Data Security

Exercise 1: Perform Disk Encryption using VeraCrypt

VeraCrypt is a software used for establishing and maintaining an on-the-fly-encrypted volume (data storage device).

Lab Scenario

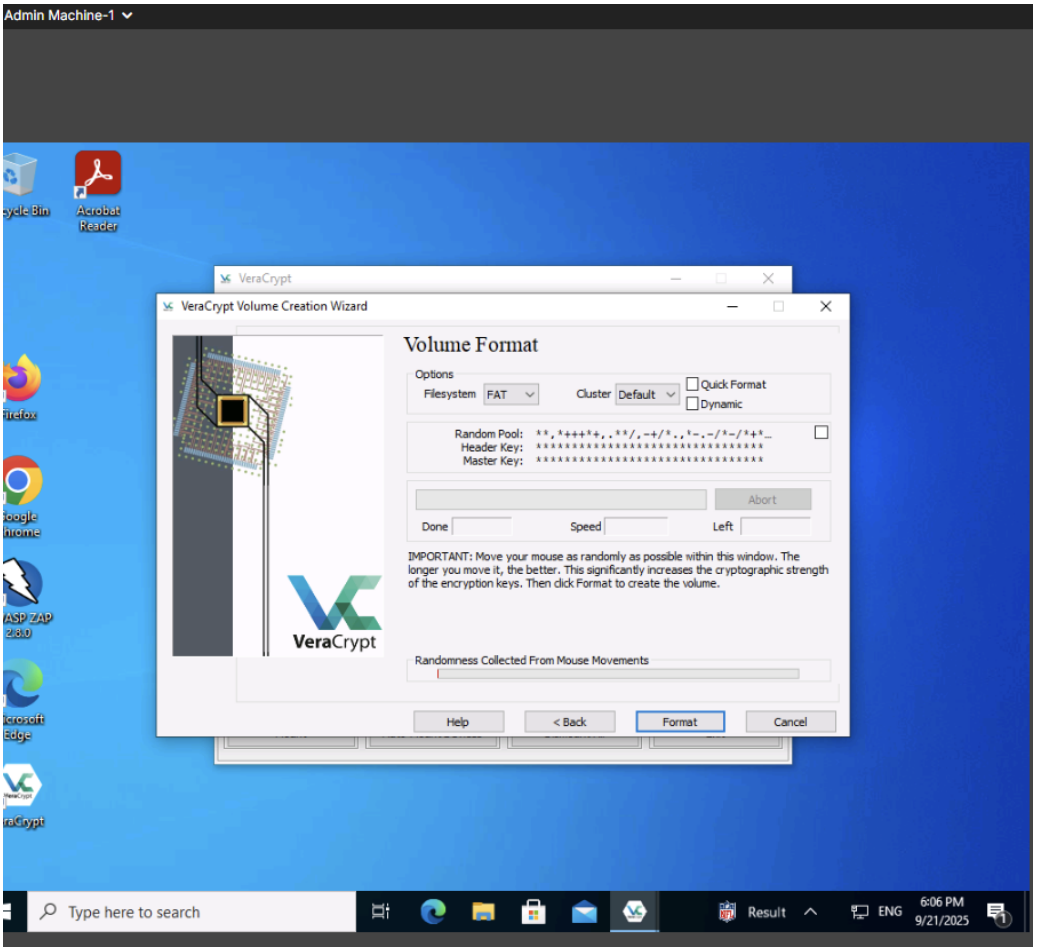
Network defenders should know how to encrypt a volume/disk to safeguard an organization's data.

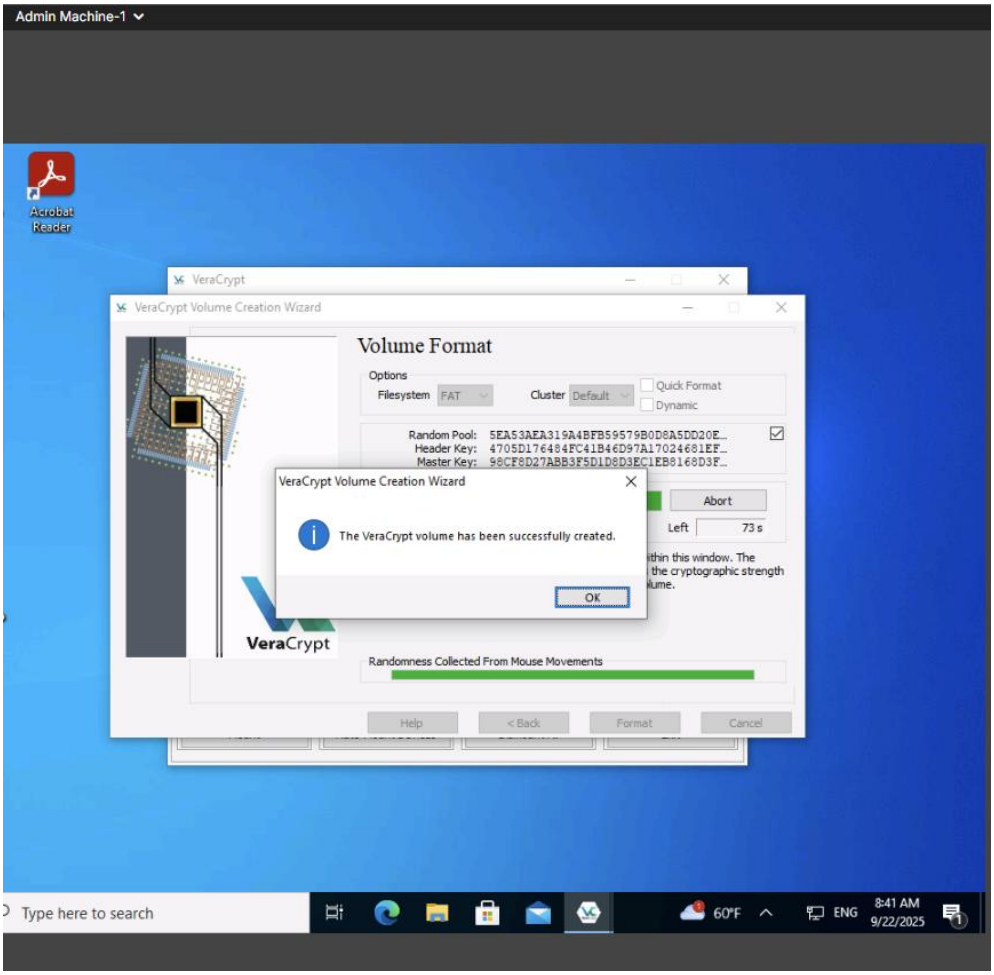
Lab Objectives

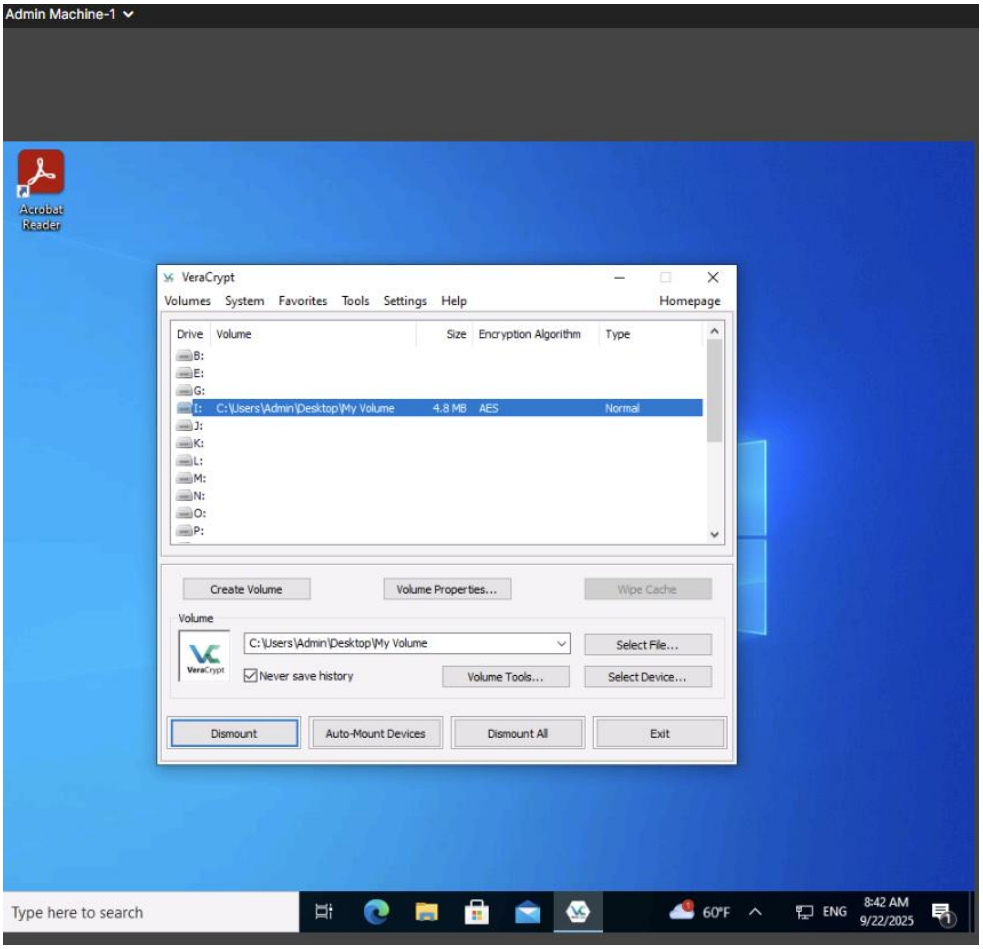
The objective of this lab is to demonstrate how to encrypt a volume using the VerCrypt tool. It is prevalent to encrypt data as it prevents the data from unauthorized access. No data stored on an encrypted volume can be read (decrypted) without using the correct password/keyfile(s) or correct encryption keys. The entire file system is encrypted (e.g., file names, folder names, free space and metadata).

