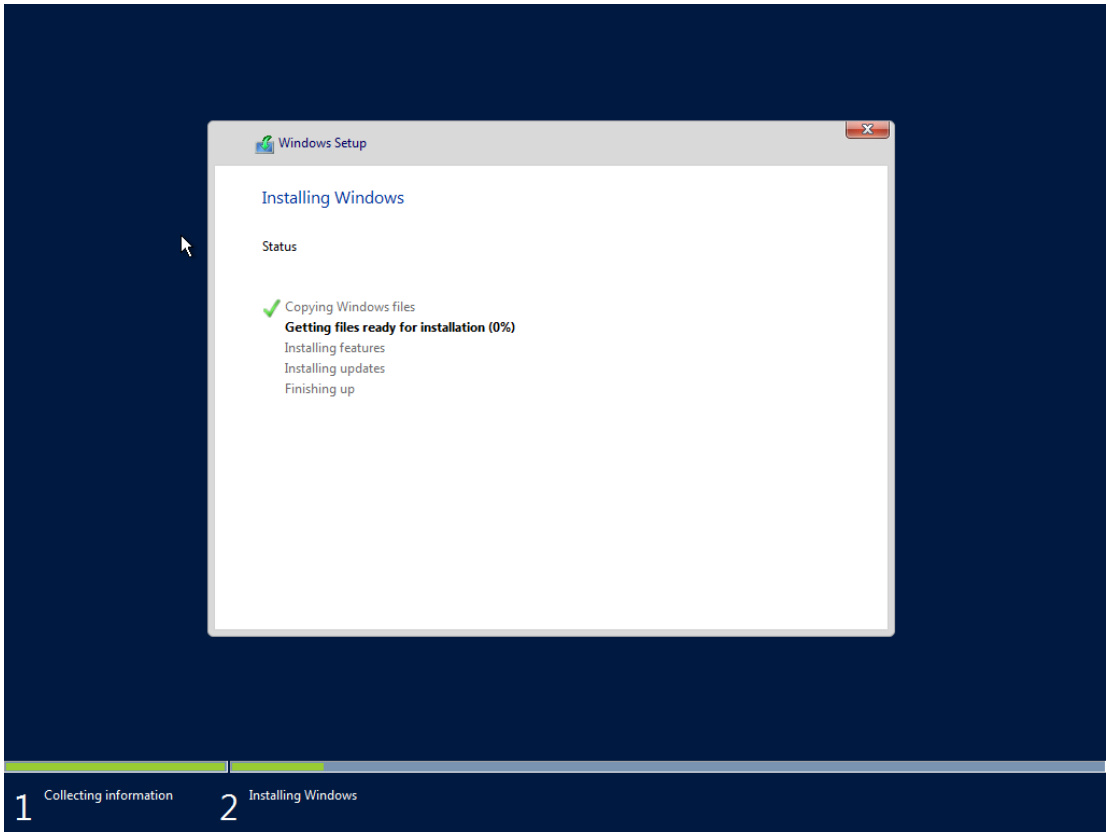
Installing and Configuring Windows Server 2016

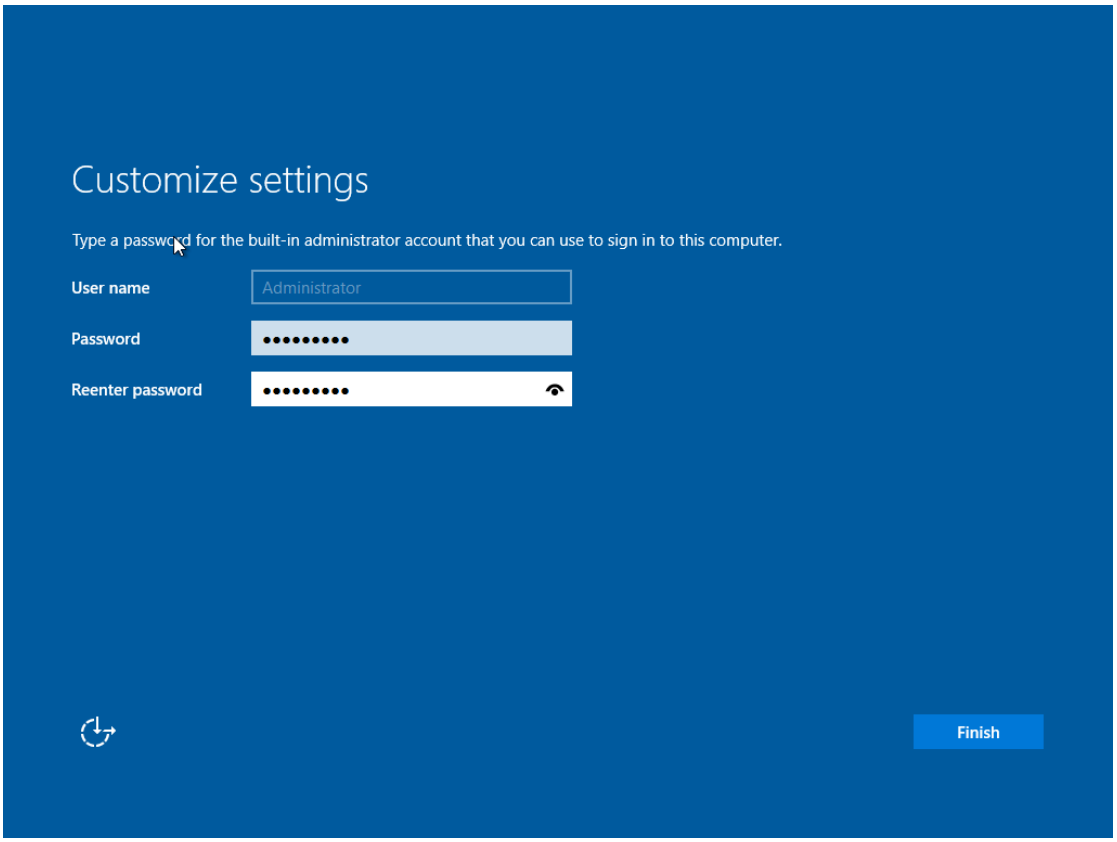


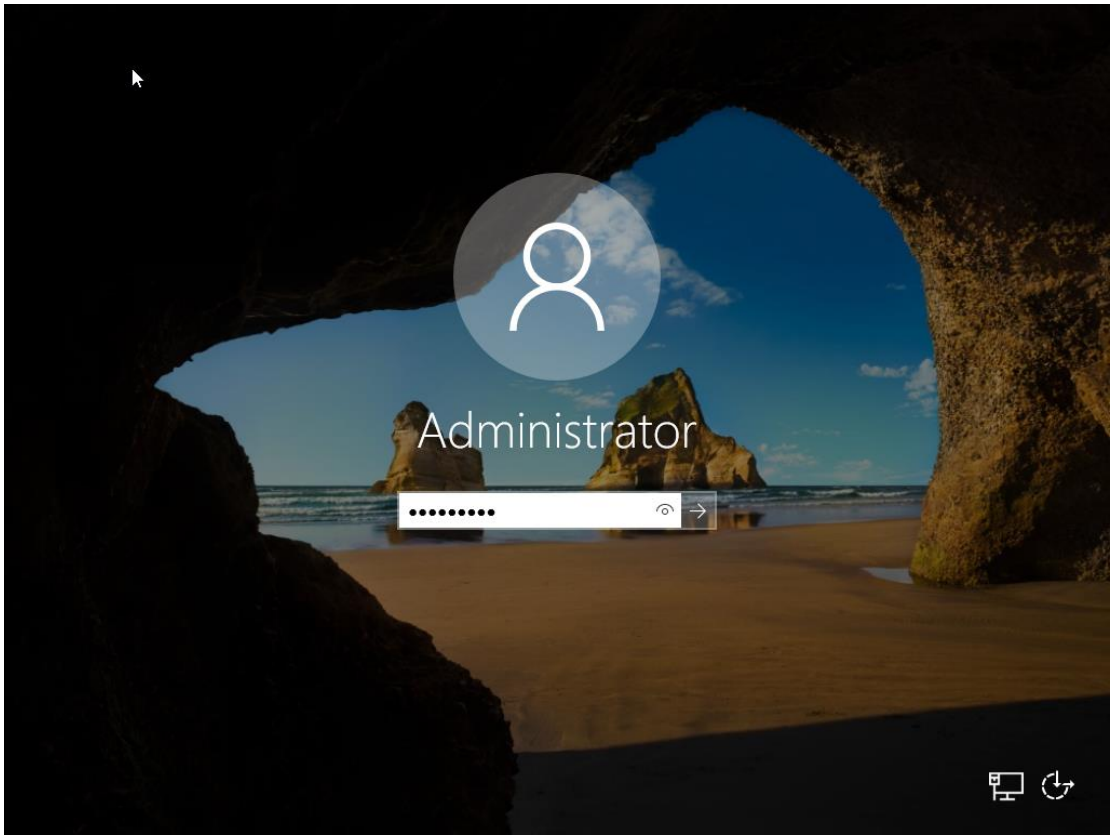

Windows Setup
Select the operating system you want to install
Operating system
Architecture
Date modified
Windows Server 2016 Standard Evaluation
x64
7/16/2016
Windows Server 2016 Standard Evaluation (Desktop Experien...
x64
7/16/2016
Windows Server 2016 Datacenter Evaluation
x64
7/16/2016
Windows Server 2016 Datacenter Evaluation (Desktop Experie...
x64
7/16/2016
Description:
This option is useful when a GUI is required—for example, to provide backward compatibility for an application that cannot be run on a Server Core installation. All server roles and features are supported. For more details see "Windows Server Installation Options."
Next
1 Collecting information
2 Installing Windows


Windows Setup
Which type of installation do you want?
Upgrade: Install Windows and keep files, settings, and applications
The files, settings, and applications are moved to Windows with this option. This option is only available when a supported version of Windows is already running on the computer.
Custom: Install Windows only (advanced)
The files, settings, and applications aren't moved to Windows with this option. If you want to make changes to partitions and drives, start the computer using the installation disc. We recommend backing up your files before you continue.
Help me decide
1 Collecting information
2 Installing Windows

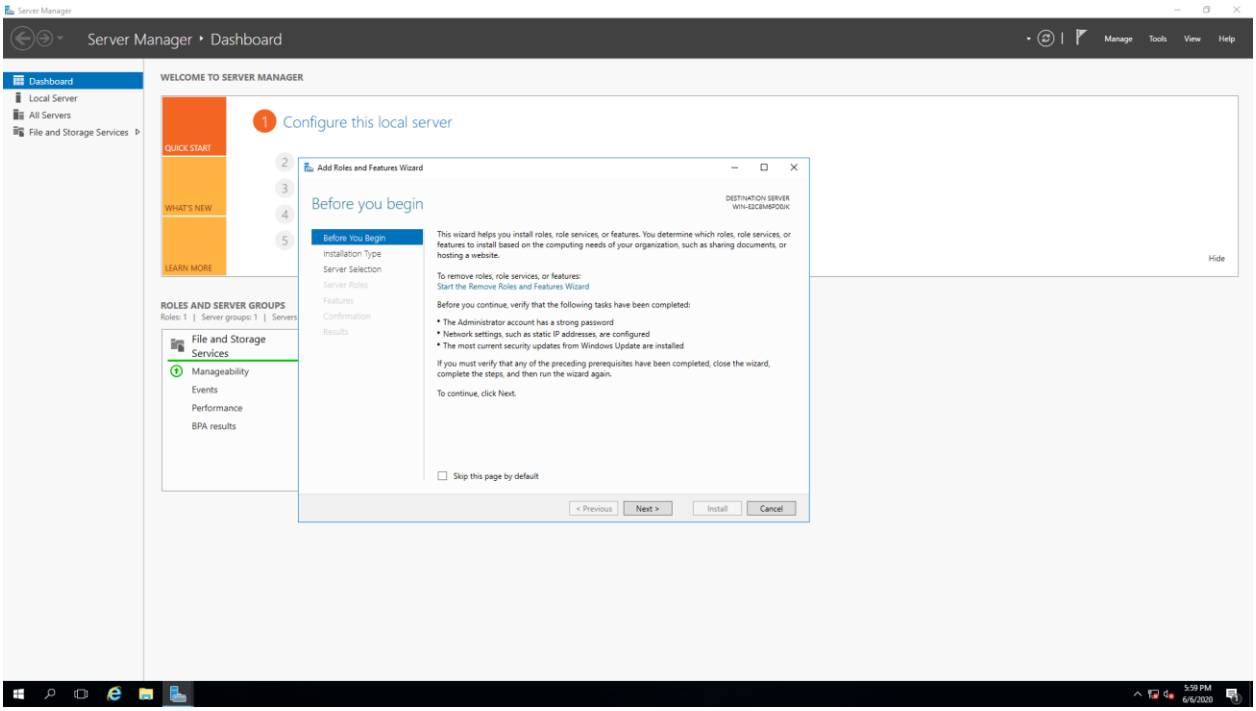

Windows Setup
Where do you want to install Windows?
Name
Total size
Free space
Type
Drive 0 Unallocated Space
60.0 GB
60.0 GB
Refresh
Delete
Format
New
Load driver
Extend
Next
1 Collecting information
2 Installing Windows

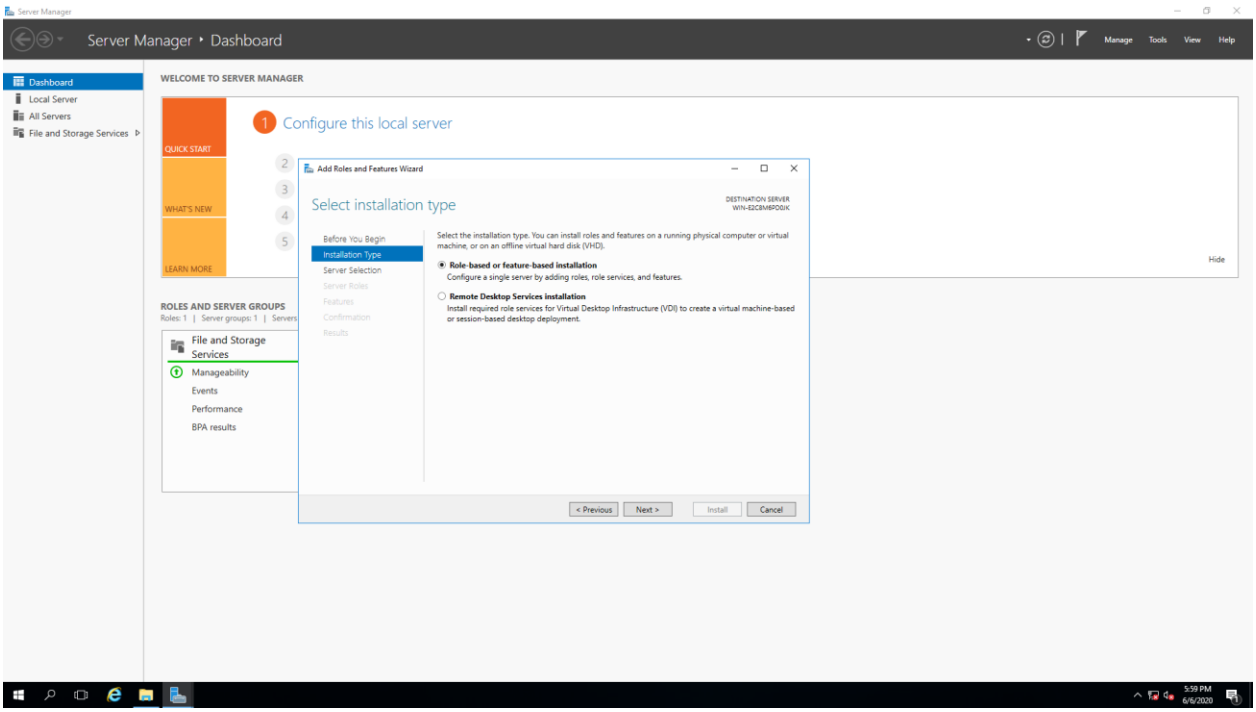

Windows Setup
Installing Windows
Status
Copying Windows files
Getting files ready for installation (0%)
Installing features
Installing updates
Finishing up
1 Collecting information
2 Installing Windows

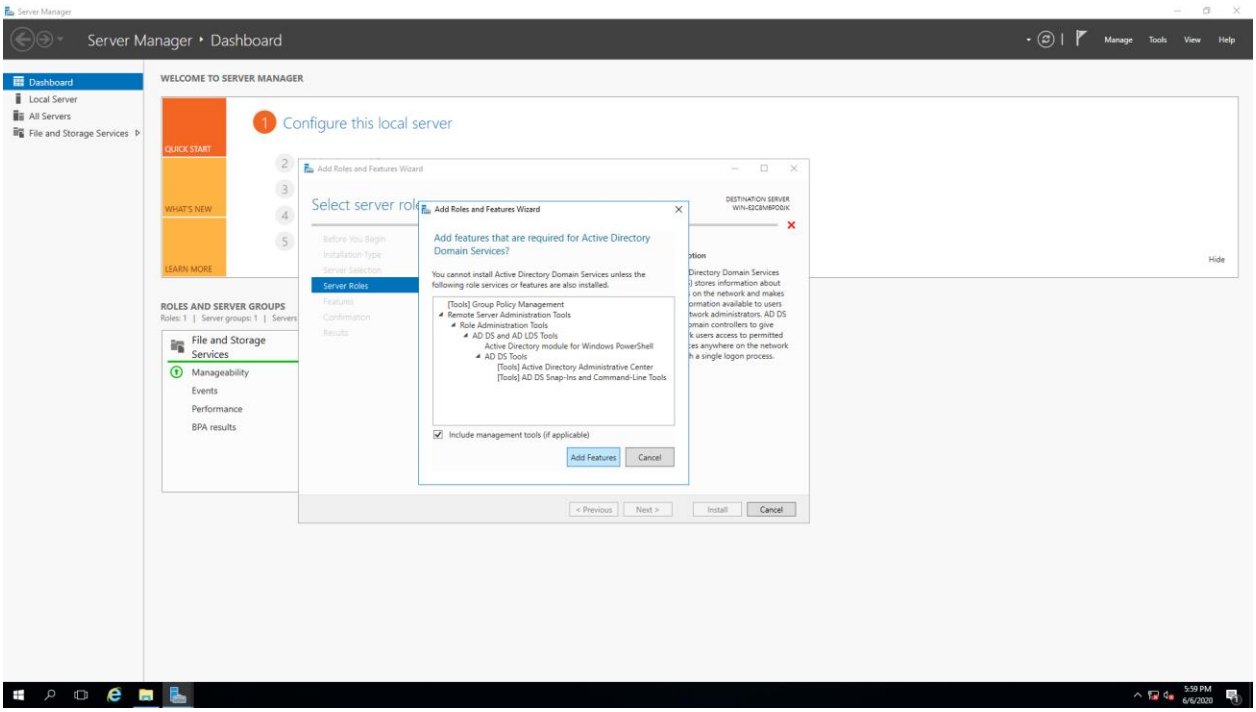

Customize settings
Type a password for the built-in administrator account that you can use to sign in to this computer.
User name
Administrator
Password
Reenter password
Finish

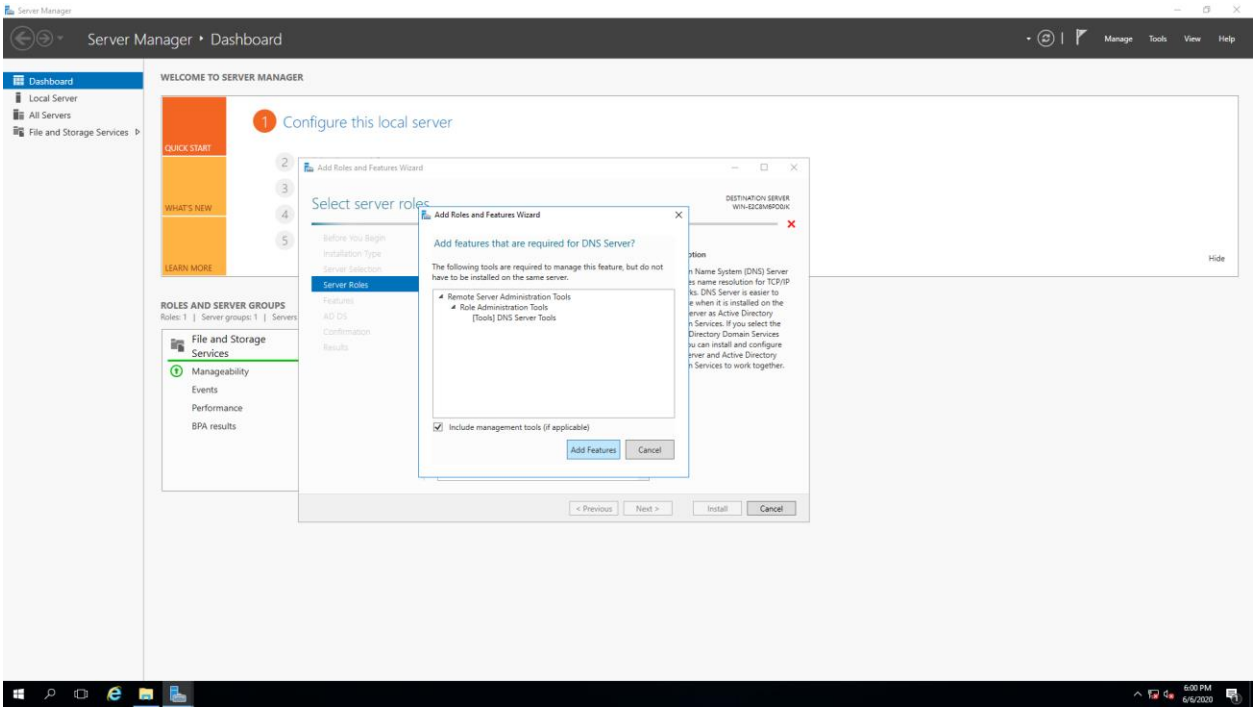

Administrator

3.2 Implementing AD DS server






Server Manager
Server Manager • Dashboard
Manage
Tools
View
Help
Dashboard
Local Server
All Servers
File and Storage Services
WELCOME TO SERVER MANAGER
QUICK START
WHAT'S NEW
LEARN MORE
Configure this local server
Add Roles and Features Wizard
Select server roles
DESTINATION SERVER
Add Roles and Features Wizard
Add features that are required for Active Directory Domain Services?
You cannot install Active Directory Domain Services unless the following role services or features are also installed.
[Tools] Group Policy Management
Remote Server Administration Tools
Role Administration Tools
AD DS and AD LDS Tools
Active Directory module for Windows PowerShell
AD DS Tools
[Tools] Active Directory Administrative Center
[Tools] AD DS Snap-Ins and Command-Line Tools
Include management tools (if applicable)
Add Features
Cancel
Before You Begin
Installation Type
Server Selection
Server Roles
Features
Confirmation
Results
< Previous
Next >
Install
Cancel
Hide
ROLES AND SERVER GROUPS
File and Storage Services
Manageability
Events
Performance
BPA results
5:59 PM
6/6/2020


