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- 2. 5. 1. Basic Disks -

Disk Partitions

In a Basic Disk, disk partitioning is the creation of one or more regions on a hard disk or other secondary storage, so that an operating system can manage information in each region separately.

Partitioning is typically the first step of preparing a newly manufactured disk, before any files or directories have been created.

The disk stores the information about the partitions' locations and sizes in an area known as the partition table that the operating system reads before any other part of the disk.

Each partition then appears in the operating system as a distinct "logical" disk that uses part of the actual disk.

System administrators use a program called a partition editor to create, resize, delete, and manipulate the partitions.

When a hard drive is installed in a computer, it must be partitioned before you can format and use it.

Partitioning a drive is when you divide the total storage of a drive into different pieces.

These pieces are called partitions.

Once a partition is created, it can then be formatted so that it can be used on a computer.

Types of Partitions

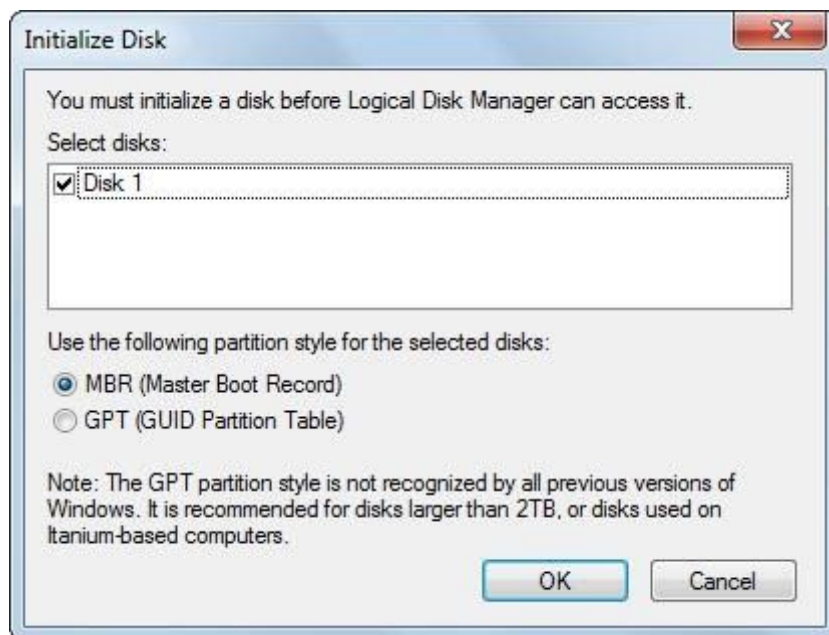
On a Basic Disk, we can create 2 styles of partitions, namely MBR (Master Boot Record) style partition and GPT (GUID Partition Table) style partition.

To create MBR style partitions, we need to initialize the hard disk to MBR (Master Boot Record).

To create GPT style partitions, we should initialize the disk to GPT (GUID Partition Table).

The Master Boot Record (MBR) partitioning scheme has been used historically in MS-DOS, Microsoft Windows and Linux (among others) on PC-compatible computer systems.

Most newer computers use the GUID Partition Table (GPT) partitioning scheme instead.



On MBR disks, partitions are called primary partition, extended partition, or logical partition while all partitions on GPT disks are called GPT partitions, which function like primary partitions.

An MBR based basic disk can have either 4 primary partitions or 3 primary partitions plus 1 extended partition, but the extended partition can contain an unlimited number of logical drives.

A GPT based hard disk can hold up to 128 GPT partitions.

The following operations can be performed only on basic disks:

- Create and delete primary and extended partitions.
- Create and delete logical drives within an extended partition.
- Format a partition and mark it as active.
- Convert from a basic disk to a dynamic disk.

1. Primary partition

A primary partition contains one file system.

In DOS and all early versions of Microsoft Windows systems, Microsoft required what it called the system partition to be the first partition.

All Windows operating systems from Windows 95 onwards can be located on (almost) any partition, but the boot files (io.sys, bootmgr, ntldr, etc.) must reside on a primary partition.

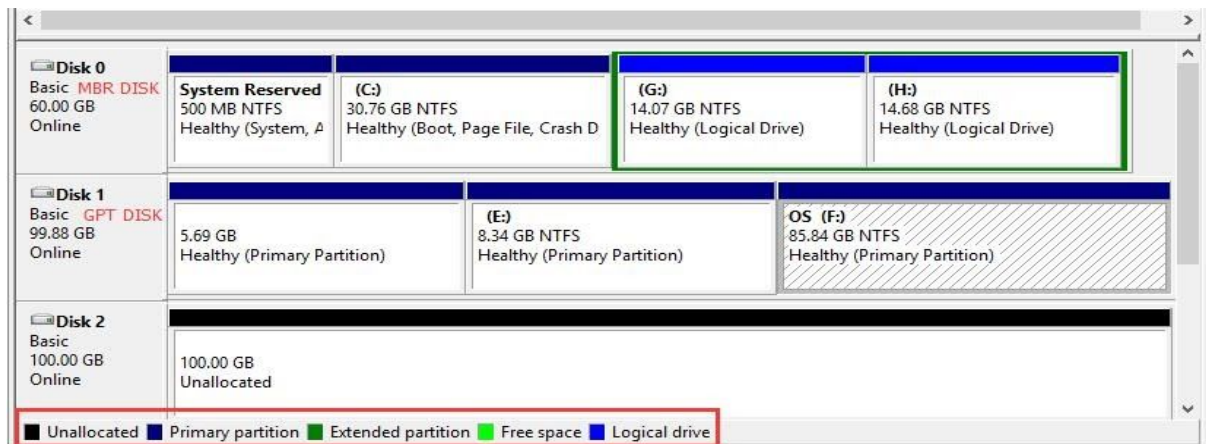
However, other factors, such as a PC's BIOS may also impose specific requirements as to which partition must contain the primary OS.

2. Extended partition

A hard disk can contain only one extended partition.

3. Logical partition

A hard disk can contain only one extended partition, but that extended partition can be subdivided into multiple logical partitions.



- 2.5.2. Dynamic Disks -

Disk Volumes

In a Dynamic Disk, a Disk Volume is similar to a Disk Partition in a Basic Disk.

A Disk Volume is a part of the hard disk that acts as a separated unit.

Dynamic disks provide features that basic disks do not, such as the ability to create volumes that span multiple disks (spanned and striped volumes) and the ability to create fault-tolerant volumes (mirrored and RAID-5 volumes).

Like basic disks, dynamic disks can use the MBR or GPT partition styles on systems that support both.

All volumes on dynamic disks are known as dynamic volumes.

Dynamic disks offer greater flexibility for volume management because they use a database to track information about dynamic volumes on the disk and about other dynamic disks in the computer.

Because each dynamic disk in a computer stores a replica of the dynamic disk database, for example, a corrupted dynamic disk database can repair one dynamic disk by using the database on another dynamic disk.

With dynamic disks, you can do the following:

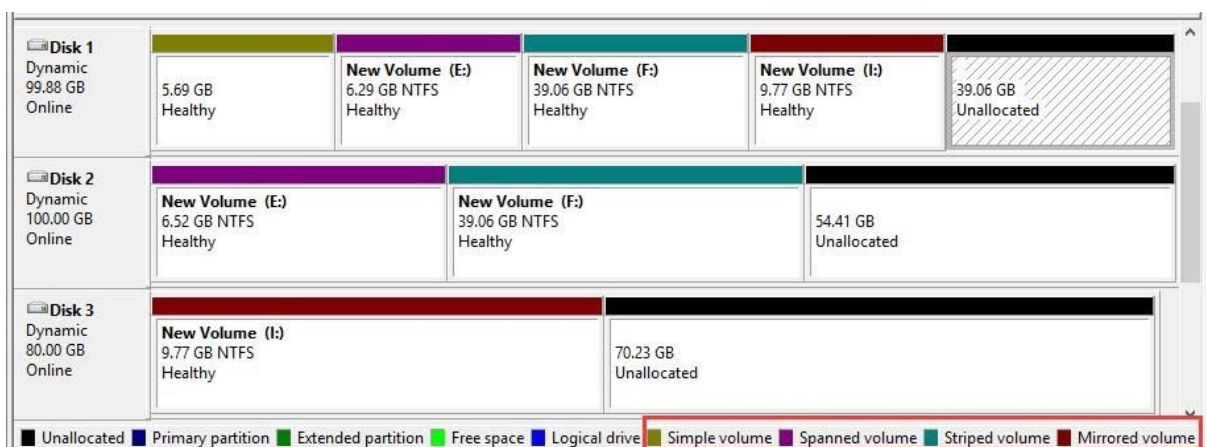
- Create and delete simple, striped, spanned, mirrored, and RAID-5 volumes.
- Remove a mirror from a mirrored volume.
- Extend simple or spanned volumes.
- Split a volume into two volumes.

