



# AZ-801

## Configuring Windows Server Hybrid Advanced Services



# AZ-801 Course Outline

- 1 Windows Server Security on Prem ←
- 2 Windows Server Security Cloud
- 3 Failover Cluster
- 4 Disaster Recovery on Prem
- 5 Disaster Recovery Cloud
- 6 Windows Server Upgrade and Migrate
- 7 Migrate Windows Server to Cloud
- 8 Windows Server Monitoring
- 9 Monitoring in the Cloud

# Secure Windows Server on-premises and hybrid infrastructures (*Windows Server security*)

- [Secure Windows Server user accounts](#) ←
- [Hardening Windows Server](#) ←
- [Windows Server update management](#)
- [Secure Windows Server DNS](#) ←
- [Lab 01 – Configuring security in Windows Server](#)

LAPS

mimikatz  
NTLM Hash  
Cred Guard LSA → dump  
LAPS  
Local Admin Password Solution

# Secure Windows Server user accounts

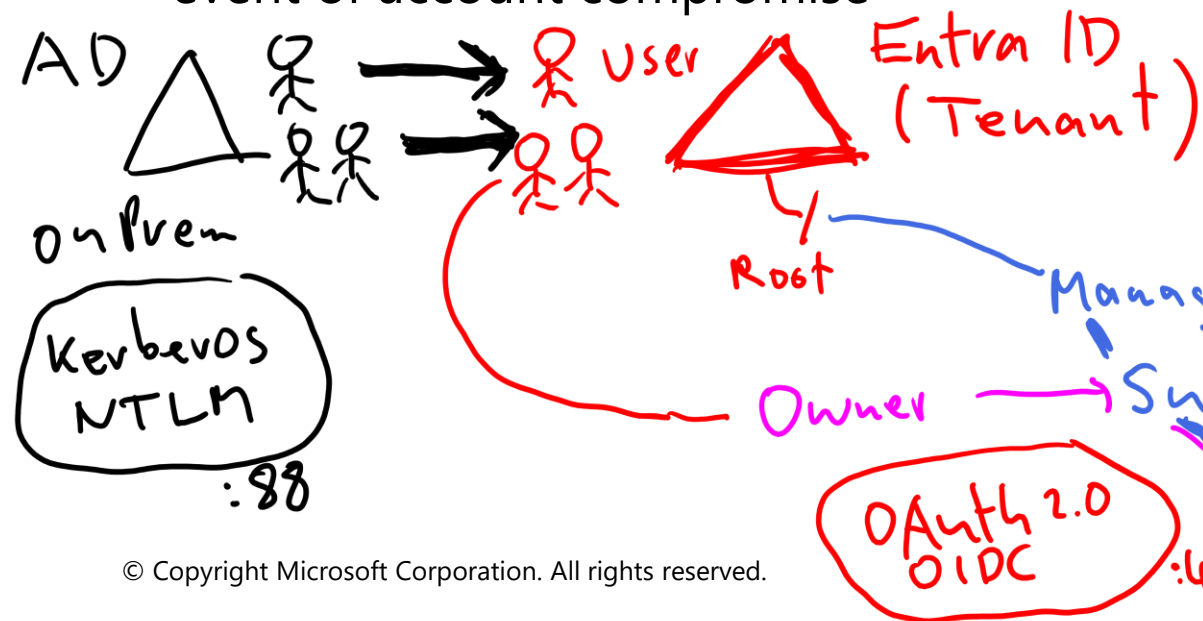


# Learning Objectives – Secure Windows Server user accounts

- Configure user account rights
- Protect user accounts
- Describe Microsoft Defender Credential Guard
- Block NTLM authentication
- Locate problematic accounts
- Learning recap

# Configure User Account Rights

- When configuring user rights, follow the principle of least privilege
- Grant users only the rights and privileges they need to perform their tasks
- This approach helps to limit access in the event of account compromise