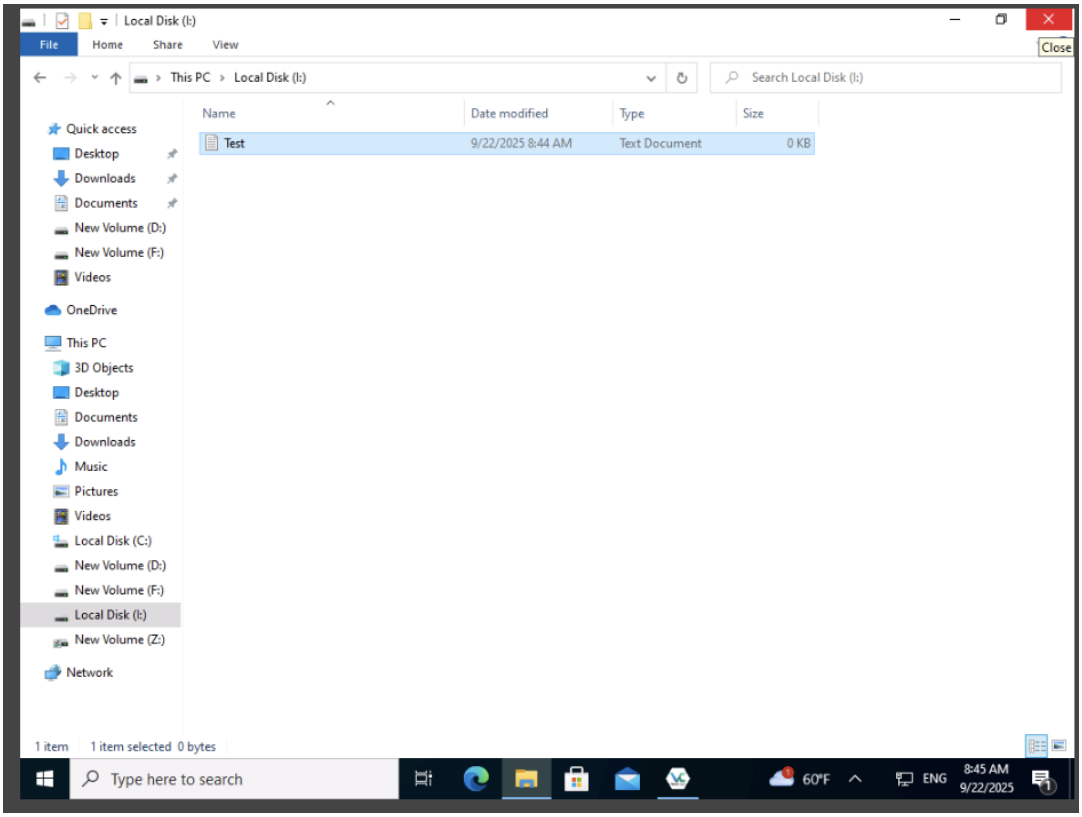
Overview of Disk Encryption

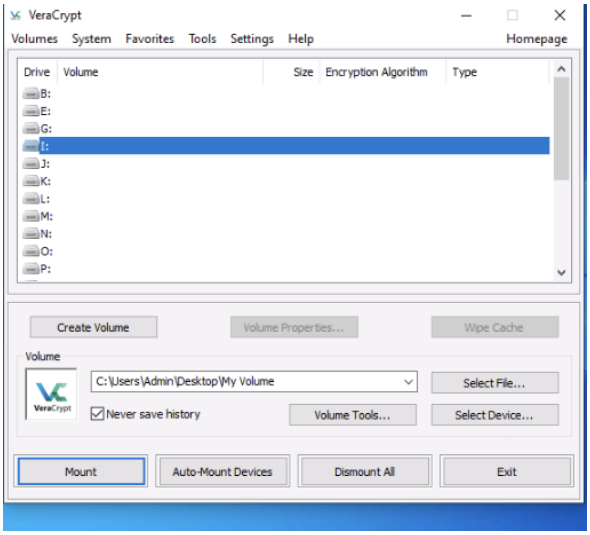
Disk encryption is the encryption of data stored in a physical or logical disk. Full disk encryption is the encryption of all data in a disk except the master boot record (MBR). The data is automatically converted into a form which cannot be easily deciphered by an unauthorized user. In full disk encryption, the data is encrypted while being written on the disk, and decrypted when the user reads the data from the disk.


Admin Machine-1
Acrobat Reader
VeraCrypt
VeraCrypt Volume Creation Wizard
Volume Format
Options
Filesystem
FAT
Cluster
Default
Quick Format
Dynamic
Random Pool:
Header Key:
Master Key:
Abort
Done
Speed
Left
IMPORTANT: Move your mouse as randomly as possible within this window. The longer you move it, the better. This significantly increases the cryptographic strength of the encryption keys. Then click Format to create the volume.
Randomness Collected From Mouse Movements
Help
< Back
Format
Cancel
Type here to search
Result
ENG
6:06 PM
9/21/2025


Admin Machine-1
Acrobat Reader
VeraCrypt
VeraCrypt Volume Creation Wizard
Volume Format
Options
Filesystem FAT
Cluster Default
Quick Format
Dynamic
Random Pool: 5EA53AEA319A4BFB59579B0D8A5DD20E...
Header Key: 4705D176484FC41B46D97A17024681EF...
Master Key: 98CF8D27ABB3F5D1D8D3EC1EB8168D3F...
Abort
Left 73 s
VeraCrypt Volume Creation Wizard
The VeraCrypt volume has been successfully created.
OK
VeraCrypt
Randomness Collected From Mouse Movements
Help
< Back
Format
Cancel
Type here to search
60°F
ENG
8:41 AM
9/22/2025


Admin Machine-1
Acrobat Reader
VeraCrypt
Volumes System Favorites Tools Settings Help Homepage
Drive Volume Size Encryption Algorithm Type
B:
E:
G:
I: C:\Users\Admin\Desktop\My Volume 4.8 MB AES Normal
J:
K:
L:
M:
N:
O:
P:
Create Volume
Volume Properties...
Wipe Cache
Volume
C:\Users\Admin\Desktop\My Volume
Select File...
Never save history
Volume Tools...
Select Device...
Dismount
Auto-Mount Devices
Dismount All
Exit
Type here to search
60°F
ENG
8:42 AM
9/22/2025





Exercise 2: File Recovery using EaseUS Data Recovery Wizard

EaseUS Data Recovery Wizard is a recovery software for Windows that supports files, partitions, and the complete recovery of data.

Lab Scenario

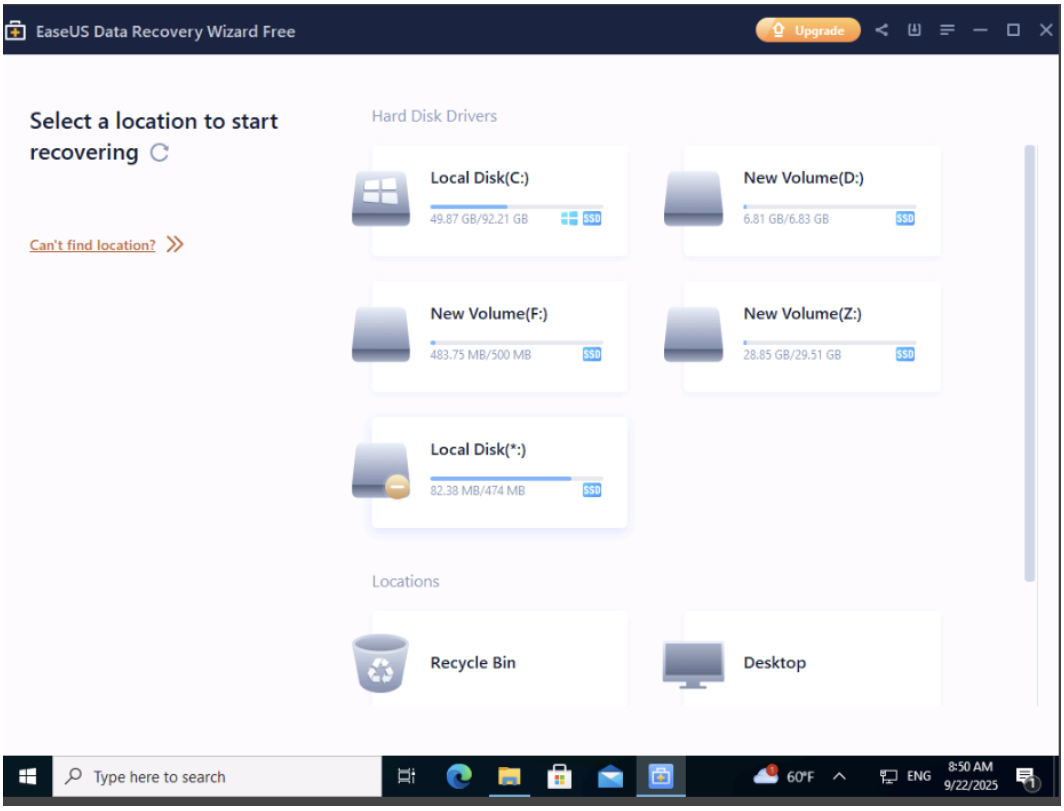
Network defenders should know how to recover deleted files and partitions, which have been deleted accidentally by users or due to a natural disaster. They can use recovery techniques or proprietary applications to obtain critical information.

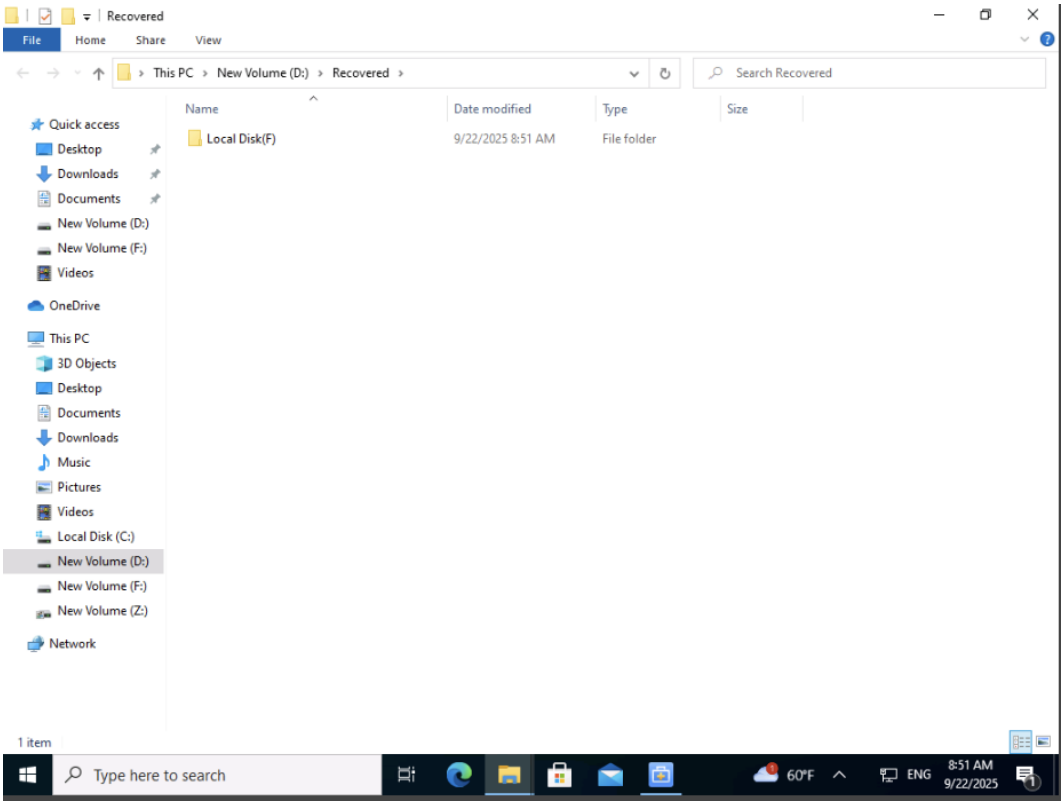
Lab Objectives

The objective of this lab is to demonstrate how to use EaseUS Data Recovery Wizard, by intentionally deleting a few files and, subsequently, recovering them.

Overview of Recovering Deleted Files and Partitions

EaseUS Data Recovery Wizard solves all data loss problems; it recovers files emptied from the Recycle Bin or data loss due to a software crash, hard drive formatting or damage, virus attack, lost partition, and other unknown reasons in Windows. It recovers data from formatted partitions with the original file names and storage paths.





Exercise 3: Backing Up and Restoring Data in Windows

Data backup is the process of copying or storing important data.

Lab Scenario

Network defenders should know how to recover files and folders, that were deleted accidentally by users or lost because of a natural disaster. They can use recovery techniques or proprietary applications to recover sensitive and confidential information.

