Lab 5: Windows File System

East Tennessee State University

CSCI 4417/5417: Introduction to System Administration

Spring 2016

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Purpose

To learn basic Windows file system including RAID, Spanning and Dynamic Disks

Materials

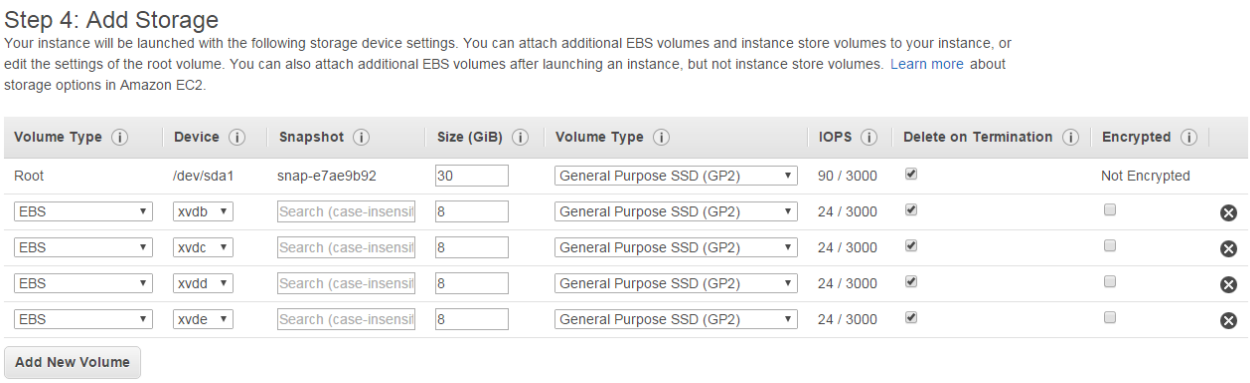
- Windows Server 2012 R2 Instance

Procedure and Results

Windows

A new Windows Server 2012 R2 Instance was launched. "General Purpose – t2.medium" instance type was selected instead of t2.micro type that was selected in the previous labs. On 'Add Storage' window four new volumes were added (see Fig. 1). Amazon Elastic Block Store (EBS) types were selected for the volumes. EBS provides persistent block level storage for use with Amazon EC2 instance ("Amazon Elastic Block Store"). However since the storage adds additional cost, 'Delete on Termination' checkbox was checked to make sure the storage blocks were deleted when the instance was terminated.

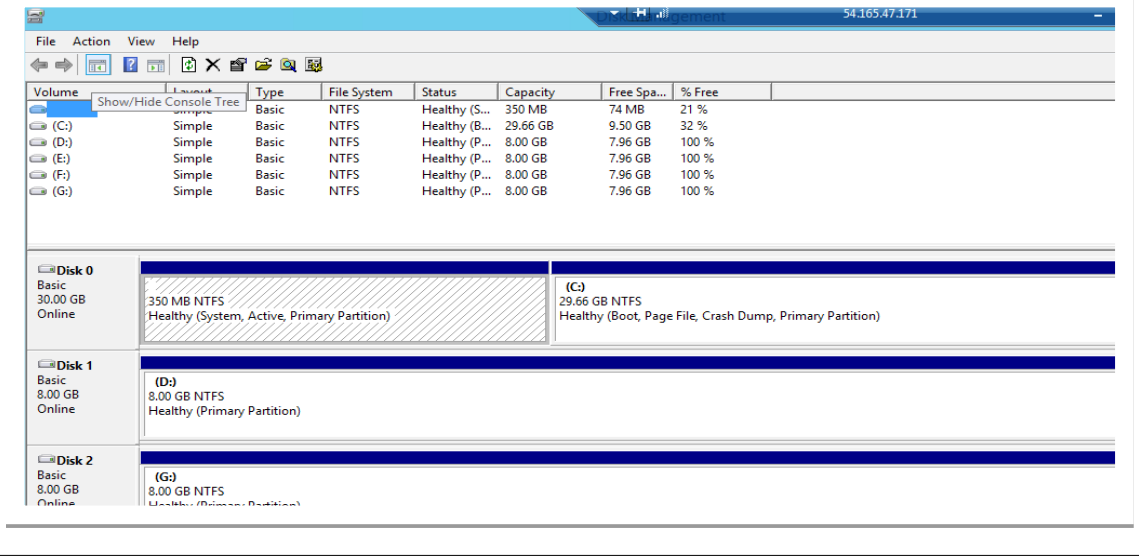
Figure 1: Adding additional storage



Upon completing the setup the instance was launched and connected through RDP. To generate a password for login the authentication key created in an earlier lab was used. After login, Disk Management Tool (DMT) was launched by right-clicking on the Start button and selecting 'Disk Management'.