Server Manager
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Manage
Tools
View
Help
Dashboard
Local Server
All Servers
File and Storage Services
WELCOME TO SERVER MANAGER
QUICK START
WHAT'S NEW
LEARN MORE
Configure this local server
Add Roles and Features Wizard
Select server roles
DESTINATION SERVER
Add Roles and Features Wizard
Add features that are required for DNS Server?
The following tools are required to manage this feature, but do not have to be installed on the same server.
Remote Server Administration Tools
Role Administration Tools
[Tools] DNS Server Tools
Include management tools (if applicable)
Add Features
Cancel
Before You Begin
Installation Type
Server Selection
Server Roles
Features
AD DS
Confirmation
Results
< Previous
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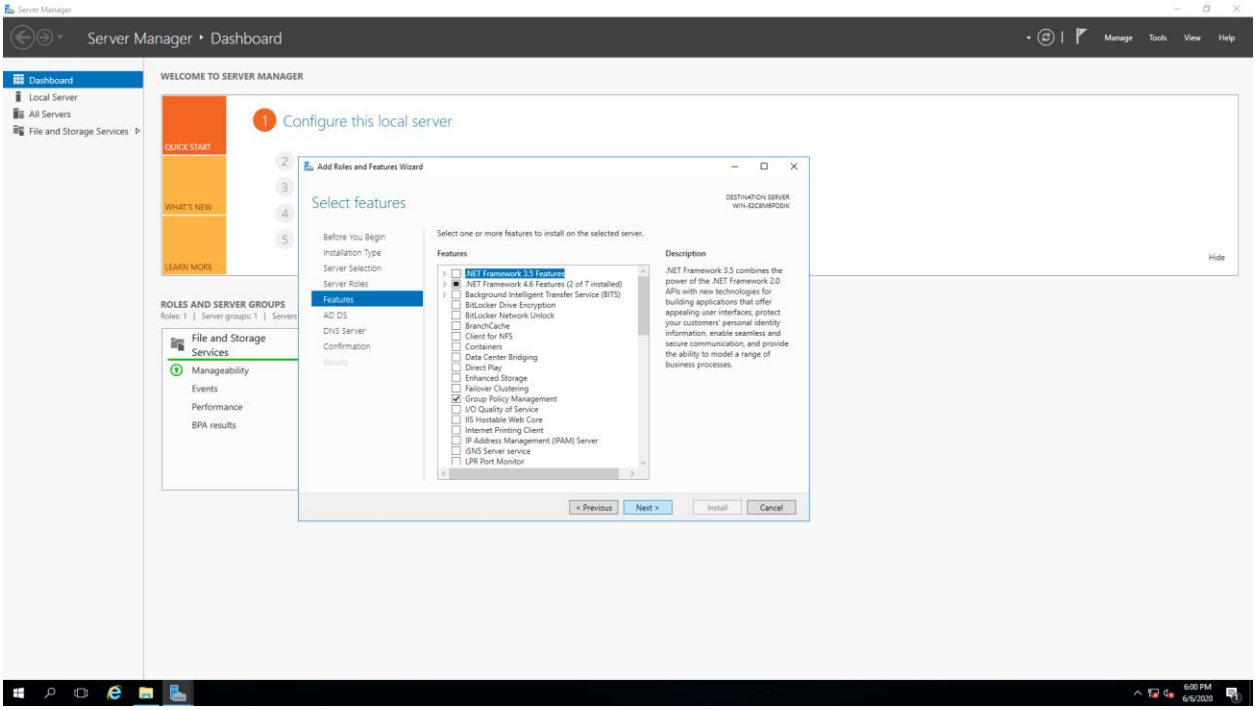
Server Manager
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Dashboard
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All Servers
File and Storage Services
WELCOME TO SERVER MANAGER
QUICK START
WHAT'S NEW
LEARN MORE
1 Configure this local server
2
3
4
5
Add Roles and Features Wizard
Select features
DESTINATION SERVER
WIN-E2C8MBP03IK
Before You Begin
Installation Type
Server Selection
Server Roles
Features
AD DS
DNS Server
Confirmation
Results
Select one or more features to install on the selected server.
Features
Description
.NET Framework 3.5 Features
.NET Framework 4.6 Features (2 of 7 installed)
Background Intelligent Transfer Service (BITS)
BitLocker Drive Encryption
BitLocker Network Unlock
BranchCache
Client for NFS
Containers
Data Center Bridging
Direct Play
Enhanced Storage
Failover Clustering
Group Policy Management
I/O Quality of Service
IIS Hostable Web Core
Internet Printing Client
IP Address Management (IPAM) Server
SNS Server service
LPR Port Monitor
.NET Framework 3.5 combines the power of the .NET Framework 2.0 APIs with new technologies for building applications that offer appealing user interfaces, protect your customers' personal identity information, enable seamless and secure communication, and provide the ability to model a range of business processes.
< Previous
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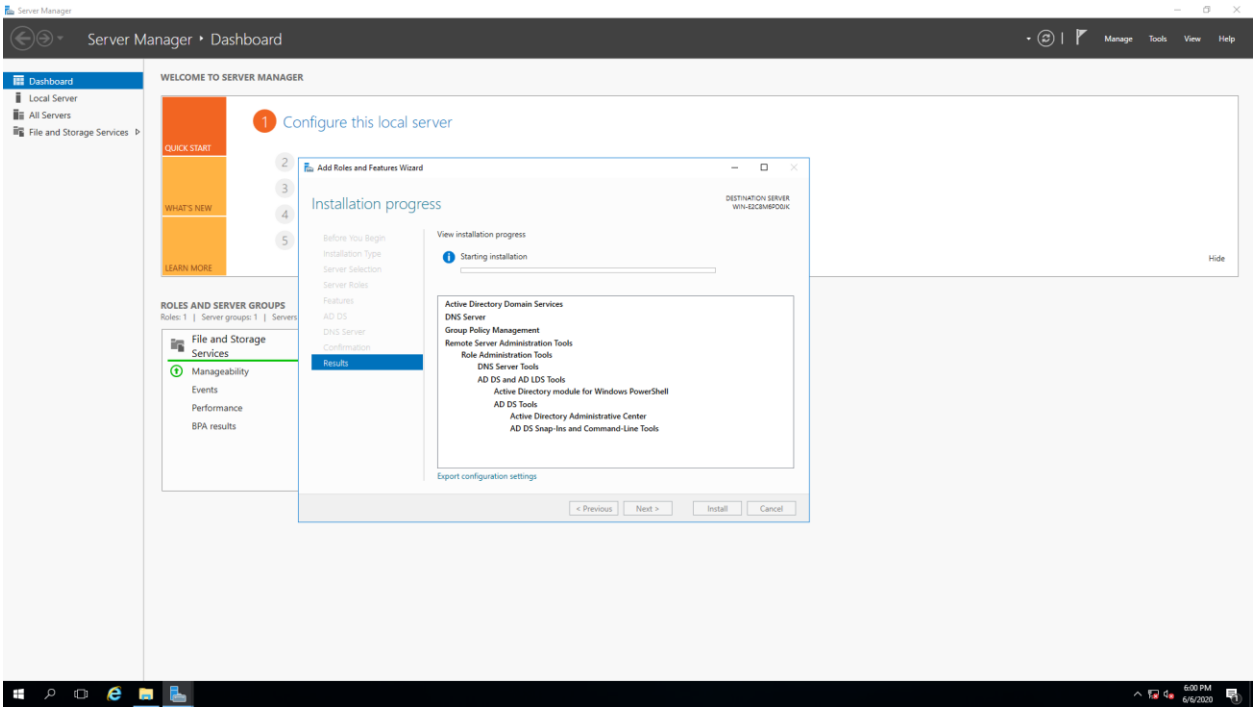
Server Manager
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File and Storage Services
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QUICK START
WHAT'S NEW
LEARN MORE
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3
4
5
Add Roles and Features Wizard
Installation progress
DESTINATION SERVER
WIN-E2C8MBP03IK
Before You Begin
Installation Type
Server Selection
Server Roles
Features
AD DS
DNS Server
Confirmation
Results
View installation progress
Starting installation
Active Directory Domain Services
DNS Server
Group Policy Management
Remote Server Administration Tools
Role Administration Tools
DNS Server Tools
AD DS and AD LDS Tools
Active Directory module for Windows PowerShell
AD DS Tools
Active Directory Administrative Center
AD DS Snap-Ins and Command-Line Tools
Export configuration settings
< Previous
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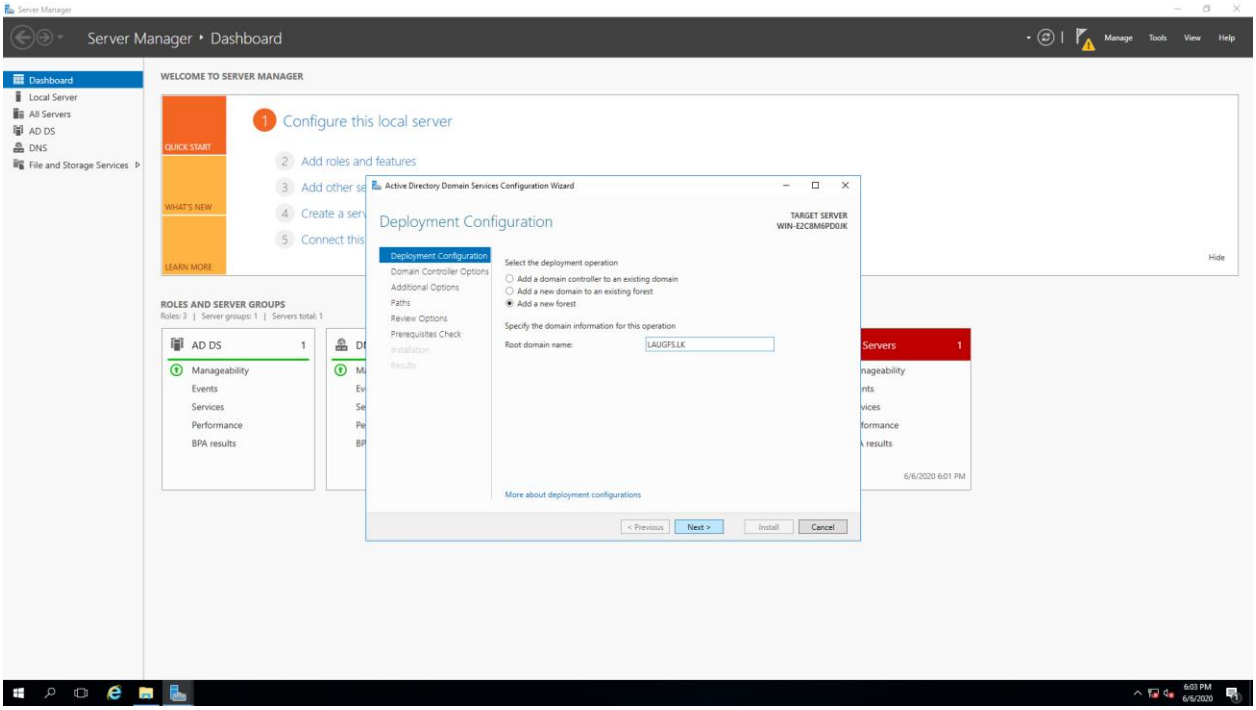
Server Manager
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Dashboard
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All Servers
AD DS
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WHAT'S NEW
LEARN MORE
1 Configure this local server
2 Add roles and features
3 Add other se
4 Create a serv
5 Connect this
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ROLES AND SERVER GROUPS
Roles: 3 | Server groups: 1 | Servers total: 1
AD DS 1
Manageability
Events
Services
Performance
BPA results
Servers 1
6/6/2020 6:01 PM
Active Directory Domain Services Configuration Wizard
Deployment Configuration
TARGET SERVER
WIN-E2C8M6PD0JK
Deployment Configuration
Domain Controller Options
Additional Options
Paths
Review Options
Prerequisites Check
Installation
Results
Select the deployment operation
Add a domain controller to an existing domain
Add a new domain to an existing forest
Add a new forest
Specify the domain information for this operation
Root domain name:
LAUGFS.LK
More about deployment configurations
< Previous
Next >
Install
Cancel
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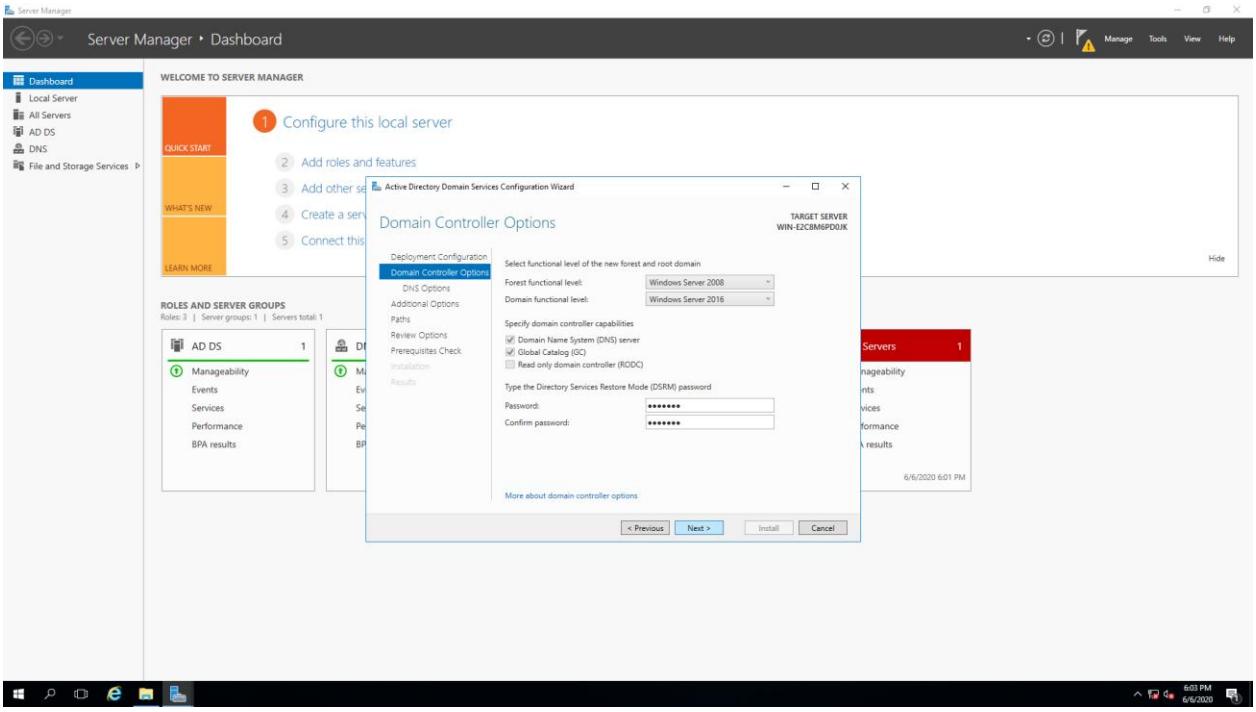
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File and Storage Services
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5 Connect this
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Roles: 3 | Server groups: 1 | Servers total: 1
AD DS 1
Manageability
Events
Services
Performance
BPA results
Servers 1
6/6/2020 6:01 PM
Active Directory Domain Services Configuration Wizard
Domain Controller Options
TARGET SERVER
WIN-E2C8M6PD0JK
Deployment Configuration
Domain Controller Options
DNS Options
Additional Options
Paths
Review Options
Prerequisites Check
Installation
Results
Select functional level of the new forest and root domain
Forest functional level:
Windows Server 2008
Domain functional level:
Windows Server 2016
Specify domain controller capabilities
Domain Name System (DNS) server
Global Catalog (GC)
Read only domain controller (RODC)
Type the Directory Services Restore Mode (DSRM) password
Password:
Confirm password:
More about domain controller options
< Previous
Next >
Install
Cancel
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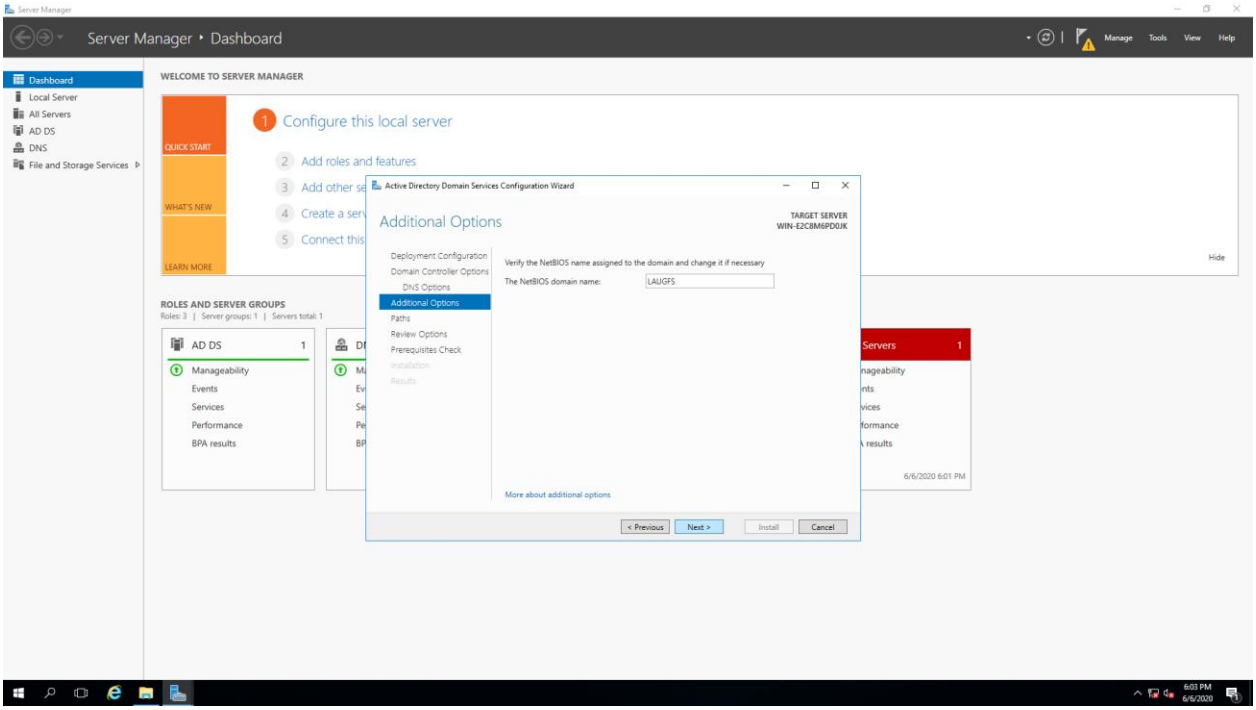
6/6/2020


Server Manager • Dashboard
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Dashboard
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All Servers
AD DS
DNS
File and Storage Services
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4 Create a serv
5 Connect this
Hide
ROLES AND SERVER GROUPS
Roles: 3 | Server groups: 1 | Servers total: 1
AD DS 1
Manageability
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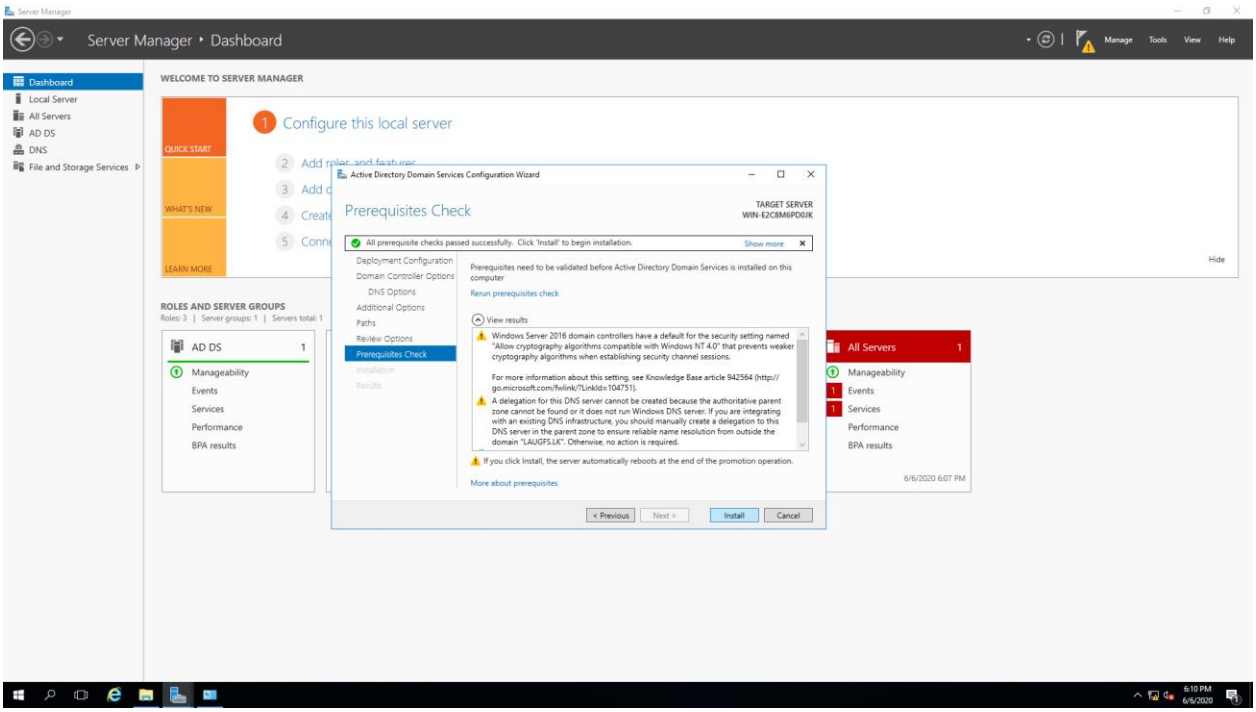
Services
Performance
BPA results
Servers 1
6/6/2020 6:01 PM
Active Directory Domain Services Configuration Wizard
Additional Options
TARGET SERVER
WIN-E2C8M6PD0JK
Deployment Configuration
Domain Controller Options
DNS Options
Additional Options
Paths
Review Options
Prerequisites Check
Installation
Results
Verify the NetBIOS name assigned to the domain and change it if necessary
The NetBIOS domain name:
LAUGFS
More about additional options
< Previous
Next >
Install
Cancel
6:03 PM
6/6/2020


Server Manager • Dashboard
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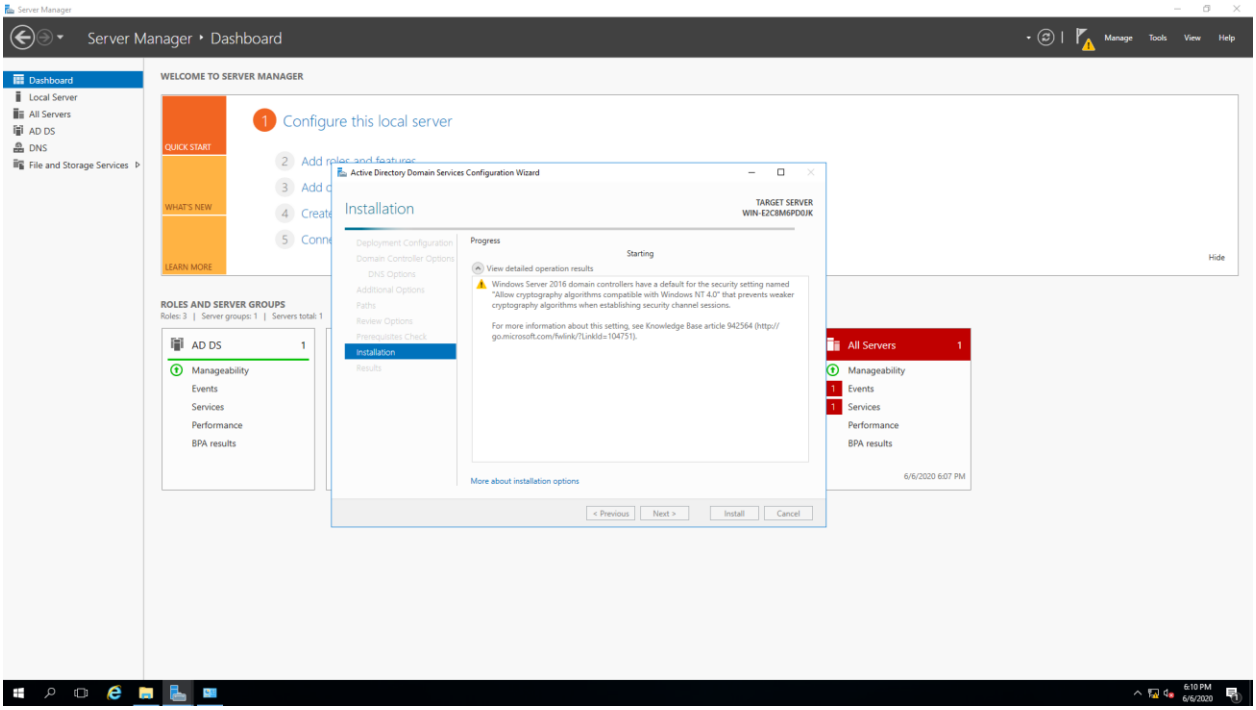
DNS
File and Storage Services
WELCOME TO SERVER MANAGER
QUICK START
WHAT'S NEW
LEARN MORE
1 Configure this local server
Hide
ROLES AND SERVER GROUPS
Roles: 3 | Server groups: 1 | Servers total: 1
AD DS 1
Manageability
Events
Services
Performance
BPA results
All Servers 1
Manageability
Events
Services
Performance
BPA results
6/6/2020 6:07 PM
Active Directory Domain Services Configuration Wizard
Prerequisites Check
TARGET SERVER
WIN-E2C8M6PD0JK
All prerequisite checks passed successfully. Click 'Install' to begin installation.
Show more
Deployment Configuration
Domain Controller Options
DNS Options
Additional Options
Paths
Review Options
Prerequisites Check
Installation
Results
Prerequisites need to be validated before Active Directory Domain Services is installed on this computer
Rerun prerequisites check
View results
Windows Server 2016 domain controllers have a default for the security setting named "Allow cryptography algorithms compatible with Windows NT 4.0" that prevents weaker cryptography algorithms when establishing security channel sessions.
For more information about this setting, see Knowledge Base article 942564 (http://go.microsoft.com/fwlink/?LinkId=104751).
A delegation for this DNS server cannot be created because the authoritative parent zone cannot be found or it does not run Windows DNS server. If you are integrating with an existing DNS infrastructure, you should manually create a delegation to this DNS server in the parent zone to ensure reliable name resolution from outside the domain "LAUGFS.LK". Otherwise, no action is required.
If you click Install, the server automatically reboots at the end of the promotion operation.
More about prerequisites
< Previous
Next >
Install
Cancel
6:10 PM
6/6/2020