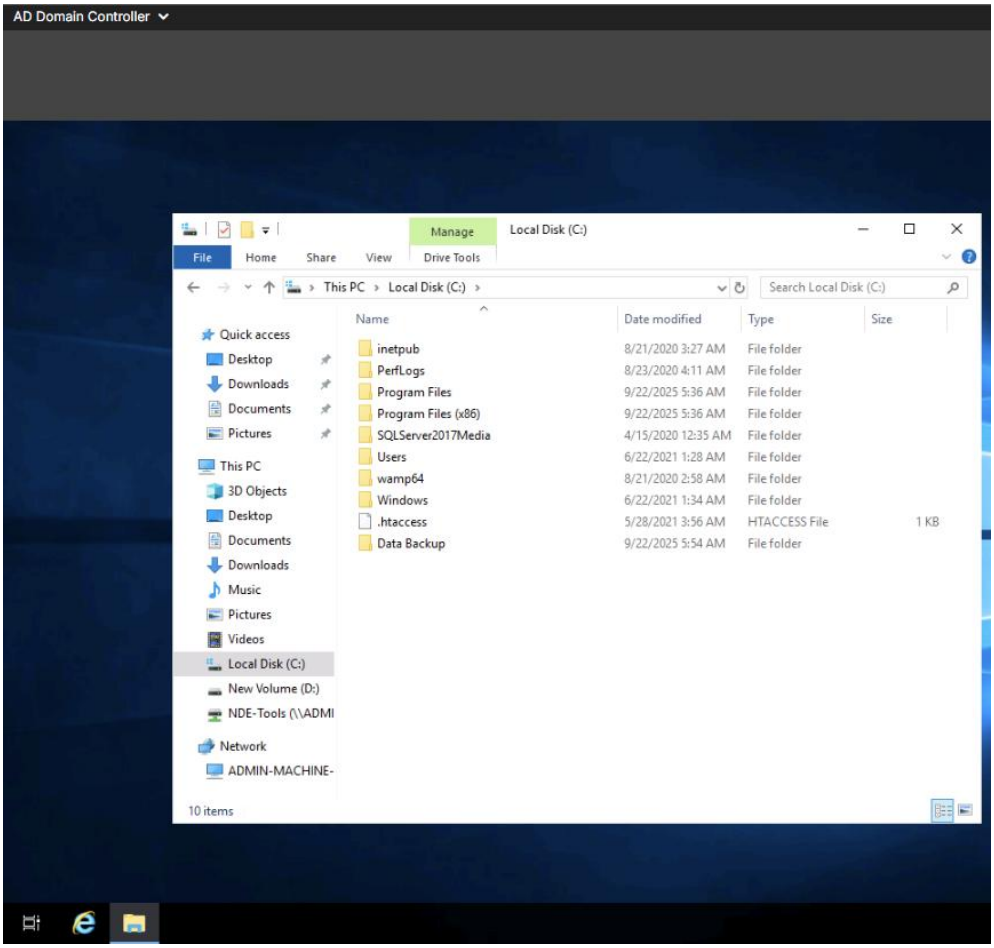
Lab Objectives

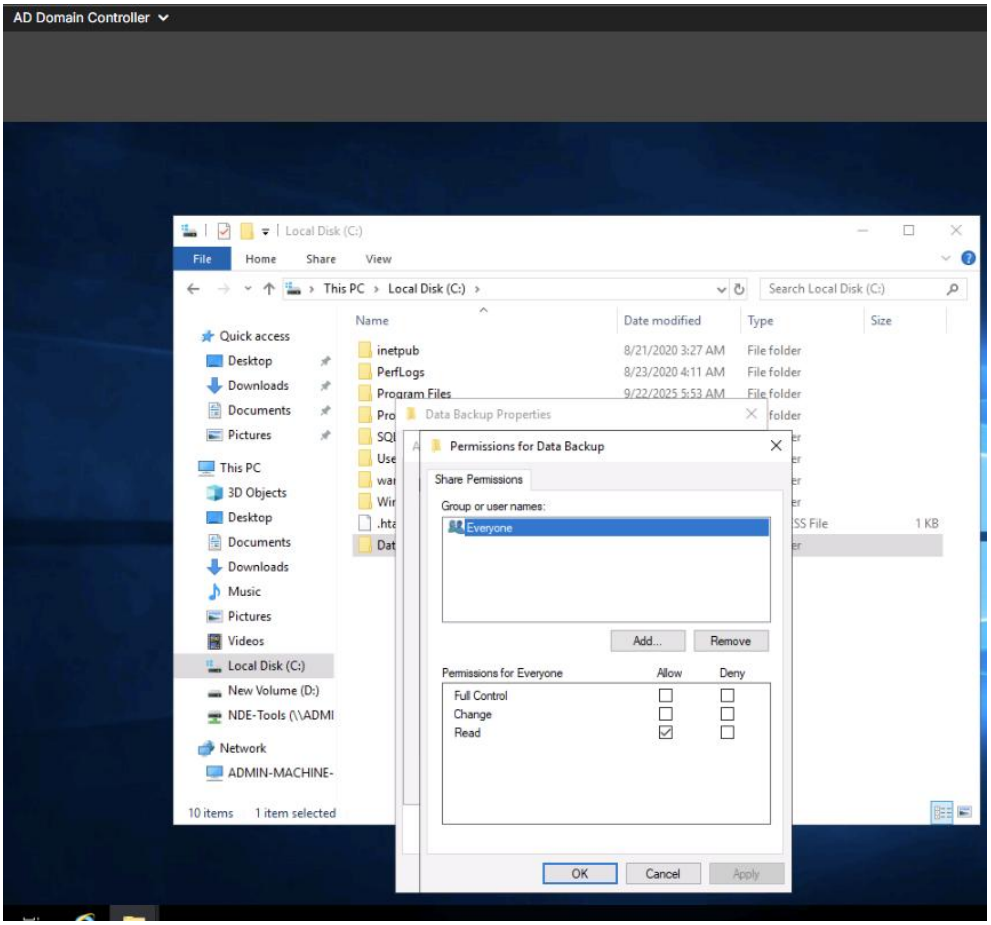
Data loss in an organization can affect its finances, customer relationship, and company data. Data loss in personal computers may lead to the loss of personal files, images, and other important documents saved in the system. Data can be lost because of various reasons such as: hard drive failure, accidental deletion of data or data corruption.

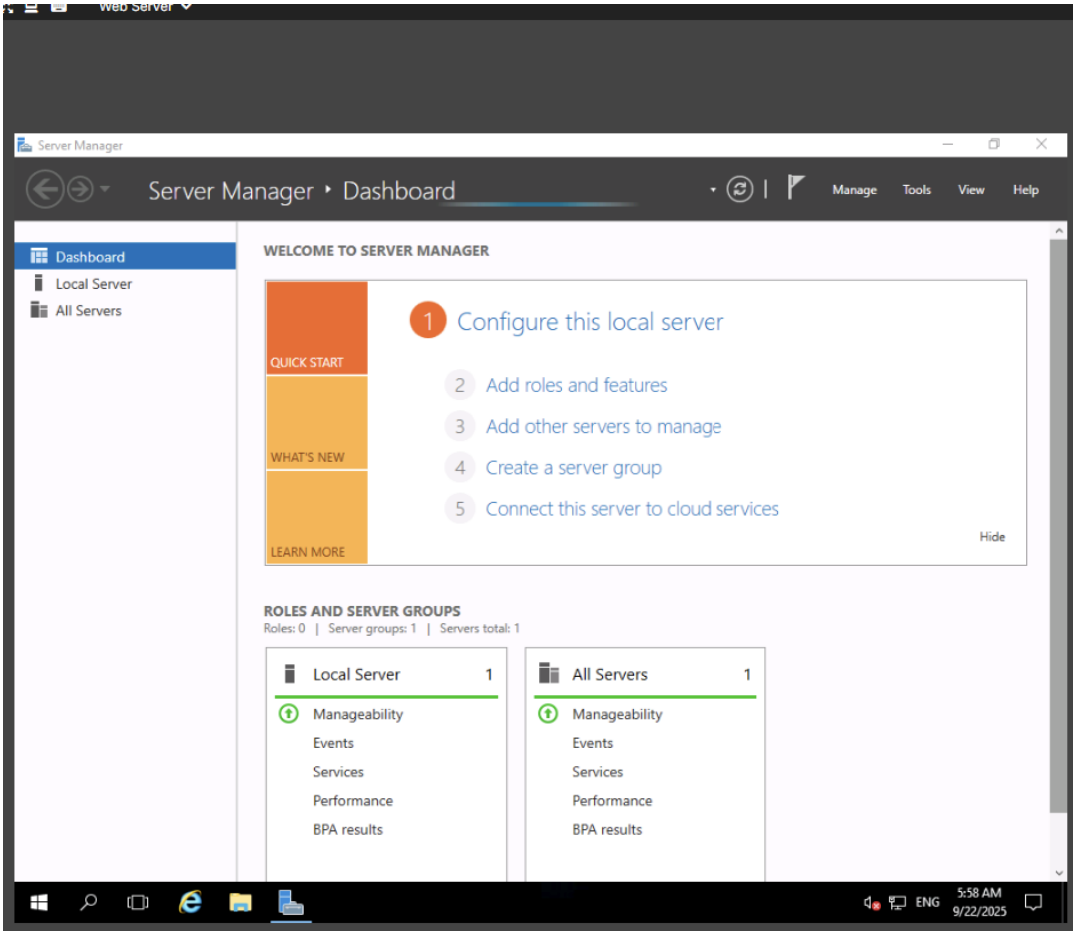
The objective of this lab is to demonstrate how to backup crucial data in a Windows Server machine and use remote servers to store backup data which helps an organization in restoring data in case of a hard-drive failure on the main server.