- Repair mirrored or RAID-5 volumes.
- Reactivate a missing or offline disk.

Types of Volumes

On a dynamic disk, we can create 5 types of dynamic volumes to enhance computer performance:

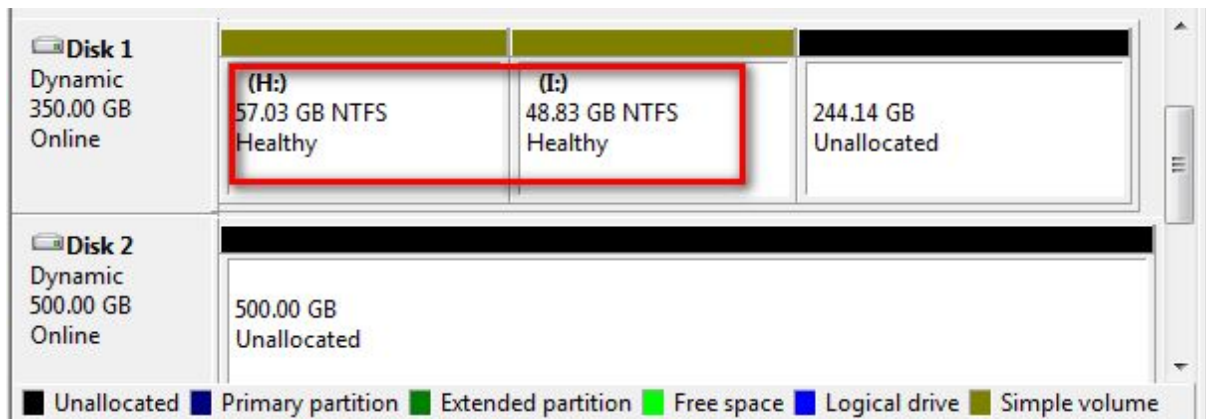
- Simple volume: functions like primary partitions on basic disks.
- Mirrored volume: provides fault tolerance by creating a copy of data contained in this volume.
- Striped volume: improves disk input/output performance by distributing I/O requests across disks.
- Spanned volume: combines spaces on 2 hard disks at least to a dynamic volume.
- RAID-5 volume: stripes data and parity across three or more disks.



By creating different types of dynamic volumes, users can enhance data security (Mirrored volume and RAID-5 volume), make the best use of disk space (Striped volume and Spanned volume), and quicken data storage speed (Striped volume and RAID-5 volume).

All these volumes can be created in Windows Disk Management tool.

1. Simple Volume



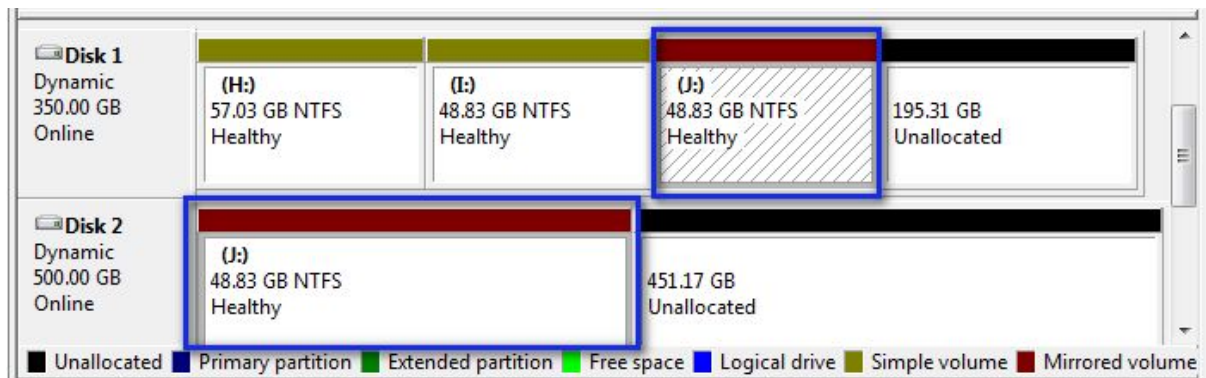
On the image above H: and I: are simple volumes.

Simple volume equals to primary partition or logical drive on basic disks, and users can create lots of simple volumes on one dynamic disk, not limited to 4.

A simple volume can be extended to unallocated space on the same disk but keeps simple.

However, if users extend it to unallocated space on other disk, it will become a spanned volume.

2. Mirrored Volume



Mirrored volume is created by 2 unallocated spaces with the same size.

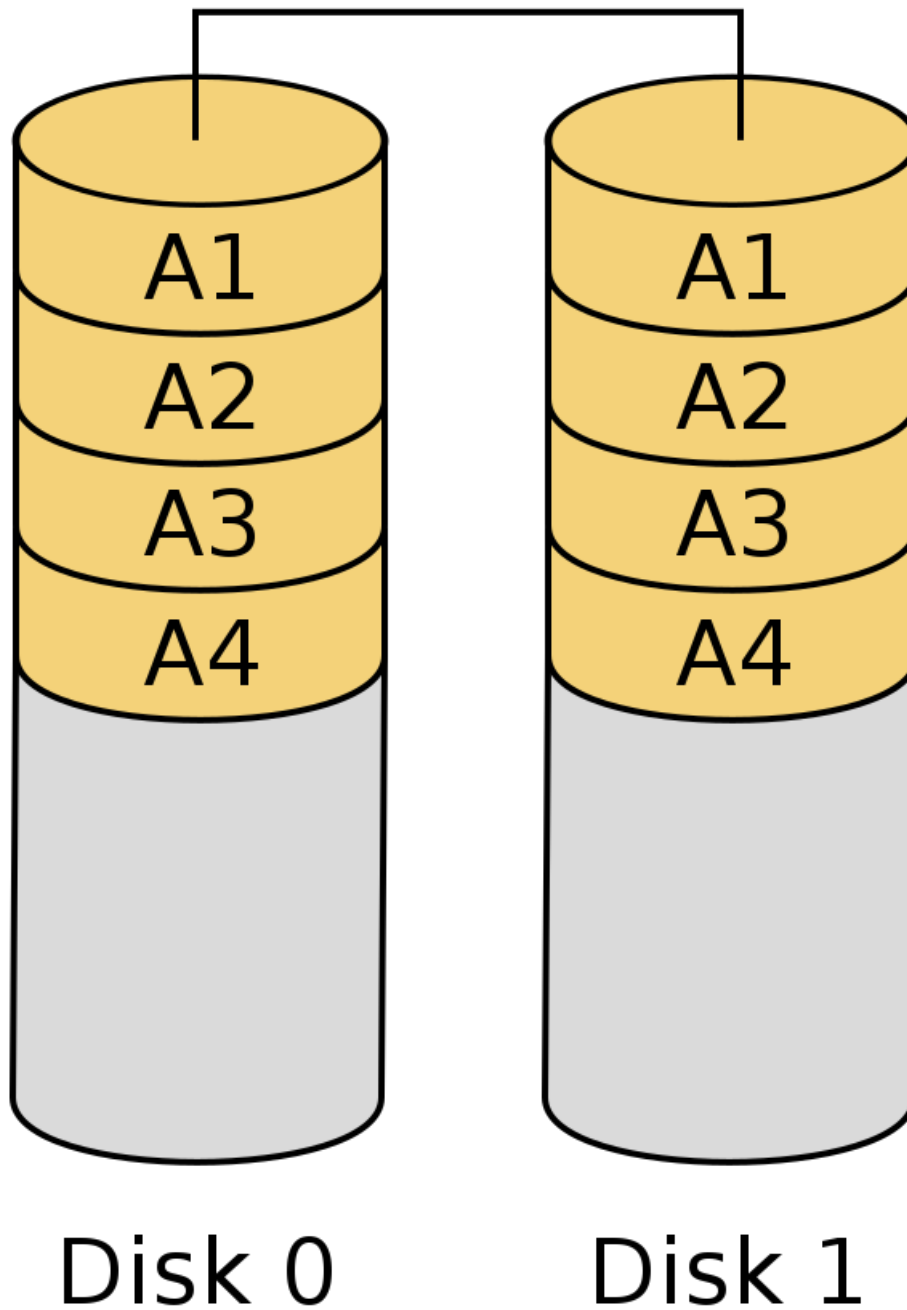
It offers fault-tolerance by imaging data on the volume.

If one of the disks failed, data on the failed disk will be unavailable, but Windows can run normally by reading data on the other disk.