On Prem: ACL (Permissions)  
Account Rights  
+ more

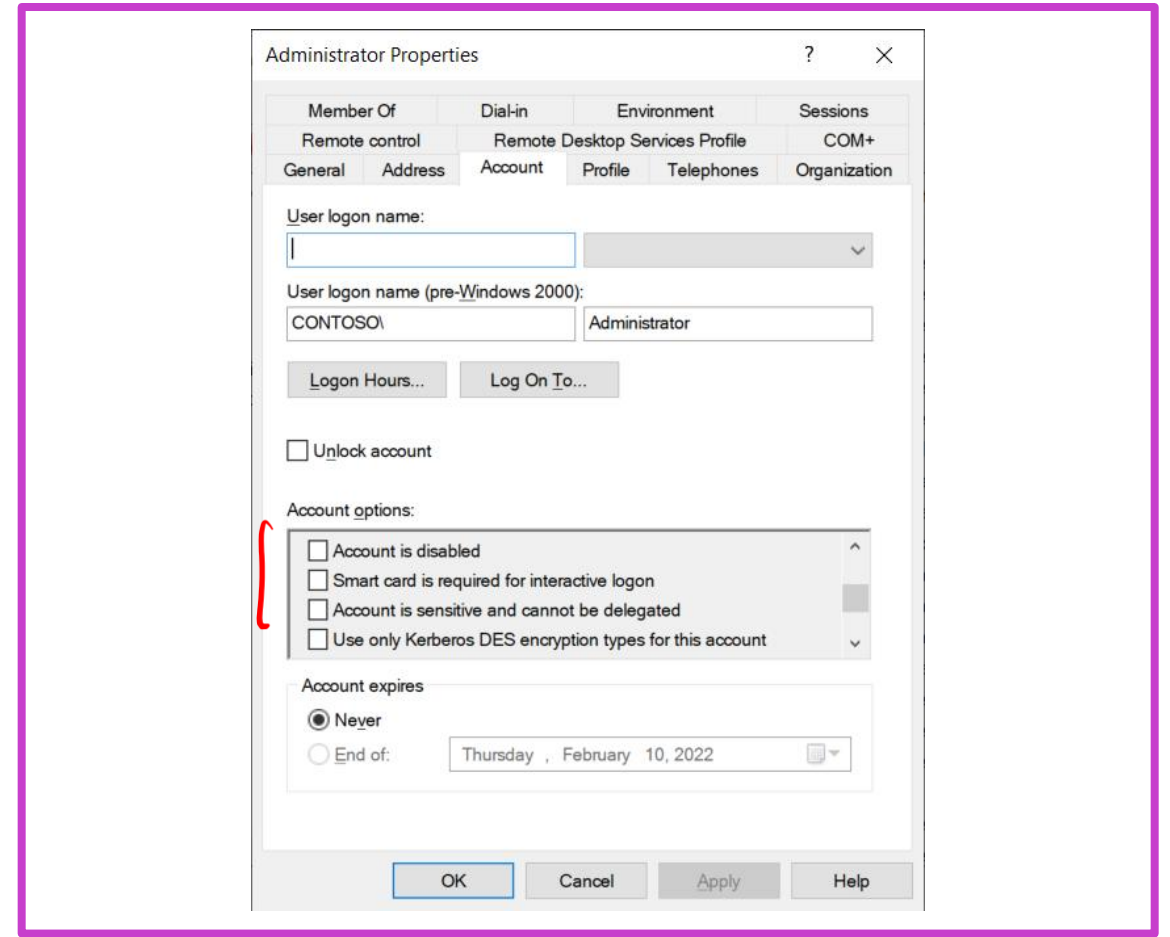
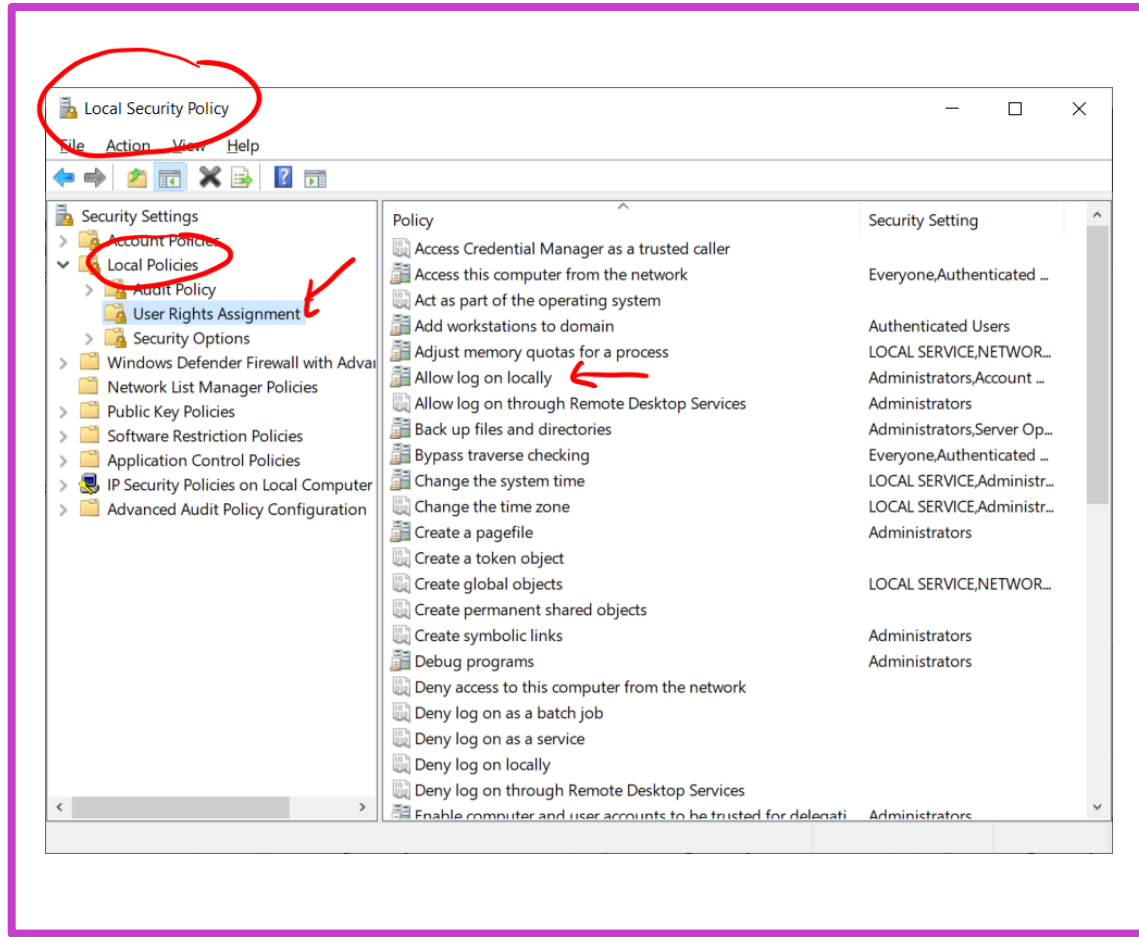
Azure: Roles RBAC Owner

You can use the following to help manage user rights:

- User rights assignment policy, such as:
  - Take ownership of files or other objects
  - Load and unload device drivers
- Account security options, including:
  - Logon hours
  - Logon workstations
  - Account is sensitive and cannot be delegated



# Configure User Account Rights



# Protect User Accounts – with the Protected Users Group

When a user is a member of the Protected Users group:

- User credentials are not cached locally
- Credential delegation (CredSSP) will not cache user credentials
- Windows Digest will not cache user credentials
- NTLM will not cache user credentials
- Kerberos will not create Data Encryption Standard (DES) or RC4 keys, or cache credentials or long-term keys
- The user can no longer sign-in offline
- NTLM authentication is not allowed
- DES and RC4 encryption in Kerberos preauthentication cannot be used
- Credentials cannot be delegated using constrained delegation
- Cannot be delegated using unconstrained delegation
- Ticket-granting tickets (TGTs) cannot renew past the initial lifetime



# Protect User Accounts – with the Protected Users Group

## Protected Users group prerequisites:

- The group must be replicated to all domain controllers
- The user must sign in to a device running Windows 8.1 or Windows Server 2012 R2 or newer
- Domain controller protection requires that domains must be running at a Windows Server 2012 R2 or higher domain functional level

**Note:** Lower functional levels still support protection on client devices

# Protect User Accounts – with Authentication Policies

## Authentication policies:

- Enable you to configure:
  - TGT lifetime
  - Access-control conditions for a user, service, or computer account
- For user accounts, you can:
  - Configure the user's TGT lifetime
  - Restrict devices the user can sign in to
  - Define criteria that the devices must meet