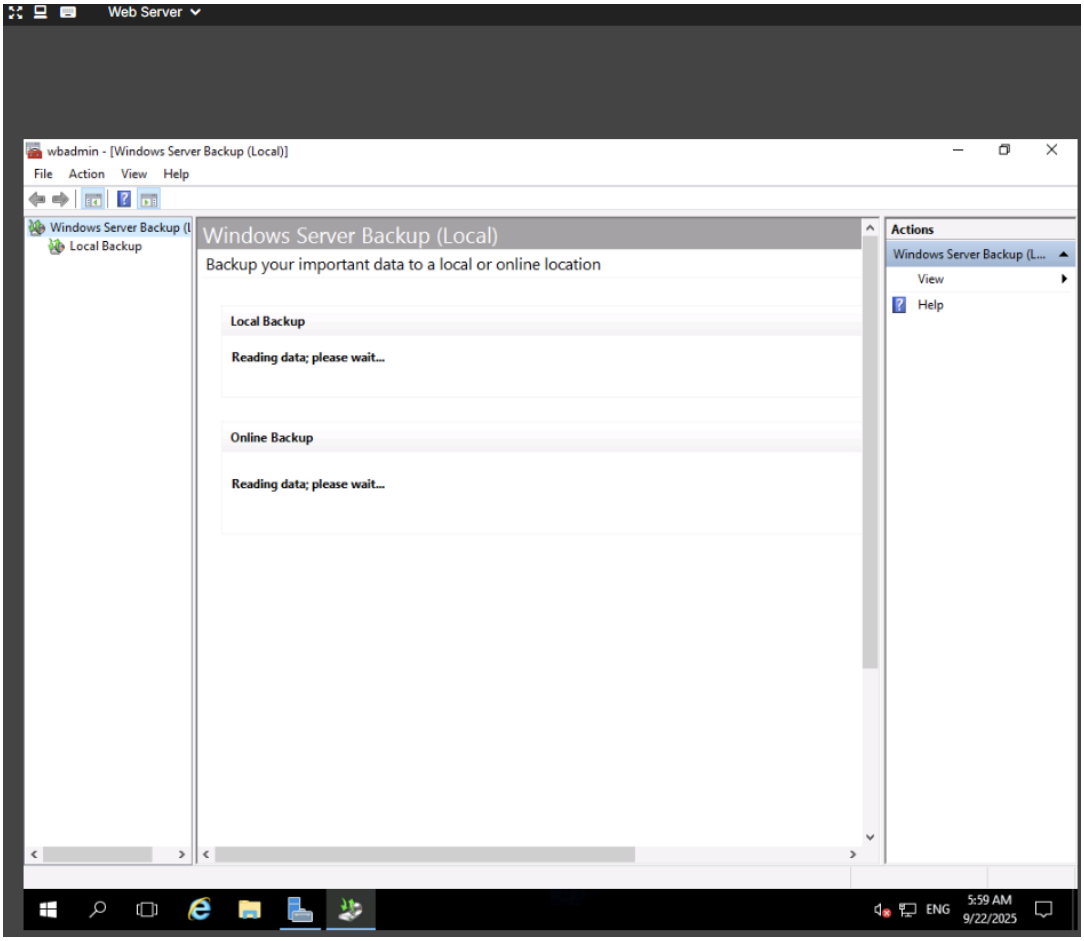
Overview of Back up and Restoration

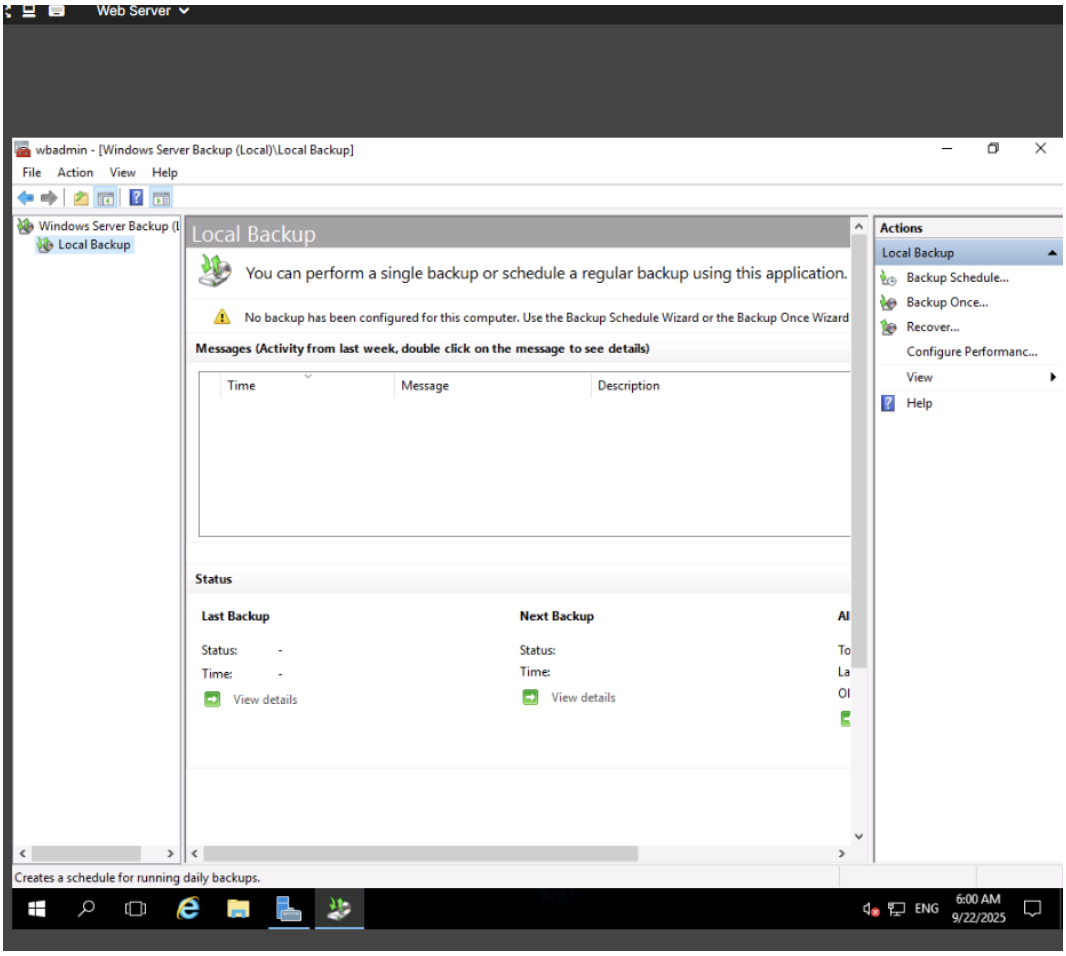
Backup is a mandatory process for all organizations. The process of retrieving lost files from a backup is known as the restoration or recovery of files. The main idea behind data backup is to protect data and information and recover the same after data loss. Data backup is mainly used for two purposes: to reinstate a system to its normal working state after damage, and to recover data and information following data loss or corruption.

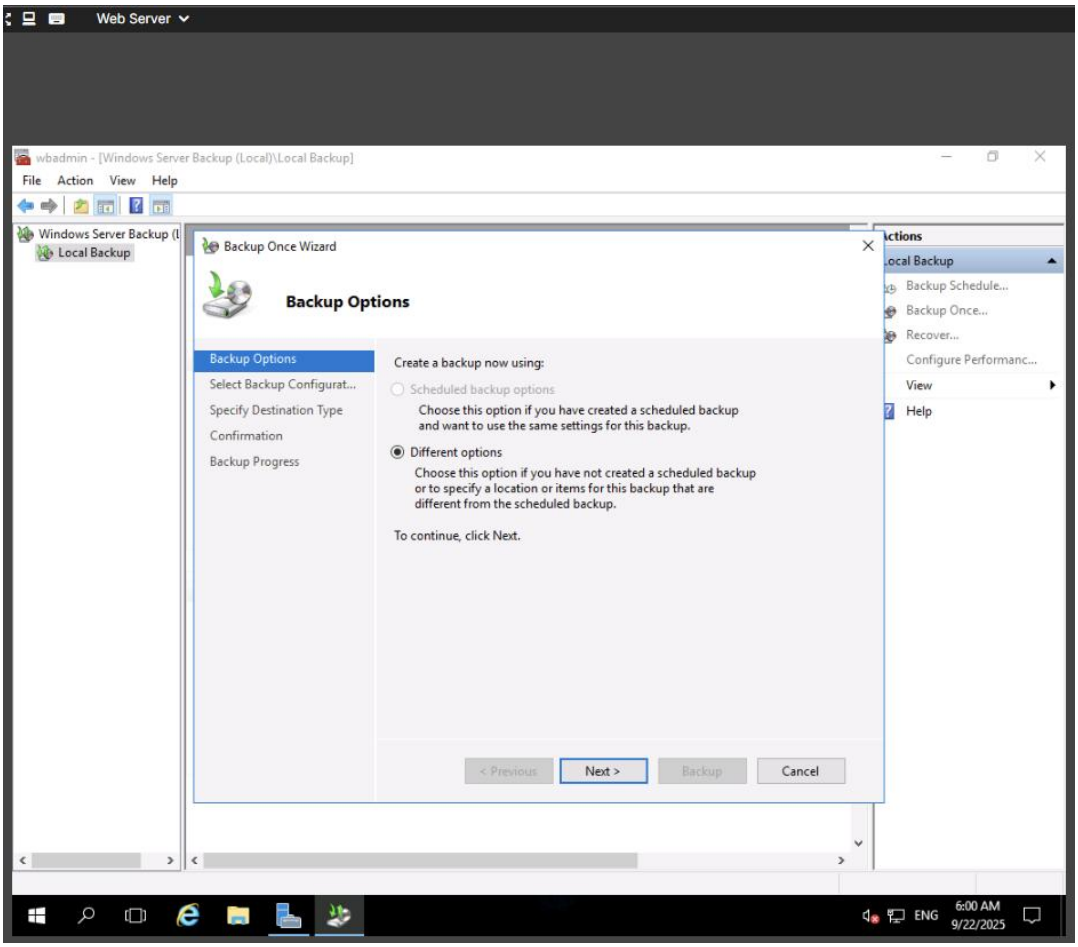


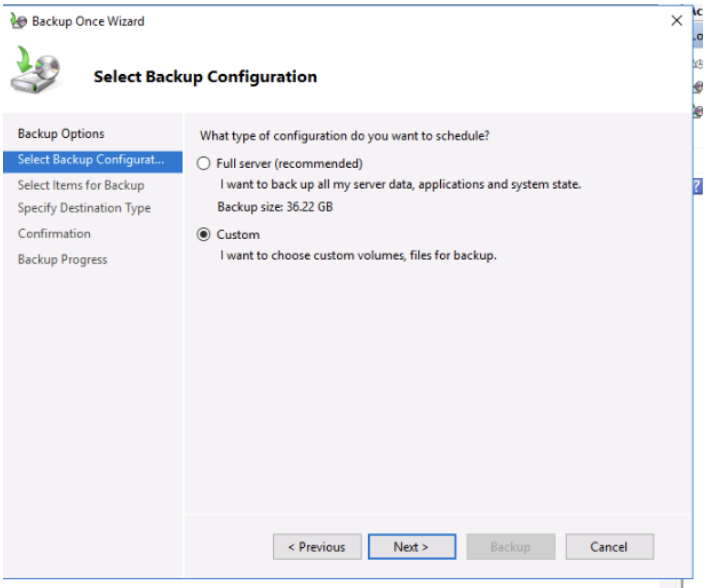

AD Domain Controller
Local Disk (C:)
File
Home
Share
View
This PC › Local Disk (C:) ›
Search Local Disk (C:)
Quick access
Desktop
Downloads
Documents
Pictures
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
New Volume (D:)
NDE-Tools (\\ADMI
Network
ADMIN-MACHINE-
Name
Date modified
Type
Size
inetpub
8/21/2020 3:27 AM
File folder
PerfLogs
8/23/2020 4:11 AM
File folder
Program Files
9/22/2025 5:53 AM
File folder
Data Backup Properties
Permissions for Data Backup
Share Permissions
Group or user names:
Everyone
Add...
Remove
Permissions for Everyone
Allow
Deny
Full Control
Change
Read
OK
Cancel
Apply
10 items
1 item selected

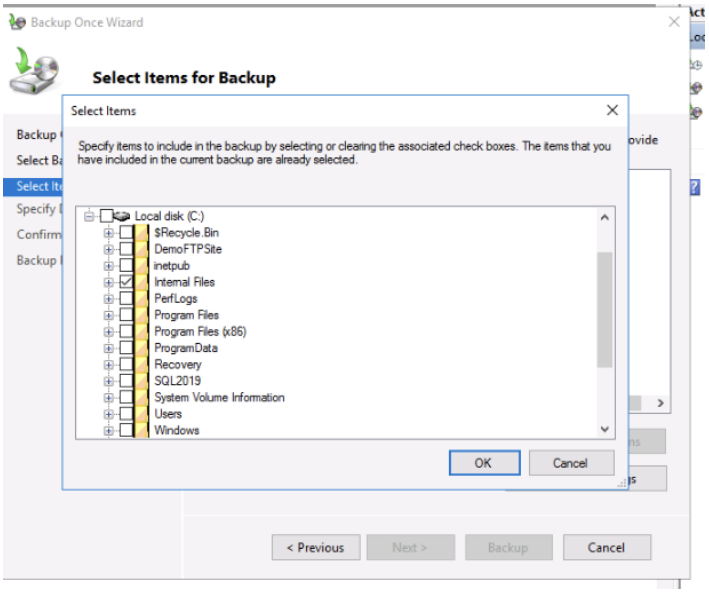

Server Manager
Server Manager ‣ Dashboard
Manage
Tools
View
Help
Dashboard
Local Server
All Servers
WELCOME TO SERVER MANAGER
QUICK START
WHAT'S NEW
LEARN MORE
1 Configure this local server
2 Add roles and features
3 Add other servers to manage
4 Create a server group
5 Connect this server to cloud services
Hide
ROLES AND SERVER GROUPS
Roles: 0 | Server groups: 1 | Servers total: 1
Local Server 1
Manageability
Events
Services
Performance
BPA results
All Servers 1
Manageability
Events
Services
Performance
BPA results
ENG
5:58 AM
9/22/2025