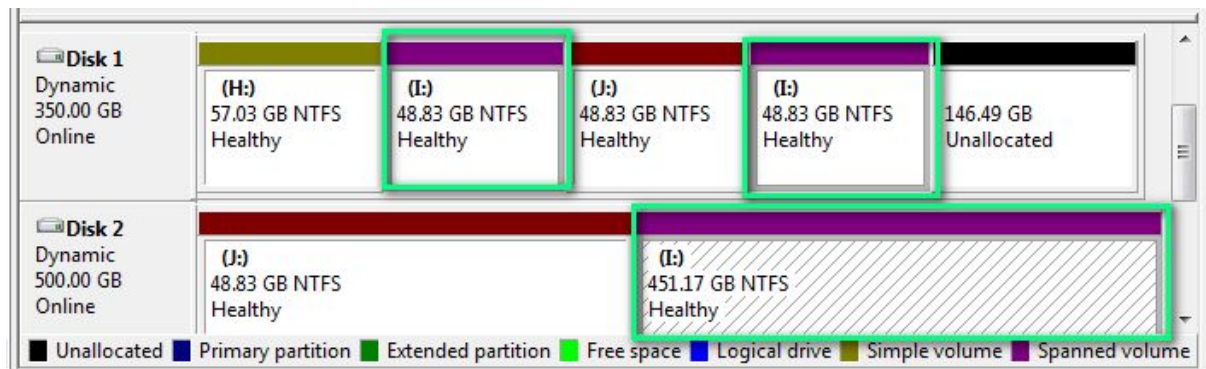
However, this kind of volume just enjoys a 50% disk use ratio.

Mirrored volume is similar to RAID-1 disk configuration.

RAID 1



3. Spanned volume



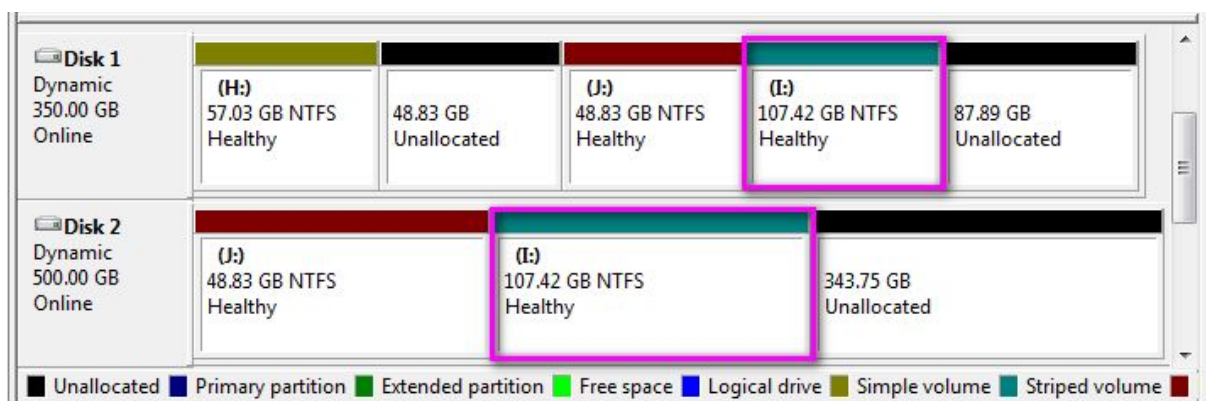
Spanned volume combines unallocated spaces on 2 or more disks (*up to 32 disks*) to one volume, and each unallocated space can be different.

Creating spanned volume can make the best use of disk space.

Nevertheless, this kind of volume does not provide fault tolerance.

If a part of the spanned volume fails, the entire spanned volume will fail.

4. Striped volume



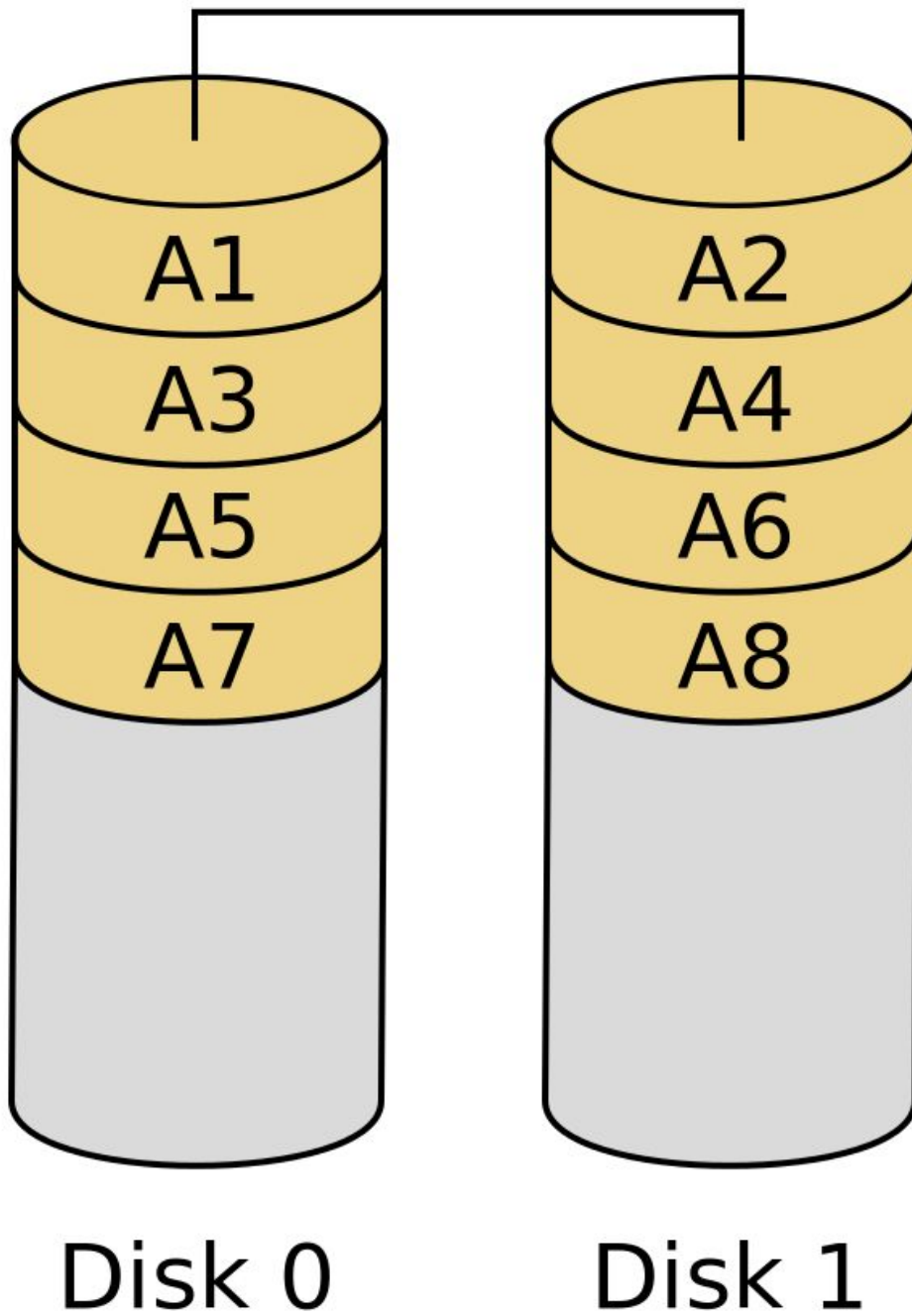
Striped volume is created by unallocated space with the same size on 2 or more dynamic disks.

When users store data to a striped volume, the very data will be divided to multiple parts and saved to all portions of striped volume at the same time, which can enhance data storage speed.

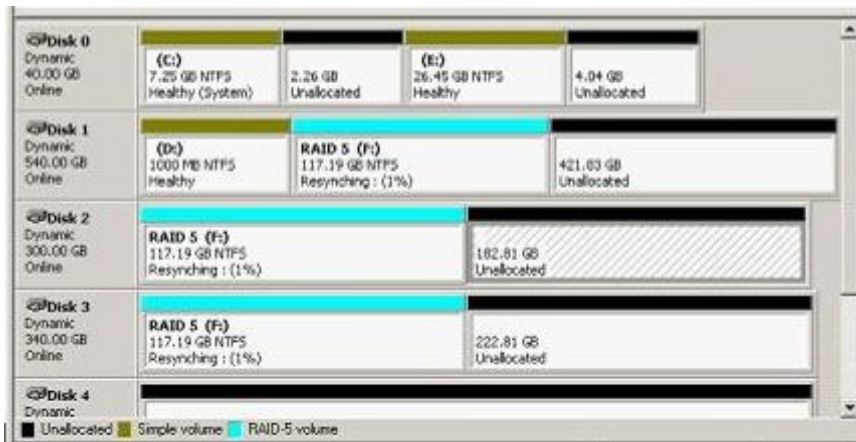
Nevertheless, this kind of volume does not have the ability to create fault-tolerant volumes.