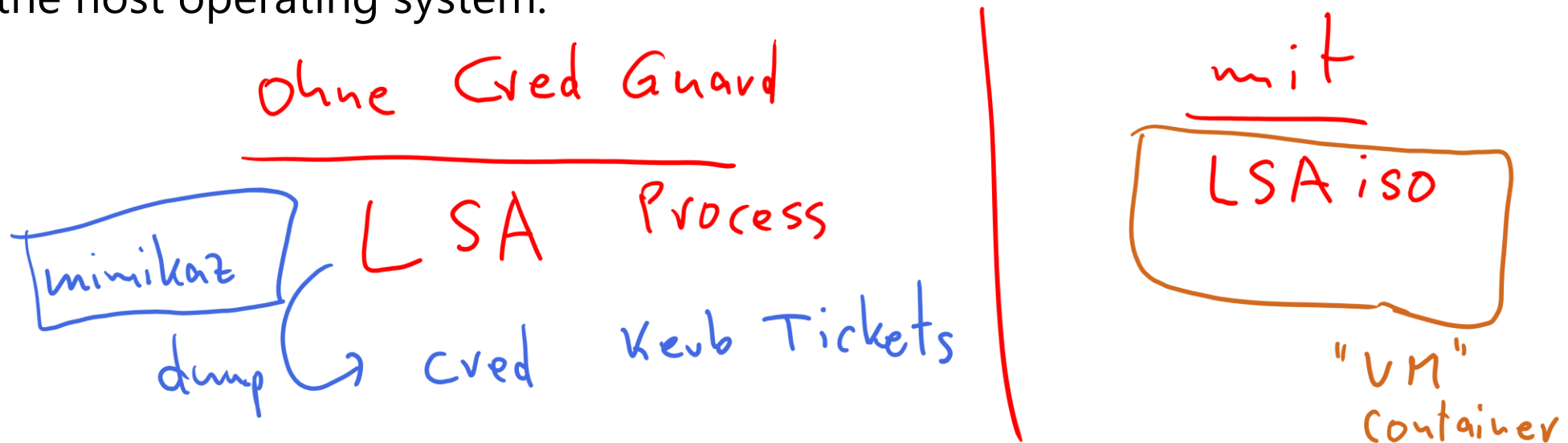
## Authentication policy silos:

- Enable you to assign authentication policies to user, computer, and service accounts
- Work with the Protected Users group to add configurable restrictions to the group's existing non-configurable restrictions
- Ensure that the accounts belong to only a single authentication policy silo

When an account signs in, a user that is part of an Authentication Policy Silo is granted a claim. This claim controls access to claims-aware resources.

# Describe Microsoft Defender Credential Guard

- Microsoft Defender Credential Guard protects user credentials from compromise by isolating those credentials within a protected, virtualized container, separate from the rest of the operating system.
- The virtualized container's operating system runs in parallel with, but independent from, the host operating system.



# Describe Microsoft Defender Credential Guard

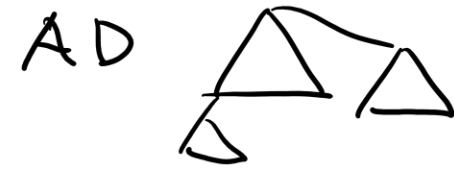
Requirements: wie Hyper-V

- Windows 10 Enterprise or Windows Server 2016 or newer
- 64-bit CPU
- CPU virtualization extensions plus extended page tables (Intel VT-x or AMD-V)
- Trusted Platform Module (TPM) 1.2 or 2.0
- Unified Extensible Firmware Interface (UEFI) firmware version 2.3.1.c or newer
- UEFI Secure boot
- UEFI secure firmware update

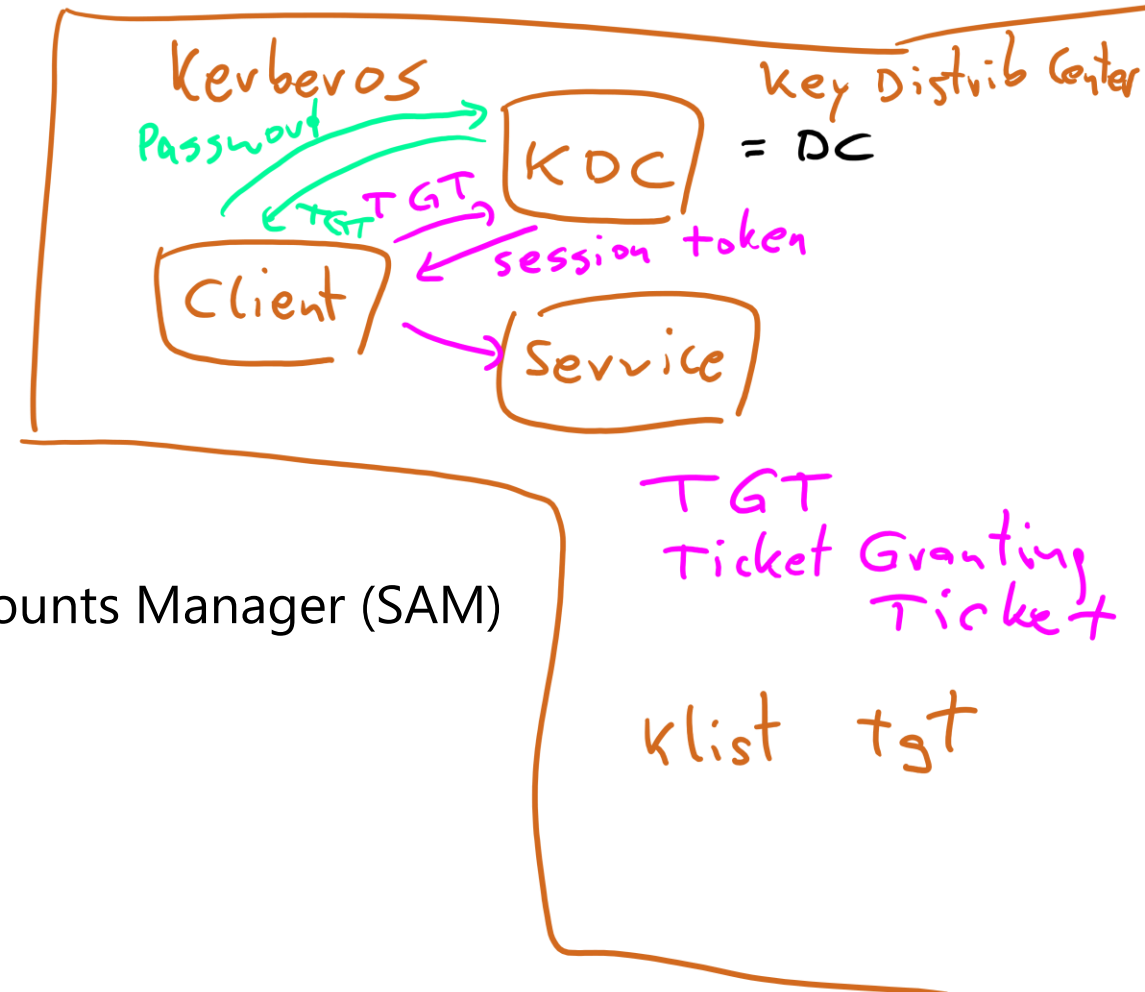
# Describe Microsoft Defender Credential Guard

Windows Defender Credential Guard does not support:

- Unconstrained Kerberos delegation
- ~~NTLMv1~~ or MS-CHAPv2 **NTLM**
- Digest authentication
- CredSSP delegation
- Kerberos DES encryption
- Use on domain controllers
- Protections for the AD DS database or Security Accounts Manager (SAM)