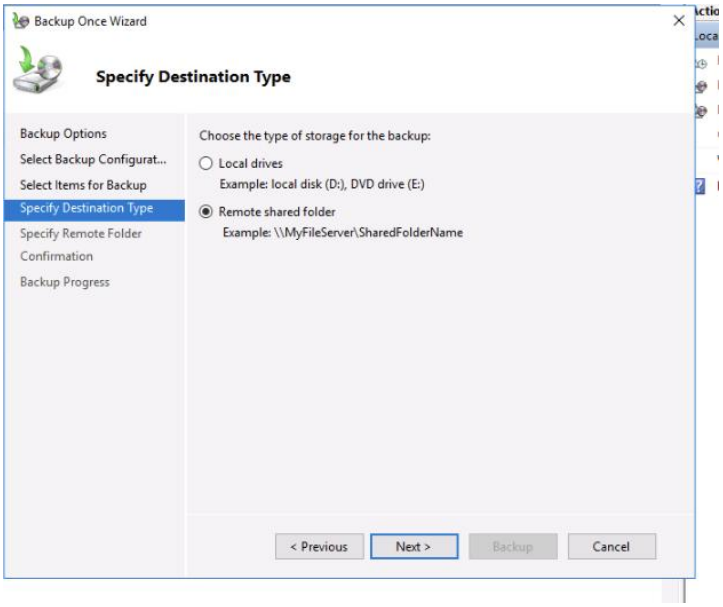

Web Server
wbadmin - [Windows Server Backup (Local)]
File Action View Help
Windows Server Backup (L
Local Backup
Windows Server Backup (Local)
Backup your important data to a local or online location
Local Backup
Reading data; please wait...
Online Backup
Reading data; please wait...
Actions
Windows Server Backup (L...
View
Help
ENG
5:59 AM
9/22/2025

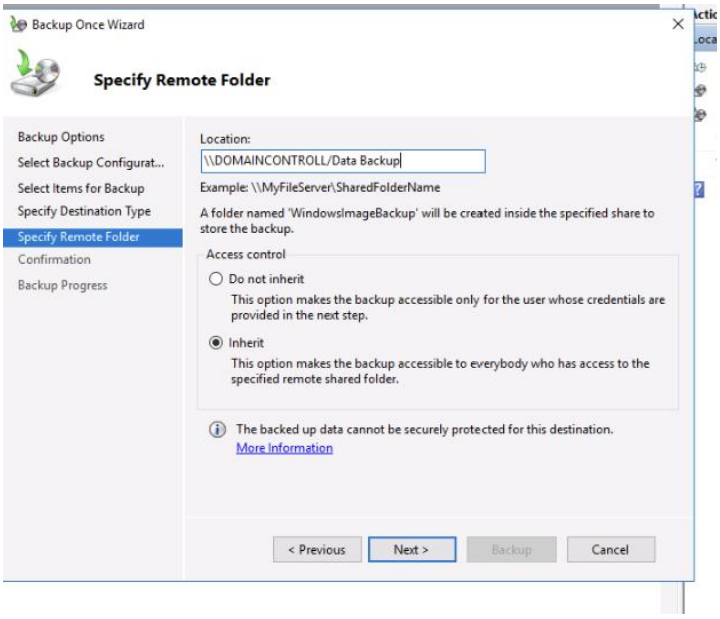

Web Server
wbadmin - [Windows Server Backup (Local)\Local Backup]
File Action View Help
Windows Server Backup (l
Local Backup
Local Backup
You can perform a single backup or schedule a regular backup using this application.
No backup has been configured for this computer. Use the Backup Schedule Wizard or the Backup Once Wizard
Messages (Activity from last week, double click on the message to see details)
Time
Message
Description
Status
Last Backup
Status: -
Time: -
View details
Next Backup
Status:
Time:
View details
Actions
Local Backup
Backup Schedule...
Backup Once...
Recover...
Configure Performanc...
View
Help
Creates a schedule for running daily backups.
ENG
6:00 AM
9/22/2025

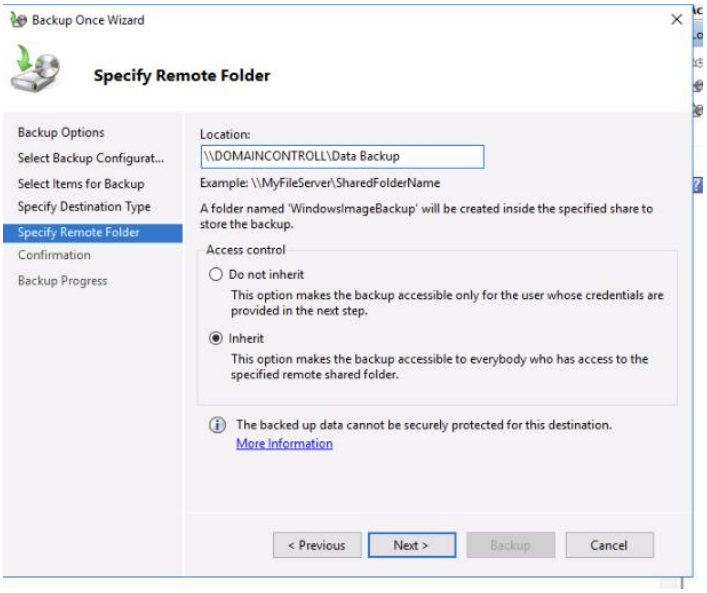

Web Server
wbadmin - [Windows Server Backup (Local)\Local Backup]
File Action View Help
Windows Server Backup (l
Local Backup
Backup Once Wizard
Backup Options
Backup Options
Select Backup Configurat...
Specify Destination Type
Confirmation
Backup Progress
Create a backup now using:
Scheduled backup options
Choose this option if you have created a scheduled backup and want to use the same settings for this backup.
Different options
Choose this option if you have not created a scheduled backup or to specify a location or items for this backup that are different from the scheduled backup.
To continue, click Next.
< Previous
Next >
Backup
Cancel
Actions
Local Backup
Backup Schedule...
Backup Once...
Recover...
Configure Performanc...
View
Help
ENG
6:00 AM
9/22/2025

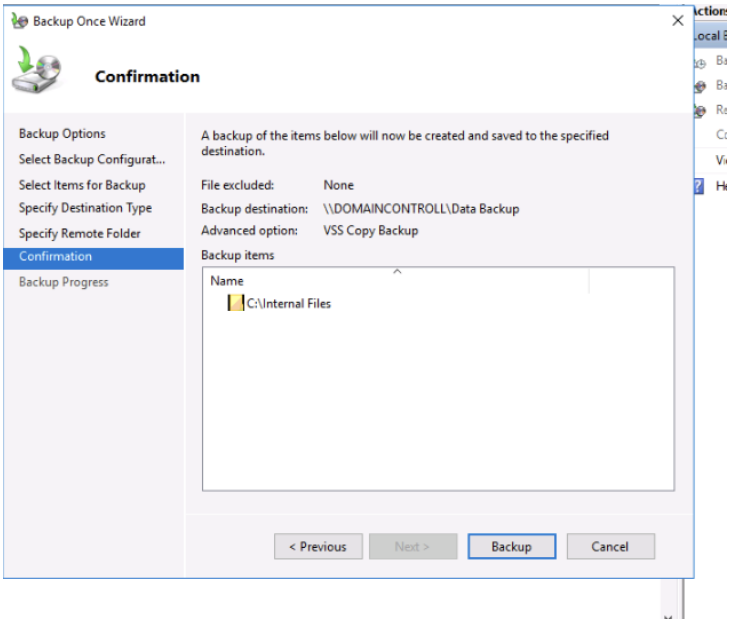

Backup Once Wizard
Select Backup Configuration
Backup Options
Select Backup Configurat...
Select Items for Backup
Specify Destination Type
Confirmation
Backup Progress
What type of configuration do you want to schedule?
Full server (recommended)
I want to back up all my server data, applications and system state.
Backup size: 36.22 GB
Custom
I want to choose custom volumes, files for backup.
< Previous
Next >
Backup
Cancel

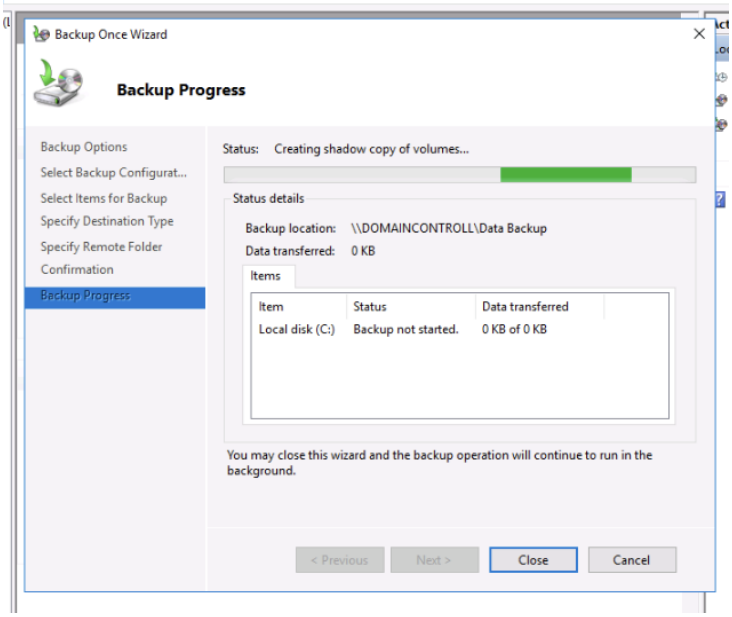

Backup Once Wizard
Select Items for Backup
Select Items
Specify items to include in the backup by selecting or clearing the associated check boxes. The items that you have included in the current backup are already selected.
Local disk (C:)
$Recycle.Bin
DemoFTPSite
inetpub
Internal Files
PerfLogs
Program Files
Program Files (x86)
ProgramData
Recovery
SQL2019
System Volume Information
Users
Windows
OK
Cancel
< Previous
Next >
Backup
Cancel