Striped volume is similar to RAID-0 disk configuration.

RAID 0



5. RAID-5 Volume



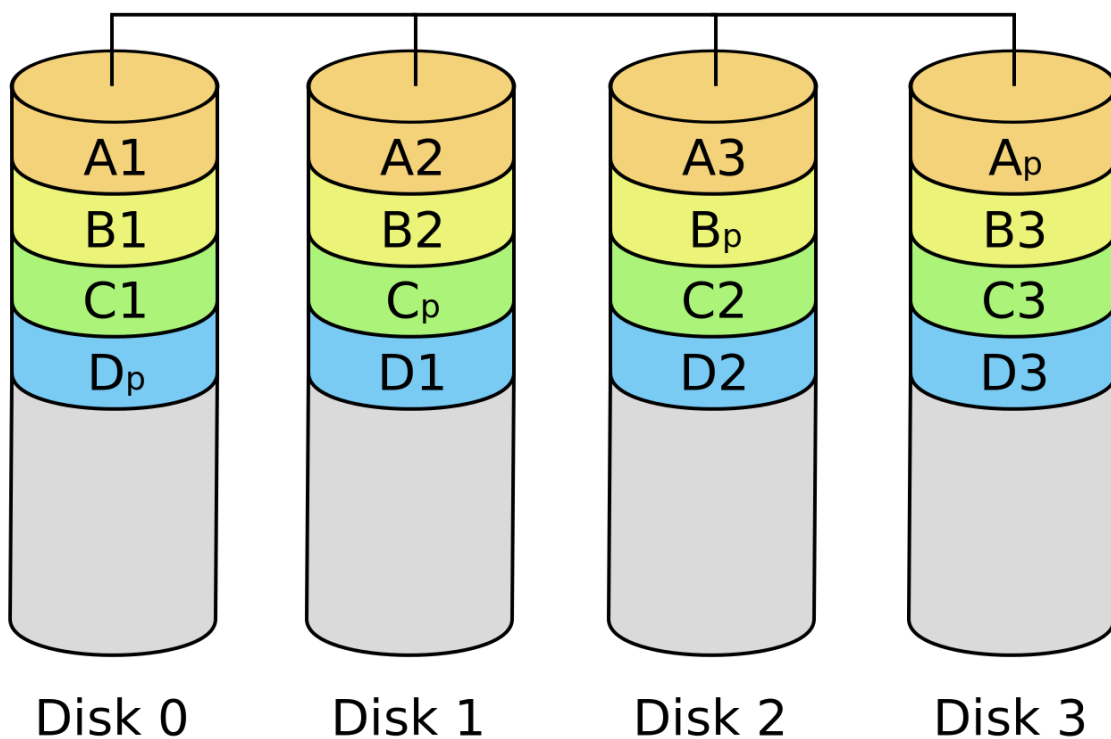
RAID-5 volume should be created on 3 or more dynamic disks and provides features mirrored volume and striped volume have.

It is fault tolerant since parity check is contained.

When one disk fails, Windows will continue by reconstructing data on the failed disk from remaining data and parity. Moreover, it saves data as mirrored volume acts.

RAID-5 Volume is similar to RAID-5 disk configuration.

RAID 5



Converting a Basic Disk to a Dynamic Disk

Windows Server provides the tools you need to convert a basic disk to a dynamic disk, and to change a dynamic disk back to a basic disk.

When you convert to a dynamic disk, partitions are changed to volumes of the appropriate type automatically.

You don't lose the information on the disk when converting a basic disk to a dynamic disk.

You can't change these volumes back to partitions.

Instead, you must delete the volumes on the dynamic disk and then change the disk back to a basic disk.

Deleting the volumes destroys all the information on the disk, so you will lose the information on the disk when converting a dynamic disk to a basic disk.

That is why, before converting a dynamic disk to a basic disk, you must do a backup copy of everything contained in the dynamic disk.

To convert a basic disk to a dynamic disk, follow these steps:

1. In Disk Management, right-click a basic disk that you want to convert, either in the Disk List view or in the left pane of the Graphical View. Then select Convert To Dynamic Disk.
2. In the Convert To Dynamic Disk dialog box, select the checkboxes for the disks you want to convert. If you're converting a spanned, striped, mirrored, or RAID-5 volume, be sure to select all the basic disks in this set. You must convert the set together. Click OK to continue.
3. The Disks To Convert dialog box shows the disks you're converting. The buttons and columns in this dialog box contain the following information:
 - **Name** Shows the disk number.
 - **Disk Contents** Shows the type and status of partitions, such as boot, active, or in use.
 - **Will Convert** Specifies whether the drive will be converted. If the drive doesn't meet the criteria, it won't be converted, and you might need to take corrective action, as described previously.
 - **Details** Shows the volumes on the selected drive.
 - **Convert** Starts the conversion.
4. To begin the conversion, click Convert. Disk Management warns you that after you finish the conversion you won't be able to boot previous versions of Windows from volumes on the selected disks. Click Yes to continue.
5. Disk Management will restart the computer if a selected drive contains the boot partition, system partition, or a partition in use.

Special Considerations for Basic and Dynamic Disks

Whether you're working with basic or dynamic disks, you need to keep in mind five special types of drive sections:

- **System.** The system partition or volume contains the hardware-specific files needed to load the operating system. The system partition or volume can't be part of a striped or spanned volume.
- **Active.** The active partition or volume is the drive section for system cache and startup. Some devices with removable storage may be listed as having an active partition.
- **Boot.** The boot partition or volume contains the operating system and its support files. The system and boot partition or volume can be the same.
- **Crash Dump.** The partition to which the computer attempts to write dump files in the event of a system crash. By default, dump files are written to the %SystemRoot% folder, but can be located on any desired partition or volume.
- **Page File.** A partition containing a paging file used by the operating system. Because a computer can page memory to multiple disks, according to the way virtual memory is configured, a computer can have multiple page file partitions or volumes.

On an x86-based computer, you can mark a partition as active using Disk Management.

In Disk Management, right-click the primary partition you want to mark as active, and then select "Mark Partition As Active".

You can't mark dynamic disk volumes as active.

When you convert a basic disk containing the active partition to a dynamic disk, this partition becomes a simple volume that's active automatically.

- Exercises: Dynamic Disks -

You are going to create a new Google Document inside the "2. Windows Server" folder of your Google Drive, named:

"2. 5. Hard Disk Management - Apellidos, Nombre"

being "Apellidos, Nombre" your Last Name and Name.

Inside this Google Document you are going to copy and answer all the "Exercises" of this sub-unit.

Exercise 1: Checking your basic hard disk

1. Login to your Windows Server with the "Administrator" user.
2. Go to the Windows "Start" button -> Windows Administrative Tools -> Computer Management -> On the left pane, select: "Storage" -> "Disk Management".
3. Check the hard disks and partitions that you already have in your Domain Controller: all your hard disks should be "Basic" and all your partitions should be "Primary".
4. Switch off your server.

Exercise 2: Adding a new hard disk to your Windows Server virtual machine

To add a new hard disk to your Windows Server in VirtualBox, in this exercise or in the following exercises, just follow the following steps:

1. Shut down your Windows Server virtual machine (if it is switched on).
2. Go to VirtualBox and select your Windows Server virtual machine.
3. Go to: "Settings" -> "Storage" -> "Storage Devices" -> "Controller: SATA" -> Click on the icon of a hard disk with a plus (+) -> In the new window, click on "Create".

4. "Hard disk file type": select "VDI (VirtualBox Disk Image)", and click on "Continue".
5. "Storage on physical hard disk" -> "Dynamically allocated" -> "Continue".
6. "File location and size":
 - a. "Location" -> Choose a folder that you have under control, like:
"C:\DAM\SI\2 - Windows Server\Máquinas Virtuales".
 - b. "Size" -> Write the size of the particular hard disk in each exercise. For example: "5 GB"
7. Click on "Create".
8. Click on "Choose".
9. Click on "OK".
10. Start your Windows Server virtual machine on VirtualBox.
11. Login to your Windows Server with the "Administrator" user.
12. Go to the Windows "Start" button -> Windows Administrative Tools -> Computer Management -> On the left pane, select: "Storage" -> "Disk Management".
13. A new window will appear: "Initialize Disk", because Windows has detected the new hard disk that you have added.
14. Leave selected "MBR (Master Boot Record)" and click "OK".
15. After initializing, this new hard disk should be a "Basic" disk.
16. Now your new hard disk can be used in Windows Server.