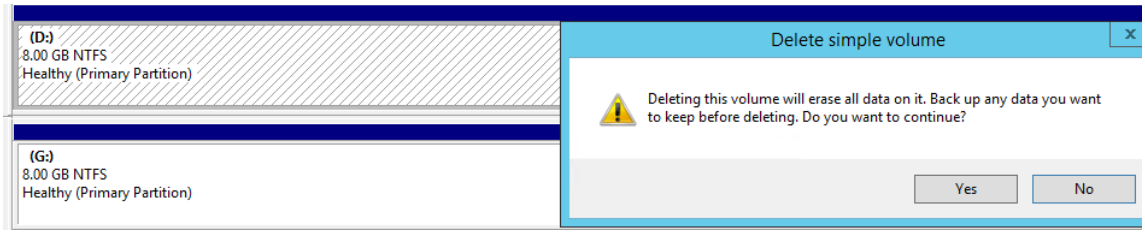
The Disk Management window shows all the partitions on the top pane and all the physical drives on the bottom pane (see Fig. 2) (“Understanding Hard Drive Partitioning”).

Figure 2: Drives listing in Disk Management window



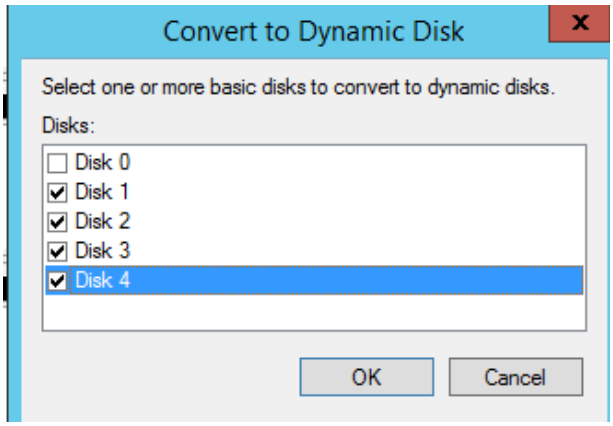
Disks 1-4 were selected and the partitions on each were deleted by selecting ‘Delete Volume’ on the right-click menu. Windows warns about the loss of data (see Fig. 3).

Figure 3: Deleting simple volume



The Disks (1-4) were then converted to dynamic disks by right-clicking on the Disk 1 in the lower pane and selecting ‘Convert to Dynamic Disk’. ‘Convert to Dynamic Disk’ window pops up which lets selecting other disks to convert them to dynamic disks as well (see Fig. 4).

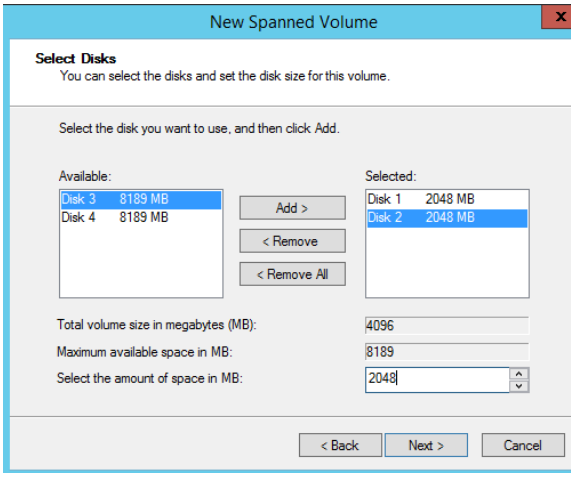
Figure 4: Converting to dynamic disks



Once the disks are converted to dynamic disks they are shown as 'Dynamic' in the Disk Management window. Several different kinds of volumes were created on these disks. First, a simple volume was created on Disk 1 of size 2 GB. Simple volume can be created by right-clicking on the disk and selecting 'New Simple Volume'. The size could be specified on the wizard that appears next. Unused drive letters were used sequentially (D, E and so on). The drives were formatted to NTFS format.