Server Manager
Server Manager • Dashboard
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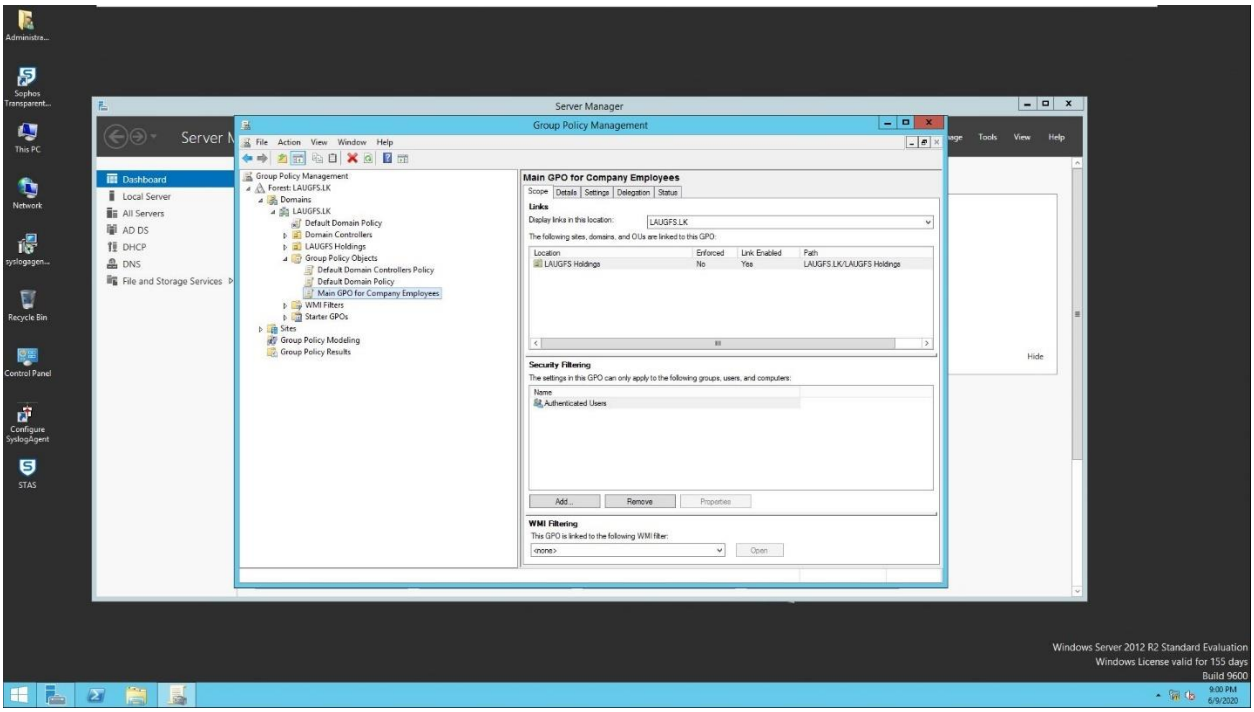
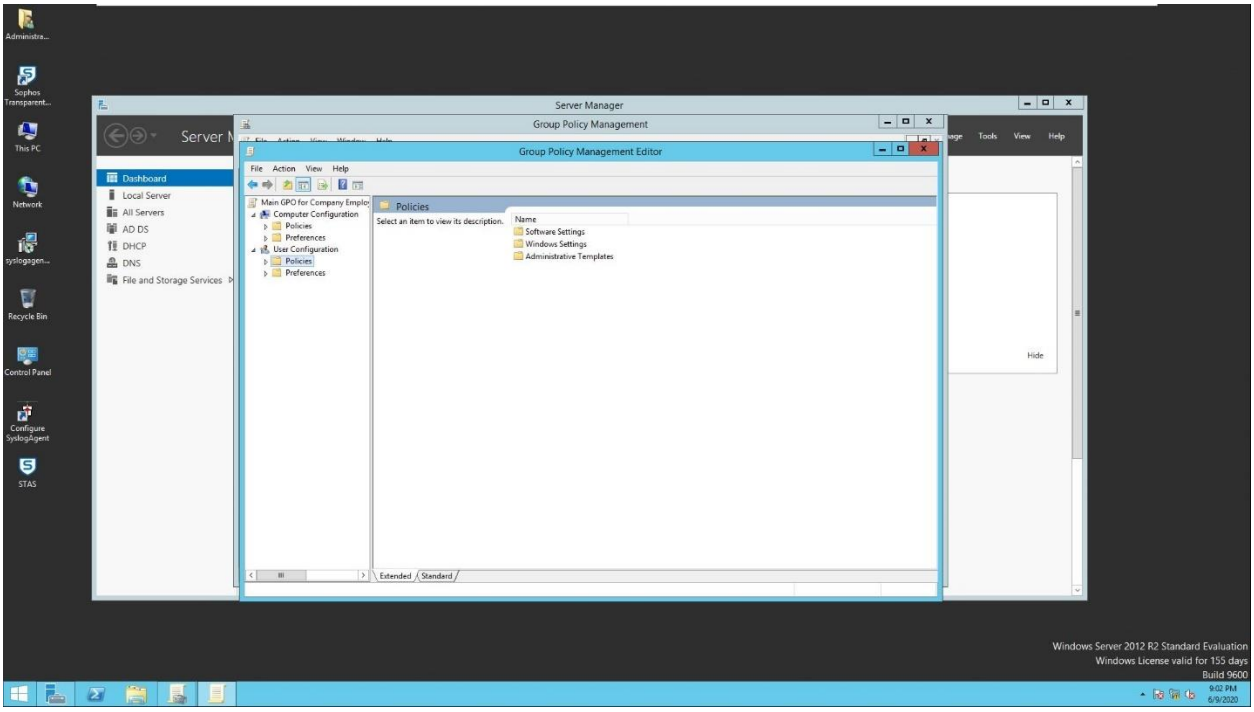
Dashboard
Local Server
All Servers
AD DS
DNS
File and Storage Services
WELCOME TO SERVER MANAGER
QUICK START
WHAT'S NEW
LEARN MORE
1 Configure this local server
2 Add roles and features
3 Add d
4 Create
5 Conn
Hide
ROLES AND SERVER GROUPS
Roles: 3 | Server groups: 1 | Servers total: 1
AD DS 1
Manageability
Events
Services
Performance
BPA results
All Servers 1
Manageability
Events
Services
Performance
BPA results
6/6/2020 6:07 PM
Active Directory Domain Services Configuration Wizard
Installation
TARGET SERVER
WIN-E2CBM6PD0JK
Deployment Configuration
Domain Controller Options
DNS Options
Additional Options
Paths
Review Options
Prerequisites Check
Installation
Results
Progress
Starting
View detailed operation results
Windows Server 2016 domain controllers have a default for the security setting named "Allow cryptography algorithms compatible with Windows NT 4.0" that prevents weaker cryptography algorithms when establishing security channel sessions.
For more information about this setting, see Knowledge Base article 942564 (http://go.microsoft.com/fwlink/?LinkId=104751).
More about installation options
< Previous
Next >
Install
Cancel
6:10 PM
6/6/2020

3.2.1 Implementing Group Policies

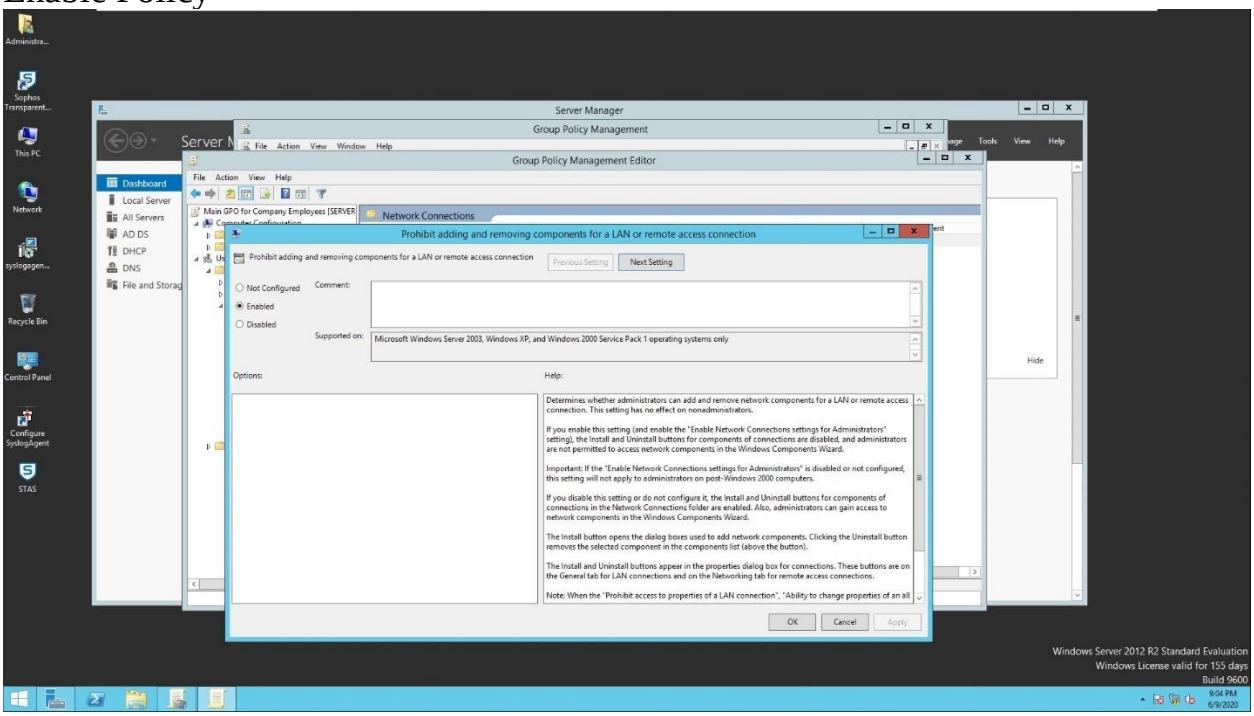
Create New Group Policy Object



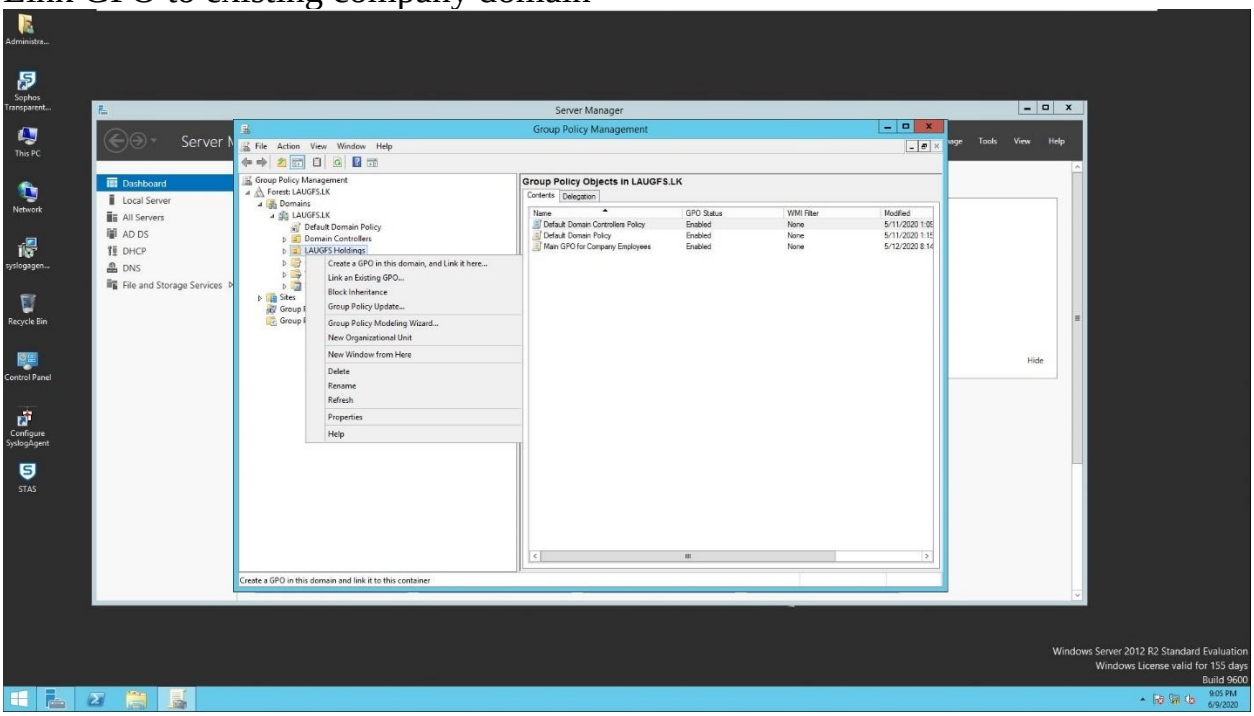
Add Policies into GPO

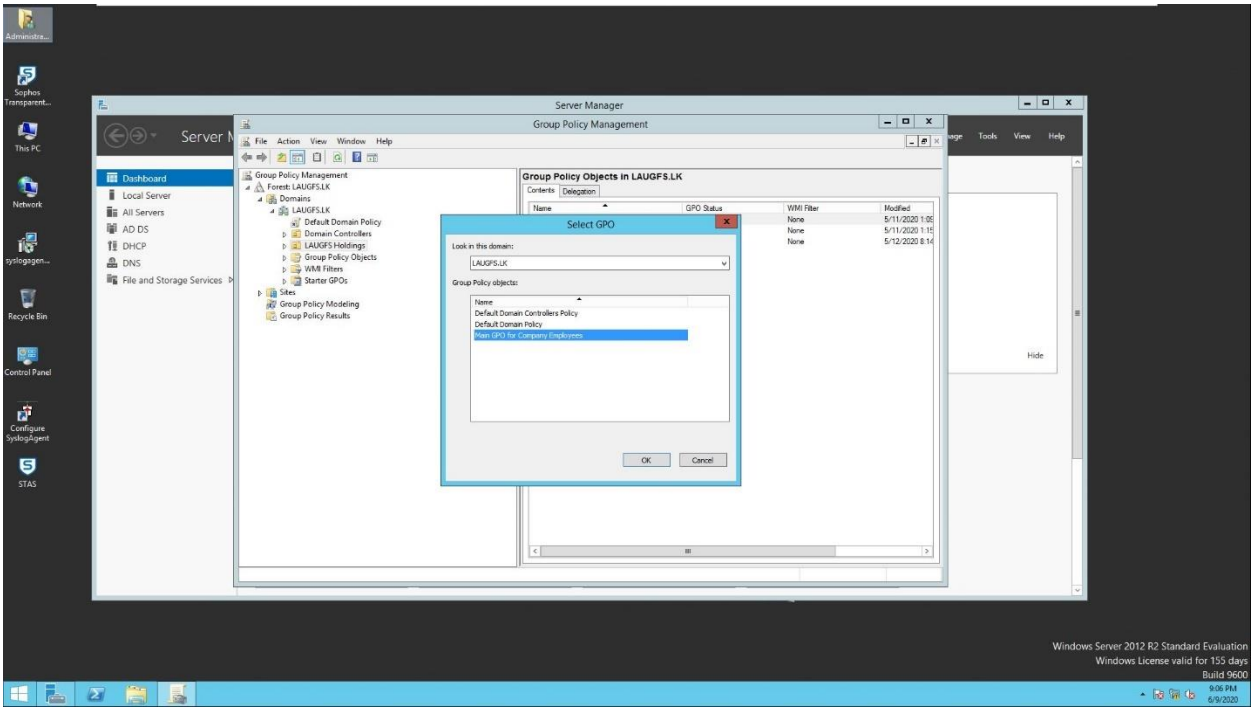


Enable Policy



Link GPO to existing company domain





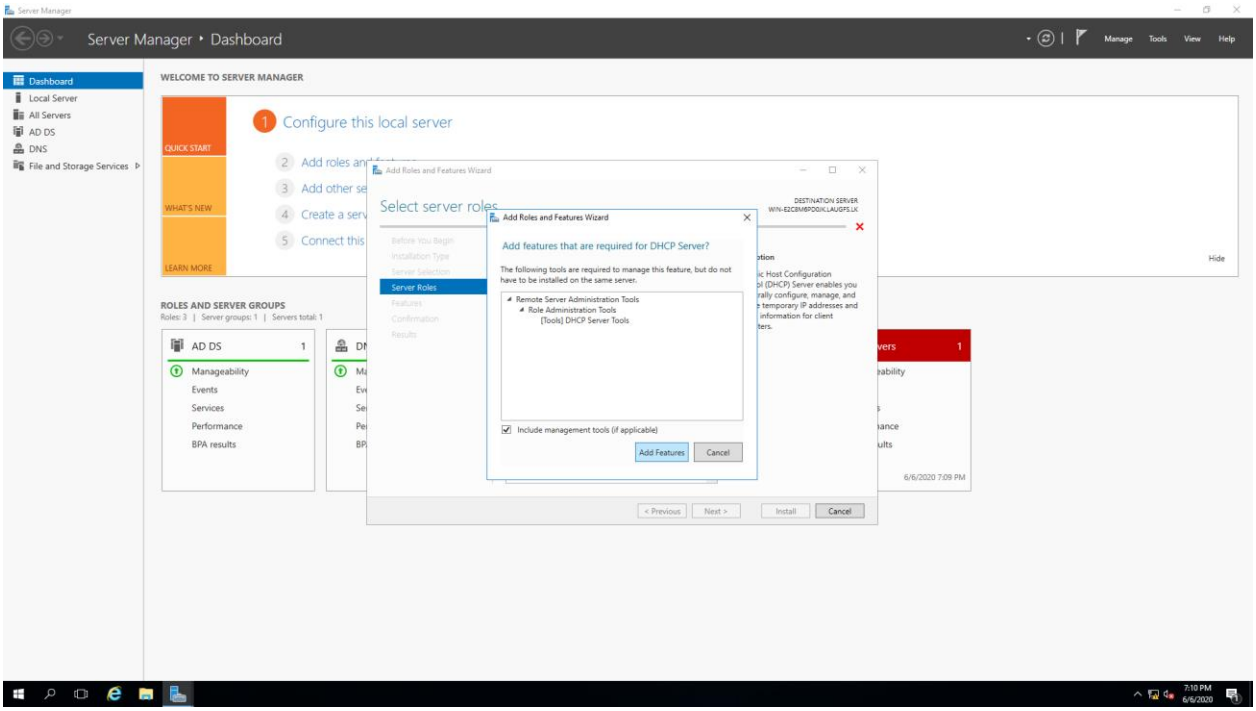
Currently Enabled GPOs:

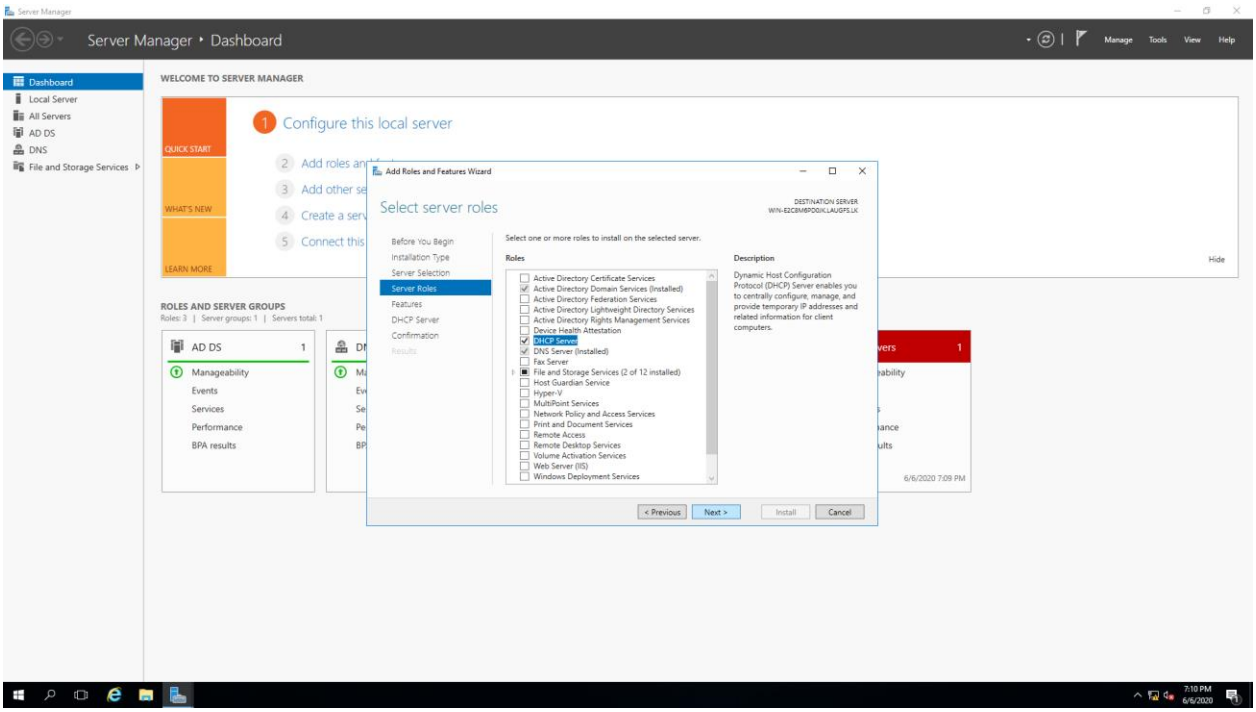
Prohibit Adding and Removing Components For A LAN Or Remote Access Connection

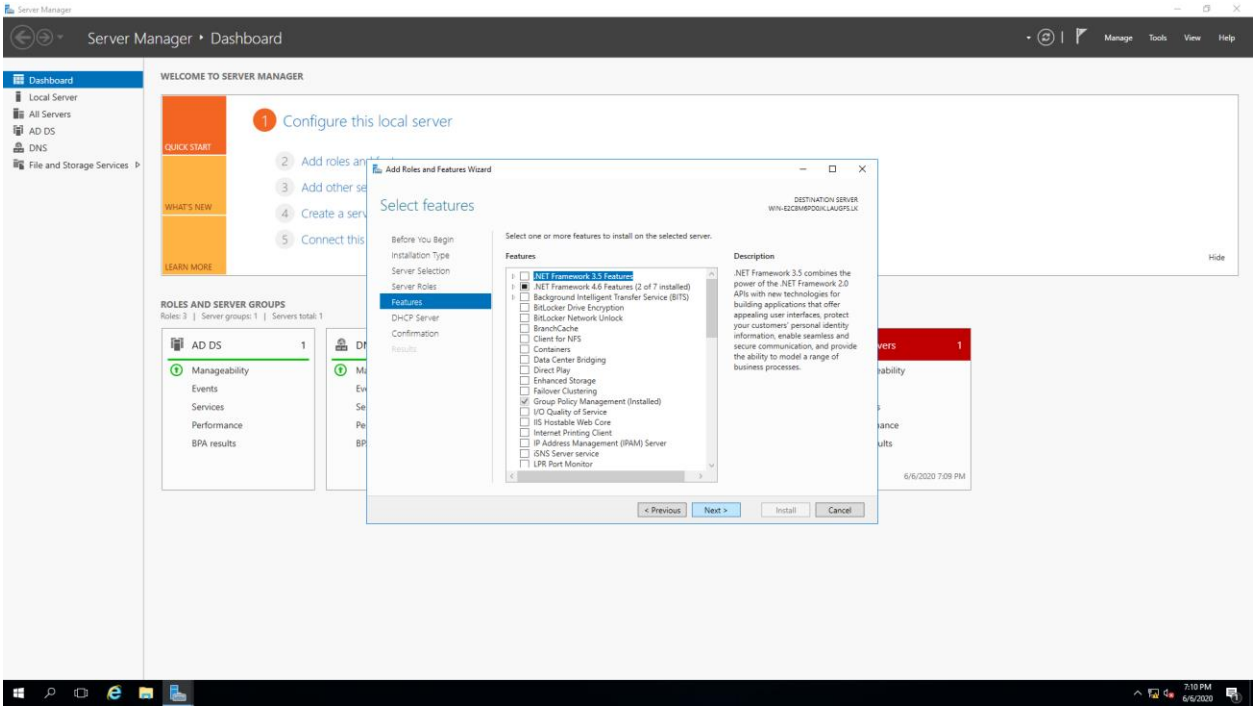
Turn off Windows Installer

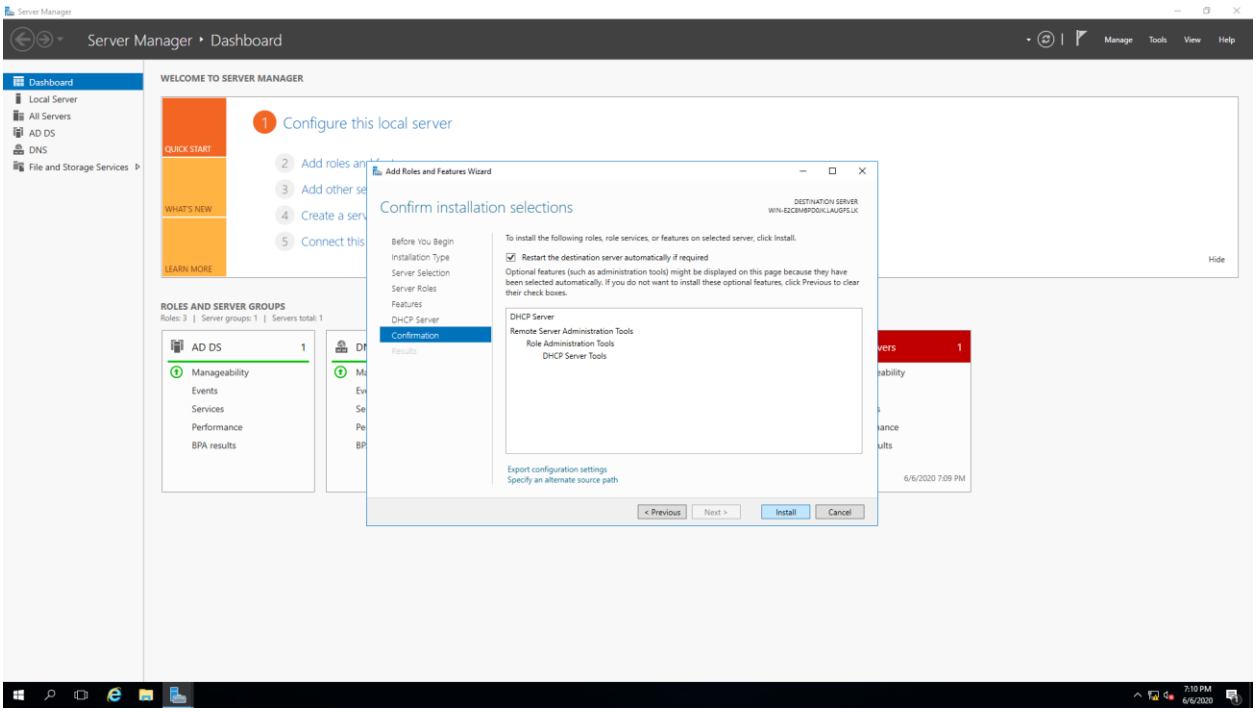
User Can’t change Desktop Wallpaper

3.3 Implementing a DHCP server






Server Manager
Server Manager • Dashboard
Manage
Tools
View
Help
Dashboard
Local Server
All Servers
AD DS
DNS
File and Storage Services
WELCOME TO SERVER MANAGER
QUICK START
WHAT'S NEW
LEARN MORE
1 Configure this local server
2 Add roles and features
3 Add other servers to manage
4 Create a server group
5 Connect this server to cloud services
Hide
ROLES AND SERVER GROUPS
Roles: 3 | Server groups: 1 | Servers total: 1
AD DS
1
Manageability
Events
Services
Performance
BPA results
Add Roles and Features Wizard
Select features
DESTINATION SERVER
WIN-E2CBM8PDGIK.LAUGPS.LK
Before You Begin
Installation Type
Server Selection
Server Roles
Features
DHCP Server
Confirmation
Results
Select one or more features to install on the selected server.
Features
Description
.NET Framework 3.5 Features
.NET Framework 4.6 Features (2 of 7 installed)
Background Intelligent Transfer Service (BITS)
BitLocker Drive Encryption
BitLocker Network Unlock
BranchCache
Client for NFS
Containers
Data Center Bridging
Direct Play
Enhanced Storage
Failover Clustering
Group Policy Management (Installed)
I/O Quality of Service
IIS Hostable Web Core
Internet Printing Client
IP Address Management (IPAM) Server
iSNS Server service
LPR Port Monitor
.NET Framework 3.5 combines the power of the .NET Framework 2.0 APIs with new technologies for building applications that offer appealing user interfaces, protect your customers' personal identity information, enable seamless and secure communication, and provide the ability to model a range of business processes.
< Previous
Next >
Install
Cancel
6/6/2020 7:09 PM
7:10 PM
6/6/2020