DC - Kerberos  
- LDAP DB



# Block NTLM Authentication

The NTLM authentication protocol:

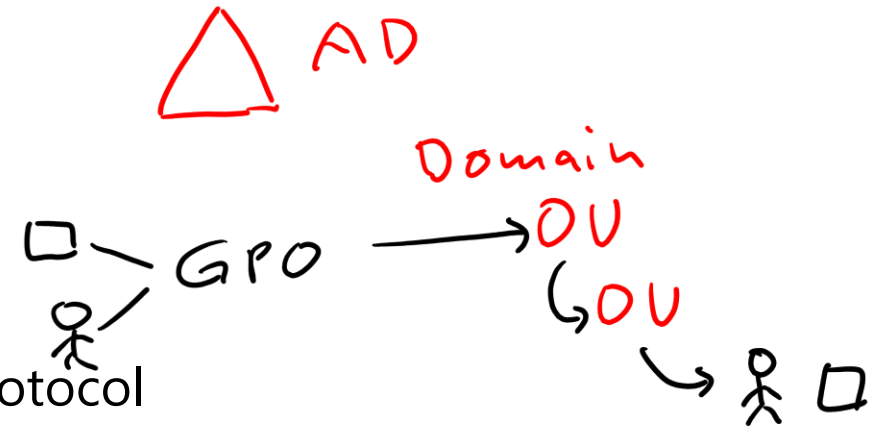
- Is less secure than the Kerberos authentication protocol
- Should be blocked in favor of using Kerberos

Prior to blocking NTLM, you must:

- Ensure that existing applications are no longer using the protocol

You can audit NTLM traffic by configuring the following Group Policy settings:

- Network security: Restrict NTLM: Outgoing NTLM Traffic to remote servers.
- Network security: Restrict NTLM: Audit Incoming NTLM Traffic.
- Network security: Restrict NTLM: Audit NTLM authentication in this domain.



**Navigate to:** Computer Configuration\Windows Settings\Security Settings\Local Policies\Security Options

# Block NTLM Authentication

After you have determined that you can block NTLM in your organization, you must configure the **Restrict NTLM: NTLM authentication in this domain** policy. The configuration options are:

- Deny for domain accounts to domain servers
- Deny for domain accounts
- Deny for domain servers
- Deny all



**Navigate to:** Computer Configuration\Windows Settings\Security Settings\Local Policies\Security Options

# Locate Problematic Accounts

You should check your AD DS environment for accounts that:




- Haven't signed in for a period of time
- Have passwords with no expiration date

Inactive user accounts usually indicate a person that has left the organization and organization processes have failed to remove or disable the account.

Accounts with fixed passwords are less secure than accounts that are required to update their password periodically.

When you find accounts that haven't signed in for a specified number of days, you can disable those accounts.

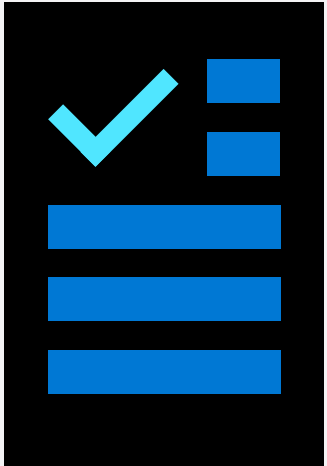
**Note:** User accounts with credentials shared by multiple IT staff members should be avoided, even if they have a strong password policy.

PowerShell  
Modules  
active directory →   
az → Azure   
az.\*  
(azuread) →  Entra  
microsoft.graph ↗



# Learning recap – Secure Windows Server User Accounts

## Knowledge Check



Microsoft Learn Modules ([docs.microsoft.com/Learn](https://docs.microsoft.com/Learn))

Secure Windows Server user accounts

# Hardening Windows Server



# Learning Objectives – Hardening Windows Server Introduction

- Configure user account rights
- Protect user accounts
- Describe Microsoft Defender Credential Guard
- Block NTLM authentication
- Locate problematic accounts
- Learning recap

# Describe Local Password Administrator Solution

Local Administrator Password Solution (LAPS) provides organizations with a central local administrator passwords repository for domain-member machines.

## Features:

- Local administrator passwords are unique on each computer that LAPS manages
- LAPS randomizes and changes local administrator passwords regularly
- LAPS stores local administrator passwords and secrets securely within AD DS
- Configurable permissions control access to passwords in AD DS
- Passwords that LAPS retrieves are transmitted to the client in a secure, encrypted manner

**Note:** You can download LAPS from Microsoft's website

# Describe Local Password Administrator Solution

How LAPS works:

1. LAPS determines if the password of the local Administrator account has expired
2. If the password hasn't expired, LAPS does nothing
3. If the password has expired, LAPS performs the following steps:
  - a) Changes the local Administrator password to a new, random value based on the configured parameters for local Administrator passwords
  - b) Transmits this new password and the new password-expiration date to AD DS
  - c) AD DS stores these properties in a special, confidential attribute associated with the computer account of the computer that has had its local Administrator account password updated

**Note:** authorized users can read passwords from AD DS, and an authorized user can trigger a local Administrator password change on a specific computer

# Describe Local Password Administrator Solution

Configure and manage passwords using LAPS:

There are several steps that you need to take to configure and manage passwords by using LAPS.

1. Move computers targeted for LAPS to a specific OU
2. Using the **Set-AdmPwdComputerSelfPermission** cmdlet to assign the computer accounts the ability to update their computer's local Administrator account password when it expires
3. Run the LAPS installer to install the GPO templates into AD DS

Policies that you can configure after you have installed the templates:

- Enable local admin password management.
- Password settings.

# Configure Privileged Access Workstations

When configuring a PAW, you should:

- Ensure that only authorized users can sign in to the PAW
- Enable Microsoft Defender Credential Guard
- Enable BitLocker Drive Encryption
- Use Microsoft Defender Device Guard policies to restrict app execution to only trusted apps
- Block PAWs from accessing the internet.
- Install all the tools your administrative tasks require
- Limit physical access to the PAWs

# Configure Privileged Access Workstations

After you have configured your PAWs, perform the following configuration tasks:

- Block RDP, Windows PowerShell, and management console connections to your servers that come from any computer that isn't a PAW
- Implement Connection Security Rules so that traffic between servers and PAWs is authenticated and encrypted to help protect against replay attacks
- Configure sign-in restrictions for administrative accounts so that those accounts can only sign in to a PAW



# Configure Privileged Access Workstations

Combining a daily-user workstation and a PAW:

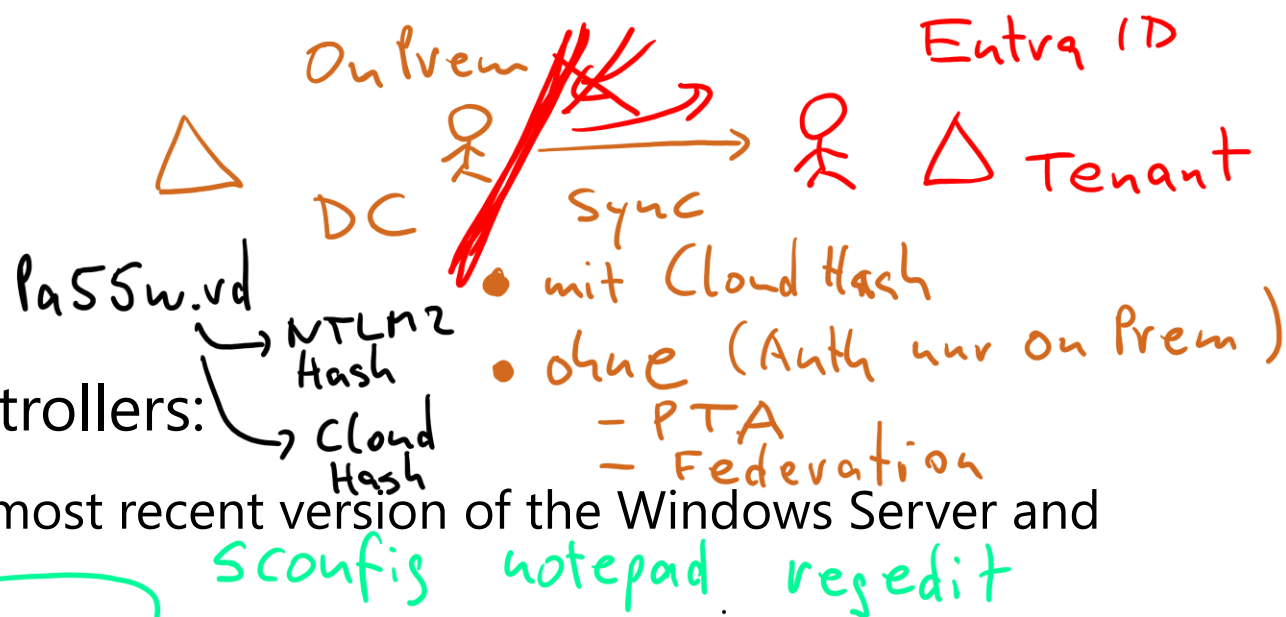
- Combine these computers by hosting one of the operating systems in a virtual environment
- Host the daily-use workstation VM within the PAW host, and not a PAW virtual machine within a daily-user host

**Note:** this is recommended because if the PAW is hosted in the daily user workstation, and the workstation is compromised, the PAW could be compromised as well.

# Secure Domain Controllers

Take the following precautions to help secure your organization's domain controllers:

- Ensure domain controllers are running the most recent version of the Windows Server and have current security updates
- Deploy domain controllers using the Server Core installation option
- Keep physically deployed domain controllers in dedicated, secure racks separate from other servers
- Run virtualized domain controllers either on separate virtualization hosts or as a shielded VM on a guarded fabric
- Deploy domain controllers on hardware that includes a TPM and configure all volumes with BitLocker



Nano Server  
↳ Container Image

# Secure Domain Controllers

RDP : 3389  
WinRM : 5985  
(WS-Man) 6 SSL  
PS Remote

Take the following precautions to help secure your organization's domain controllers:

- Use Microsoft Defender Device Guard to control the execution of scripts and executables on the domain controller
- Limit RDP connections by configuring RDP through Group Policy assigned to the Domain Controllers' OU
- Configure the perimeter firewall to block outbound connections to the internet from domain controllers
- Review Center for Internet Security (CIS) benchmark for Windows Server for security guidance specific to domain controllers

# Analyze Security Configuration with Security Compliance Toolkit

## What is Microsoft Security Compliance Toolkit?

- The Microsoft SCT is a set of tools provided by Microsoft that you can use to download and implement security configuration baselines
- You can also use the SCT to compare your current GPOs to the recommended GPO security baselines
- You can then edit the recommended GPOs and apply them to devices in your organization

## Contents included in SCT:

- Policy Analyzer tool
- LGPO tool

# Analyze Security Configuration with Security Compliance Toolkit

## Policy Analyzer tool:

- Highlights redundant or inconsistent settings
- Highlights differences between sets of GPOs
- Compares GPOs to local policy and registry settings
- Exports results to Microsoft Excel

## LGPO tool:

- Helps you verify the effects of GPO settings on a local host
- Enables you to manage systems that are not domain joined
- Can export and import Registry Policy settings files, security templates, Advanced Auditing backup files, and from LGPO files, text files with a special formatting

# Secure SMB traffic

~~SMB 1~~

Azure  
Storage Account  
Shares

What is SMB 3.1.1 protocol security?

SMB 3.1.1, provides several enhancements over SMB 3.0 security, including:

- Preauthentication integrity checks
- Encryption improvements

Blobs Container  
Tables  
Queues

These are discussed on the following slide

**Note:** Server Message Block (SMB) protocol is a network protocol primarily used for file sharing

# Secure SMB traffic

## Preauthentication integrity

With preauthentication integrity, while a session is being established the "negotiate" and "session setup" messages are protected by using a strong (SHA-512) hash