Exercise 3: Converting a Basic Disk (Primary Partition) to a Dynamic Disk (Simple Volume)

1. Shut down your Windows Server virtual machine (if it is switched on).
2. Go to VirtualBox and select your Windows Server virtual machine.
3. Add a new hard disk of 1 GB.
4. Start your Windows Server virtual machine on VirtualBox.
5. Login to your Windows Server with the "Administrator" user.
6. Go to the Windows "Start" button -> Windows Administrative Tools -> Computer Management -> On the left pane, select: "Storage" -> "Disk Management".
7. Create a "Primary" partition (occupying all the space) in the new 1 GB and format that partition as NTFS.
8. Copy some files and documents to that new primary partition.
9. Convert the 1 GB "Basic" disk into a "Dynamic" disk.
10. Now that new "Dynamic" disk should contain a "Simple Volume" of 1 GB approximately.
11. Check if the files and documents that you copied to the "Primary" partition (when that disk was a "Basic" disk) are present in the new "Simple Volume" of the converted "Dynamic" disk.

Remember that it is not a good idea to do these types of operations in the partition where Windows Server is installed (normally "C:/").

Exercise 4: Converting a Dynamic Disk (Simple Volume) to a Basic Disk (Primary Partition)

1. Login to your Windows Server with the "Administrator" user.
2. Open "Disk Management".
3. Convert the 1 GB "Dynamic" disk to a "Basic" disk: that is, you will convert a "Simple Volume" to a "Primary" partition.
4. Remember that if you do this conversion you will lose all the information of the "Dynamic" disk, so before you should backup that information to a different hard drive or the cloud.
5. Besides that, in order to do that conversion, the "Dynamic" disk must not contain any information.
6. In order to convert the 1 GB "Dynamic" disk to a "Basic" disk, select the "Simple Volume" -> Right click: "Delete volume".
7. You will see that the 1 GB "Dynamic" disk is now a "Basic" disk with "Unallocated" space.
8. Select the "Unallocated" space of the "Basic" disk and create a new "Primary" partition.
9. After the conversion, check if the files and documents that were before in the "Simple Volume" of the "Dynamic" disk, are now present in the new "Primary" partition of the new "Basic" disk.

Exercise 5: Spanned Volume

1. Shut down your Windows Server virtual machine (if it is switched on).
2. Go to VirtualBox and select your Windows Server virtual machine.
3. Add 2 new hard disks: one 2 GB hard disk and one 3 GB disk.
4. Start your Windows Server virtual machine on VirtualBox.
5. Login to your Windows Server with the "Administrator" user.
6. Go to the Windows "Start" button -> Windows Administrative Tools -> Computer Management -> On the left pane, select: "Storage" -> "Disk Management".

7. Initialize your 2 new hard disks (one 2 GB hard disk and one 3 GB disk) with "MBR" partition style: these 2 new hard disks should be "Basic" disks.
8. Convert the 2 "Basic" disks (one 2 GB hard disk and one 3 GB disk) into 2 "Dynamic" disks.
9. Create a new "Spanned Volume" composed of: 500 MB of the first new 2 GB hard disk and 200 MB of the second new 3 GB hard disk.
10. Copy into this new "Spanned Volume" a 600 MB file (for example, a movie file), and check in the properties of that "Spanned Volume" that the total size is 700 MB (500 MB + 200 MB), and that the occupied size is 600 MB (the movie file).
11. Install the VLC program in the server in order to play movies.
12. Check that the movie can be played properly in the server.
13. Add a third new hard disk (of 4 GB) to your server.
14. Expand the "Spanned Volume" and add 300 MB of the third new hard disk (of 4 GB). In order to do this, select one volume of the previously created "Spanned Volume" (for example, the 500 MB volume of the 2 GB hard disk), right click and "Extend Volume". As you can see, you can expand the size of a "Spanned Volume" with the server turned on, you don't need to switch off the server in order to do this.
15. Check if you can access to the "Spanned Volume" and to the movie file.
16. Check in the properties of that "Spanned Volume" that the total size is 1000 MB (500 MB + 200 MB + 300 MB).
17. Disconnect the second new 3 GB hard disk.
18. Check if you can access to the "Spanned Volume" and to the movie file.
19. Connect again the second new 3 GB hard disk.
20. Check if you can access to the "Spanned Volume" and to the movie file.
21. Disconnect again the second new 3 GB hard disk.
22. Connect a different new 3 GB hard disk.
23. Check if you can access to the "Spanned Volume" and to the movie file.

Exercise 6: Mirrored Volume

1. Shut down your Windows Server virtual machine (if it is switched on).
2. Go to VirtualBox and select your Windows Server virtual machine.
3. Add 2 new hard disks of 5 GB.
4. Start your Windows Server virtual machine on VirtualBox.
5. Login to your Windows Server with the "Administrator" user.
6. Go to the Windows "Start" button -> Windows Administrative Tools -> Computer Management -> On the left pane, select: "Storage" -> "Disk Management".
7. Initialize your 2 new hard disks of 5 GB with "MBR" partition style: these 2 new hard disks should be "Basic" disks.
8. Convert the 2 "Basic" disks of 5 GB into 2 "Dynamic" disks.

9. Create a new "Mirrored Volume" composed of the 2 "Dynamic" disks of 5 GB.
10. Copy into this new "Mirrored Volume" a 600 MB file (for example, a movie file), and check in the properties of that "Mirrored Volume" that the total size is 5 GB, and that the occupied size is 600 MB (the movie file).
11. Check that the movie can be played properly on the server.
12. Disconnect the second new 5 GB hard disk.
13. Check if you can access the "Mirrored Volume" and to the movie file.
14. Connect the second new 5 GB hard disk.
15. Check if you can access the "Mirrored Volume" and to the movie file.
16. Add a third new hard disk of 5 GB and convert it to Dynamic Disc.
17. Open "Disk Management".
18. Select the "surviving" 5 GB hard disk of the "Mirrored Volume" -> Right click -> "Remove mirror" -> Select the second new 5 GB hard disk.
19. Select the "surviving" 5 GB hard disk of the "Mirrored Volume" -> Right click -> "Add mirror" -> Select the third new hard disk of 5 GB that you have just added to your server -> "Yes".
20. It will say "Resyncing" on both disks.
21. Open File Explorer and check if you can access to the "Mirrored Volume" and to the movie file.

Exercise 7: Striped Volume

1. Shut down your Windows Server virtual machine (if it is switched on).
2. Go to VirtualBox and select your Windows Server virtual machine.
3. Add 3 new hard drives of: 6 GB, 7 GB and 8 GB.
4. Start your Windows Server virtual machine on VirtualBox.
5. Login to your Windows Server with the "Administrator" user.
6. Go to the Windows "Start" button -> Windows Administrative Tools -> Computer Management -> On the left pane, select: "Storage" -> "Disk Management".
7. Initialize your 3 new hard disks (6 GB, 7 GB and 8 GB) with "MBR" partition style: these 3 new hard disks should be "Basic" disks.
8. Convert the 3 "Basic" disks (6 GB, 7 GB and 8 GB) into a 3 "Dynamic" disks.
9. Create a new "Striped Volume" composed of the 3 new "Dynamic" disks (6 GB, 7 GB and 8 GB).
10. As you can check, the total size of the new "Striped Volume" will not be the sum of the sizes of the 3 new hard disks: $6\text{ GB} + 7\text{ GB} + 8\text{ GB} = 21\text{ GB}$.
11. Actually, the total size of the new "Striped Volume" is determined by the size of the new disk with less capacity (6 GB), so the total size of the new "Striped Volume" will be: $6\text{ GB} + 6\text{ GB} + 6\text{ GB} = 18\text{ GB}$ approximately.

12. Copy into this new "Striped Volume" a 600 MB file (for example, a movie file), and check in the properties of that "Striped Volume" that the total size is 18 GB, and that the occupied size is 600 MB (the movie file).
13. Check that the movie can be played properly on the server.
14. Disconnect the third new 8 GB hard disk.
15. Check if you can access to the "Striped Volume" and to the movie file.
16. Connect again the third new 8 GB hard disk.
17. Check if you can access to the "Striped Volume" and to the movie file.
18. Disconnect again the third new 8 GB hard disk.
19. Connect a fourth different new 8 GB hard disk.
20. Check if you can access to the "Striped Volume" and to the movie file.