Server Manager
Server Manager • Dashboard
Manage
Tools
View
Help
Dashboard
Local Server
All Servers
AD DS
DNS
File and Storage Services
WELCOME TO SERVER MANAGER
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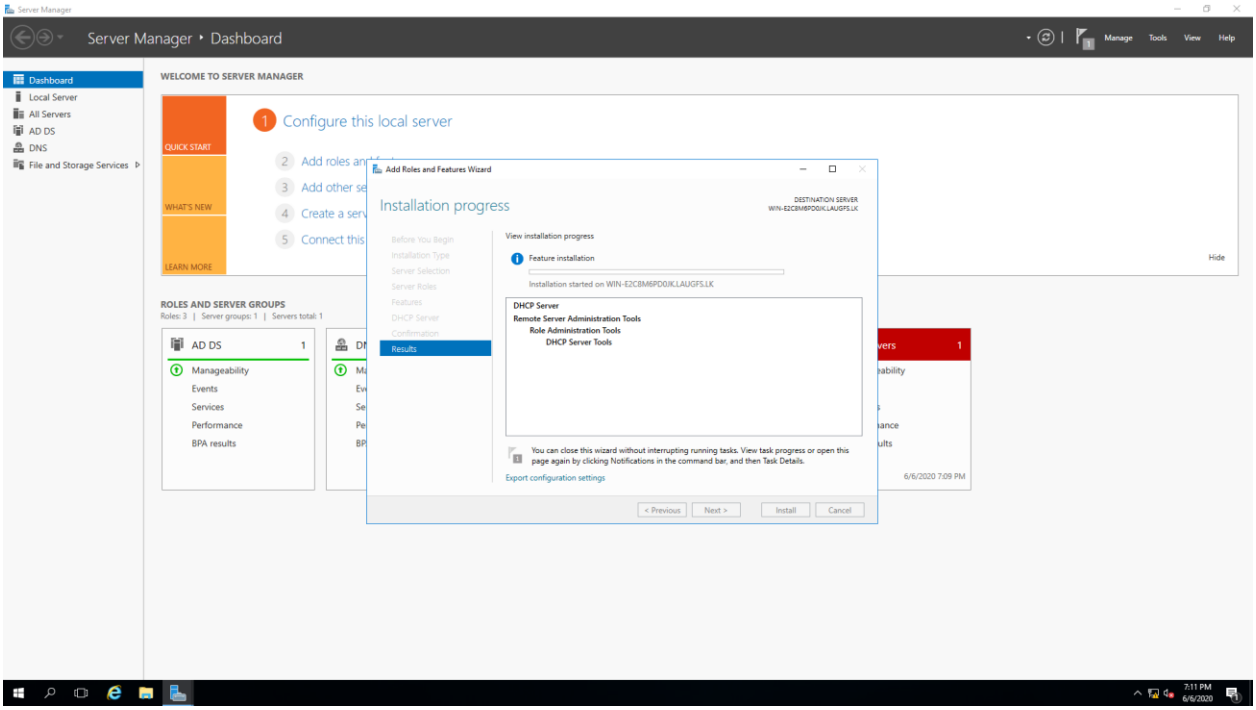
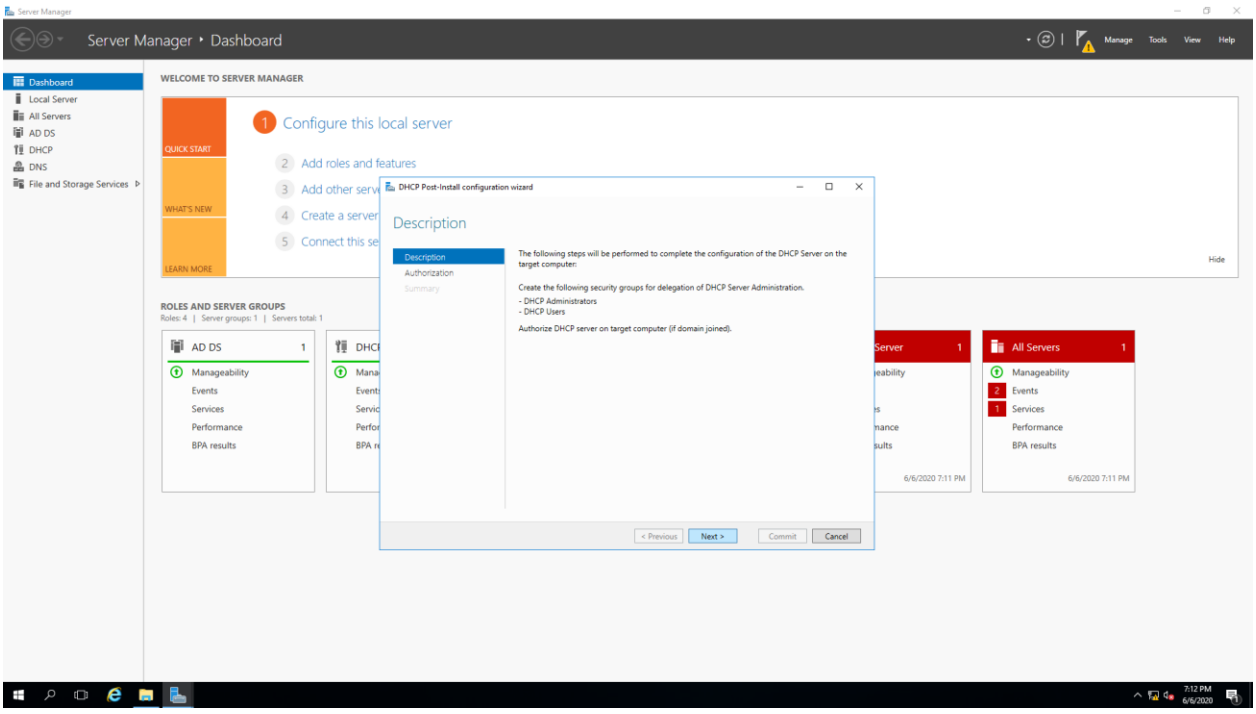
ROLES AND SERVER GROUPS
Roles: 3 | Server groups: 1 | Servers total: 1
AD DS
1
Manageability
Events
Services
Performance
BPA results
Add Roles and Features Wizard
Confirm installation selections
DESTINATION SERVER
WIN-E2CBM8PDGIK.LAUGPS.LK
Before You Begin
Installation Type
Server Selection
Server Roles
Features
DHCP Server
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.
DHCP Server
Remote Server Administration Tools
Role Administration Tools
DHCP Server Tools
Export configuration settings
Specify an alternate source path
< Previous
Next >
Install
Cancel
6/6/2020 7:09 PM
7:10 PM
6/6/2020


Server Manager
Server Manager • Dashboard
Manage
Tools
View
Help
Dashboard
Local Server
All Servers
AD DS
DNS
File and Storage Services
WELCOME TO SERVER MANAGER
QUICK START
WHAT'S NEW
LEARN MORE
1 Configure this local server
2 Add roles and features
3 Add other servers to manage
4 Create a server group
5 Connect this server to cloud services
Hide
ROLES AND SERVER GROUPS
Roles: 3 | Server groups: 1 | Servers total: 1
AD DS
Manageability
Events
Services
Performance
BPA results
Add Roles and Features Wizard
Installation progress
DESTINATION SERVER
WIN-E2C8M6PDOJK.LAUGFS.LK
Before You Begin
Installation Type
Server Selection
Server Roles
Features
DHCP Server
Confirmation
Results
View installation progress
Feature installation
Installation started on WIN-E2C8M6PDOJK.LAUGFS.LK
DHCP Server
Remote Server Administration Tools
Role Administration Tools
DHCP Server Tools
You can close this wizard without interrupting running tasks. View task progress or open this page again by clicking Notifications in the command bar, and then Task Details.
Export configuration settings
< Previous
Next >
Install
Cancel
6/6/2020 7:09 PM
7:11 PM
6/6/2020


Server Manager
Server Manager • Dashboard
Manage
Tools
View
Help
Dashboard
Local Server
All Servers
AD DS
DHCP
DNS
File and Storage Services
WELCOME TO SERVER MANAGER
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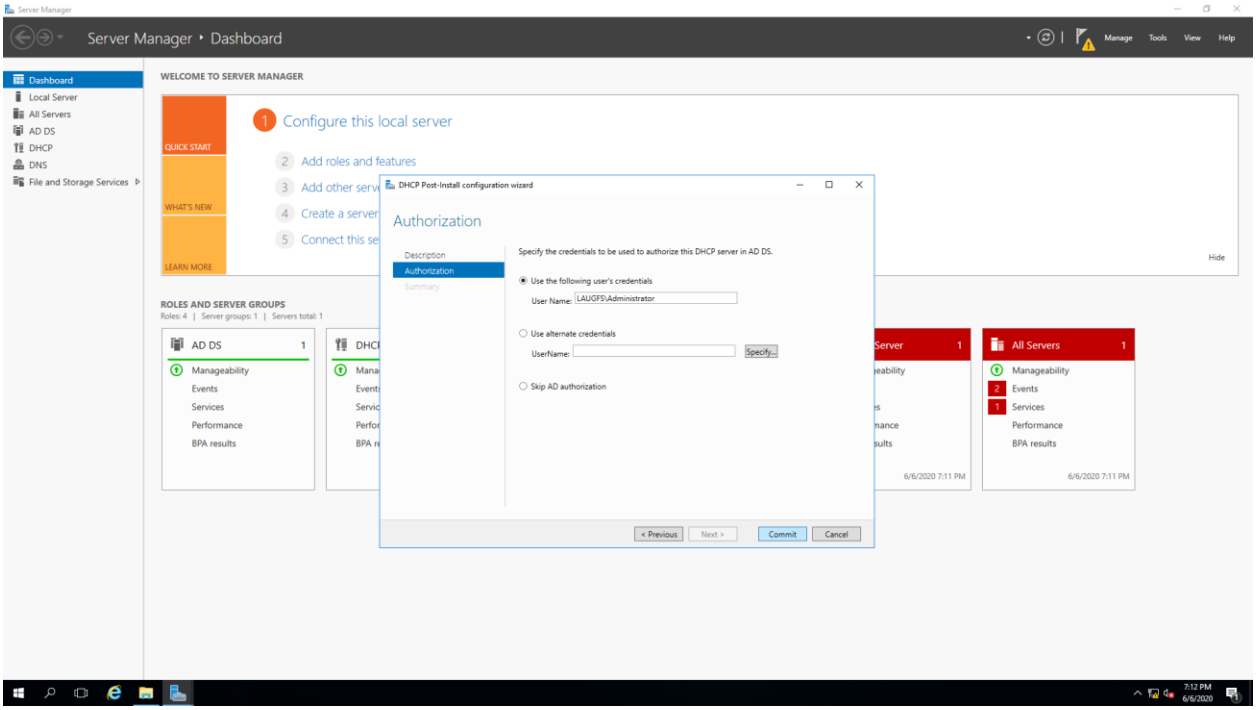
4 Create a server group
5 Connect this server to cloud services
Hide
ROLES AND SERVER GROUPS
Roles: 4 | Server groups: 1 | Servers total: 1
AD DS
Manageability
Events
Services
Performance
BPA results
All Servers
Manageability
Events
Services
Performance
BPA results
6/6/2020 7:11 PM
DHCP Post-Install configuration wizard
Description
Description
Authorization
Summary
The following steps will be performed to complete the configuration of the DHCP Server on the target computer:
Create the following security groups for delegation of DHCP Server Administration.
- DHCP Administrators
- DHCP Users
Authorize DHCP server on target computer (if domain joined).
< Previous
Next >
Commit
Cancel
7:12 PM
6/6/2020


Server Manager
Server Manager • Dashboard
Manage
Tools
View
Help
Dashboard
Local Server
All Servers
AD DS
DHCP
DNS
File and Storage Services
WELCOME TO SERVER MANAGER
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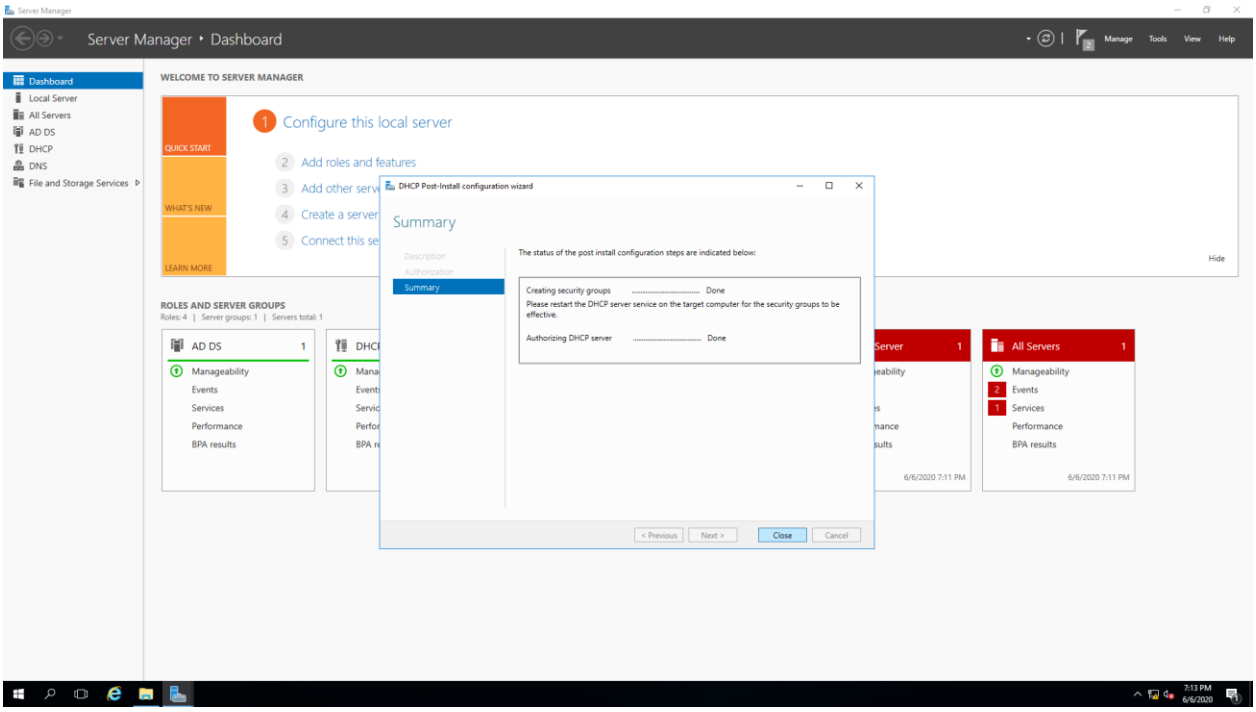
Roles: 4 | Server groups: 1 | Servers total: 1
AD DS
Manageability
Events
Services
Performance
BPA results
All Servers
Manageability
Events
Services
Performance
BPA results
6/6/2020 7:11 PM
DHCP Post-Install configuration wizard
Authorization
Description
Authorization
Summary
Specify the credentials to be used to authorize this DHCP server in AD DS.
Use the following user's credentials
User Name: LAUGFS\Administrator
Use alternate credentials
UserName:
Specify...
Skip AD authorization
< Previous
Next >
Commit
Cancel
7:12 PM
6/6/2020


Server Manager
Server Manager • Dashboard
Manage
Tools
View
Help
Dashboard
Local Server
All Servers
AD DS
DHCP
DNS
File and Storage Services
WELCOME TO SERVER MANAGER
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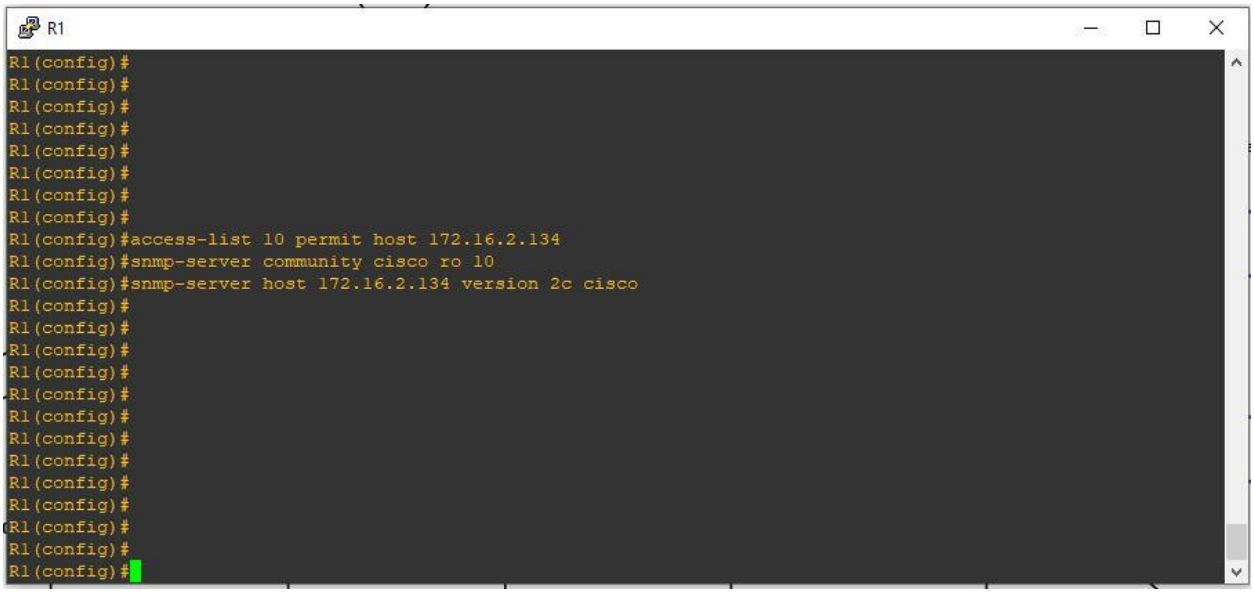
Hide
ROLES AND SERVER GROUPS
Roles: 4 | Server groups: 1 | Servers total: 1
AD DS
Manageability
Events
Services
Performance
BPA results
All Servers
Manageability
Events
Services
Performance
BPA results
6/6/2020 7:11 PM
DHCP Post-Install configuration wizard
Summary
Description
Authorization
Summary
The status of the post install configuration steps are indicated below:
Creating security groups ..... Done
Please restart the DHCP server service on the target computer for the security groups to be effective.
Authorizing DHCP server ..... Done
< Previous
Next >
Close
Cancel
7:13 PM
6/6/2020

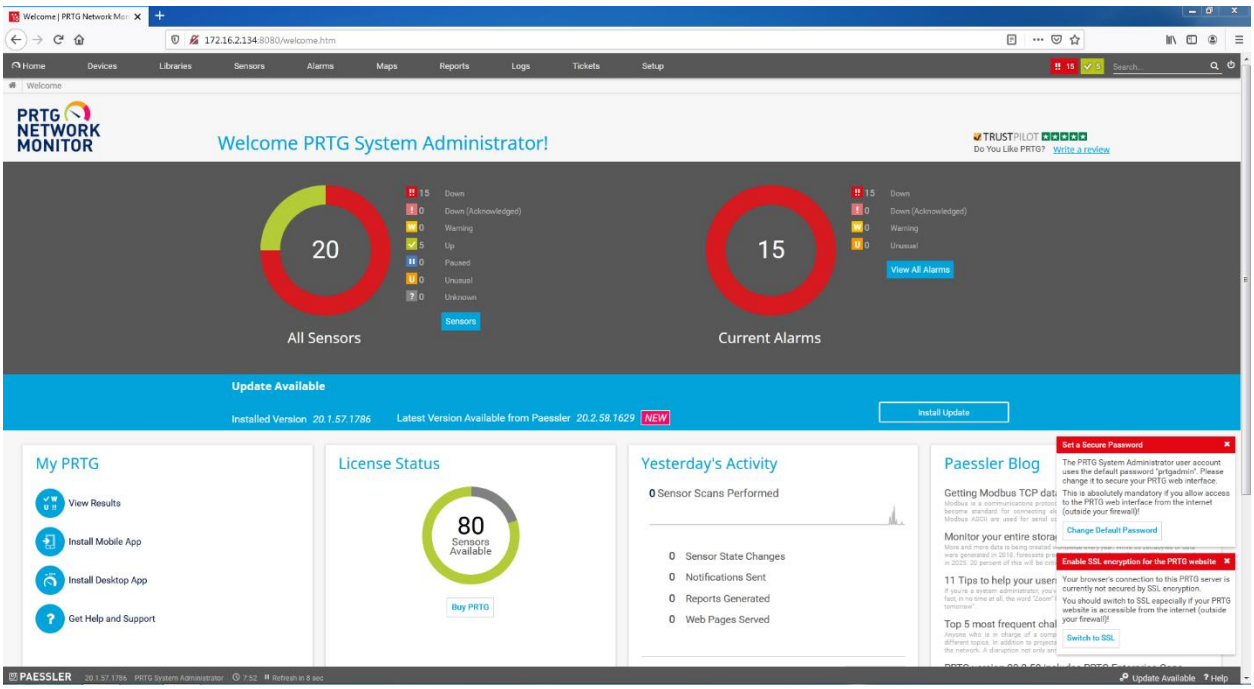
3.4 Implementing Network Monitoring (SNMP)

We prefer SNMP for network monitoring & used PRTG Network monitor tool to view SNMP outputs form the devices.

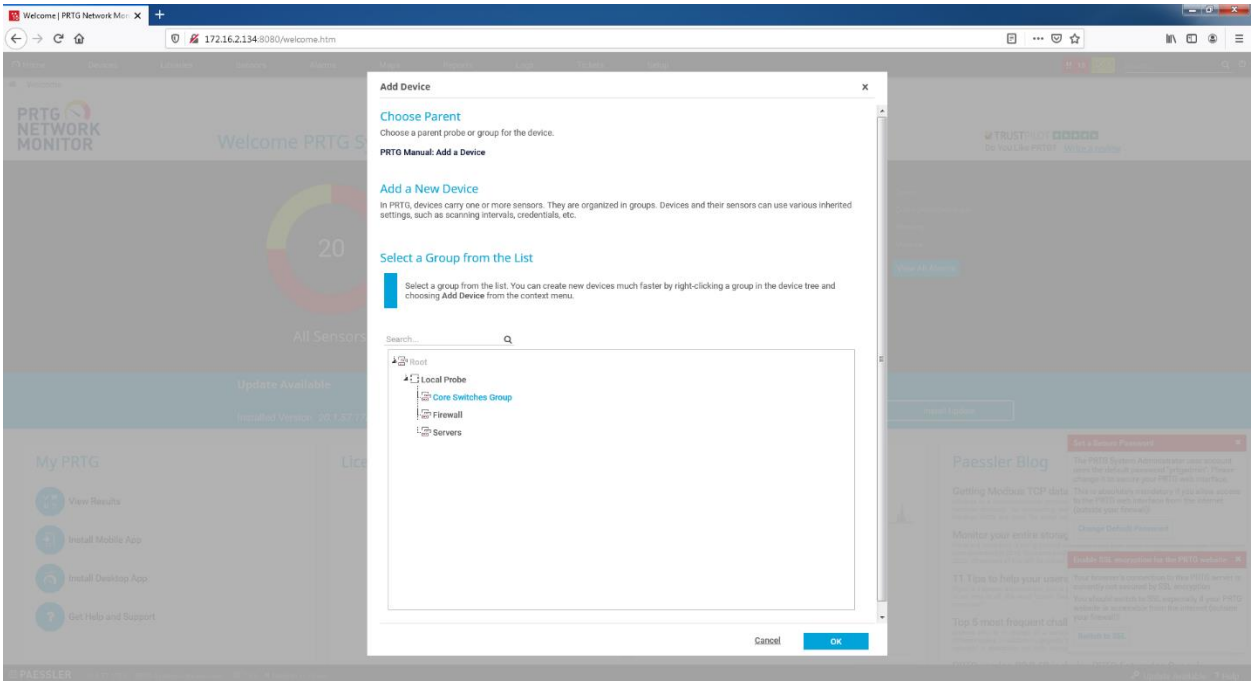
Setting up SNMP on the Cisco device.



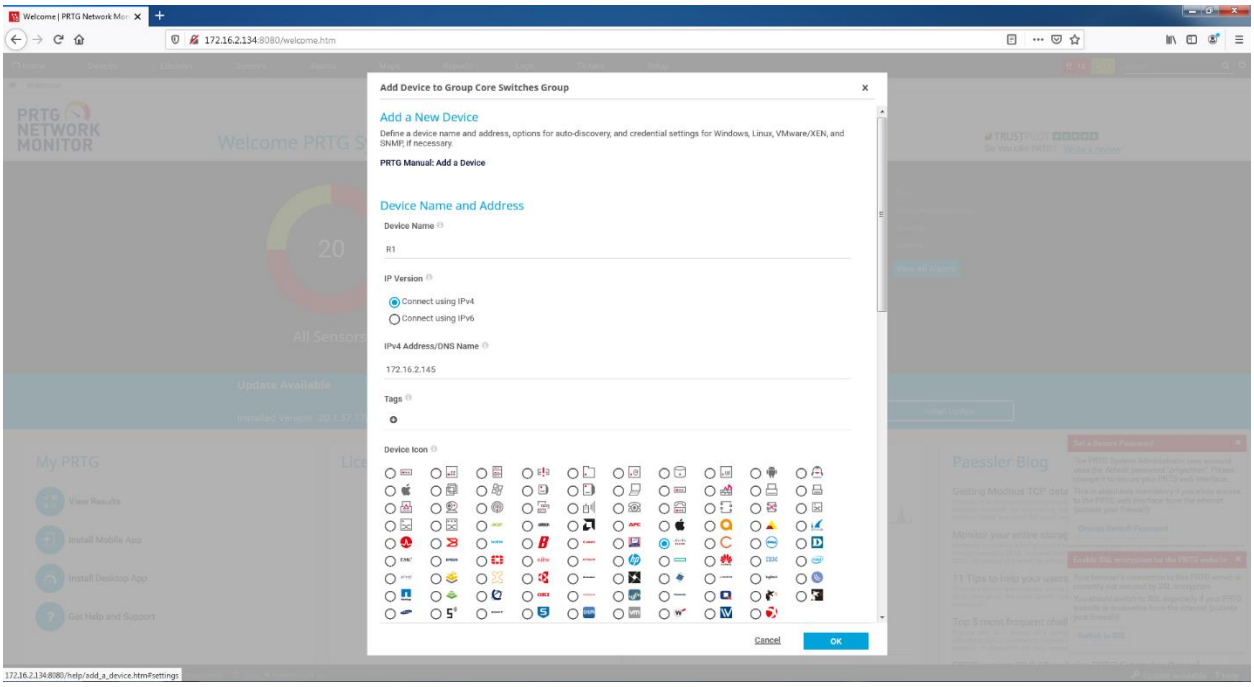
Configs in PRTG Network Monitoring Tool



Adding Device into PRTG Tool.

