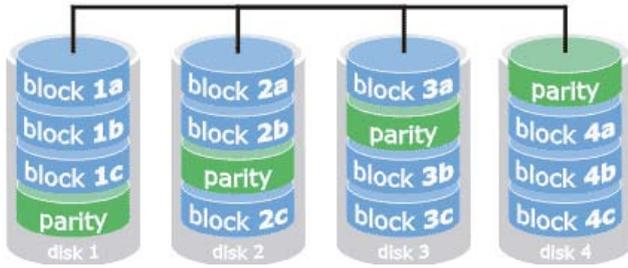


RAID 5
parity across disks



RAID 5 Configuration in Windows Server 2008.

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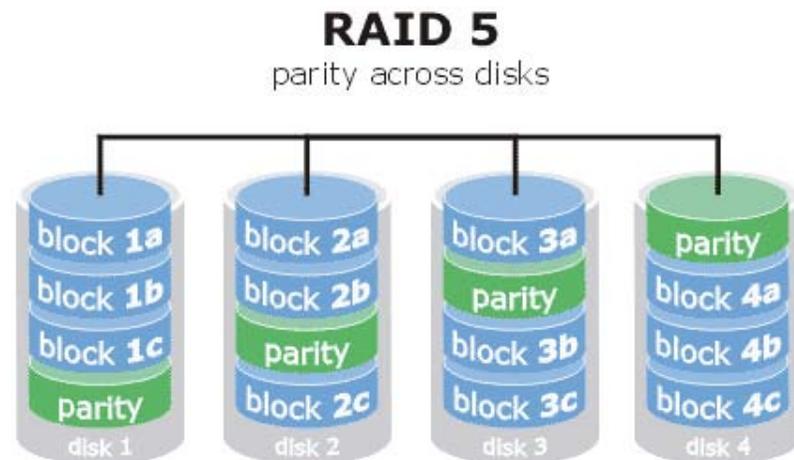
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RAID 5 Configuration in Windows Server 2008

Introduction – an overview of RAID 5

RAID 5 consists of three or more volumes each located on a separate physical disk. As with RAID 0, RAID 5 also uses disk striping, whereby blocks of data are divided up into stripes with each stripe written to a different disk. RAID 5, however, differs quite considerably from RAID 0.



Under RAID 5, not only are the data stripes written, but also parity information relating to the data. The key to RAID 5 fault tolerance is the fact that the parity information for a particular data stripe is always written to a different drive from the drive containing the corresponding data stripe (as illustrated). This means that if a disk fails, the corresponding parity information stored on another disk can be used for error detection and data correction (also referred to as *regeneration*).

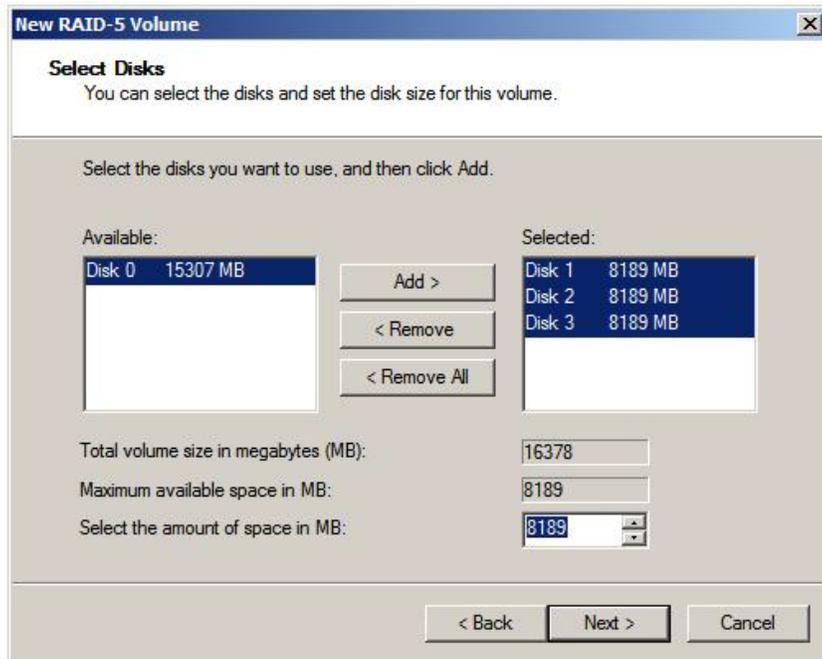
Whilst RAID 5 has considerable advantages over RAID 0 there are one or two drawbacks that should be taken into consideration when considering this storage option. Firstly, there is the inevitable performance overhead inherent in calculating and storing parity information for each data stripe written to disk. Secondly, the loss of more than one disk in a RAID 5 array will leave insufficient parity data on the remaining disks to regenerate the original data. That said, RAID 5 does provide considerable advantages that generally outweigh the disadvantages.

Configuring RAID 5 Using Windows Server 2008 Disk Management

A Windows Server 2008 RAID 5 configuration may be set up using the Disk Management snap-in. This is accessed either from the Server Manager or Computer Management tools. To launch the Server Manager, open the Start menu and click on the Server Manager option, or click on the Server Manager icon in the task bar. Alternatively launch Computer Management from Start -> All Programs -> Administration Tools -> Computer Management or run **compmgmt.csc** at the command prompt or in a Run dialog. In all cases the Disk Management tool can be found under the *Storage* category.