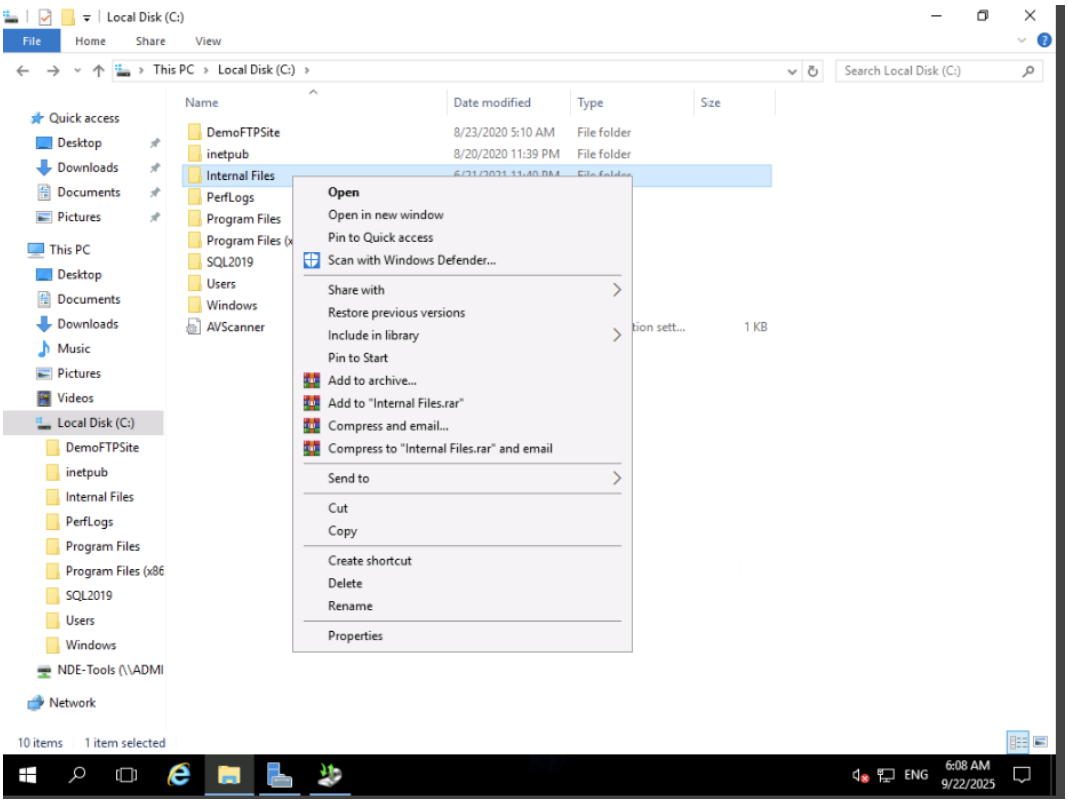

Backup Once Wizard
Specify Destination Type
Backup Options
Select Backup Configurat...
Select Items for Backup
Specify Destination Type
Specify Remote Folder
Confirmation
Backup Progress
Choose the type of storage for the backup:
Local drives
Example: local disk (D:), DVD drive (E:)
Remote shared folder
Example: \\MyFileServer\SharedFolderName
< Previous
Next >
Backup
Cancel

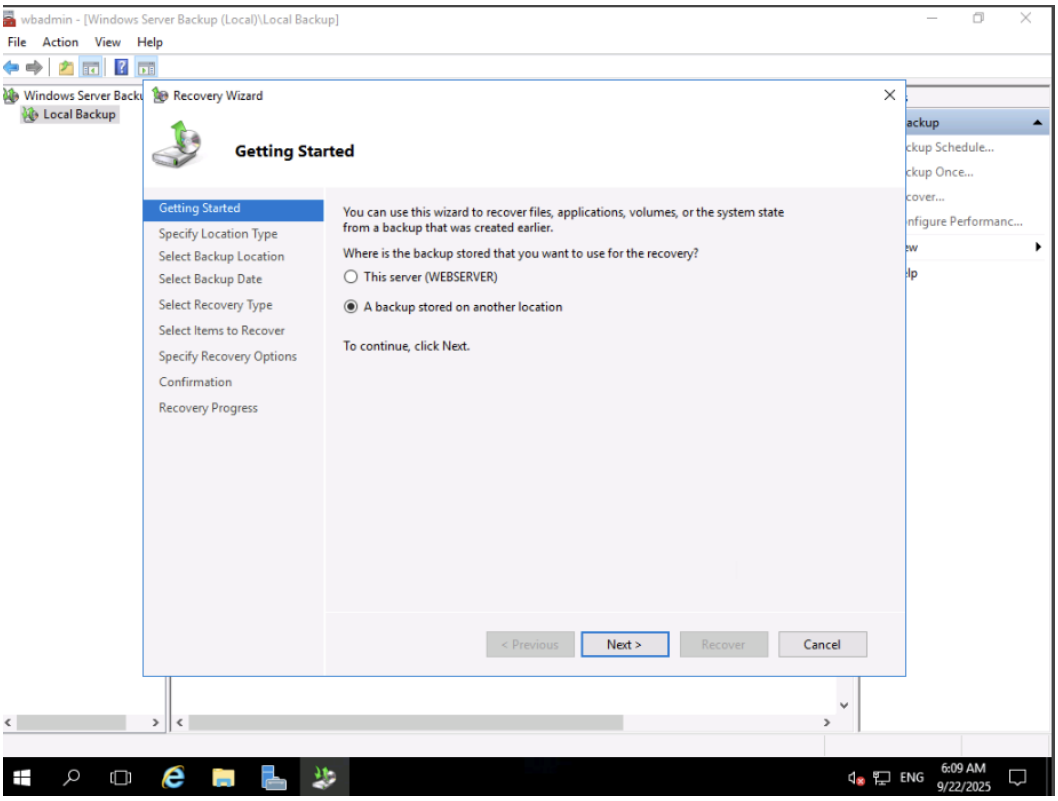

Backup Once Wizard
Specify Remote Folder
Backup Options
Select Backup Configurat...
Select Items for Backup
Specify Destination Type
Specify Remote Folder
Confirmation
Backup Progress
Location:
\\DOMAINCONTROLL/Data Backup
Example: \\MyFileServer\SharedFolderName
A folder named 'WindowsImageBackup' will be created inside the specified share to store the backup.
Access control
Do not inherit
This option makes the backup accessible only for the user whose credentials are provided in the next step.
Inherit
This option makes the backup accessible to everybody who has access to the specified remote shared folder.
The backed up data cannot be securely protected for this destination.
More Information
< Previous
Next >
Backup
Cancel

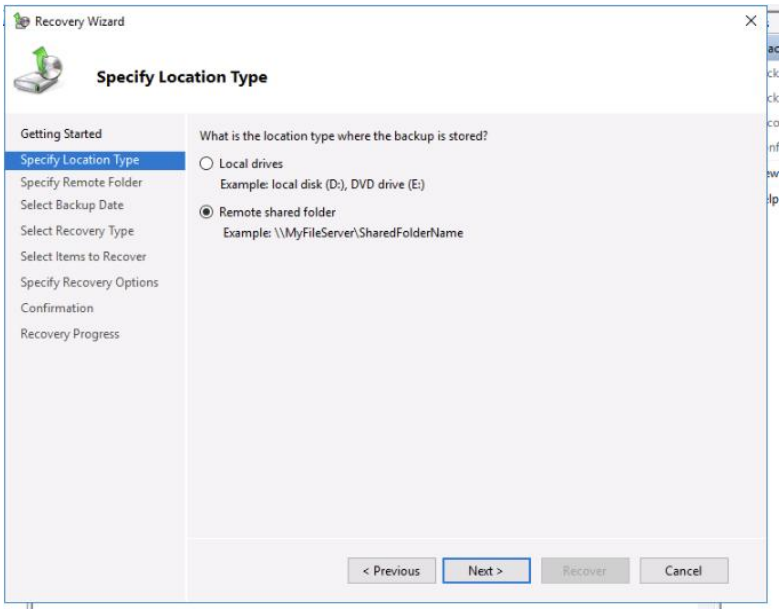

Backup Once Wizard
Specify Remote Folder
Backup Options
Select Backup Configurat...
Select Items for Backup
Specify Destination Type
Specify Remote Folder
Confirmation
Backup Progress
Location:
\\DOMAINCONTROLL\Data Backup
Example: \\MyFileServer\SharedFolderName
A folder named 'WindowsImageBackup' will be created inside the specified share to store the backup.
Access control
Do not inherit
This option makes the backup accessible only for the user whose credentials are provided in the next step.
Inherit
This option makes the backup accessible to everybody who has access to the specified remote shared folder.
The backed up data cannot be securely protected for this destination.
More Information
< Previous
Next >
Backup
Cancel

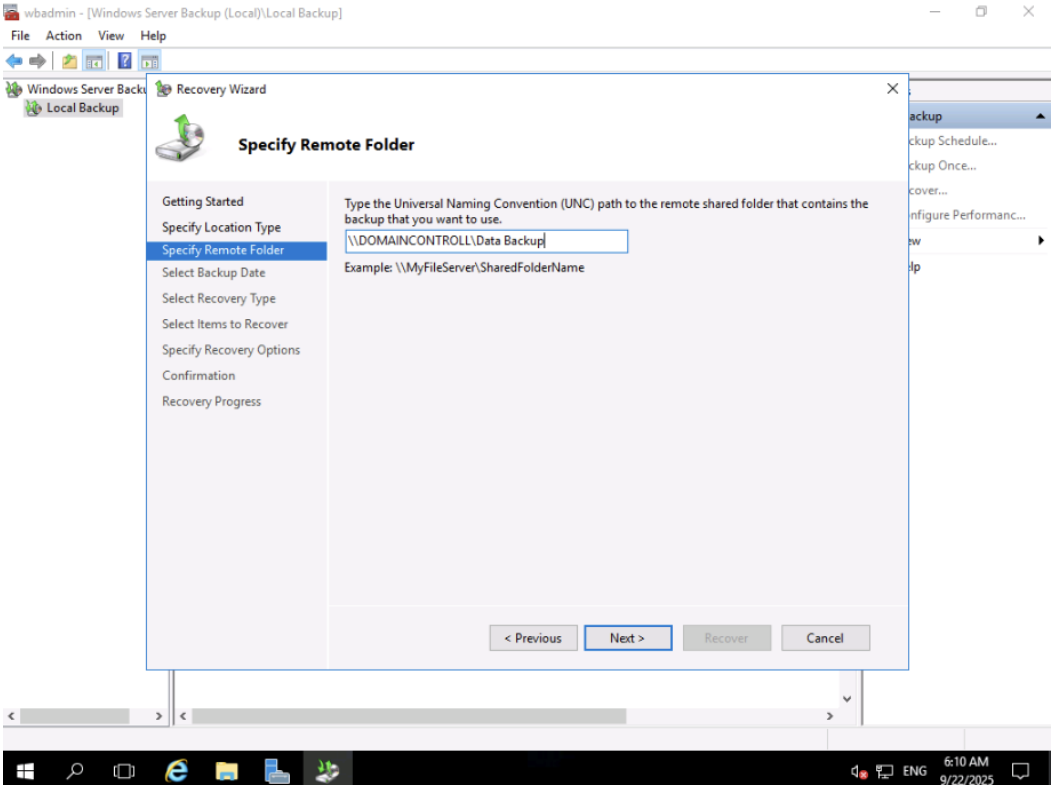

Backup Once Wizard
Confirmation
Backup Options
Select Backup Configurat...
Select Items for Backup
Specify Destination Type
Specify Remote Folder
Confirmation
Backup Progress
A backup of the items below will now be created and saved to the specified destination.
File excluded: None
Backup destination: \\DOMAINCONTROLL\Data Backup
Advanced option: VSS Copy Backup
Backup items
Name
C:\Internal Files
< Previous
Next >
Backup
Cancel