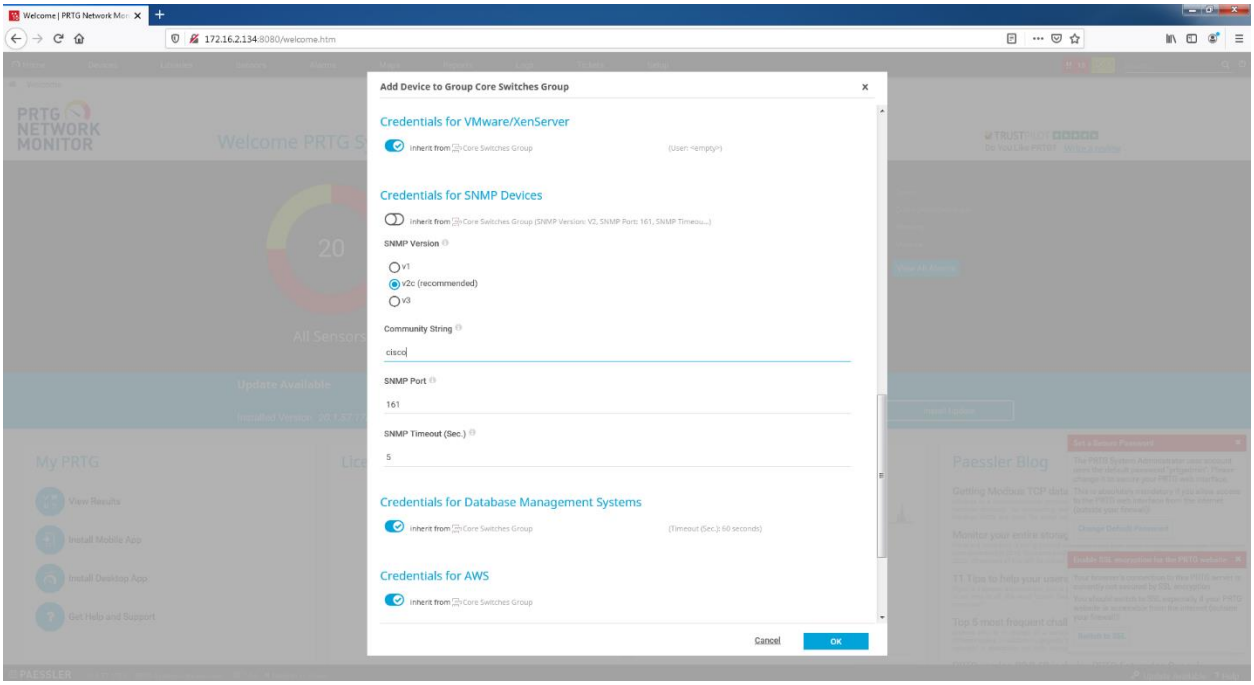


Setting up Device IP.

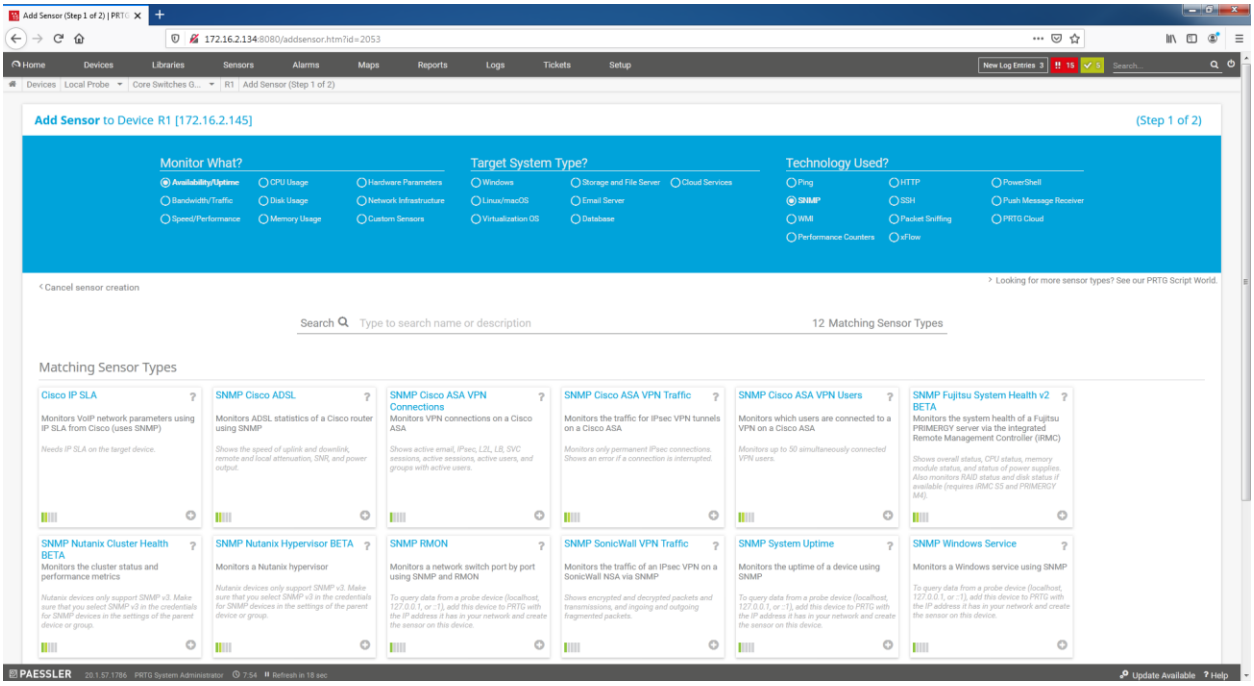


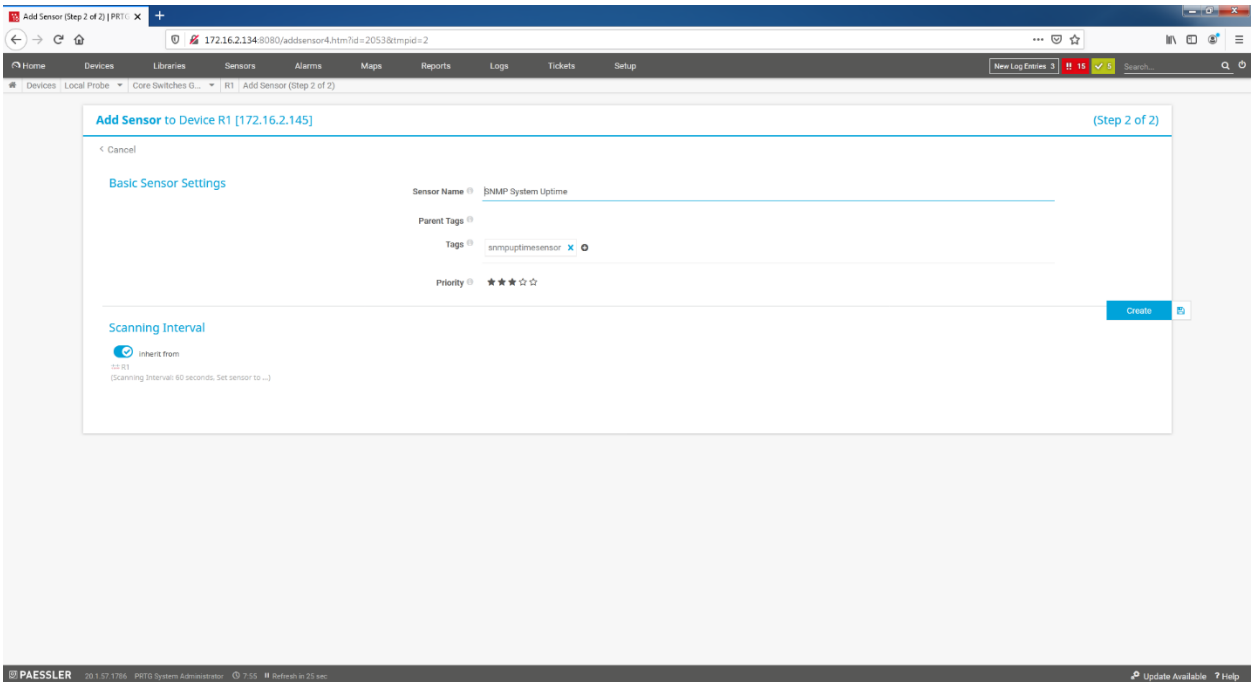
Setting up SNMP Community

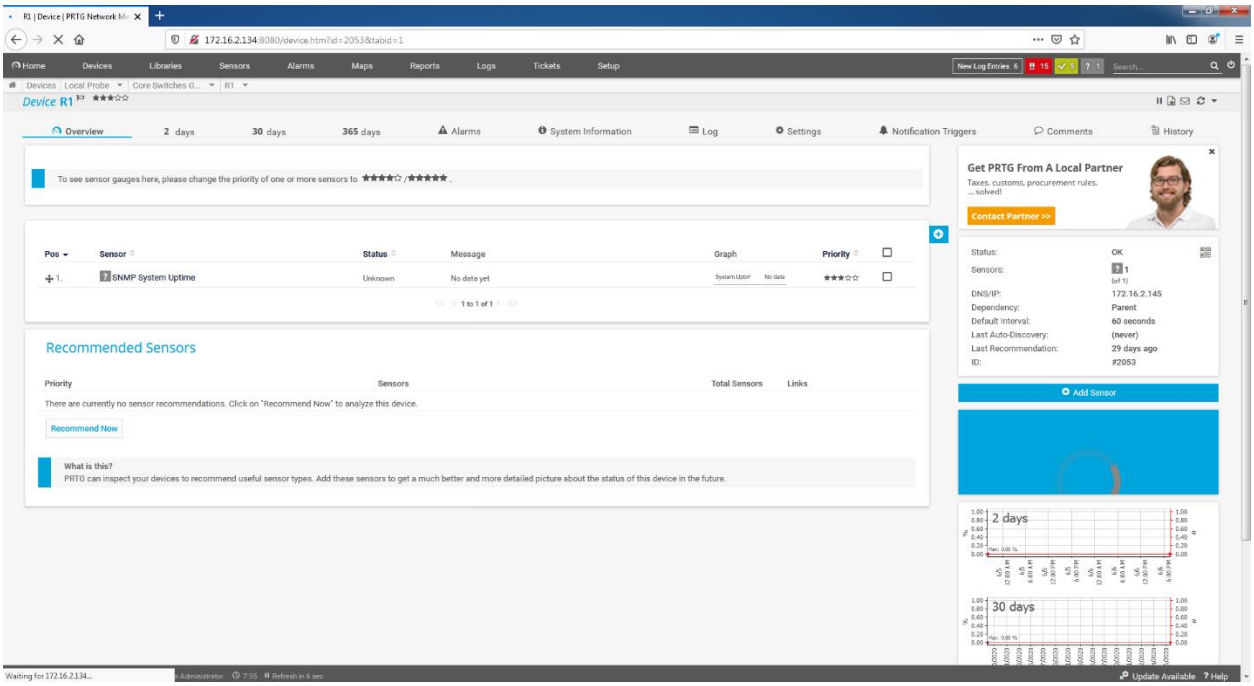
.



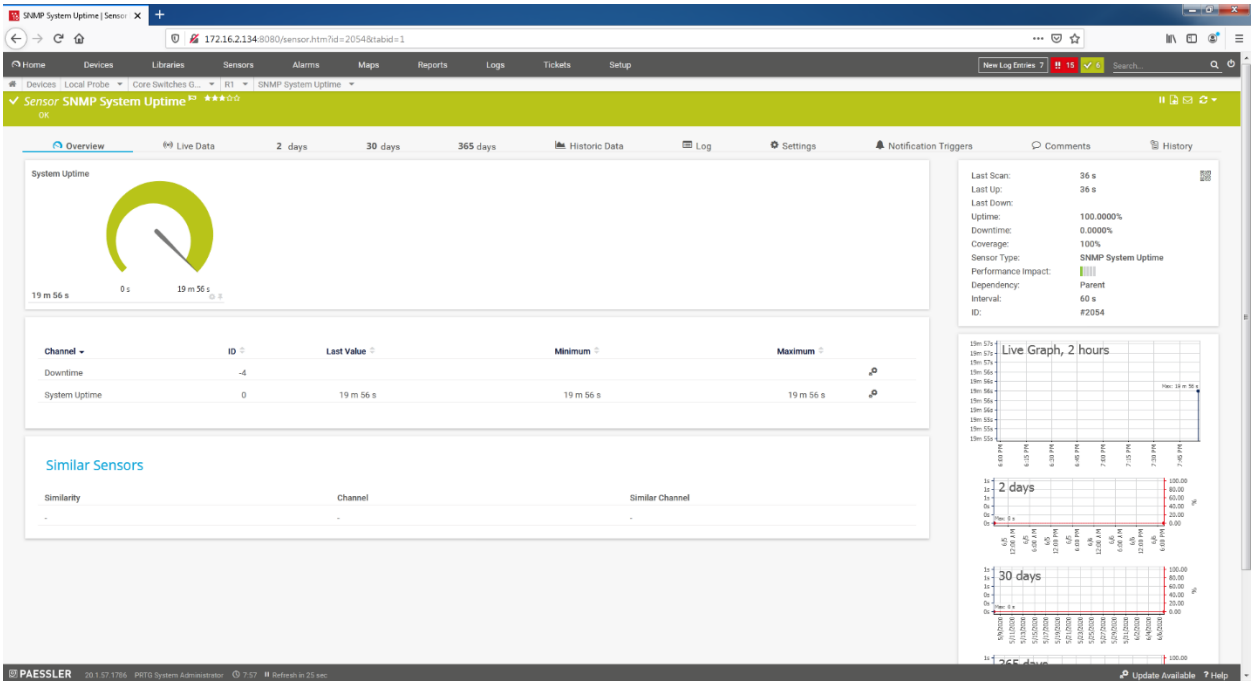
Adding Sensors to Device. (Device Uptime Sensor)




Add Sensor (Step 2 of 2) | PRTG
172.16.2.134:8080/addsensor4.htm?id=2053&tmpid=2
Home
Devices
Libraries
Sensors
Alarms
Maps
Reports
Logs
Tickets
Setup
Devices | Local Probe | Core Switches G... | R1 | Add Sensor (Step 2 of 2)
Add Sensor to Device R1 [172.16.2.145]
(Step 2 of 2)
Cancel
Basic Sensor Settings
Sensor Name
SNMP System Uptime
Parent Tags
Tags
snmpuptimesensor
Priority
Create
Scanning Interval
inherit from
PAESSLER
Update Available
Help


R1 | Device | PRTG Network Mo
172.16.2.134:8080/device.htm?id=2053&tabid=1
Home
Devices
Libraries
Sensors
Alarms
Maps
Reports
Logs
Tickets
Setup
Devices | Local Probe | Core Switches G... | R1
Device R1
Overview
2 days
30 days
365 days
Alarms
System Information
Log
Settings
Notification Triggers
Comments
History
To see sensor gauges here, please change the priority of one or more sensors to ★★★★☆/★★★★★.
Pos
Sensor
Status
Message
Graph
Priority
SNMP System Uptime
Unknown
No data yet
1 to 1 of 1
Recommended Sensors
Priority
Sensors
Total Sensors
Links
There are currently no sensor recommendations. Click on "Recommend Now" to analyze this device.
Recommend Now
What is this?
PRTG can inspect your devices to recommend useful sensor types. Add these sensors to get a much better and more detailed picture about the status of this device in the future.
Get PRTG From A Local Partner
Taxes, customs, procurement rules, ... solved!
Contact Partner >>
Status: OK
Sensors: 1
DNS/IP: 172.16.2.145
Dependency: Parent
Default Interval: 60 seconds
Last Auto-Discovery: (never)
Last Recommendation: 29 days ago
ID: #2053
Add Sensor
2 days
30 days
Waiting for 172.16.2.134...
Update Available
Help

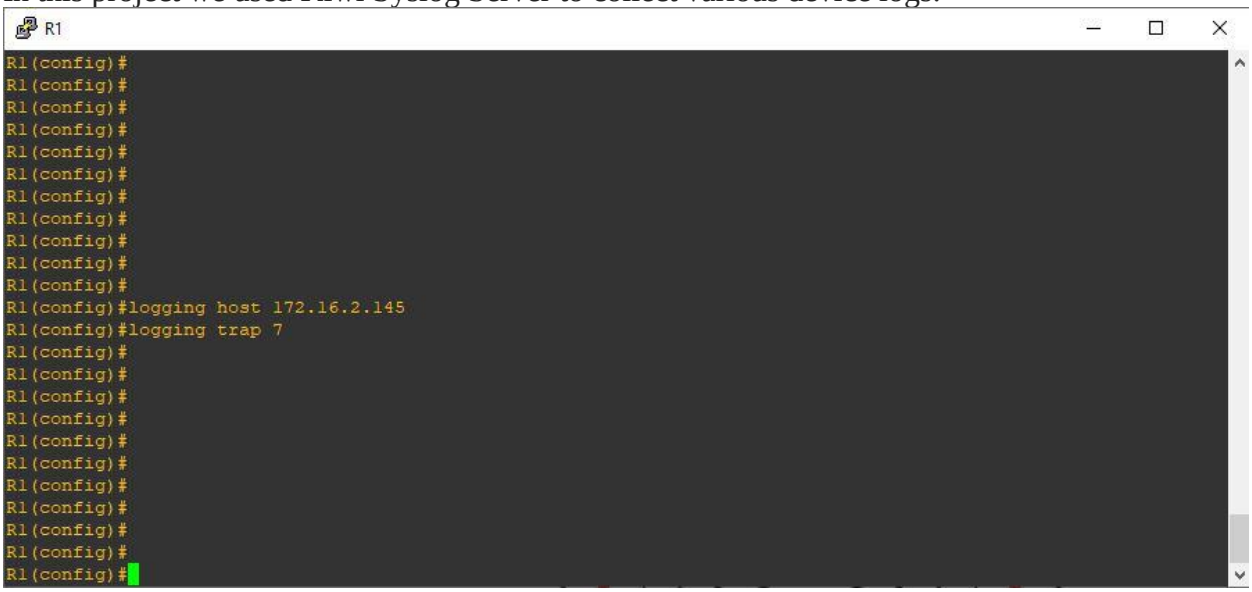
Monitoring Device Uptime via SNMP.



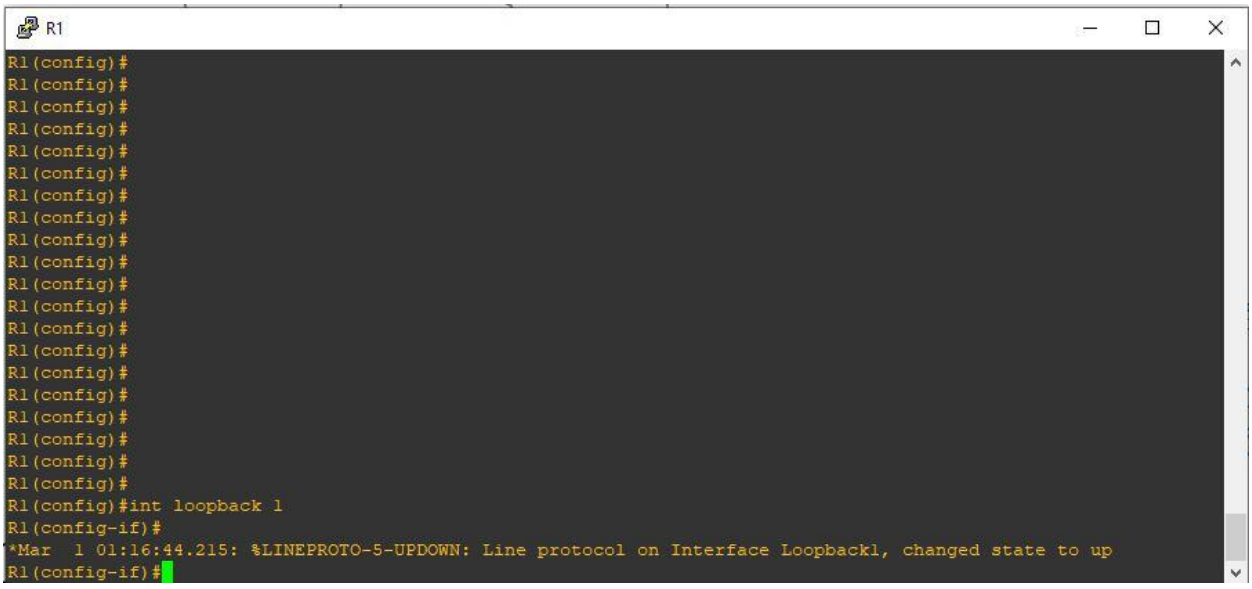
3.5 Implementing Syslog Server

Syslog stands for System Logging Protocol and is a standard protocol used to send system log or event messages to a specific **server**, called a **syslog server**. It is primarily used to collect various device logs from several different machines in a central location for monitoring and review.

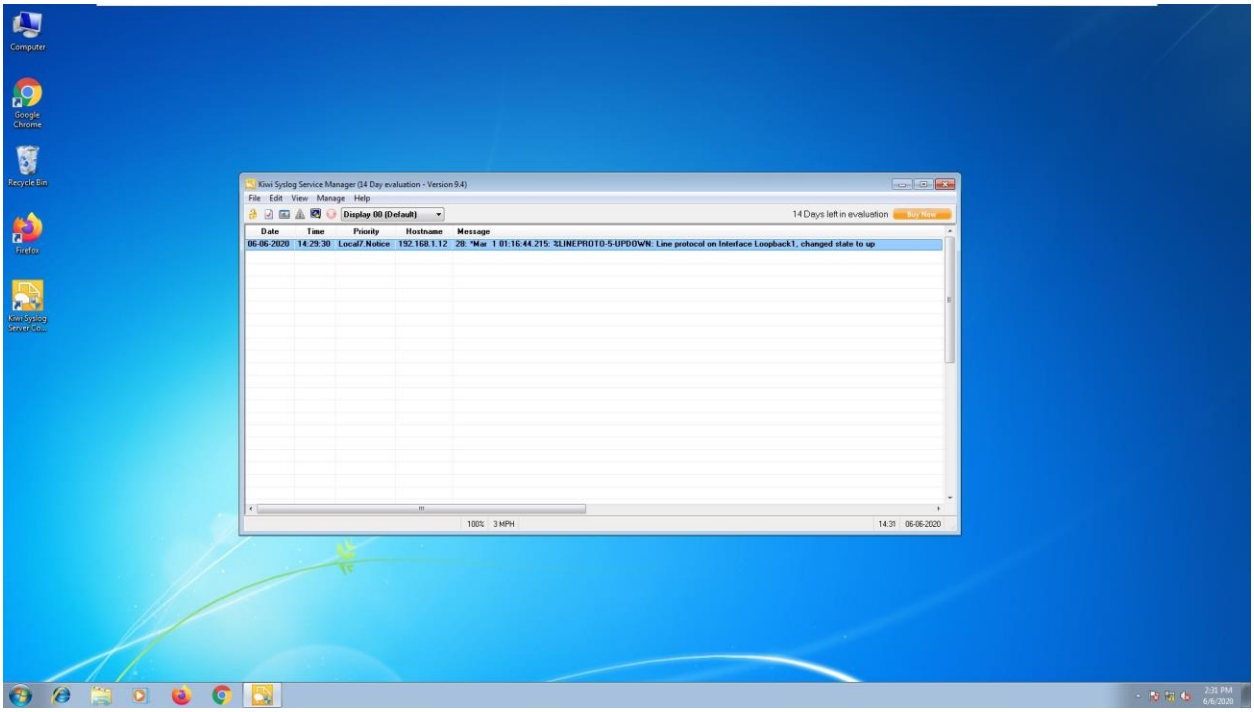
In this project we used Kiwi Syslog Server to collect various device logs.



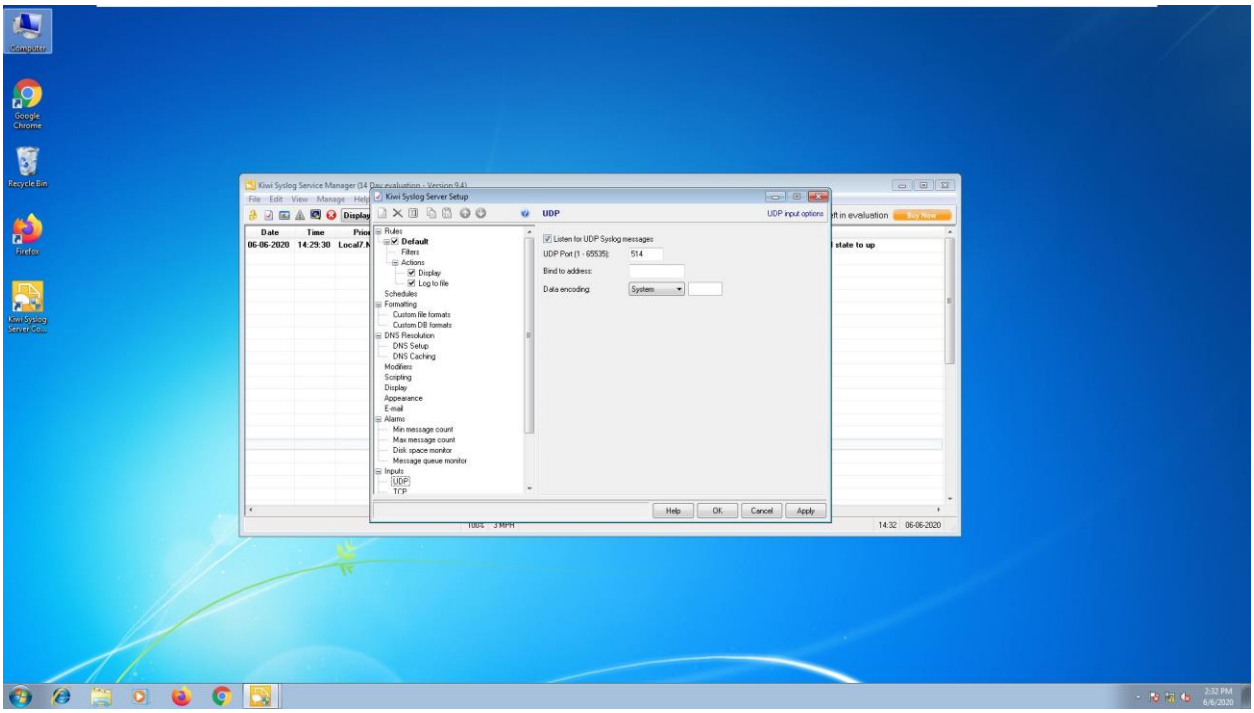
We configured trap level 7 for testing & enabled loopback interface on router to check syslog messages from Kiwi Syslog server.