Exercise 8: RAID-5 Volume

1. Shut down your Windows Server virtual machine (if it is switched on).
2. Go to VirtualBox and select your Windows Server virtual machine.
3. Add 3 new hard drives of 9 GB each.
4. Start your Windows Server virtual machine on VirtualBox.
5. Login to your Windows Server with the "Administrator" user.
6. Go to the Windows "Start" button -> Windows Administrative Tools -> Computer Management -> On the left pane, select: "Storage" -> "Disk Management".
7. Initialize your 3 new hard disks (9 GB) with "MBR" partition style: these 3 new hard disks should be "Basic" disks.
8. Convert the 3 "Basic" disks (9 GB) into a 3 "Dynamic" disks.
9. Create a new "RAID-5 Volume" composed of the 3 new "Dynamic" disks (9 GB).
10. As you can check, the total size of the new "RAID-5 Volume" will not be the sum of the sizes of the 3 new hard disks: $9\text{ GB} + 9\text{ GB} + 9\text{ GB} = 27\text{ GB}$.
11. Actually, the total size of the new "RAID-5 Volume" is determined by the loss of $\frac{1}{3}$ of the space in order to write the parity information, so the size of the new "RAID-5 Volume" will be: $27\text{ GB} (9\text{ GB} + 9\text{ GB} + 9\text{ GB}) - \frac{1}{3} \text{ of the total space } (9\text{ GB}) = 18\text{ GB}$ approximately .
12. Copy into this new "RAID-5 Volume" a 600 MB file (for example, a movie file), and check in the properties of that "RAID-5 Volume" that the total size is 18 GB, and that the occupied size is 600 MB (the movie file).
13. Check that the movie can be played properly on the server.
14. Disconnect the third new 9 GB hard disk.
15. Check if you can access to the "RAID-5 Volume" and to the movie file.
16. Disconnect the second new 9 GB hard disk.
17. Check if you can access to the "RAID-5 Volume" and to the movie file.
18. Connect the second new 9 GB hard disk and the third new 9 GB hard disk.

19. Check if you can access to the "RAID-5 Volume" and to the movie file: maybe you will need to right click on the "RAID-5 Volume" and select "Reactivate Volume". You will need to right click on the "RAID-5 Volume" and select "Reactivate Volume".
20. Disconnect the third new 9 GB hard disk.
21. Connect a fourth different new 9 GB hard disk.
22. Check if you can access to the "RAID-5 Volume" and to the movie file.
23. You will need to right click on the "RAID-5 Volume" and select "Repair Volume".
24. Disconnect the second new 9 GB and the third new 9 GB hard disk.
25. Connect 2 different new 9 GB hard disks (fourth and fifth).
26. Check if you can access to the "RAID-5 Volume" and to the movie file.
27. Disconnect the 2 different new 9 GB hard disks (fourth and fifth).
28. Connect the second new 9 GB hard disk: maybe you will need to right click on the "RAID-5 Volume" and select "Reactivate Volume".
29. Check if you can access to the "RAID-5 Volume" and to the movie file.
30. Connect one different new 9 GB hard disk. In order to have this new hard disk as the third part of the "RAID-5 Volume", you will need to right click on the "RAID-5 Volume" and select "Repair Volume".
31. Check if you can access to the "RAID-5 Volume" and to the movie file.

- 2.5.3. Disk Quotas -

We can configure quotas with File Server Resource Manager (FSRM) to warn or limit a user based on the total file size of all of the files that they own on the file server.

This can be used to fairly share the available space between many users.

To use this feature you must first install the FSRM role.

About Quotas

Any file that a user creates will be owned by that user, and this ownership is used to determine the total file size of all files owned by a user.

We can set both soft and hard quotas.

If a soft quota limit is hit, the user will not be restricted however the event will be logged.

Instead of this, or in combination with, we can also set a hard limit, which will restrict the user from taking up any more space once the defined threshold is reached.

For example, we could set a 900mb soft limit and 1gb hard limit on a group of users.

Once any user owns more than 900mb of files, we can send out an automatic warning email, log an event, or optionally execute a command.

If no action is taken and more space is used once the user owns 1gb of files they will be prevented from using any more space on the file share.

Again when this event takes place we can send out an email, log the event, or run some command, as we'll see in the examples below.

Quota Templates

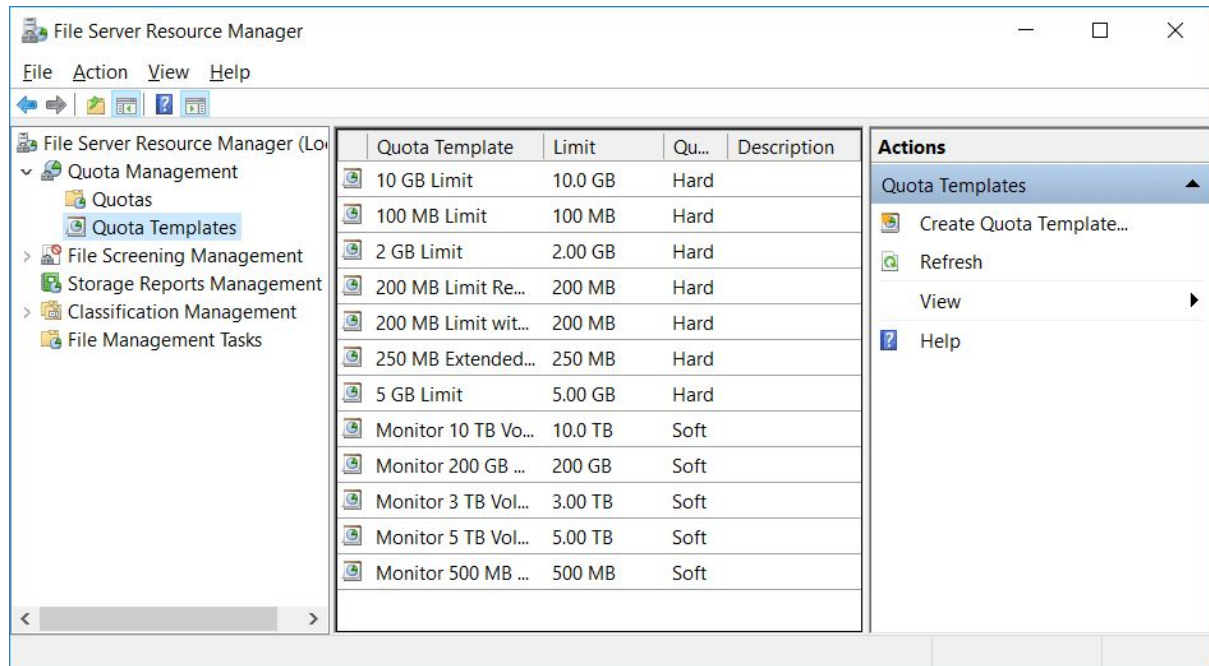
From Server Manager, select "Tools" and then "File Server Resource Manager".

To configure a quota, we must first create a quota template.

This template will be applied to some specific directory later when we create the quota itself.

We can view default quota templates available under Quota Management -> Quota Templates.

Each template will have it's own soft and hard limits defined as well as unique actions that should take place if a limit is reached.



We can either edit these existing templates by double clicking them, or select Create Quota Template to create a new one.

We'll create a new template here to walk you through all of the available settings.

The image below shows you the Create Quota Template window, we'll cover what each part does below.

The screenshot shows the 'Create Quota Template' dialog box. At the top, there is a section 'Copy properties from quota template (optional):' with a dropdown menu showing '10 GB Limit' and a 'Copy' button. This is highlighted with a red '1'. Below this is the 'Settings' tab. Under 'Template name:', there is a text input field with 'Name goes here'. Under 'Description (optional):', there is a text input field with 'Informative description'. This section is highlighted with a red '2'. Below that is the 'Space limit' section, which includes a 'Limit' input field with '100' and a unit dropdown menu showing 'MB'. Below this are two radio buttons: 'Hard quota: Do not allow users to exceed limit' (selected) and 'Soft quota: Allow users to exceed limit (use for monitoring)'. This section is highlighted with a red '3'. At the bottom is the 'Notification thresholds' section, which contains a table with columns: 'Threshold', 'E-mail', 'Event L...', 'Comma...', and 'Report'. The first row has 'Warning (85%)' in the 'Threshold' column and a checkmark in the 'E-mail' column. This section is highlighted with a red '4'. At the bottom of the dialog are 'Add...', 'Edit..', and 'Remove' buttons. At the very bottom are 'OK' and 'Cancel' buttons.

1. The first option allows you to import the settings from an existing quota template, this can speed up the quota creation process as you will not need to manually set everything.
2. We can define a name and description for the template to help us identify it from the others.
3. We can set a space limit in KB, MB, GB, or TB, as well as if the limit should be hard or soft.
4. Finally we can create multiple notification thresholds by clicking the add button. These allow us to trigger specific events once the space in use reaches

the threshold value of the space limit. In this example we have a warning threshold that will send an email at 85% of 100MB, which would be 85MB.

When adding a new notification threshold, there are a few different options that we can choose.

At the top we define the percentage of the space limit when we want the events in the threshold to take place.

We can then pick what happens once the threshold is reached, including sending an e-mail, logging an event, running a command, or creating a report.

- **E-mail Message:** We can select if we want to send an email to a list of administrators, or send an email notification directly to the user who exceeded the threshold with a custom message advising them that they should remove files that are not required.