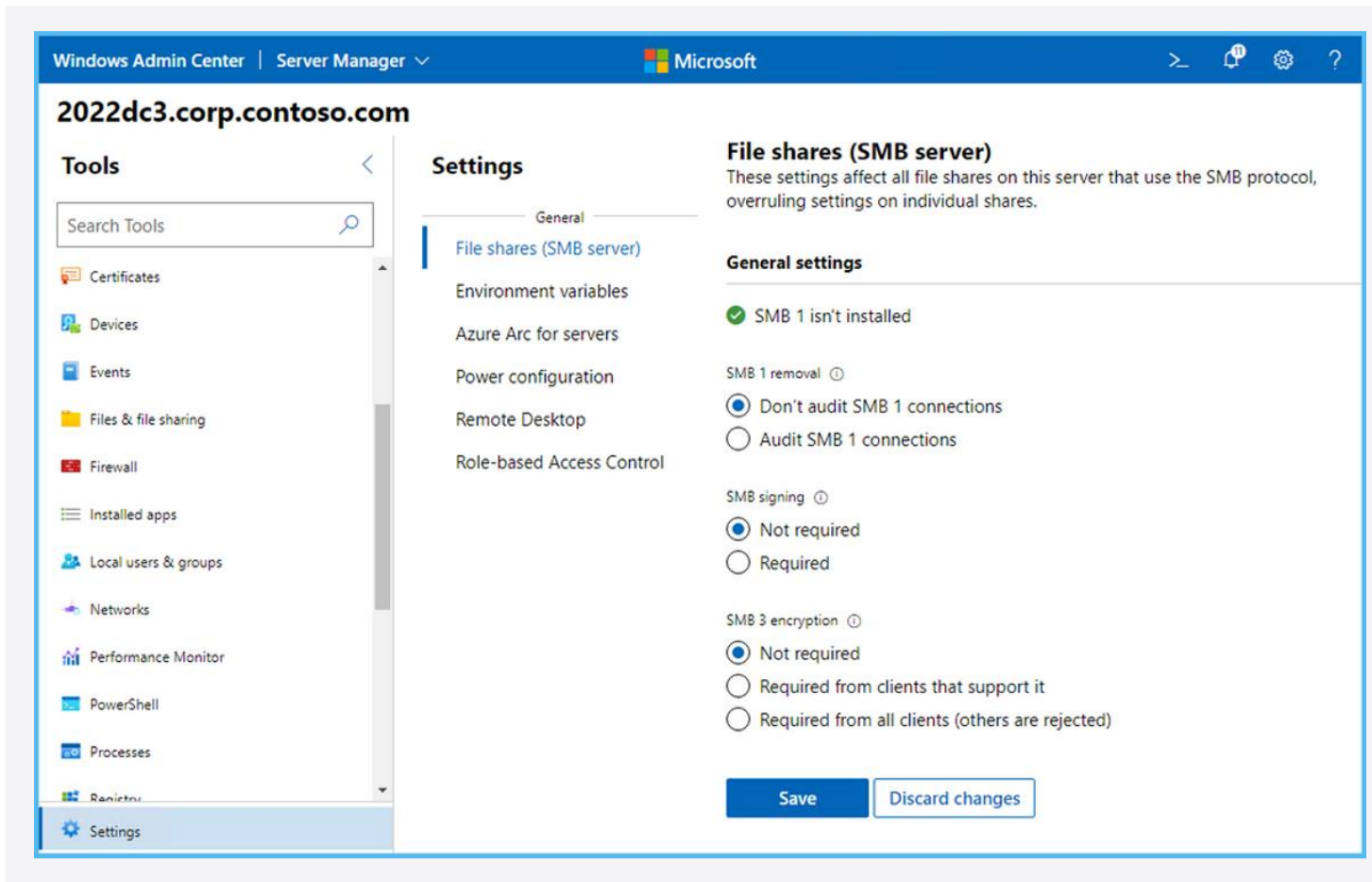
## SMB encryption improvements

- SMB encryption
- Directory Caching
- Rolling cluster upgrade support
- Support for FileNormalizedNameInformation API calls
- Write-through to disk
- Guest access to file shares
- SMB global mapping
- SMB dialect control

# Secure SMB traffic

You can configure SMB encryption:

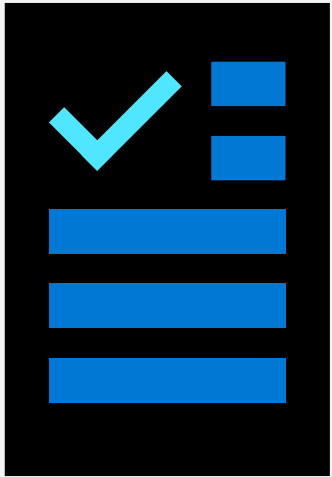
- On a per-share basis or for an entire file server
- Using Windows Admin Center
- Using Windows PowerShell:
  - `Set-SmbShare -Name <sharename> -EncryptData $true`
  - `Set-SmbServerConfiguration -EncryptData $true`
  - `New-SmbShare -Name <sharename> -Path <pathname> -EncryptData $true`
  - `Set-SmbServerConfiguration -RejectUnencryptedAccess $false`





# Learning recap – Hardening Windows Server

## Knowledge Check



Microsoft Learn Modules ([docs.microsoft.com/Learn](https://docs.microsoft.com/Learn))

Hardening Windows Server

# Windows Server Update Management



# Learning Objectives – Windows Server Update Management

- Explore Windows Update
- Outline Windows Server Update Services server deployment options
- Define Windows Server Update Services update management process
- Describe the process of Update Management
- Learning recap

# Explore Windows Update

Windows Update is a Microsoft service that provides updates to Microsoft software. This includes service packs, security patches, drive updates, and even firmware updates.

Orchestrator software on a Windows device scans for and downloads updates. You can configure the orchestrator to get updates from a Windows Server Update Services (WSUS) by using Group Policy.

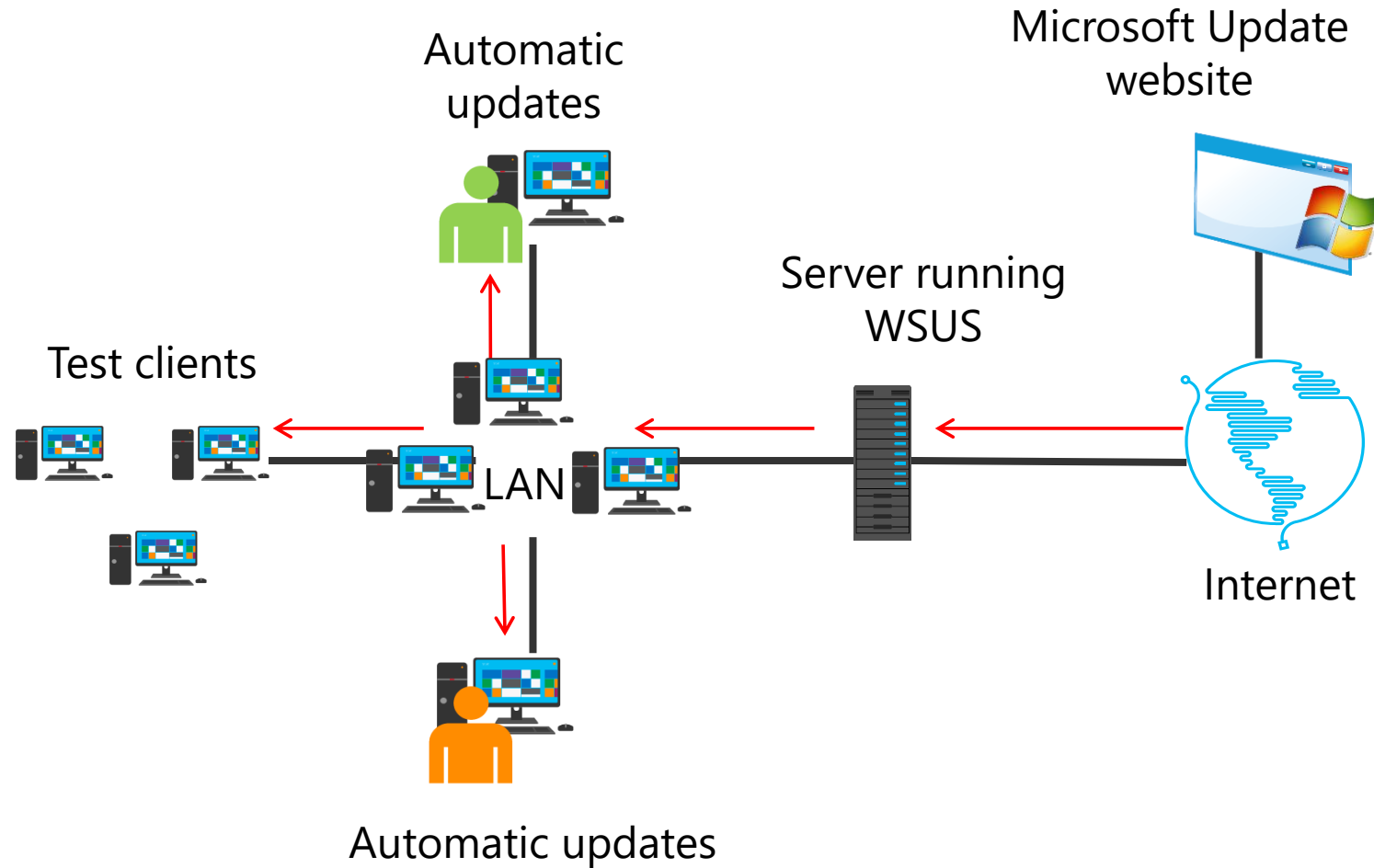
## What is WSUS?