Syslog messages in Kiwi Syslog Server.



Server Listening on UDP Port 514

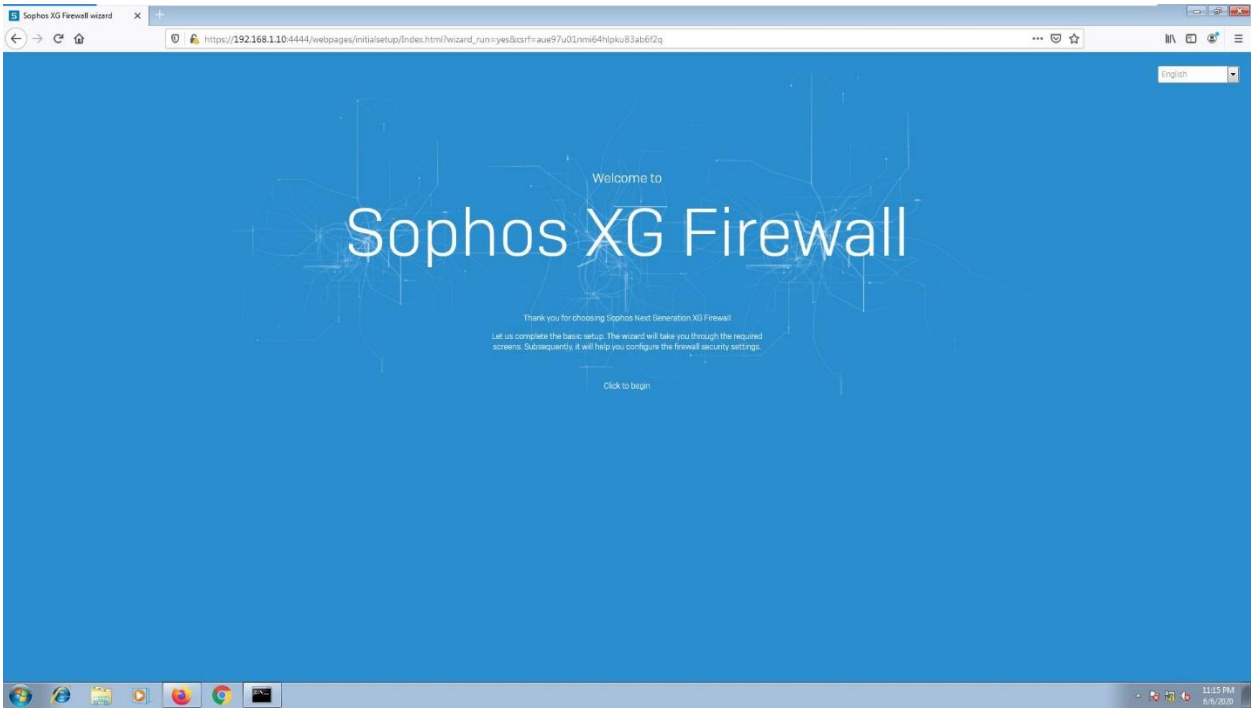


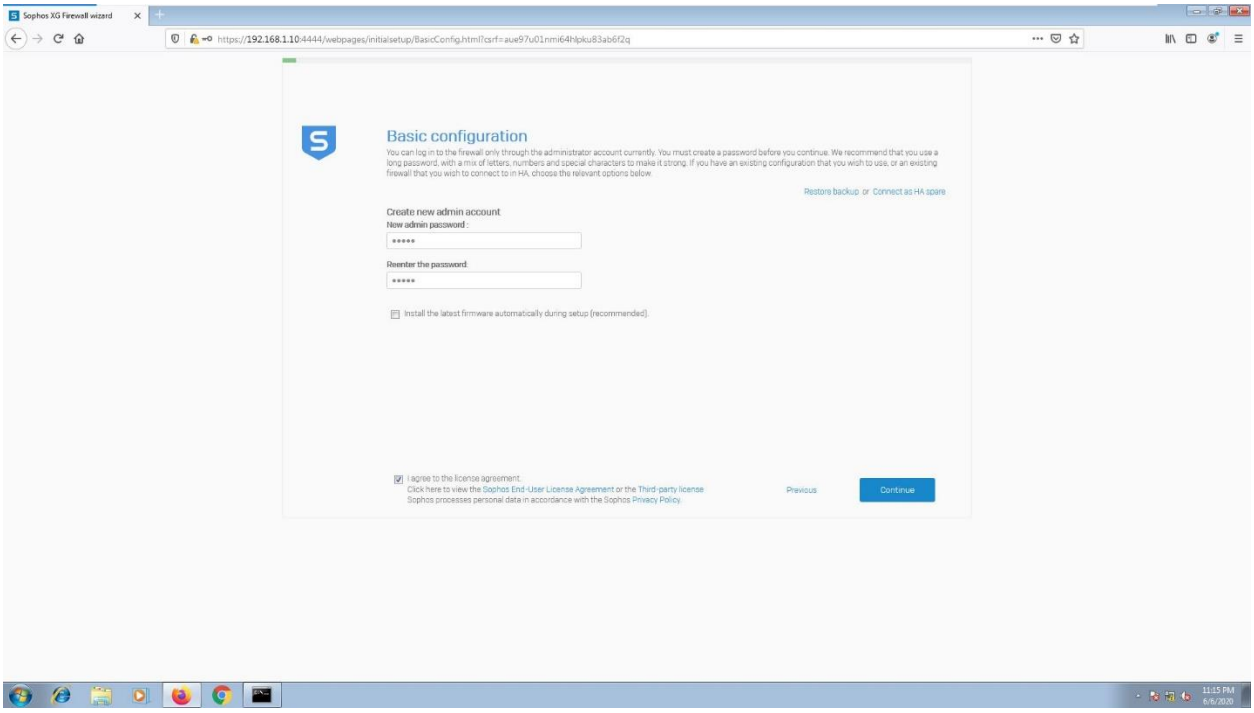
3.6 Implementing Firewall (Sophos XG 550 Rev.2)

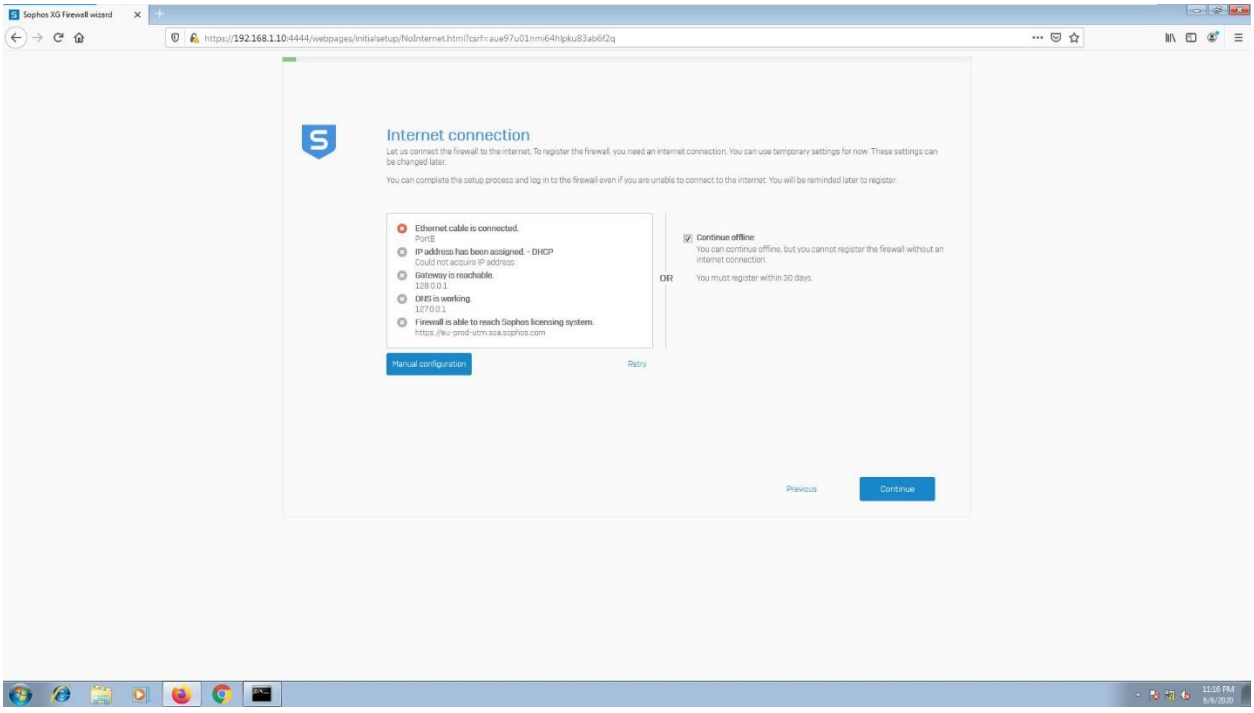
Sophos XG Firewall provides advanced threat protection across all areas of network security. The solution simplifies the core network security tasks in firewall management, information reporting and system configuration. Sophos XG Firewall helps organizations to secure their network, wireless, web operations as well as email and web server.

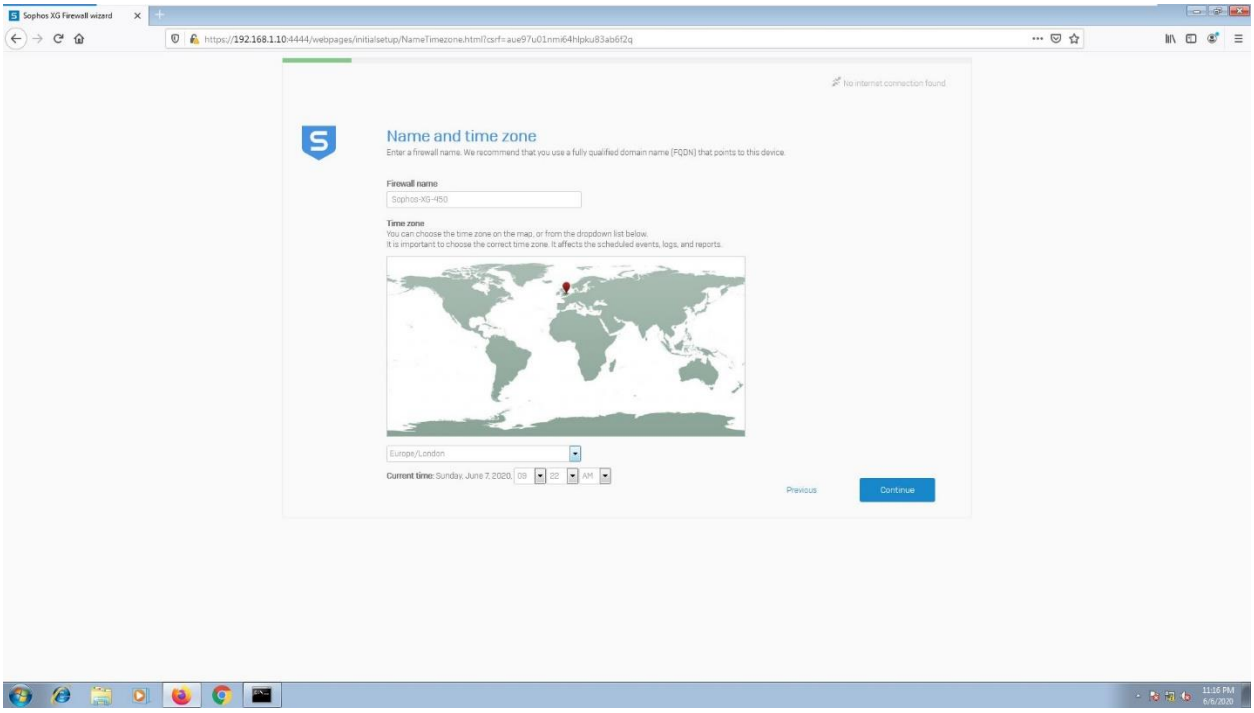
In this project we used Sophos XG 550 Rev. 2 firewall to sure the company network.

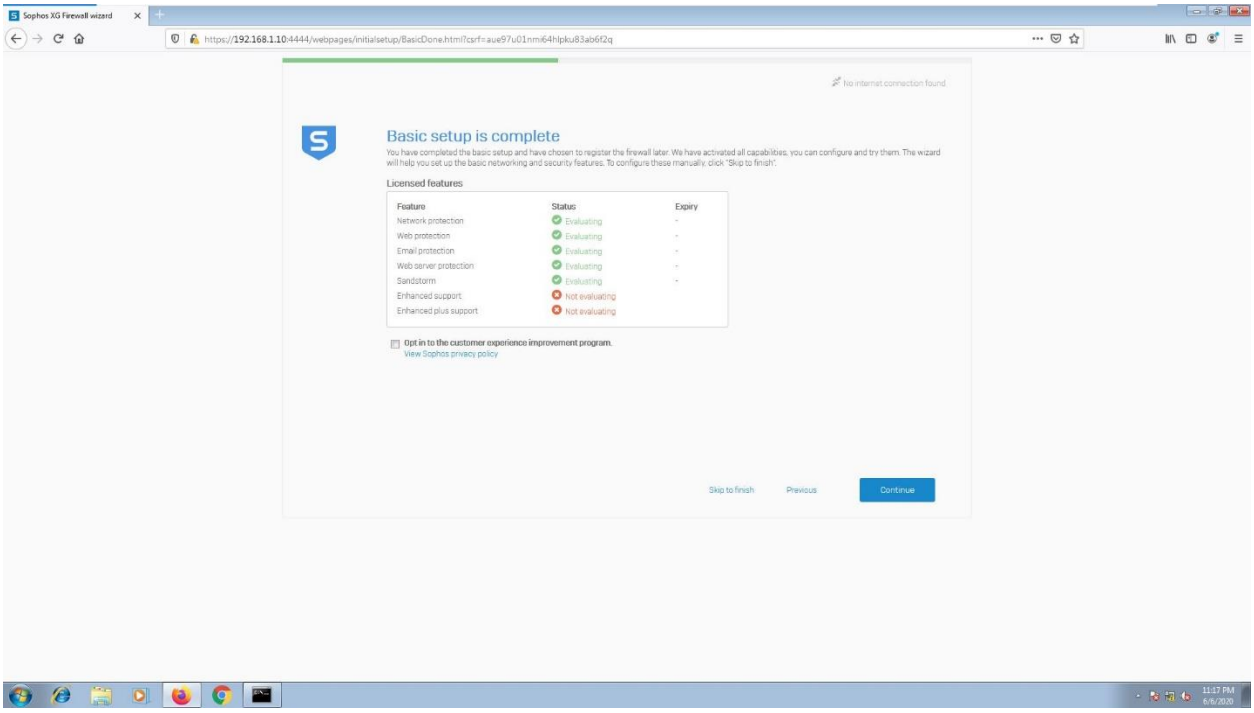
Sophos XG 550 Initial Setup Process.

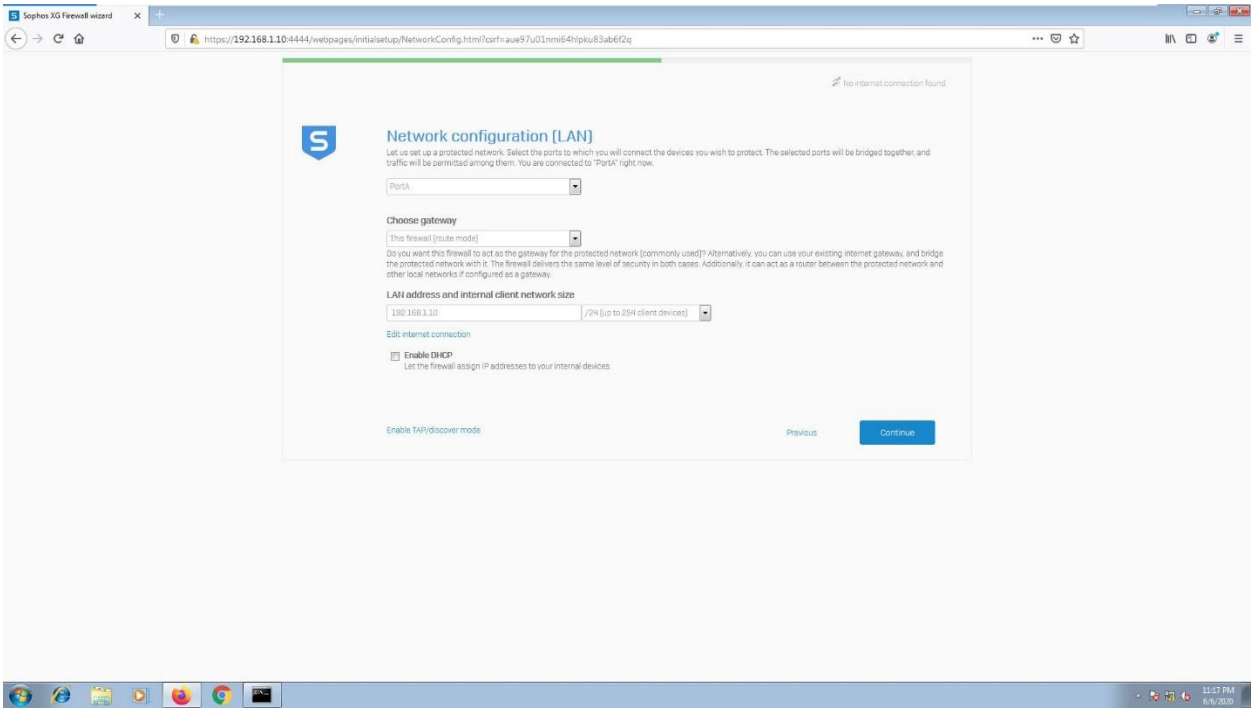



Sophos XG Firewall wizard
https://192.168.1.10:4444/webpages/initialsetup/BasicConfig.html?csrf=aue97u01nmi64hlpku83ab6f2q
Basic configuration
You can log in to the firewall only through the administrator account currently. You must create a password before you continue. We recommend that you use a long password, with a mix of letters, numbers and special characters to make it strong. If you have an existing configuration that you wish to use, or an existing firewall that you wish to connect to in HA, choose the relevant options below.
Restore backup or Connect as HA spare
Create new admin account
New admin password :
Reenter the password:
Install the latest firmware automatically during setup (recommended).
I agree to the license agreement.
Click here to view the Sophos End-User License Agreement or the Third-party license
Sophos processes personal data in accordance with the Sophos Privacy Policy.
Previous
Continue


Sophos XG Firewall wizard
https://192.168.1.10:4444/webpages/initialsetup/NoInternet.html?csrf=aue97u01nmi64hlpku83ab6f2q
Internet connection
Let us connect the firewall to the internet. To register the firewall, you need an internet connection. You can use temporary settings for now. These settings can be changed later.
You can complete the setup process and log in to the firewall even if you are unable to connect to the internet. You will be reminded later to register.
Ethernet cable is connected.
Port8
IP address has been assigned. - DHCP
Could not acquire IP address
Gateway is reachable.
128.0.0.1
DNS is working.
127.0.0.1
Firewall is able to reach Sophos licensing system.
https://eu-prod-utm.soa.sophos.com
OR
Continue offline
You can continue offline, but you cannot register the firewall without an internet connection.
You must register within 30 days.
Manual configuration
Retry
Previous
Continue


Sophos XG Firewall wizard
https://192.168.1.10:4444/webpages/initialsetup/NameTimezone.html?csrf=aue97u01nmi64hlpku83ab6f2q
No internet connection found.
Name and time zone
Enter a firewall name. We recommend that you use a fully qualified domain name (FQDN) that points to this device.
Firewall name
Sophos-XG-450
Time zone
You can choose the time zone on the map, or from the dropdown list below.
It is important to choose the correct time zone. It affects the scheduled events, logs, and reports.
Europe/London
Current time: Sunday, June 7, 2020, 09 22 AM
Previous
Continue
11:16 PM
6/6/2020


Sophos XG Firewall wizard
https://192.168.1.10:4444/webpages/initialsetup/BasicDone.html?csrf=aue97u01nmi64hlpku83ab6f2q
No internet connection found.
Basic setup is complete
You have completed the basic setup and have chosen to register the firewall later. We have activated all capabilities, you can configure and try them. The wizard will help you set up the basic networking and security features. To configure these manually, click "Skip to finish".
Licensed features
Feature
Status
Expiry
Network protection
Evaluating
Web protection
Evaluating
Email protection
Evaluating
Web server protection
Evaluating
Sandstorm
Evaluating
Enhanced support
Not evaluating
Enhanced plus support
Not evaluating
Opt in to the customer experience improvement program.
View Sophos privacy policy
Skip to finish
Previous
Continue
11:17 PM
6/6/2020