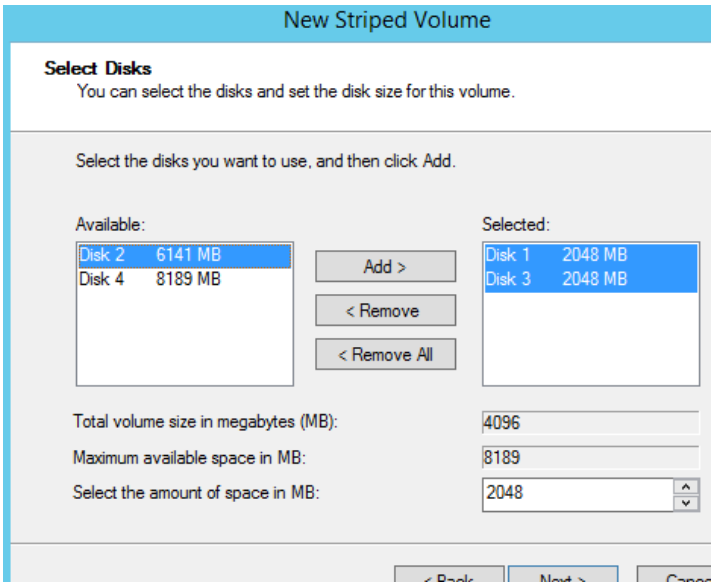
A 2 GB spanned volume was created that spanned across Disk 1 and Disk 2 (See Fig. 5). The Disk Management window reflected this by assigning same drive letter to both the partitions.

Figure 5: Creating new Spanned Volume



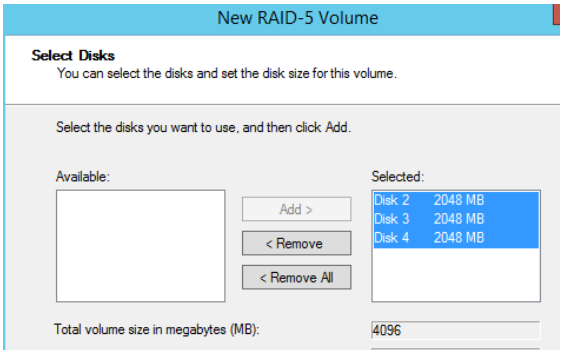
Similarly, a 2 GB striped volume was created using Disk 1 and Disk 3 (See Fig. 6).

Figure 6: Creating new Stripped Volume



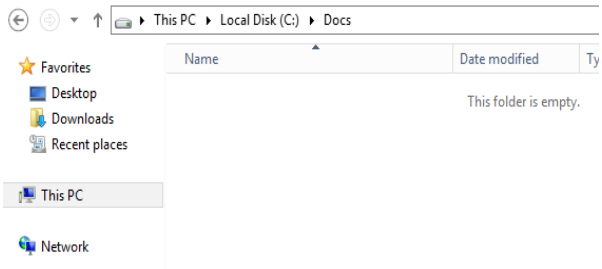
A mirrored drive between Disk 1 and Disk 2 was also created using steps similar to above. Also a RAID 5 volume was created between Disk 2, Disk 3 and Disk 4 (See Fig. 7). The Disk Management windows show this by assigning same drive letter for the partitions.