WSUS is a server role that helps you download and distribute updates to Windows clients and servers.

## What does WSUS provide?

WSUS provides a central management point for updates to your computers running Windows operating systems.

# Explore Windows Update



# Outline Windows Server Update Services Server Deployment Options

WSUS implementations vary in size and configuration depending on your network environment and how you want to manage updates.

- 1 Single WSUS server
- 2 Multiple WSUS servers
- 3 Disconnected WSUS servers
- 4 WSUS server hierarchies

# Define Windows Server Update Services Update Management Process

The update management process enables you to manage and maintain WSUS (Windows Server Update Services) and the updates retrieved by WSUS. The four phases in the update management process are:

- 1** The assess phase
- 2** The identify phase
- 3** The evaluate and plan phase
- 4** The deploy phase

# Define Windows Server Update Services Update Management Process

## Troubleshooting WSUS

List of common problems you could encounter when managing a WSUS environment:

- Computers not displaying in WSUS
- WSUS server stops with a full database
- You cannot connect to WSUS



# Describe the Process of Update Management

You can also use Microsoft Azure Update Management, in conjunction with WSUS or instead of WSUS to manage updates on your servers.

## What is Azure Automation?

A cloud-based service that provides:

- Process automation
- Configuration management
- Update management
- Other management features

Supports both Azure and non-Azure environments, including on-premises environments.

## What is Update Management?

- A free service within Azure Automation that helps you manage operating system updates for both Windows and Linux machines
- Supports both cloud and on-premises environments

# Describe the Process of Update Management

## Update Management capabilities

Update Management includes the following capabilities related to on-premises servers:

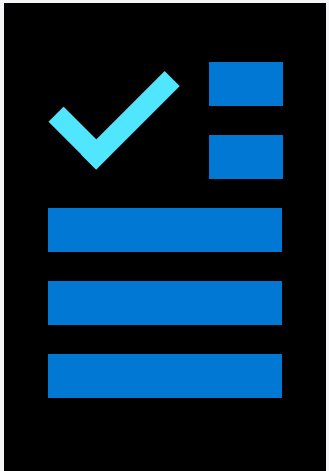
- Check status of updates on your servers
- Configure dynamic groups of machines to target
- Search Azure Monitor logs

## Onboarding your on-premises server

- You must add your on-premises servers to Update Management in Azure Automation manually
- After you enable Update Management, you then download and install the Log Analytics agent for Windows to your on-premises server

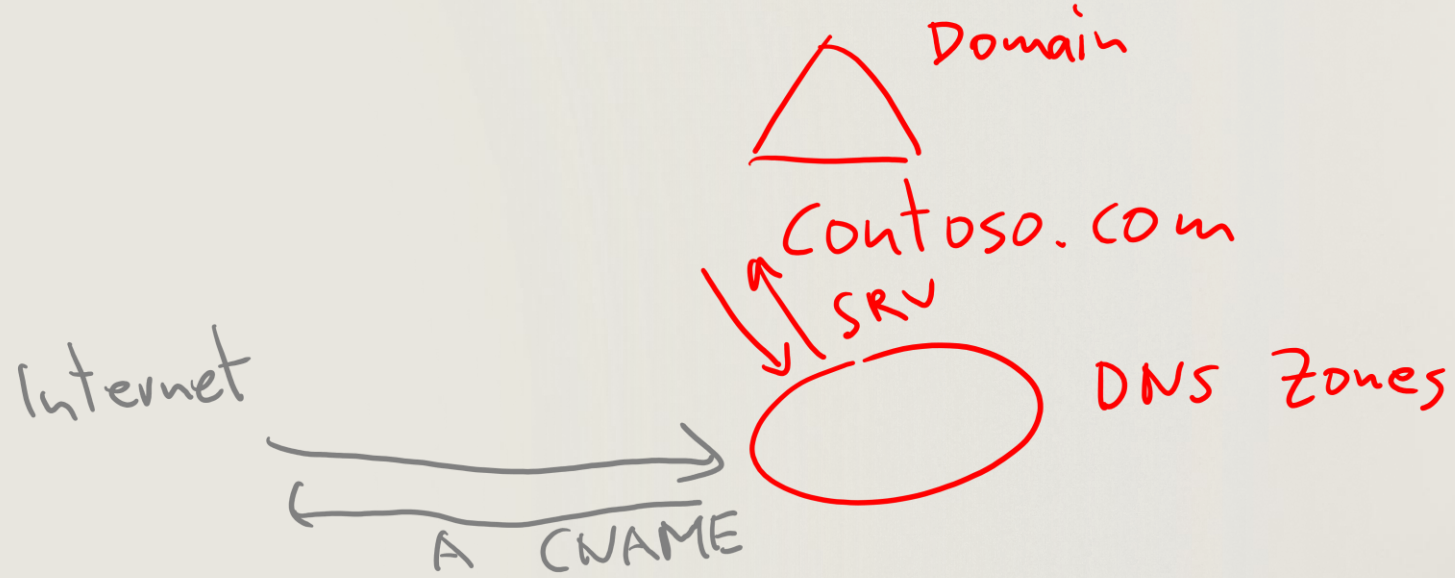
# Knowledge Check and Resources – Windows Server Update Management

## Knowledge Check



Microsoft Learn Modules ([docs.microsoft.com/Learn](https://docs.microsoft.com/Learn))

Windows Server update management



## Module 4: Secure Windows Server DNS

BIND

\_ldap

SOA

SRV

dc1

dc2

The text shows a list of DNS records. "\_ldap" is on the left. To its right, "SOA" is written above "SRV", which is circled in red. Further to the right, "dc1" and "dc2" are listed vertically.