Sophos XG Firewall wizard
https://192.168.1.10:4444/webpages/initialsetup/NetworkConfig.html?csrf=aue97u01nmi64hlpku83ab6f2q
No internet connection found
Network configuration (LAN)
Let us set up a protected network. Select the ports to which you will connect the devices you wish to protect. The selected ports will be bridged together, and traffic will be permitted among them. You are connected to "PortA" right now.
PortA
Choose gateway
This firewall (route mode)
Do you want this firewall to act as the gateway for the protected network (commonly used)? Alternatively, you can use your existing internet gateway, and bridge the protected network with it. The firewall delivers the same level of security in both cases. Additionally, it can act as a router between the protected network and other local networks if configured as a gateway.
LAN address and internal client network size
192.168.1.10
/24 (up to 254 client devices)
Edit internet connection
Enable DHCP
Let the firewall assign IP addresses to your internal devices.
Enable TAP/discover mode
Previous
Continue
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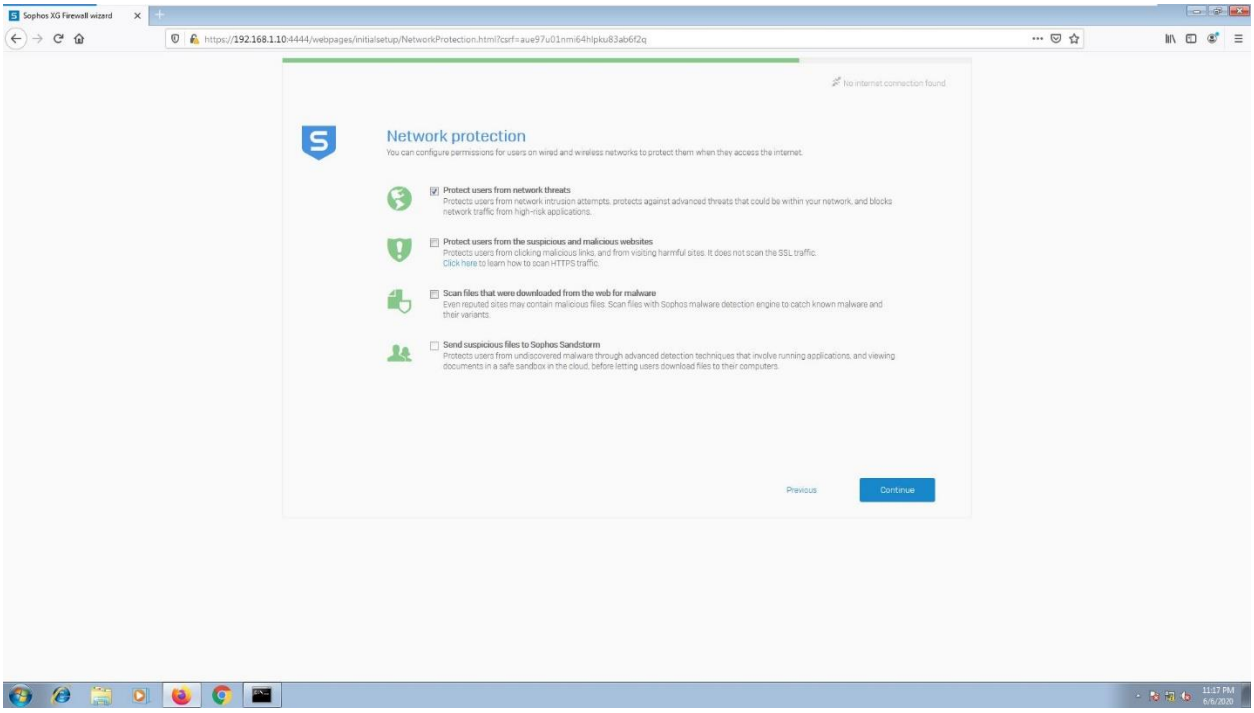
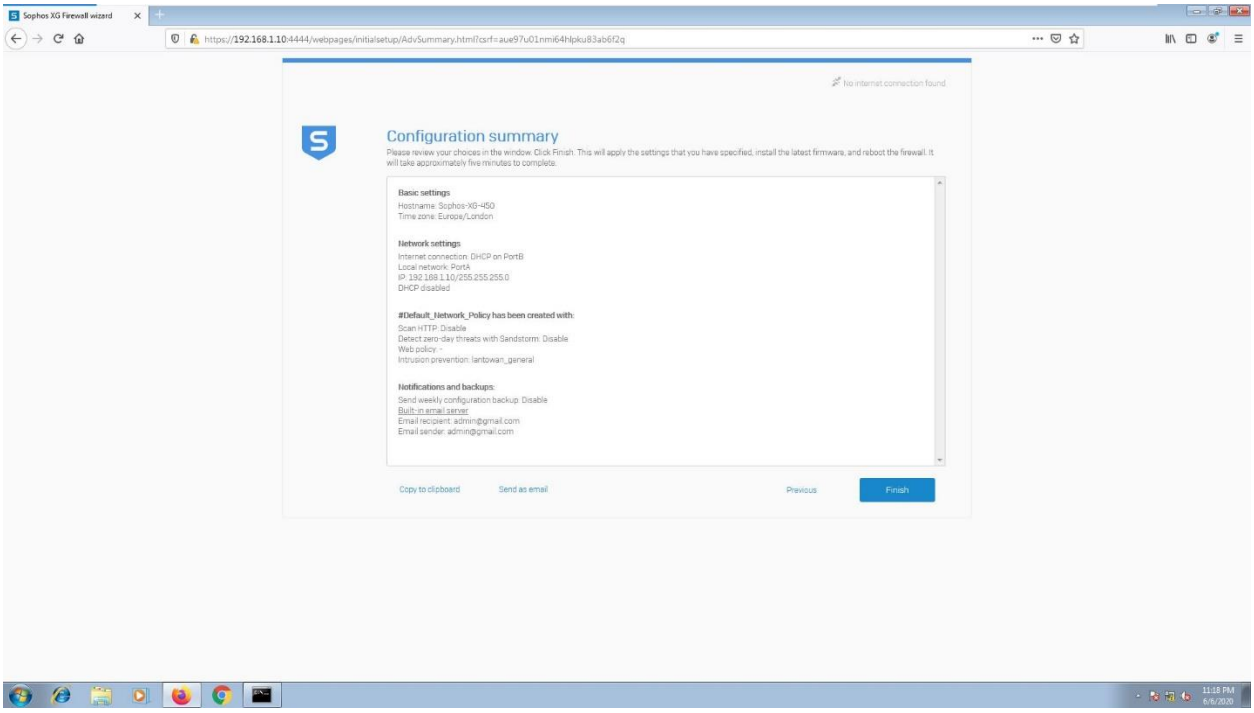
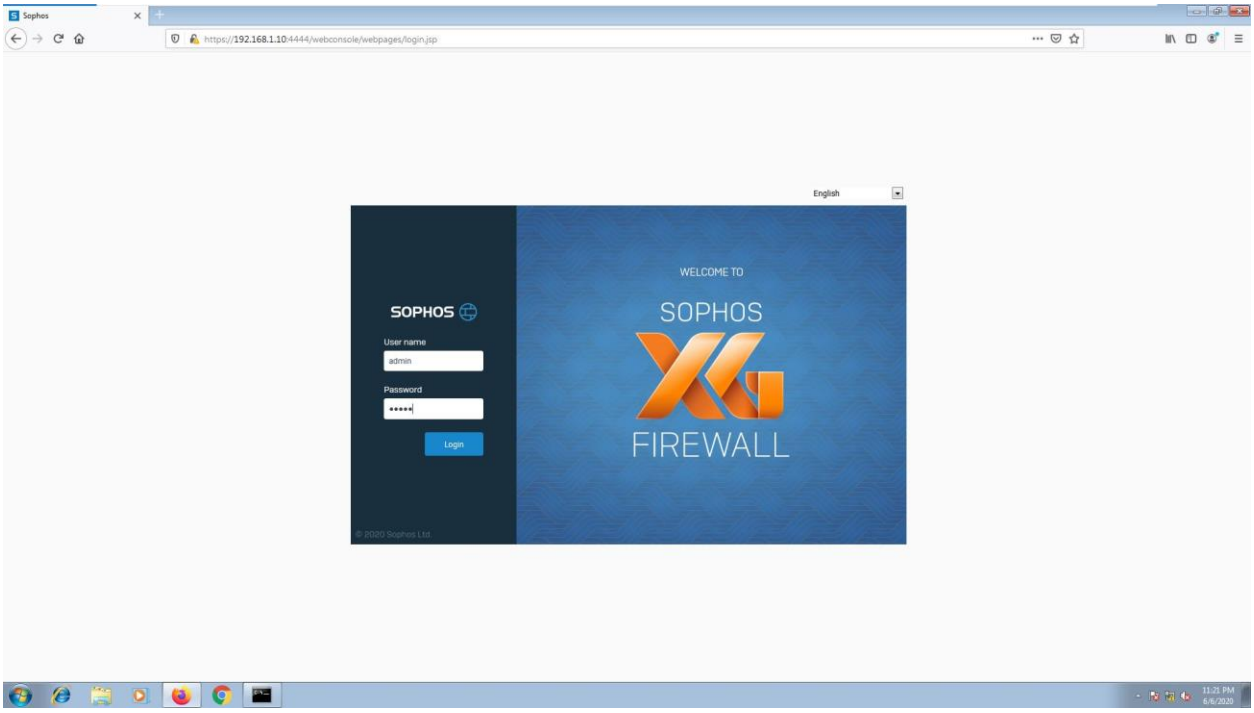
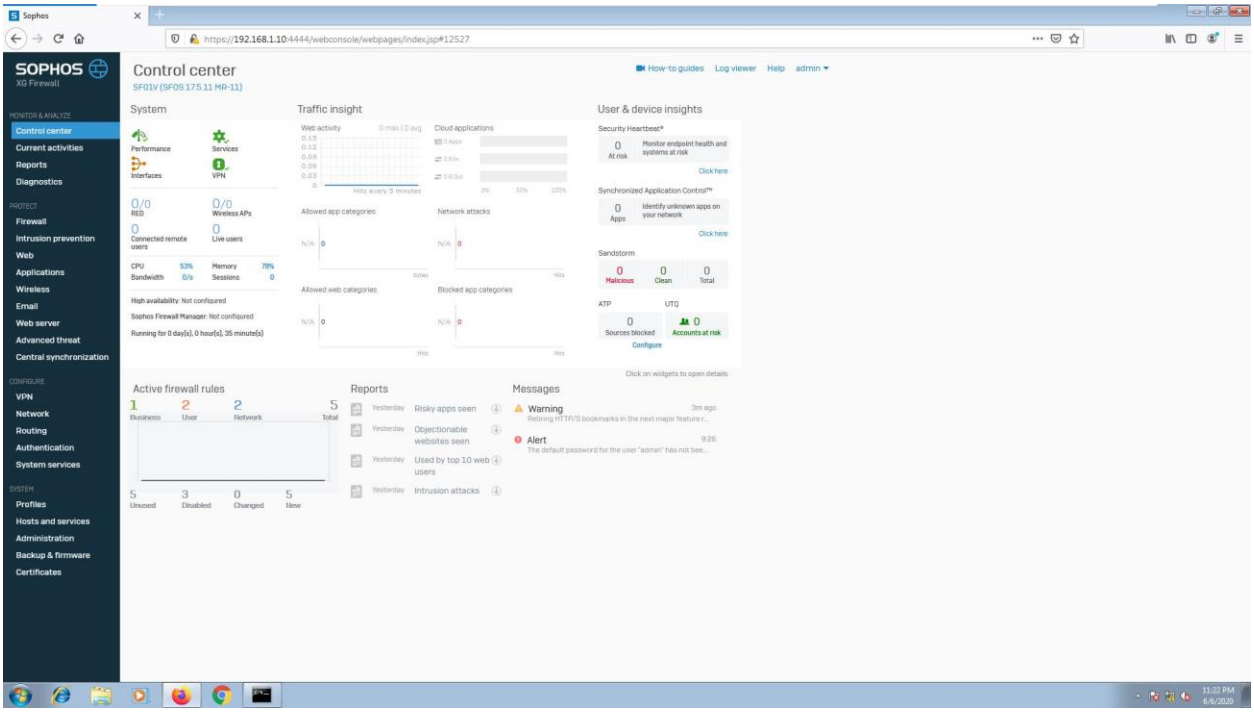
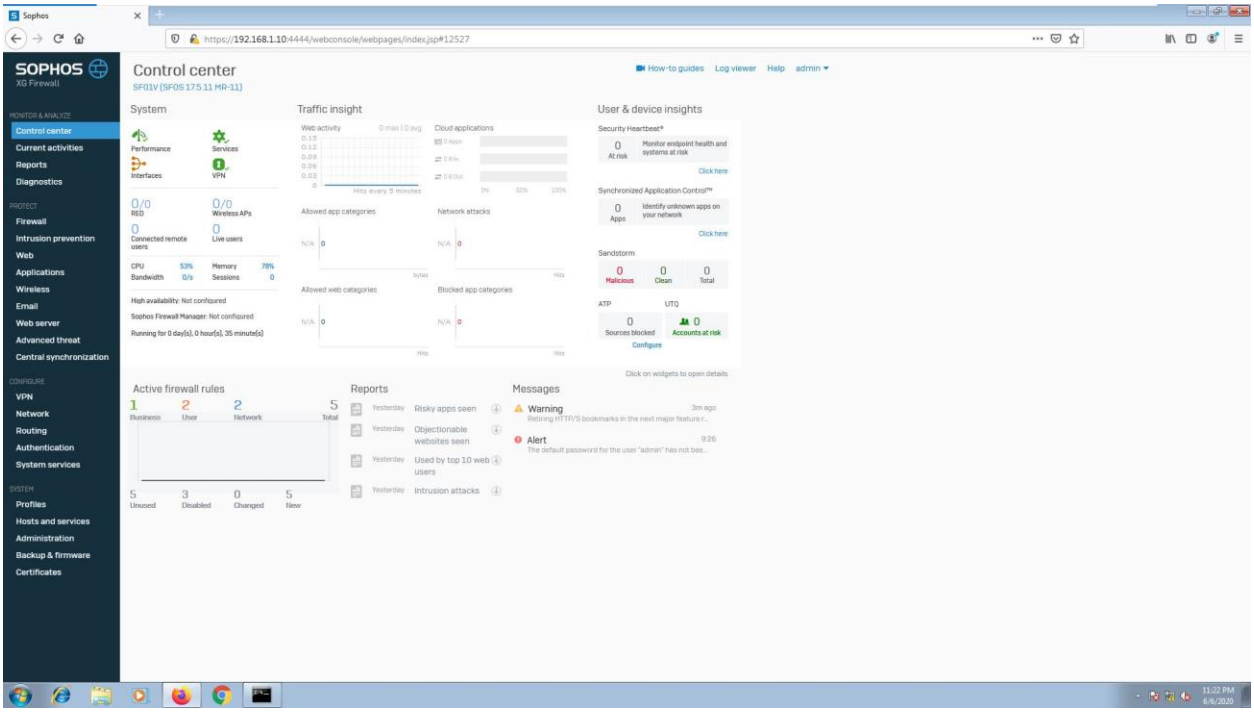

Sophos XG Firewall wizard
https://192.168.1.10:4444/webpages/initialsetup/NetworkProtection.html?csrf=aue97u01nmi64hlpku83ab6f2q
No internet connection found
Network protection
You can configure permissions for users on wired and wireless networks to protect them when they access the internet.
Protect users from network threats
Protects users from network intrusion attempts, protects against advanced threats that could be within your network, and blocks network traffic from high-risk applications.
Protect users from the suspicious and malicious websites
Protects users from clicking malicious links, and from visiting harmful sites. It does not scan the SSL traffic.
Click here to learn how to scan HTTPS traffic.
Scan files that were downloaded from the web for malware
Even reputed sites may contain malicious files. Scan files with Sophos malware detection engine to catch known malware and their variants.
Send suspicious files to Sophos Sandstorm
Protects users from undiscovered malware through advanced detection techniques that involve running applications, and viewing documents in a safe sandbox in the cloud, before letting users download files to their computers.
Previous
Continue
11:17 PM
6/6/2020


Sophos XG Firewall wizard
https://192.168.1.10:4444/webpages/initialsetup/AdvSummary.html?csrf=aue97u01nmi64hlpku83ab6f2q
No internet connection found.
Configuration summary
Please review your choices in the window. Click Finish. This will apply the settings that you have specified, install the latest firmware, and reboot the firewall. It will take approximately five minutes to complete.
Basic settings
Hostname: Sophos-XG-450
Time zone: Europe/London
Network settings
Internet connection: DHCP on PortB
Local network: PortA
IP: 192.168.1.10/255.255.255.0
DHCP disabled
#Default_Network_Policy has been created with:
Scan HTTP: Disable
Detect zero-day threats with Sandstorm: Disable
Web policy: -
Intrusion prevention: lantowan_general
Notifications and backups:
Send weekly configuration backup: Disable
Built-in email server
Email recipient: admin@gmail.com
Email sender: admin@gmail.com
Copy to clipboard
Send as email
Previous
Finish
11:18 PM
6/6/2020


Sophos
https://192.168.1.10:4444/webconsole/webpages/login.jsp
English
SOPHOS
User name
admin
Password
Login
WELCOME TO
SOPHOS
XG
FIREWALL
© 2020 Sophos Ltd.
11:21 PM
6/6/2020


Sophos
https://192.168.1.10:4444/webconsole/webpages/index.jsp#12527
SOPHOS
XG Firewall
Control center
SF01V (SFOS 17.5.11 MR-11)
How-to guides
Log viewer
Help
admin
System
Traffic insight
User & device insights
Active firewall rules
Reports
Messages
Control center
Current activities
Reports
Diagnostics
Firewall
Intrusion prevention
Web
Applications
Wireless
Email
Web server
Advanced threat
Central synchronization
VPN
Network
Routing
Authentication
System services
Profiles
Hosts and services
Administration
Backup & firmware
Certificates


Sophos
https://192.168.1.10:4444/webconsole/webpages/index.jsp#12527
SOPHOS
XG Firewall
Control center
SF01V (SFOS 17.5.11 MR-11)
How-to guides
Log viewer
Help
admin
System
Traffic insight
User & device insights
Active firewall rules
Reports
Messages
Control center
Current activities
Reports
Diagnostics
Firewall
Intrusion prevention
Web
Applications
Wireless
Email
Web server
Advanced threat
Central synchronization
VPN
Network
Routing
Authentication
System services
Profiles
Hosts and services
Administration
Backup & firmware
Certificates

3.7 Implementing AAA Server (Cisco ACS)

If a single administrator wants to access 15 routers and local database of the device is used for username and password (authentication) then the administrator have to make the same user account different times. Also, if he wants to keep different username and password for the devices then he have to manually change the authentication for the devices.

To ease this task to some extent, Cisco ACS (Access Control Server) is used. ACS provides a centralized management system in which the database of username and password are kept. Also, authorization (means what the user is authorized to do) can be configured. But for this we have to tell the router to refer to ACS for its decision on authentication and authorization.

Two protocols are used between the ACS server and the client to serve this purpose:

1. TACACS+
2. RADIUS

In this project, We used TACACS+ only.

TACACS+ (Terminal Access Controller Access-Control System Plus)

TACACS+ is a separate protocol that handles authentication, authorization, and accounting (AAA) services between client and AAA Server.

AAA Servers

The **AAA server** is a network server that is used for access control (Cisco ACS). Authentication identifies the user. Authorization implements policies that determine which resources and services an authenticated user may access. Accounting keeps track of time and data resources that are used for billing and analysis.

4. Evaluation

This chapter demonstrates that all the services active and function properly. The following services are evaluated in this chapter.

1. ADDS
    1.1 Domain based User Authentication
    1.2 Group Policies

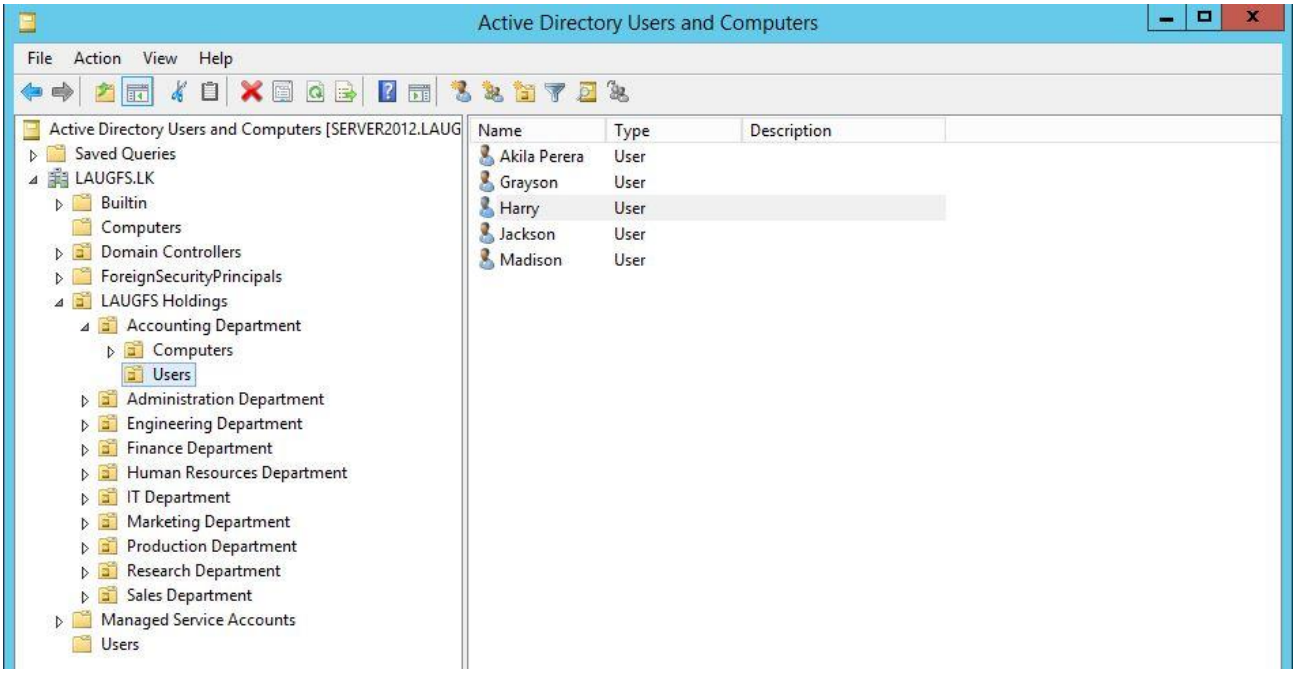
2. DHCP
3. DNS
4. Firewall
    4.1 URL Blocking via Firewall
    4.2 Usage Reports

5. SNMP
6. Syslog
7. AAA Server

1. ADDS (Active Directory Domain Services)

1.1 Domain based User Authentication

Active Directory includes following user accounts for Accounting Department.



User “Harry” able to log into domain.

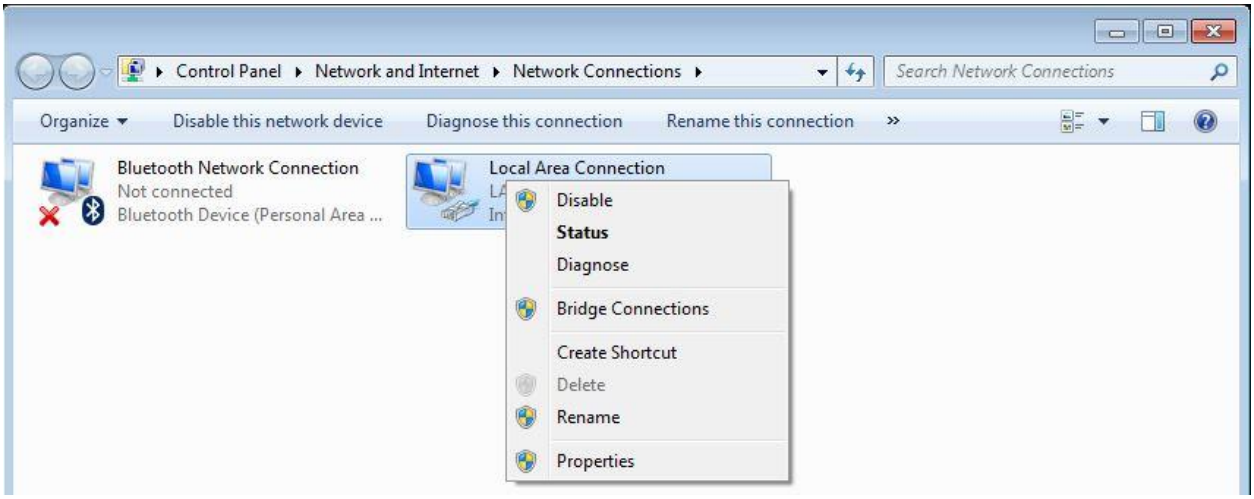
1.2 Group Policies

Following Group policies are implemented.

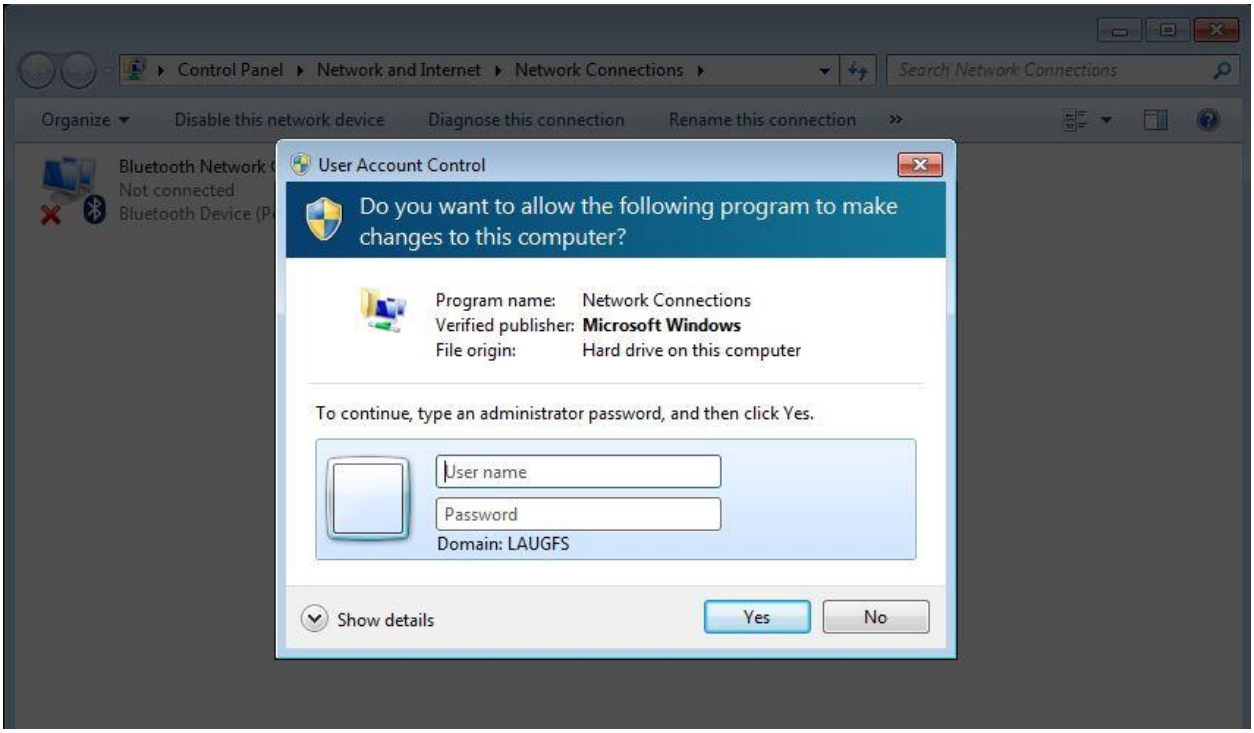
01. Prohibit Adding And Removing Components For A LAN Or Remote Access Connection.
02. Turn off Windows Installer.
03. User cannot change the Dekstop Wallpaper
04. No auto-restart with logged on users for scheduled automatic updates installations.
05. Disable Guest Account.
06. Disable Guest Account.

Status of the policy called "**Prohibit Adding And Removing Components For A LAN Or Remote Access Connection**"

User try to change LAN adapter settings.

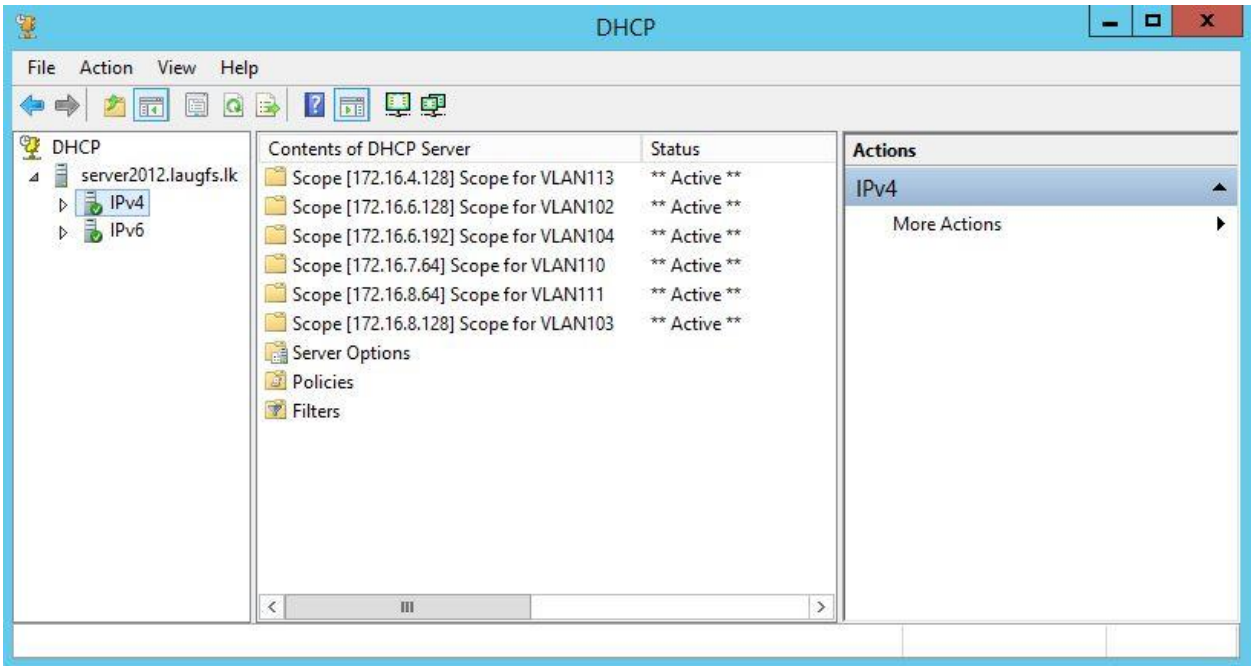


Windows required Administrator logins to change the LAN adapter settings.