Figure 7: Creating new RAID-5 Volume



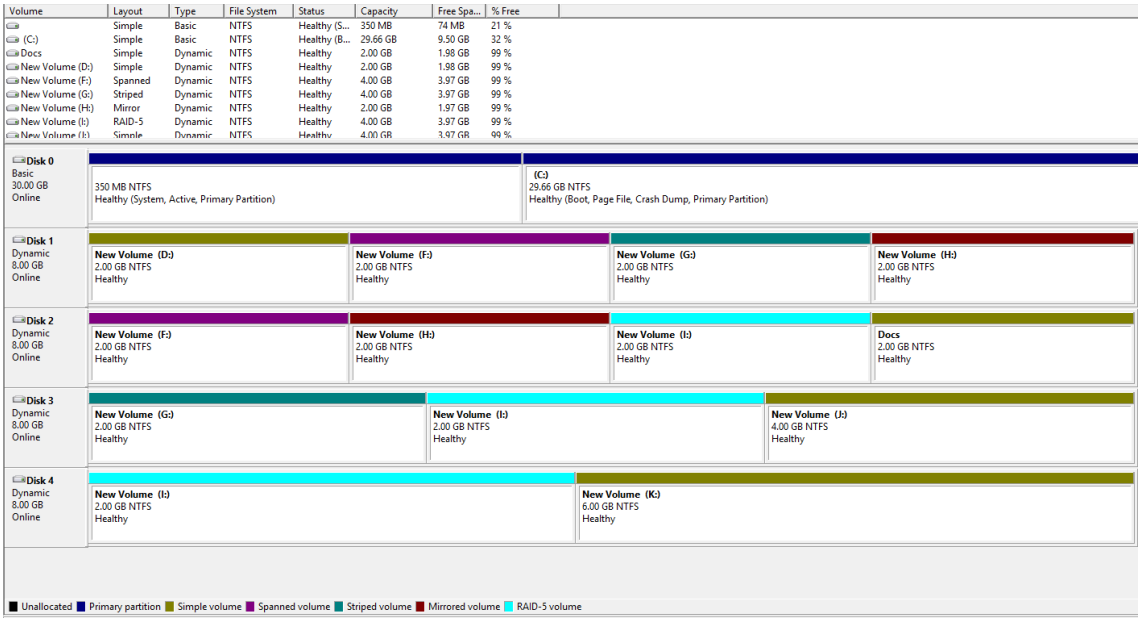
Finally, mounting a partition to a drive was also experimented in the lab. A simple volume was created, but instead of assigning it a drive letter, it was mounted to C:\Docs directory (See Fig. 8).

Figure 8: Mounted drive to a directory



The Disk Management window shows the partitions created in the lab (See Fig. 9).

Figure 9: Disk Management window showing partitions



Similarly, the File Explorer also shows the partitions accordingly (See Fig. 10).

Figure 10: File Explorer showing partitions

Observations

The lab experimented with different volume types. There are several reasons for a System Administrator to choose one over another. E.g. A simple volume may be desirable where an administrator does not have many disks to spend for redundancy. A spanned volume may be desirable if the space on one of the drives is not enough for a desirable volume size. A mirrored volume can be used as a way to prevent fault tolerance. Similarly a RAID-5 volume might be desirable for better fault tolerance capability than just a mirrored volume. In RAID-5 since multiple disks are added, it can provide better fault tolerance because the data can be verified from across all the participating drives. A striped-volume is used to make the data scatter over multiple drives to improve performance. Based on these features an Administrator can choose one more volume types to store the data. Sometimes mounting a drive to a directory makes more sense than accessing them through drive letters. If a drive is supposed to store a particular kind of data (that is relevant to the work) it can be logically mounted to a related directory. There were two disk types explored in the lab. A basic disk types are easier to manage. There can be 4 primary partitions on a basic disk. System Administrator can add more partitions by making the fourth partition as extended and creating partitions on the extended partition. Dynamic disks can have around 2000 partitions. Volumes (partitions) in dynamic disks can be created that can use more than one hard disk. A System Administrator may also choose Hardware RAID to maintain only a single disk per RAID array. The

hardware RAID handling is done through an external controller. Software RAID on the other hand provides the cheapest solution because the disk controller cards and hot-swap Chassis required for external RAID are not required. Since software RAID uses CPU computing power it might make the system slow (“Hardware RAID versus Software RAID”). However, many argue that today’s processors are powerful enough and can handle such processing without any noticeable hit in the performance.

In Linux Logical Volume Manager (LVM) is used to manage disk with the capability to be added or replaced without disrupting service. LVM also provides partitions to be easily expanded or resized. It provides the capability to expand a volume across multiple hard disks.

References

"Amazon Elastic Block Store (EBS) – Block Storage." Amazon Web Services, Inc. Web. 14 Mar. 2016.

"Windows Admin: Understanding Hard Drive Partitioning with Disk Management." HowTo Geek RSS. 01 May 2014. Web. 14 Mar. 2016.

"3.3. Hardware RAID versus Software RAID." Hardware RAID versus Software RAID. Web. 14 Mar. 2016.