# Learning Objectives – Secure Windows Server DNS

- Implement split-horizon DNS
- Create DNS policies
- Implement DNS policies
- Demonstration – Implement DNS policies
- Secure Windows Server DNS
- Implement DNSSEC
- Demonstration – Implement DNSSEC
- Knowledge check and resources
- Learning recap

# Implement split-horizon DNS

## Implement split-DNS

- Split-horizon DNS, also known as split DNS, uses the same DNS domain name for both internet and internal domain-member resources.
- However, the DNS server role is assigned to separate servers: one or more servers for the internet, and the other server(s) for the AD DS domain.

## Options

- Use the same namespace internally and externally
- Use unique namespaces for the internal and public namespaces
- Use a subdomain of the public namespace for AD DS

# Implement split-horizon DNS

## Non-split configuration

| Host       | Record type | IP address    |
|------------|-------------|---------------|
| www        | A           | 131.107.1.200 |
| Relay      | A           | 131.107.1.201 |
| Webserver1 | A           | 192.168.1.200 |
| Exchange1  | A           | 192.168.0.201 |

## Split-DNS configuration – internal zone

| Host       | Record type | IP address             |
|------------|-------------|------------------------|
| www        | CNAME       | Webserver1.contoso.com |
| Relay      | CNAME       | Exchange1.contoso.com  |
| Webserver1 | A           | 192.168.1.200          |
| Exchange1  | A           | 192.168.0.201          |

## Split-DNS configuration – external zone


| Host  | Record type | IP address        |
|-------|-------------|-------------------|
| www   | A           | 131.107.1.200     |
| Relay | A           | 131.107.1.201     |
|       | MX          | Relay.contoso.com |

# Create DNS Policies

## Scenarios for using DNS policies

- You can use DNS policies to manipulate how a DNS server manages queries based on different factors.

Various factors that might benefit from creating a DNS policy, based on the following scenarios:

- Application high availability
- Traffic management
- Split DNS 
- Filtering
- Forensics
- Time-of-day based redirection

## DNS policy objects

- You can identify the elements by the DNS policy objects, such as Client subnet, Recursion scope and Zone scopes.



# Implement DNS Policies

PowerShell | DNS msc  
zeigt Gesamtzone

Two policy types of DNS policies:

- Query-resolution policies
- Zone-transfer policies

The high-level steps to resolve a host record differently for users from a specific IP address range are:

1. Create a DNS server client subnet for the IP address range.
2. Create a DNS server zone scope for the zone containing the host record.
3. Add a host record to the zone that is specific to the zone scope.
4. Add a DNS server query resolution policy that allows the DNS server client subnet to query the zone scope for the zone.

# Implement DNS Policies

# Create the required subnets

Add-DnsServerClientSubnet -Name "LondonSubnet" -IPv4Subnet "172.16.18.0/24"

Add-DnsServerClientSubnet -Name "SeattleSubnet" -IPv4Subnet "172.16.10.0/24"

# Create the DNS server zone scopes

Add-DnsServerZoneScope -ZoneName "Contoso.com" -Name "LondonZoneScope"

Add-DnsServerZoneScope -ZoneName "Contoso.com" -Name "SeattleZoneScope"

# Implement DNS Policies

# Add the required host records

```
Add-DnsServerResourceRecord -ZoneName "Contoso.com" -A -Name "www" -IPv4Address  
"172.16.10.41" -ZoneScope "SeattleZoneScope"
```

```
Add-DnsServerResourceRecord -ZoneName "Contoso.com" -A -Name "www" -IPv4Address  
"172.16.18.17" -ZoneScope "LondonZoneScope"
```

# Create the DNS server query resolution policies

```
Add-DnsServerQueryResolutionPolicy -Name "LondonPolicy" -Action ALLOW -ClientSubnet  
"eq,LondonSubnet" -ZoneScope "LondonZoneScope,1" -ZoneName "Contoso.com"
```

```
Add-DnsServerQueryResolutionPolicy -Name "SeattlePolicy" -Action ALLOW -ClientSubnet  
"eq,SeattleSubnet" -ZoneScope "SeattleZoneScope,1" -ZoneName Contoso.com
```

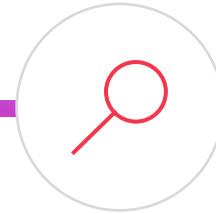
# Demonstration – Implement DNS policies



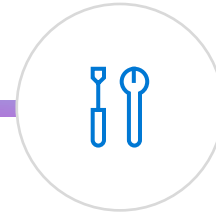
Create the  
required subnets



Create the DNS  
server zone scopes



Add the required  
host records



Create the DNS  
server query  
resolution policies

# Secure Windows Server DNS

Several options for protecting the DNS server role, including:

- 1 DNS cache locking
- 2 DNS socket pool
- 3 DANE
- 4 RRL
- 5 Unknown record support:
- 6 DNSSEC

*ipconfig /displaydns*

*www*  
↙ CNAME  
↘ A  
8.8.8.8

# Implement DNSSEC

DNSSEC protects clients that are making DNS queries from accepting false DNS responses

The high-level steps for deploying DNSSEC are:

1. Sign the DNS zone
2. Configure the trust anchor distribution
3. Configure the NRPT on client computers

Contoso.com → DNS1  
adatum.com → DNS2

nslookup X  
Resolve-DNSName ✓

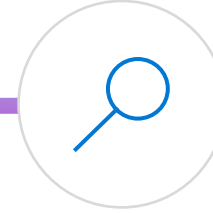
# Demonstration – Implement DNSSEC



**Sign the zone**



**Configure the trust  
anchor distribution**



**Configure the NRPT  
on client computers**

# Learning recap – Secure Windows Server DNS



## Knowledge Check



Microsoft Learn Modules ([docs.microsoft.com/Learn](https://docs.microsoft.com/Learn))

Secure Windows Server DNS



# Lab 01: Configuring Security in Windows Server



# Lab 01 – Configuring Security in Windows Server



## Lab scenario

Contoso Pharmaceuticals is a medical research company with about 5,000 employees worldwide. They have specific needs for ensuring that medical records and data remain private. The company has a headquarters location and multiple worldwide sites. Contoso has recently deployed a Windows Server and Windows client infrastructure. You have been asked to implement improvements in the server security configuration.

## Objectives

- Configure Microsoft Defender Credential Guard
- Locate problematic user accounts
- Implement and verify LAPS

# End of presentation