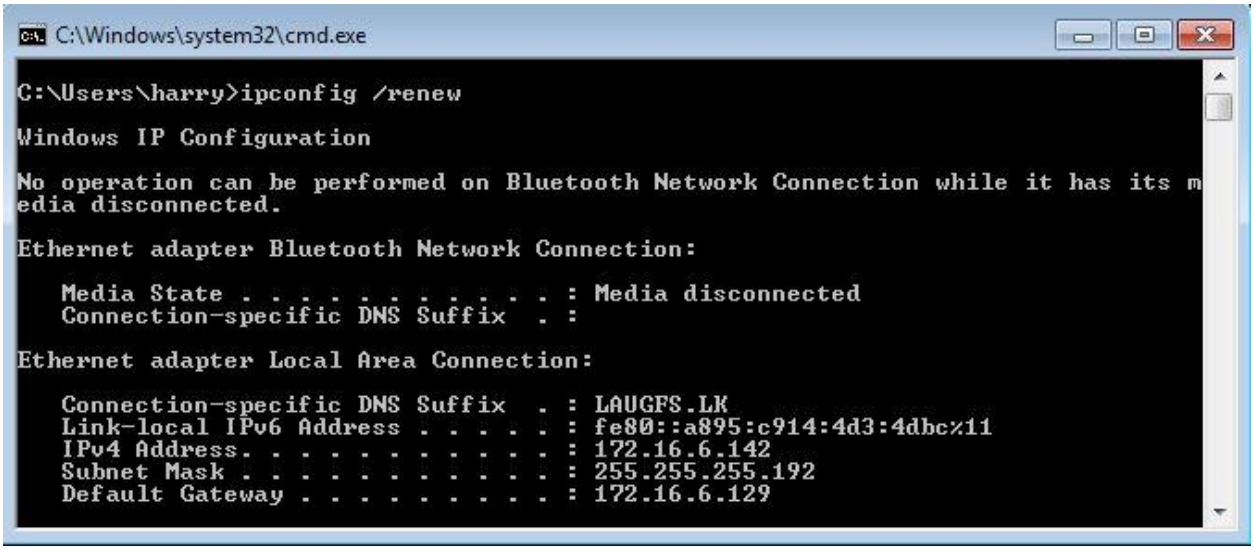


2. DHCP

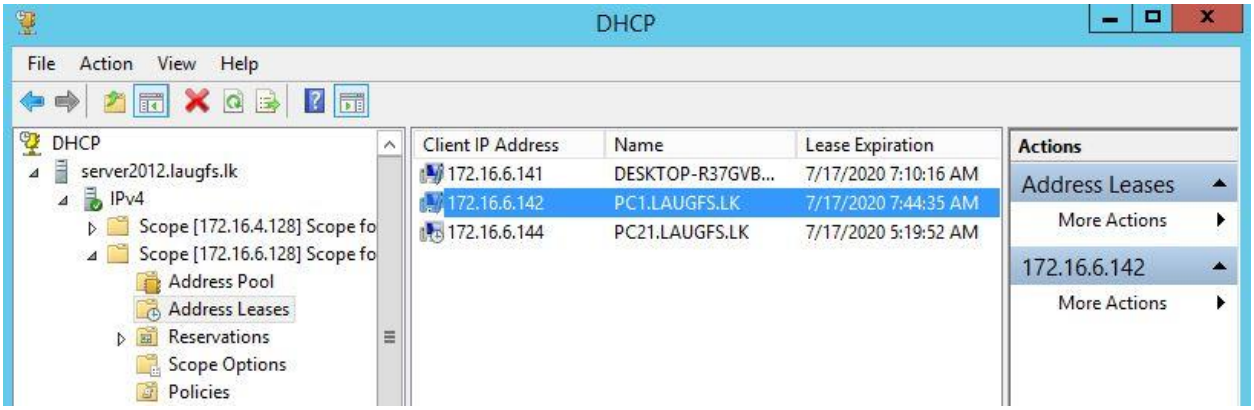
Following DHCP Pools are configured in the server machine.



User in VLAN 102 requests an IP address and assigned by DHCP Server.



DHCP address leases in the server.

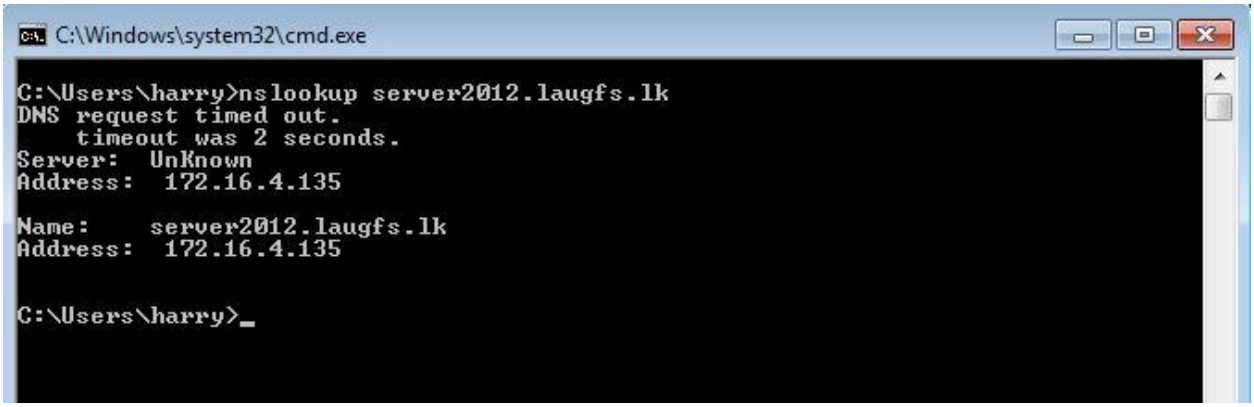


IP : 172.16.6.142 is assigned from DHCP Pool for VLAN 102.

3. DNS

FQDN of the Server : server2012.laugfs.lk

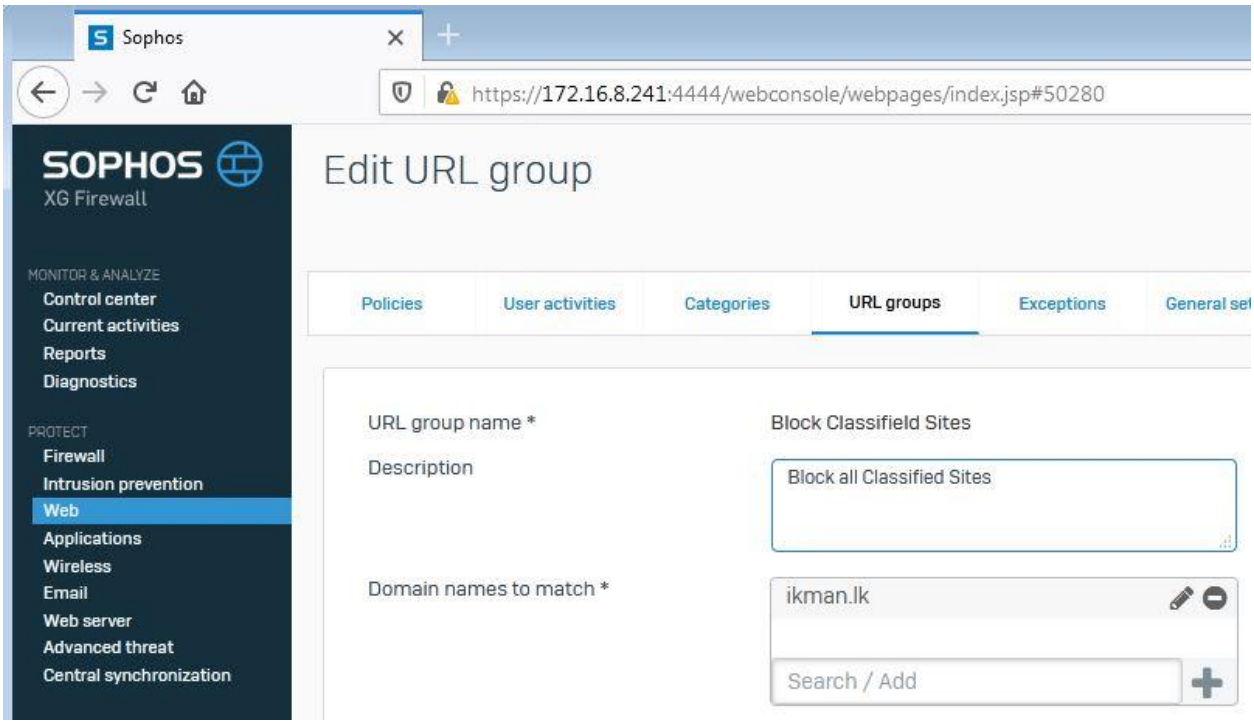
DNS server is configured in the server. Try to resolve server IP.



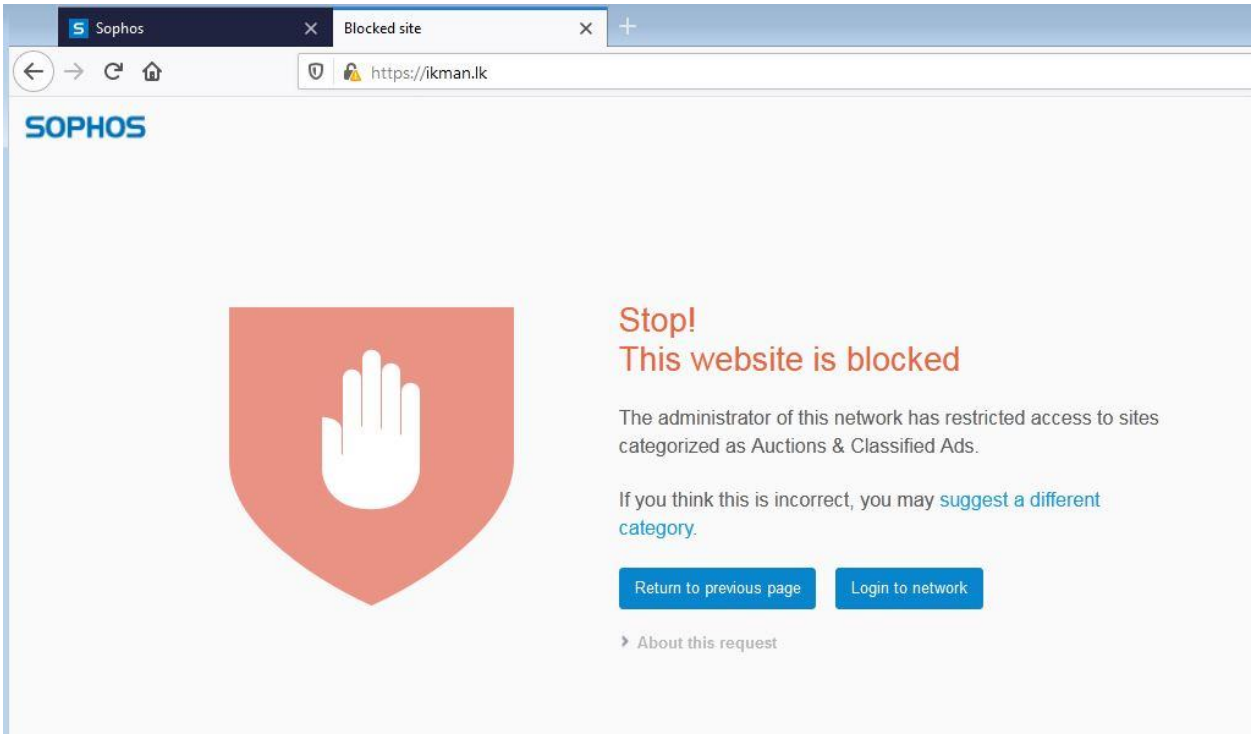
4. Firewall

4.1 URL Blocking via Firewall

Site domain called “ikman.lk” is blocked by firewall.

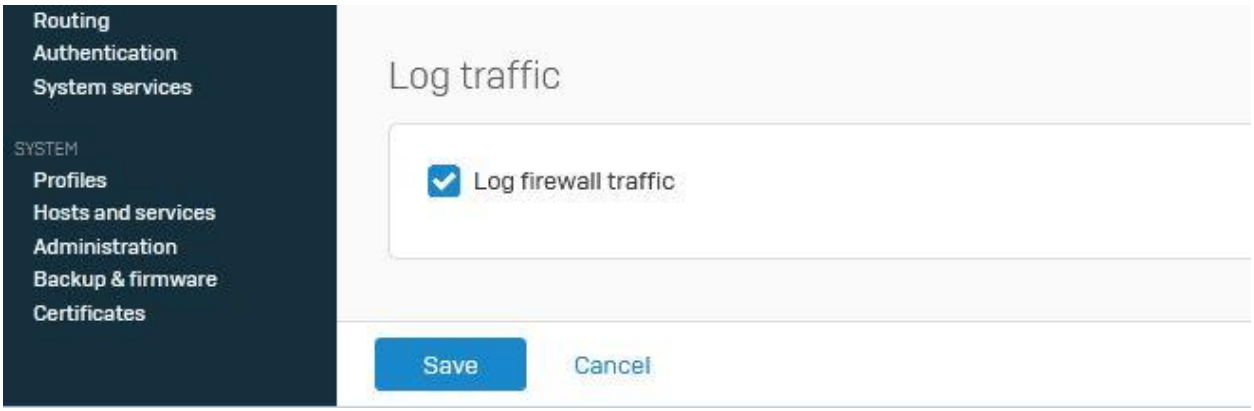


User try to access “ikman.lk” domain and Sophos firewall block the domain.

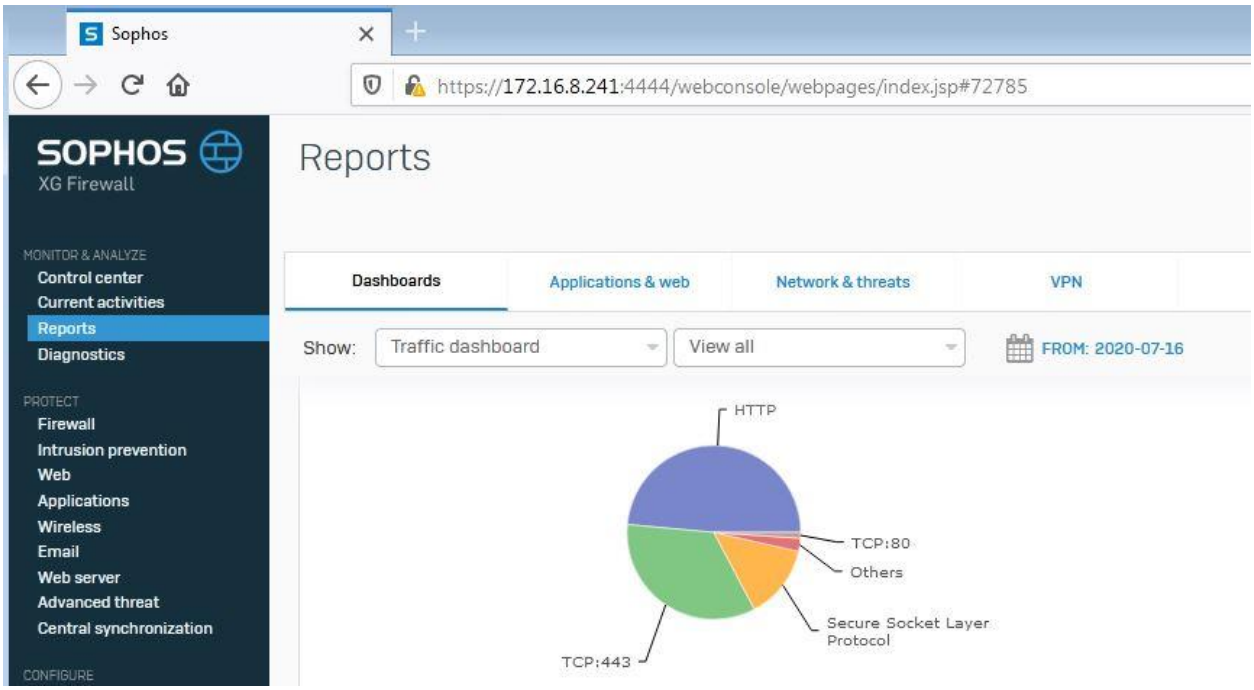


4.2 Usage Reports

Employee Internet usage is filtered by firewall.



Usage reports generated by firewall.



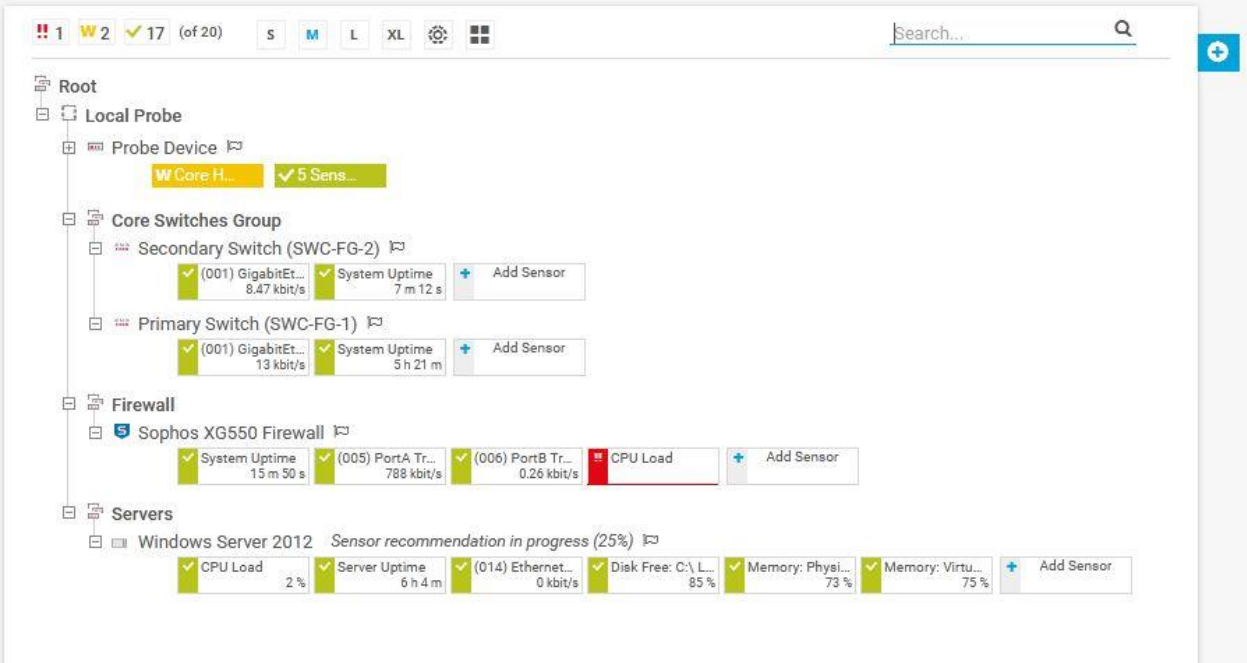
5. SNMP

SNMP is most common way to monitor the network devices. We configured SNMP in following devices.

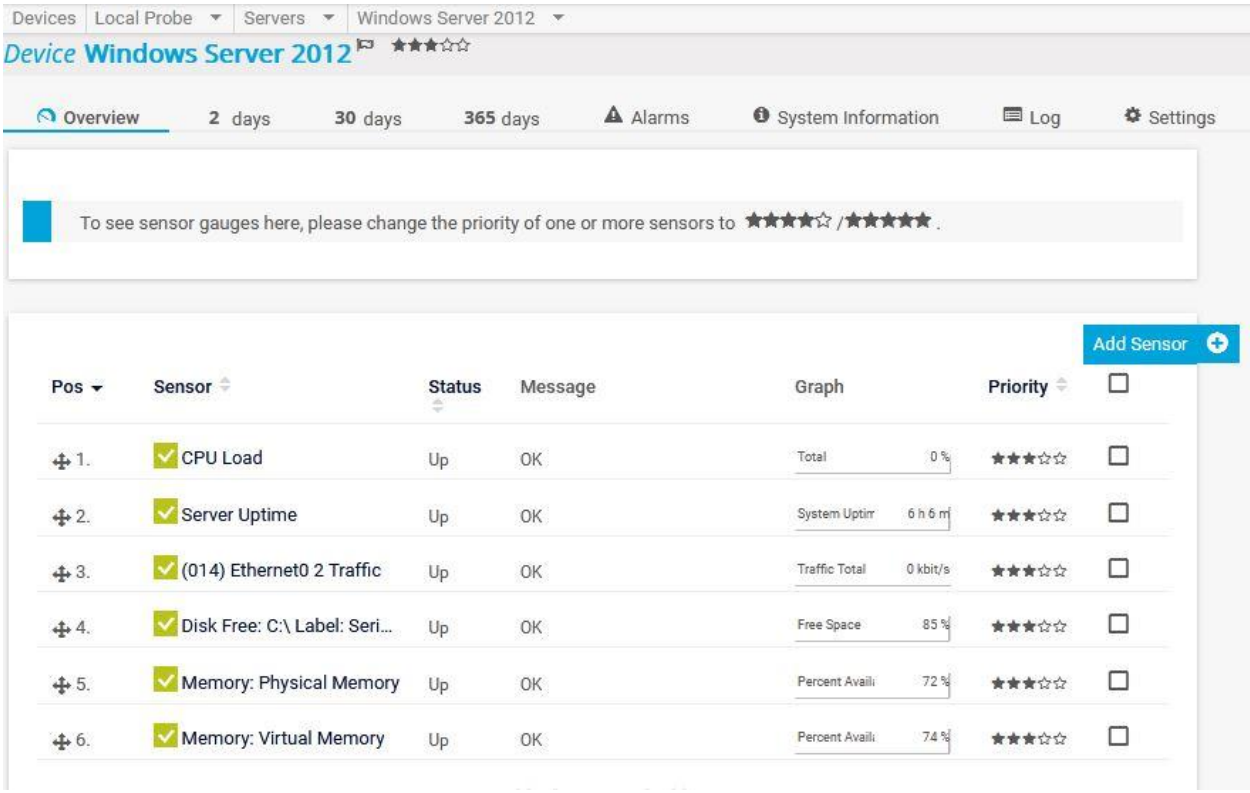
01. Sophos XG 550 Firewall
02. Dell R440 Server
03. Primary Core Switch
04. Secondary Core Switch

Following screenshots are based on PRTG Network monitor tool.

Total devices added for monitoring via SNMP



"Windows Server 2012" live status.



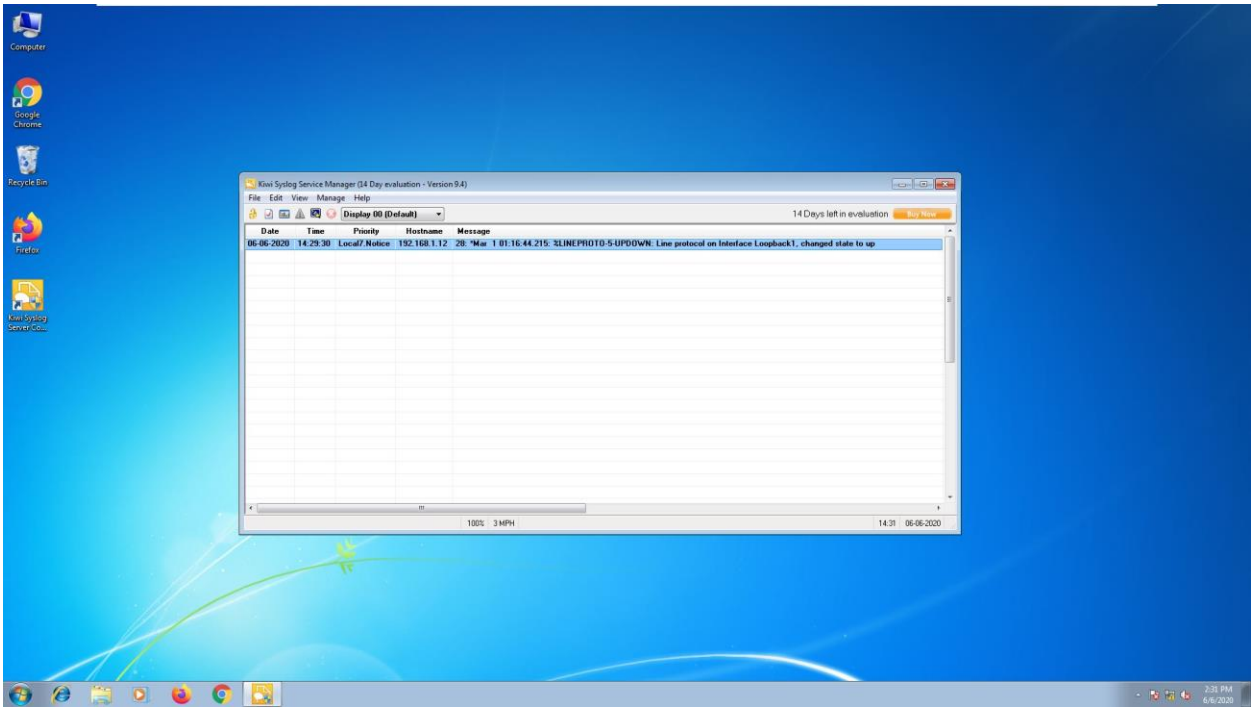
6. Syslog

Syslog is way of recording and storing device log messages. All the syslog messages are log to “Administrator PC” located in server room. We used application called “Kiwi syslog server” for reading & storing syslog messages on HDD drive.

Following devices are configured for syslog service.

01. Sophos XG 550 Firewall
02. Dell R440 Server
03. Primary Core Switch
04. Secondary Core Switch

Following screens shows the syslog messages form Windows server.



5. Conclusion

This project has proven that previous errors & connectivity issues in the company network are solved properly. The devices used in the network are based on company requirements, therefore the security of this network turned out to be very strong.

Many networks use separate servers for different jobs. For this network, we did not use separate servers because of cost. Therefore, we implemented one server and installed VMware ESXi for virtualization.

On this virtualization layer we installed Windows Server 2016 and Microsoft SQL Server. These servers help the network to perform its functions in a smooth way.

The various costs were minimized in order to maximize the quality of the designed network.

6. Appendices

6.1 Server

Product Code: Dell PowerEdge R440 Rack Server

Note: Customized via Dell.com

Specifications:

Processor: Intel Xeon Silver 4216 2.1G, 16C/32T, 9.6GT/s, 22M Cache, Turbo, HT (100W) DDR4-2400 x 2

RAM: 32GB RDIMM, 2666MT/s, Dual Rank x 2 (Total 64GB)

Hard Drive: 1.92TB SSD SATA Read Intensive 6Gbps 512e 2.5in Hot-plug HYB CARR S4510 Drive, 3.5in 1 DWPD,3504 TBW x 1

Operating System: Windows Server® 2019 Datacenter Edition,16 CORE, FI, No Med, No CAL, Multi Language

Power Supply: Dual, Hot Plug, Redundant Power Supply (1+1), 550W

Server will be used for:

- File Sharing & Backups
- Providing authentication for a domain.
- Providing database services.
- Providing e-mail services with a mail server