As previously noted, RAID 5 implementation requires a minimum of 3 disk drives. For the purposes of this tutorial a system containing four disk drives is assumed. In this scenario, disk 0 is the system disk and disks 1 through 3 are available for use in the RAID 5 configuration. Before proceeding the disks will need to be initialized using either the MBR or GPT partition style. Assuming these prerequisites are met the first step is to right click on one of the 3 disks in the Disk Management graphical view. In the resulting popup menu select the *New RAID-5 Volume...* option to invoke the *New RAID-5 Volume* wizard. On the wizard's welcome page click on the *Next* button to proceed to the *Disk Selection* screen. This screen contains a list of disk drives available for inclusion in the disk array together with a list of selected disks. Currently only the current disk is included in the *Selected* list. Two more disks must be added to the selected disks

before the RAID 5 array can be built. Select disks from the *Available* list and click on the *Add>* button to add the disk to the selected list. Once sufficient disks (in this case disks 1, 2 and 3) are selected the *Next* button will activate to allow the remainder of the configuration to be completed. Note that disk 0 (the system disk) is not included in the RAID 5 array:



With the disk selections completed, the *Next* button proceeds to the drive letter and mount point assignment screen. Once these settings are configured click *Next* to proceed to the *Format Volume* screen. Select the appropriate file system and compression options and click on *Next* to proceed to the *Summary* screen.

Review the information displayed and click on *Finish* to initiate the RAID 5 creation process. During this process the Disk Management graphical view will list the disks as *Formatting* and then *Resynching*. The amount of time these phases will take depends on the size of the volumes in question. Once the process is complete the status will change to *Healthy* and the RAID 5 volume is ready for use.

Configuring RAID 5 from the Command Prompt using DiskPart

In addition to configuring RAID 5 from within Disk Management, the configuration may also be implemented from the command prompt using **DiskPart**. DiskPart may be launched either from a command prompt or a Run dialog simply by typing *diskpart*. Once invoked, DiskPart will display the *DiskPart>* command prompt and is ready to receive commands.

The first step in the configuration process is to identify the disks attached to the system using the *list disk* command:

```
DISKPART> list disk
```

Disk ###	Status	Size	Free	Dyn	Gpt
Disk 0	Online	30 GB	15 GB	*	
Disk 1	Online	8 GB	8189 MB		
Disk 2	Online	8 GB	8189 MB		
Disk 3	Online	8 GB	8189 MB		

For the purposes of this chapter disks 1, 2 and 3 will be used to create a RAID 5 configuration. Each of these disks needs to be converted to dynamic disks before the configuration can proceed. This is achieved by selecting each disk in turn and executing the *convert dynamic* command:

```

DISKPART> select disk 1

Disk 1 is now the selected disk.

DISKPART> convert dynamic

DiskPart successfully converted the selected disk to dynamic format.

DISKPART> select disk 2

Disk 2 is now the selected disk.

DISKPART> convert dynamic

DiskPart successfully converted the selected disk to dynamic format.

DISKPART> select disk 3

Disk 3 is now the selected disk.

DISKPART> convert dynamic

DiskPart successfully converted the selected disk to dynamic format.

```

Once the disks have been converted to dynamic disks the next step is to create the RAID 5 volume using the *create volume raid* command. This command also takes as a parameter the *disk=* directive followed by a list of disks to be used in the array. The *size=* directive may also be specified to declare the size of the volume. If this value is omitted the volume will be sized to match the smallest contiguous block of unallocated space on the designated disk drives:

```

DISKPART> create volume raid disk=1,2,3

DiskPart successfully created the volume.

```

Once the command has completed and displayed the *DISKPART>* prompt the system will have begun the resynching process. This can take a considerable amount of time depending on the size of the volume. During this process, the status of the volume will be listed as *Rebuild* when the *list volume* command is executed:

```

DISKPART> list volume

```

Volume ###	Ltr	Label	Fs	Type	Size	Status	Info
* Volume 0			RAW	RAID-5	16 GB	Rebuild	
Volume 1	C		NTFS	Simple	15 GB	Healthy	System
Volume 2	D			DVD-ROM	0 B	No Media	

Once the resynch is complete the volume status will change to *Healthy* at which point the volume may be formatted (the RAW type listed above indicates the volume has yet to be formatted). The volume may be formatted using the *format* command as follows:

```
DISKPART> format fs=ntfs label="RAID 5 Vol"  
  
    100 percent completed  
  
DiskPart successfully formatted the volume.
```

Once the volume has been formatted the RAID 5 configuration is ready for use.

Notes on possible RAID 5 problems

In order to function, all the disks in a RAID 5 configuration must be online and healthy. If the RAID 5 set displays *Failed Redundancy* and the volume is listed as *Offline*, *Missing* or *Online (Errors)* there is a problem which needs to be resolved.

If the status is *Offline* or *Missing*, check that the disk is connected and powered up. If the problem is resolved select *Rescan Disks* from the *Actions* menu. Once the rescan is complete right click on the problematic drive and select *Reactivate*. All being well the drive status will change to *Regenerating* as the data is rebuilt using the parity information on the other drives in the array. If, once regeneration is complete, the status does not return to *Healthy*, right click once again and select *Regenerate Parity*.

If a disk in a RAID 5 configuration is listed as *Failed* or *Online (Errors)* repeat the above steps. If this fails the disk may be unrecoverable and will need to be replaced. To achieve this, right click on the volume on the failed disk and select *Remove Volume* from the popup menu. Once the volume has been removed, right click on a suitable block of unallocated space on another dynamic disk which is not already part of the RAID 5 array, has sufficient space and has a matching partition style and select *Repair Volume*. This will rebuild the RAID 5 configuration using the space on new disk drive together with the remaining healthy disks from the original RAID 5 configuration.