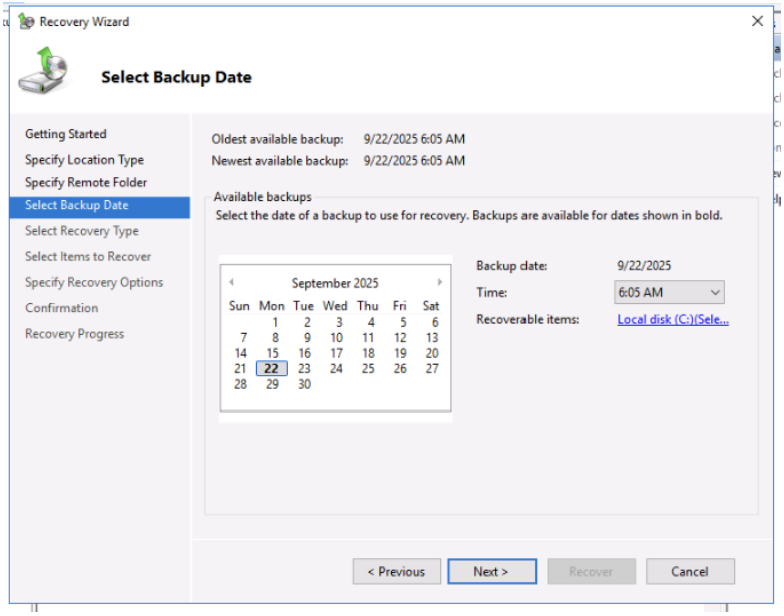

Backup Once Wizard
Backup Progress
Backup Options
Select Backup Configurat...
Select Items for Backup
Specify Destination Type
Specify Remote Folder
Confirmation
Backup Progress
Status: Creating shadow copy of volumes...
Status details
Backup location: \\DOMAINCONTROLL\Data Backup
Data transferred: 0 KB
Items
Item
Status
Data transferred
Local disk (C:)
Backup not started.
0 KB of 0 KB
You may close this wizard and the backup operation will continue to run in the background.
< Previous
Next >
Close
Cancel

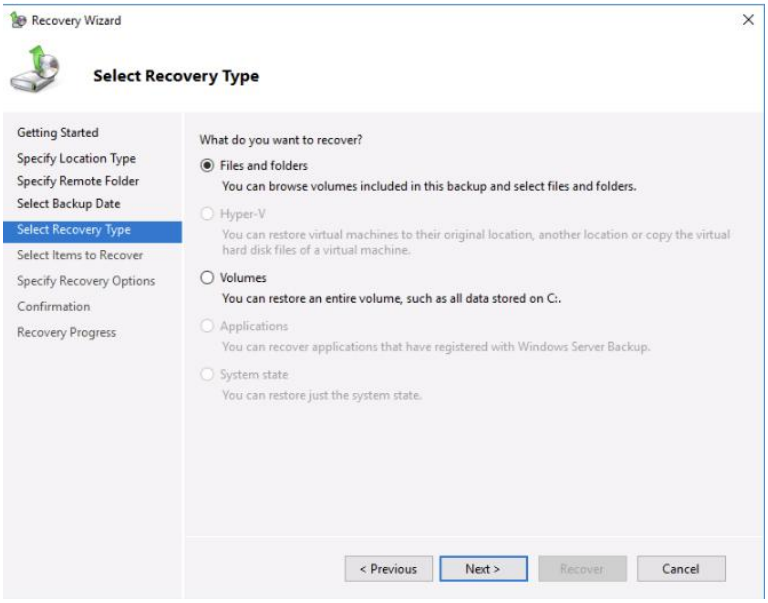

Local Disk (C:)
File
Home
Share
View
This PC › Local Disk (C:) ›
Search Local Disk (C:)
Quick access
Desktop
Downloads
Documents
Pictures
This PC
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
DemoFTPSite
inetpub
Internal Files
PerfLogs
Program Files
Program Files (x86
SQL2019
Users
Windows
NDE-Tools (\\ADMI
Network
Name
Date modified
Type
Size
DemoFTPSite
8/23/2020 5:10 AM
File folder
inetpub
8/20/2020 11:39 PM
File folder
Internal Files
PerfLogs
Program Files
Program Files (x
SQL2019
Users
Windows
AVScanner
1 KB
Open
Open in new window
Pin to Quick access
Scan with Windows Defender...
Share with
Restore previous versions
Include in library
Pin to Start
Add to archive...
Add to "Internal Files.rar"
Compress and email...
Compress to "Internal Files.rar" and email
Send to
Cut
Copy
Create shortcut
Delete
Rename
Properties
10 items
1 item selected
ENG
6:08 AM
9/22/2025

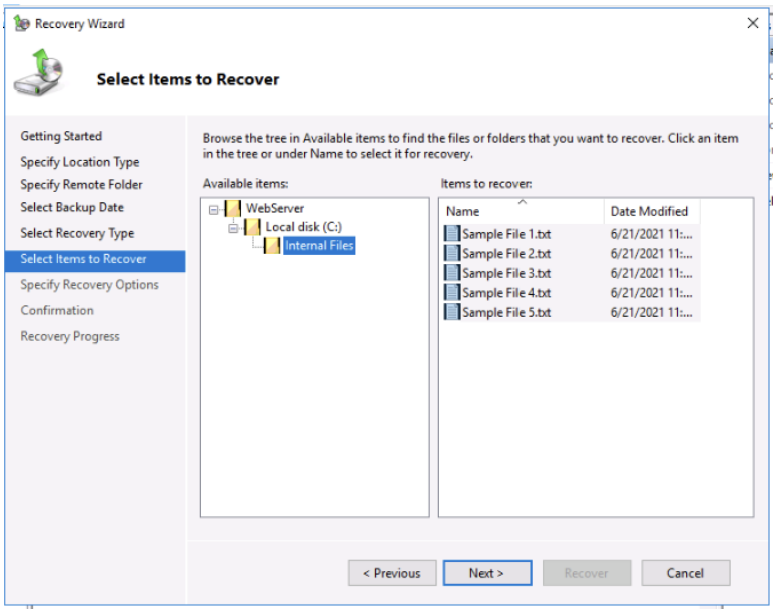

wbadmin - [Windows Server Backup (Local)\Local Backup]
File
Action
View
Help
Windows Server Backu
Local Backup
Recovery Wizard
Getting Started
Getting Started
Specify Location Type
Select Backup Location
Select Backup Date
Select Recovery Type
Select Items to Recover
Specify Recovery Options
Confirmation
Recovery Progress
You can use this wizard to recover files, applications, volumes, or the system state from a backup that was created earlier.
Where is the backup stored that you want to use for the recovery?
This server (WEBSERVER)
A backup stored on another location
To continue, click Next.
< Previous
Next >
Recover
Cancel
ackup
ckup Schedule...
ckup Once...
cover...
nfigure Performanc...
ew
lp
ENG
6:09 AM
9/22/2025

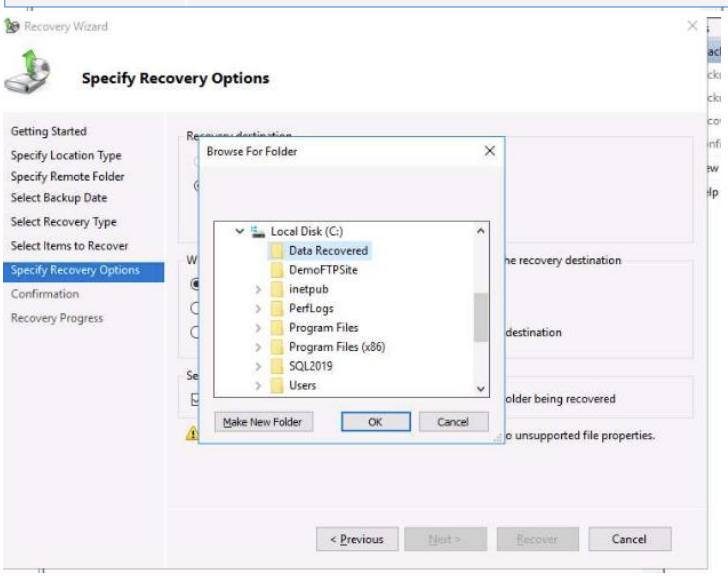

Recovery Wizard
Specify Location Type
Getting Started
Specify Location Type
Specify Remote Folder
Select Backup Date
Select Recovery Type
Select Items to Recover
Specify Recovery Options
Confirmation
Recovery Progress
What is the location type where the backup is stored?
Local drives
Example: local disk (D:), DVD drive (E:)
Remote shared folder
Example: \\MyFileServer\SharedFolderName
< Previous
Next >
Recover
Cancel

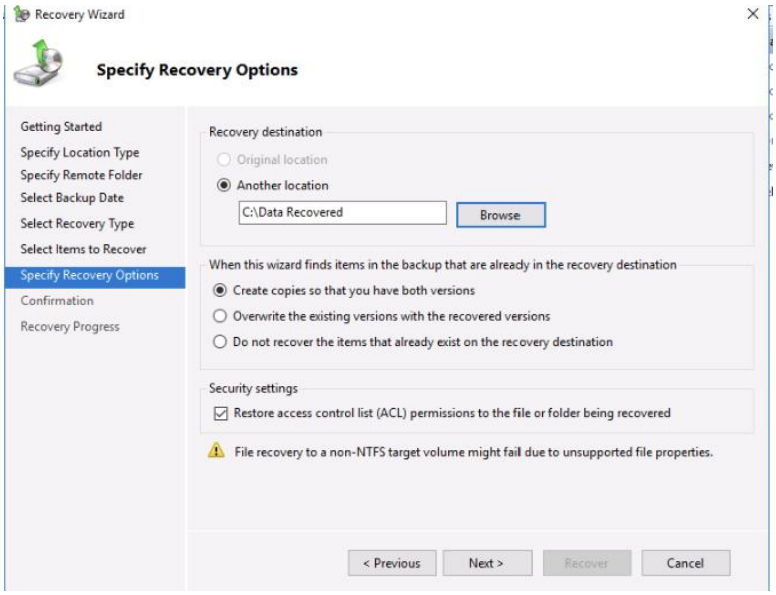

wbadmin - [Windows Server Backup (Local)\Local Backup]
File
Action
View
Help
Windows Server Backu
Local Backup
Recovery Wizard
Specify Remote Folder
Getting Started
Specify Location Type
Specify Remote Folder
Select Backup Date
Select Recovery Type
Select Items to Recover
Specify Recovery Options
Confirmation
Recovery Progress
Type the Universal Naming Convention (UNC) path to the remote shared folder that contains the backup that you want to use.
\\DOMAINCONTROLL\Data Backup
Example: \\MyFileServer\SharedFolderName
< Previous
Next >
Recover
Cancel
ENG
6:10 AM
9/22/2025

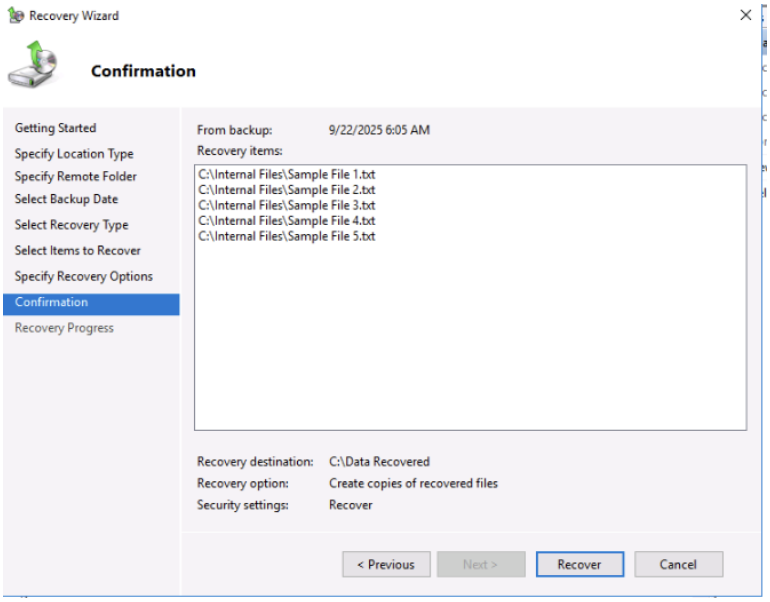

Recovery Wizard
Select Backup Date
Getting Started
Specify Location Type
Specify Remote Folder
Select Backup Date
Select Recovery Type
Select Items to Recover
Specify Recovery Options
Confirmation
Recovery Progress
Oldest available backup: 9/22/2025 6:05 AM
Newest available backup: 9/22/2025 6:05 AM
Available backups
Select the date of a backup to use for recovery. Backups are available for dates shown in bold.
September 2025
Sun Mon Tue Wed Thu Fri Sat
Backup date: 9/22/2025
Time: 6:05 AM
Recoverable items: Local disk (C:)(Sele...
< Previous
Next >
Recover
Cancel