Add Threshold

Generate notifications when usage reaches (%):

E-mail Message

Event Log

Command

Report

☒ Send e-mail to the following administrators:

Format account@domain. Use semicolons to separate accounts.

☒ Send e-mail to the user who exceeded the threshold

E-mail message

Type the text to use for the Subject line and message.
To identify the quota, limit, usage, or other information about the current threshold, you can use Insert Variable to insert a variable in your text.

Subject

Message body:

User [Source Io Owner] has exceeded the [Quota Threshold]% quota threshold for the quota on [Quota Path] on server [Server]. The quota limit is [Quota Limit MB] MB, and [Quota Used MB] MB currently is in use ([Quota Used Percent]% of limit).

Select variable to insert

Insert Variable

Inserts the e-mail addresses of the administrators who receive the e-mail.

Additional E-mail Headers...

OK

Cancel

- **Event Log:** We can optionally send an event to the event log, this may be useful if you have monitoring tools to check the logs for these types of events and generate an alert. We can also customize the contents of the log message, there are many variables available from the drop down allowing us to place all sorts of useful information into the logged message.

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Add Threshold

Generate notifications when usage reaches (%):

85

E-mail Message
Event Log
Command
Report

☒ Send warning to event log

Warning message

Type the text to use for the log entry.

To identify the quota, limit, usage or other information about the current threshold, you can use Insert Variable to insert a variable in your text.

Log entry:

User [Source Io Owner] has exceeded the [Quota Threshold]% quota threshold for the quota on [Quota Path] on server [Server]. The quota limit is [Quota Limit MB] MB, and [Quota Used MB] MB currently is in use ([Quota Used Percent]% of limit).

Select variable to insert:

[Admin Email]
[Quota Limit MB]
[Quota Limit TB]
[Quota Limit]
[Quota Path]
[Quota Peak GB]
[Quota Peak KB]
[Quota Peak MB]
[Quota Peak Percent]
[Quota Peak TB]
[Quota Peak Time]
[Quota Peak]
[Quota Remote Paths]
[Quota System Path]
[Quota Threshold]
[Quota Used GB]
[Quota Used KB]
[Quota Used MB]
[Quota Used Percent]
[Quota Used TB]

Insert Variable

Users who receive the e-mail.

OK
Cancel

- Command:** It's also possible to execute a command or script along with specific arguments from a defined working directory. This may be useful if you want to automatically compress, move, or delete large or old files automatically when the threshold has been reached for example. We can also specify the level of privileges that the script runs with, which can be useful as different accounts will have different access over various files.

Add Threshold

Generate notifications when usage reaches (%):

85

E-mail Message Event Log **Command** Report

☒ Run this command or script

Browse...

Command settings

Command arguments:

Specify the directory to run the command in:

Working directory...

Command security

To maintain security of the server, use the most restrictive account possible. This will help safeguard the system if the process is compromised.

Run the command as:

☒ Local Service
Same level of access as Users account. Accesses network resources as a null session with no credentials.

☐ Network Service
Same level of access as Users account. Accesses network resources using the credentials of the machine account.

☐ Local System
Full access to the system. Do not use this account unless full access is required, and you are certain the process cannot be compromised.

OK Cancel

- **Report:** A report can be automatically generated and sent by email to administrators or the user that reached the threshold. There are many reports that can be created which can help the recipient easily and quickly determine which files they own that are using the most space by various metrics.

Add Threshold

Generate notifications when usage reaches (%):

85

E-mail Message

Event Log

Command

Report

☒ Generate reports

Select reports to generate:

☒ Duplicate Files

☐ File Screening Audit

☐ Files by File Group

Review Selected Reports

The maximum number of files to include in all storage reports

Maximum Number:

1000

When a quota or file screening event generates incident reports, default report settings are used. To modify the default settings, use the Configure Options task, Storage Reports tab.

☒ Send reports to the following administrators:

[Admin Email]

Format: account@domain. Use a semicolon to separate multiple accounts.

☒ Send reports to the user who exceeded the threshold

The reports will be saved in C:\StorageReports\Incident.

To change the locations where reports are saved, use the Configure Options task, Report Locations tab.

OK

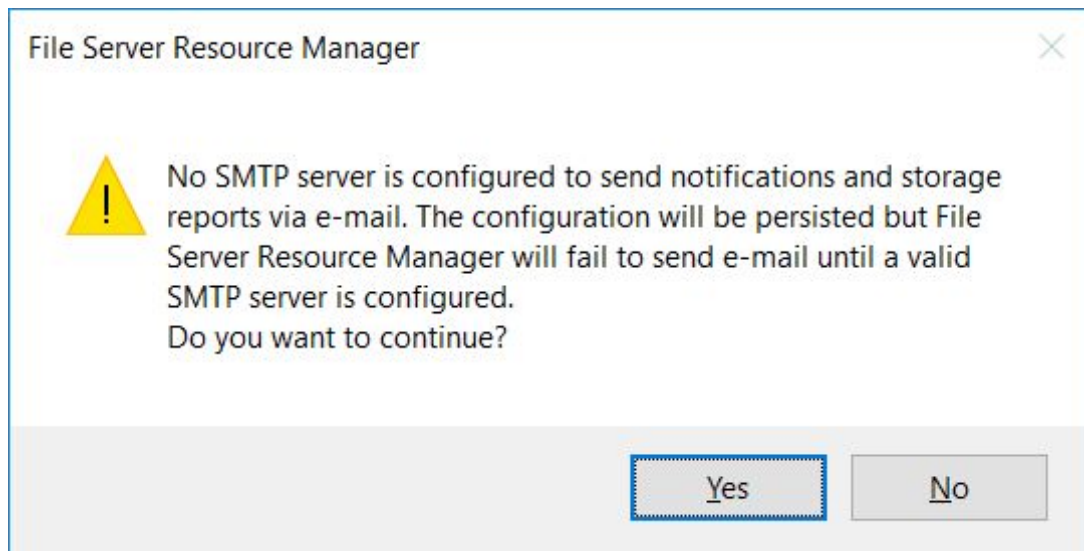
Cancel

Note that to send mail, you must install and configure an SMTP server.

You'll be warned about this if you enable any of the mail options.

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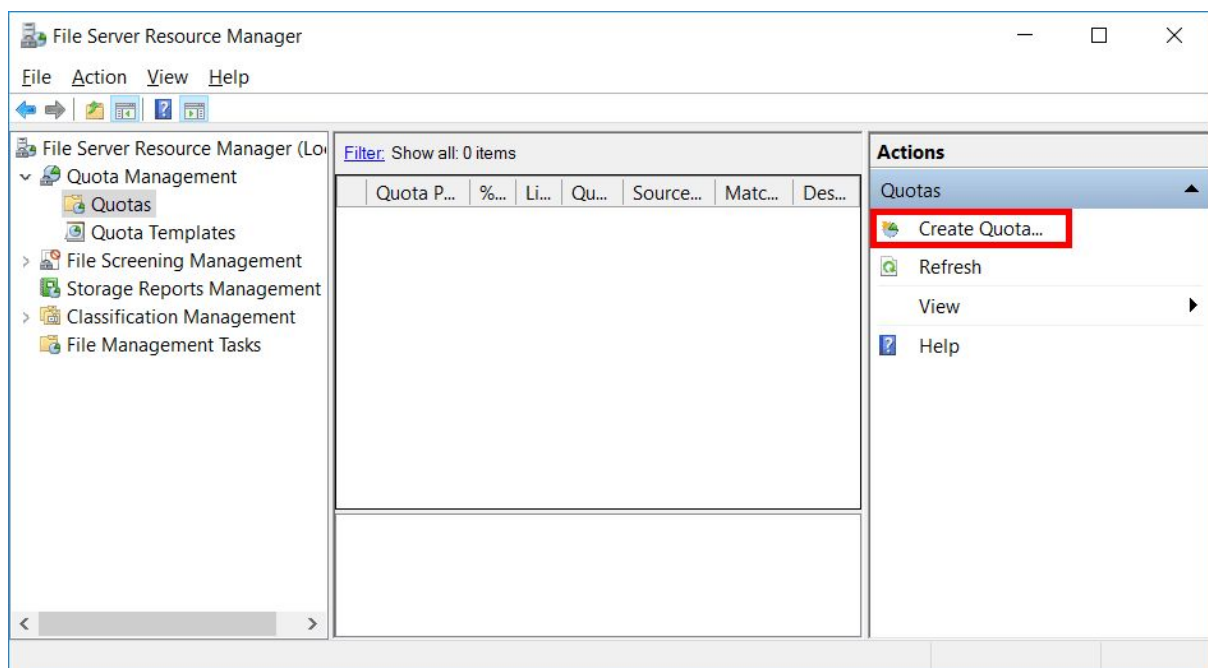
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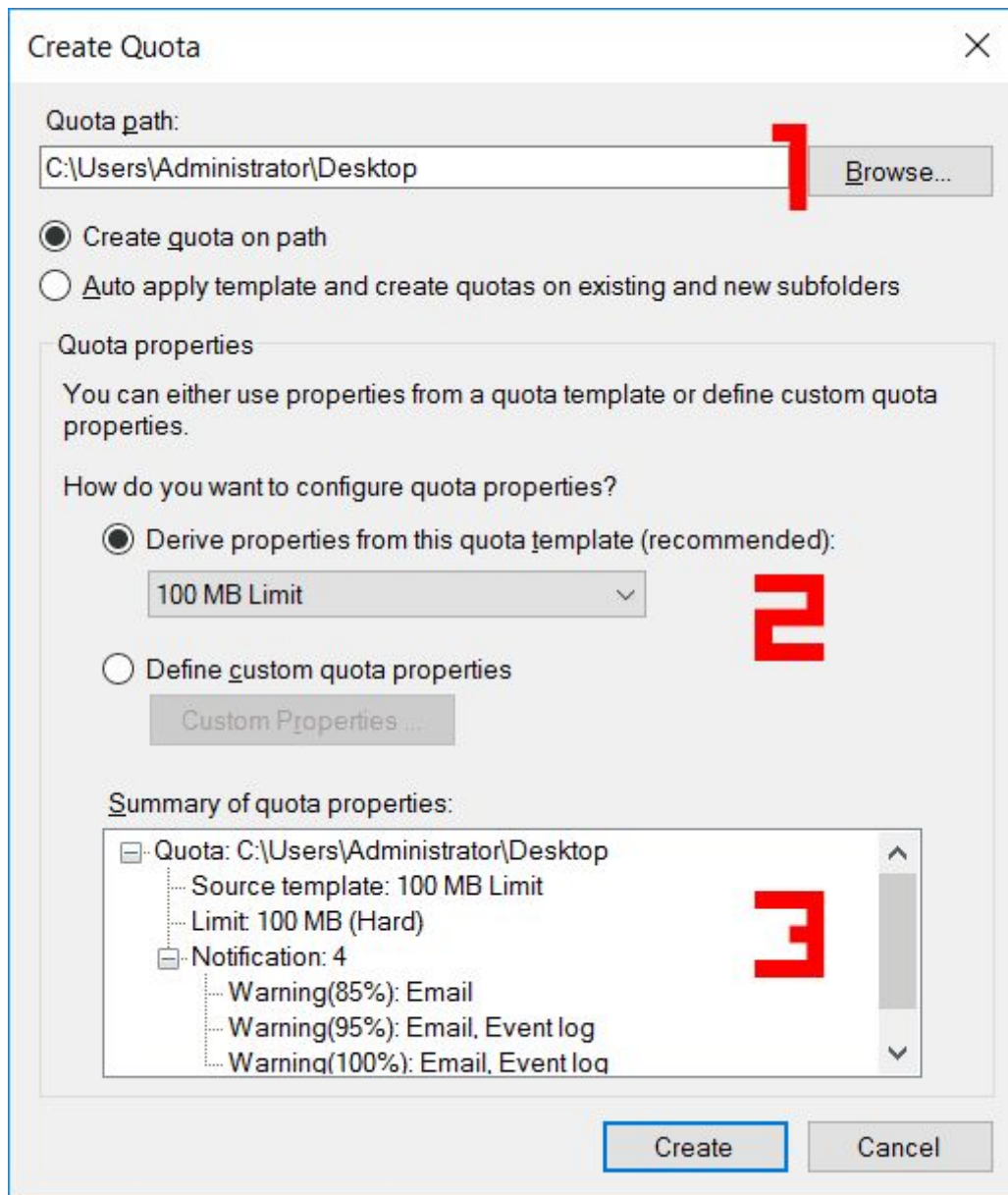
Create a Quota

Now that we have our quota template created, we can create a quota with it.

This is done by going into Quota Management -> Quotas and selecting Create Quota, as shown below.



The image below shows the options available when creating a quota.



1. The first option allows us to define a quota path. This is the location where we will apply the quota template to. By default the quota template will only apply specifically to the path, however we can optionally select to automatically apply the template to any existing and new sub folders recursively within.
2. From the drop down we can pick the quota template that we wish to use. We can instead specify to define a custom quota template, this basically just opens up the create new quota template window that we walked through previously.
3. Finally we can see a summary of all quota properties from the selected template, this gives us an overview so that we can get a brief idea of what the template is actually doing.

These quotas will apply to all users on the server with FSRM installed for the defined folders or volumes defined in the quota path.

- Exercises: Quotas -

Exercise 9: Quotas

You are going to manage quotas in order to limit the amount of capacity that the Domain Users can store in the server's hard drive.

1. Login to your Windows Server with the "Administrator" user.
2. Firstly, you need to install the File Server Resource Manager (FSRM) role service in Windows Server.
3. Open the "Server Manager" and select "Dashboard" on the left column -> Welcome to server manager -> Quick start -> 1 Configure this local server -> 2 Add roles and features.
4. On the "Add Roles and Features Wizard" window -> Next -> Next -> Next -> "Server Roles" -> In "File and Storage Services" click on the left arrow to expand -> In "File and iSCSI Services" click on the left arrow to expand -> Check "File Server Resource Manager" -> "Add Features"-> Next -> Next -> Next -> Install.
5. At this point you can open the File Server Resource Manager (FSRM) window from "Server Manager" -> "Tools" -> "File Server Resource Manager".
6. On the left panel -> File Server Resource Manager (Local) -> Quota Management -> Quota Templates -> Right click -> Create Quota Template.
7. In the new window, open the drop down selector menu ("Copy properties from quota template"), and select the "2 GB Limit" Quota Template.
8. Click on the "Copy" button.
9. If you want, you can modify the quota settings.
10. On "Template name:" write "Shared folder quota" -> "OK".
11. This way you have created a quota template that you can modify in the future if your server's needs change.
12. On the left panel -> File Server Resource Manager (Local) -> Quota Management -> Quota Templates.
13. On the center panel -> Select the "Shared folder quota" that you have just created from the "Quota Template" column.
14. Right click -> "Create Quota from Template...".
15. In the new "Create Quota" window -> "Quota path:" -> "Browse" button -> Select the "C:\XXX-Company\Shared\" folder from "This PC", being **XXX-Company** your first name.
16. Check the radio button: "Auto apply template and create quotas on existing and new subfolders".
17. "Create" button.
18. On the left panel -> File Server Resource Manager (Local) -> Quota Management -> Quotas.
19. Check that the new quota that you have created is located here.

20. Now you are going to create a file screen in order to avoid copying some particular files (like music or movies) to the server's hard drive.
21. On the left panel -> File Server Resource Manager (Local) -> File Screening Management -> File Screen Templates.
22. Here you can choose a template in order to avoid copying some particular files to the server's hard drive, like audio, video, executable, images...
23. On the center panel -> Select the "Block Audio and Video Files" from the "File screen Template" column.
24. Right click -> "Create File Screen from Template...".
25. In the new "Create File Screen" window -> "File screen path:" -> "Browse" button -> Select the "C:\XXX-Company\Shared\" folder from "This PC".
26. "Create" button.
27. Now the users of your domain can't copy audio and video files to the "C:\XXX-Company\Shared\" folder of the server's hard drive.
28. To test the Quota Management system, in your Windows Server, create the following folder -> "C:\XXX-Company\Shared\Marketing\Quota".
29. Go to the "Server Manager" -> "Tools" -> "File Server Resource Manager".
30. On the left panel -> File Server Resource Manager (Local) -> Quota Management -> Quotas -> Right click -> Create Quota.
31. In the new "Create Quota" window -> "Quota path:" -> "Browse" button -> Select the "C:\XXX-Company\Shared\Marketing\Quota" folder from "This PC".
32. Below, on "Quota properties", check the radio button "Define custom quota properties", and click on the "Custom Properties..." button.
33. In the new window, in the "Space limit", write "1" MB on "Limit" -> "OK" -> "Create" -> "Save the custom quota without creating a template" -> "OK".
34. Login into Windows 10 (into your domain) with the user of the "Marketing" department.
35. Open "File Explorer" and in the address bar write \\Name-of-your-server -> "OK".
36. You will see a list of all the shared (and visible) folders of your domain controller (server).
37. The "Marketing" folder should appear here.
38. Open the "Marketing" shared folder: you should see the "Quota" folder inside.
39. Open the "Quota" folder: this folder has a quota limit of 1 MB.
40. To test this quota, copy some files to the "Quota" folder: when you reach 1 MB, you should get a warning and you should not be able to copy new files.
41. In order to test the "Block Audio and Video Files" File Screen, try to copy a .MP4 file to the "Marketing" folder.