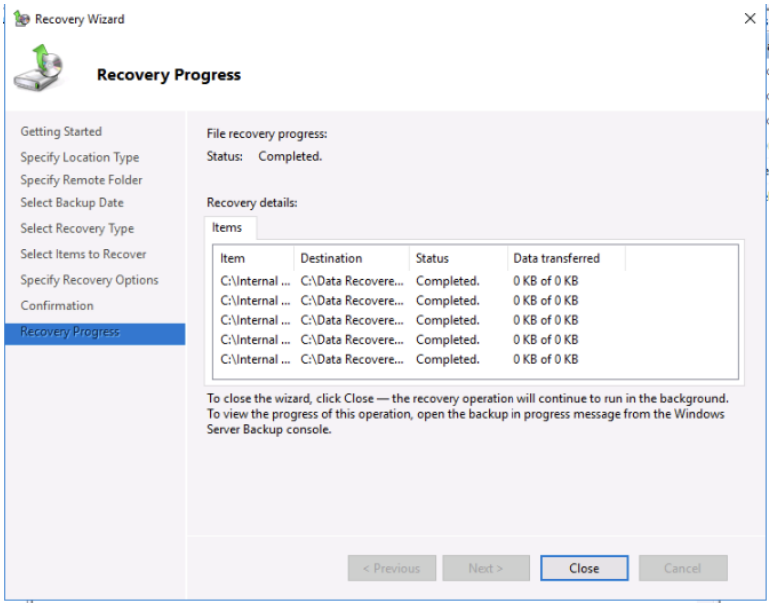

Recovery Wizard
Select Recovery Type
Getting Started
Specify Location Type
Specify Remote Folder
Select Backup Date
Select Recovery Type
Select Items to Recover
Specify Recovery Options
Confirmation
Recovery Progress
What do you want to recover?
Files and folders
You can browse volumes included in this backup and select files and folders.
Hyper-V
You can restore virtual machines to their original location, another location or copy the virtual hard disk files of a virtual machine.
Volumes
You can restore an entire volume, such as all data stored on C:.
Applications
You can recover applications that have registered with Windows Server Backup.
System state
You can restore just the system state.
< Previous
Next >
Recover
Cancel

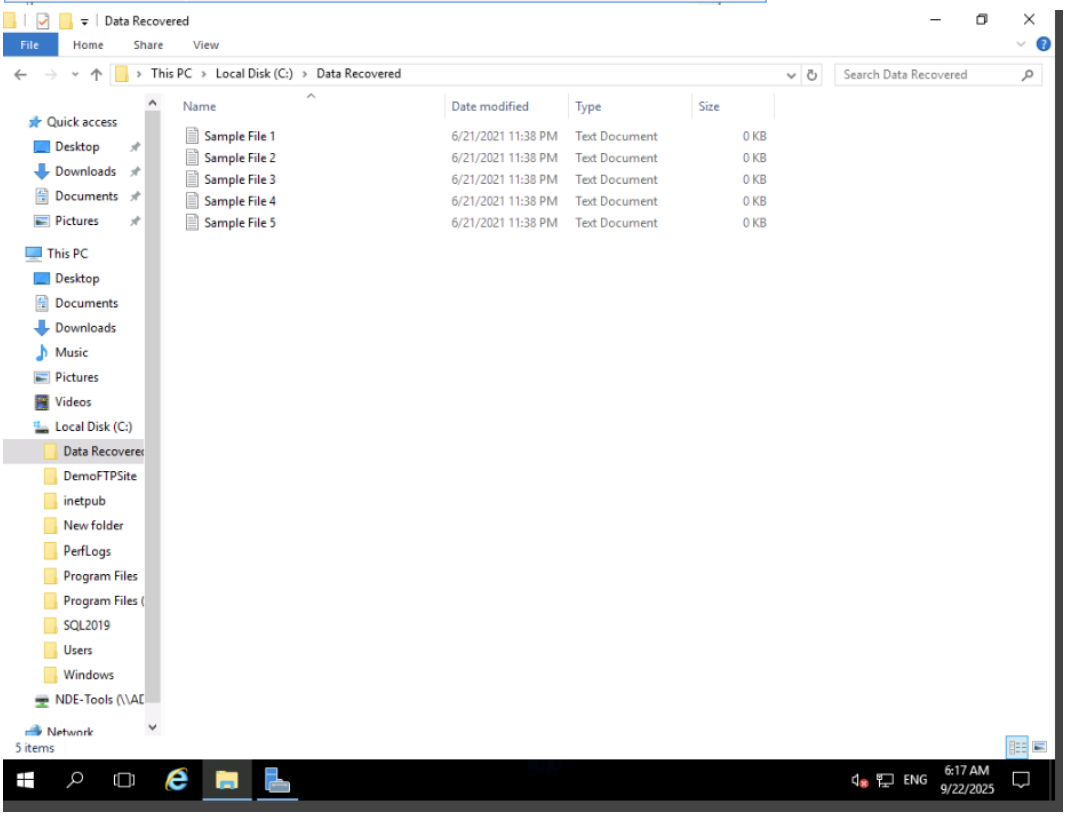

Recovery Wizard
Select Items to Recover
Getting Started
Specify Location Type
Specify Remote Folder
Select Backup Date
Select Recovery Type
Select Items to Recover
Specify Recovery Options
Confirmation
Recovery Progress
Browse the tree in Available items to find the files or folders that you want to recover. Click an item in the tree or under Name to select it for recovery.
Available items:
WebServer
Local disk (C:)
Internal Files
Items to recover:
Name
Date Modified
Sample File 1.txt
Sample File 2.txt
Sample File 3.txt
Sample File 4.txt
Sample File 5.txt
6/21/2021 11:...
< Previous
Next >
Recover
Cancel


Recovery Wizard
Specify Recovery Options
Getting Started
Specify Location Type
Specify Remote Folder
Select Backup Date
Select Recovery Type
Select Items to Recover
Specify Recovery Options
Confirmation
Recovery Progress
Browse For Folder
Local Disk (C:)
Data Recovered
DemoFTPSite
inetpub
PerfLogs
Program Files
Program Files (x86)
SQL2019
Users
Make New Folder
OK
Cancel
< Previous
Next >
Recover
Cancel


Recovery Wizard
Specify Recovery Options
Getting Started
Specify Location Type
Specify Remote Folder
Select Backup Date
Select Recovery Type
Select Items to Recover
Specify Recovery Options
Confirmation
Recovery Progress
Recovery destination
Original location
Another location
C:\Data Recovered
Browse
When this wizard finds items in the backup that are already in the recovery destination
Create copies so that you have both versions
Overwrite the existing versions with the recovered versions
Do not recover the items that already exist on the recovery destination
Security settings
Restore access control list (ACL) permissions to the file or folder being recovered
File recovery to a non-NTFS target volume might fail due to unsupported file properties.
< Previous
Next >
Recover
Cancel


Recovery Wizard
Confirmation
Getting Started
Specify Location Type
Specify Remote Folder
Select Backup Date
Select Recovery Type
Select Items to Recover
Specify Recovery Options
Confirmation
Recovery Progress
From backup: 9/22/2025 6:05 AM
Recovery items:
C:\Internal Files\Sample File 1.txt
C:\Internal Files\Sample File 2.txt
C:\Internal Files\Sample File 3.txt
C:\Internal Files\Sample File 4.txt
C:\Internal Files\Sample File 5.txt
Recovery destination: C:\Data Recovered
Recovery option: Create copies of recovered files
Security settings: Recover
< Previous
Next >
Recover
Cancel


Recovery Wizard
Recovery Progress
Getting Started
Specify Location Type
Specify Remote Folder
Select Backup Date
Select Recovery Type
Select Items to Recover
Specify Recovery Options
Confirmation
Recovery Progress
File recovery progress:
Status: Completed.
Recovery details:
Items
Item Destination Status Data transferred
C:\Internal ... C:\Data Recovere... Completed. 0 KB of 0 KB
C:\Internal ... C:\Data Recovere... Completed. 0 KB of 0 KB
C:\Internal ... C:\Data Recovere... Completed. 0 KB of 0 KB
C:\Internal ... C:\Data Recovere... Completed. 0 KB of 0 KB
C:\Internal ... C:\Data Recovere... Completed. 0 KB of 0 KB
To close the wizard, click Close — the recovery operation will continue to run in the background. To view the progress of this operation, open the backup in progress message from the Windows Server Backup console.
< Previous
Next >
Close
Cancel


Data Recovered
File Home Share View
This PC › Local Disk (C:) › Data Recovered
Search Data Recovered
Quick access
Desktop
Downloads
Documents
Pictures
This PC
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
Data Recovere
DemoFTPSite
inetpub
New folder
PerfLogs
Program Files
Program Files (
SQL2019
Users
Windows
NDE-Tools (\\AD
Network
Name Date modified Type Size
Sample File 1 6/21/2021 11:38 PM Text Document 0 KB
Sample File 2 6/21/2021 11:38 PM Text Document 0 KB
Sample File 3 6/21/2021 11:38 PM Text Document 0 KB
Sample File 4 6/21/2021 11:38 PM Text Document 0 KB
Sample File 5 6/21/2021 11:38 PM Text Document 0 KB
5 items
ENG
6:17 AM
9/22/2025

Lab Summary: Data Security

Exercise 1: Perform Disk Encryption using VeraCrypt

This exercise demonstrated how to encrypt a volume using VeraCrypt. A volume was created and secured with a password, ensuring that all files, folders, metadata, and free space were encrypted. The lab highlighted how disk encryption prevents unauthorized access to data, since the encrypted content cannot be read without the proper key or password. This reinforced the principle of confidentiality in data security.

Exercise 2: File Recovery using EaseUS Data Recovery Wizard

This lab showed how deleted files can be recovered using EaseUS Data Recovery Wizard. After intentionally deleting files, the recovery software was used to scan the system and restore them. The exercise demonstrated the importance of recovery tools in scenarios involving accidental deletion, disk formatting, software crashes, or malware attacks. This reinforced the principle of availability, since critical data can be restored even after loss.

Exercise 3: Backing Up and Restoring Data in Windows

The final exercise focused on creating backups and restoring data in a Windows environment. Backup procedures were configured to protect important files and ensure they could be restored in the event of corruption, accidental deletion, or hardware failure. The exercise highlighted how regular backups safeguard both organizational and personal data, ensuring continuity of operations after disruptions.

Reflection

This module demonstrated three complementary pillars of data security:

- **Confidentiality** through disk encryption.
- **Availability** through data recovery.
- **Resilience and continuity** through backup and restoration.

Together, these labs emphasized the need for organizations to implement layered protections that not only prevent unauthorized access but also ensure critical data can be recovered or restored in case of loss.