# Virtual Disk Operations for System Administrators Guide

## From the basics to advanced. Clear demonstrations and technical explanations.

**Tim 'Shaggy' Bielawa**

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## Introduction

I was inspired to write this document because I felt the quality of the information regarding commonly used functionality in virtual disk operation was lacking certain specific clear examples. The information that is available is not contained in a central location. Some concepts of the qemu system aren't covered at all. FAQs lead on to having an answer to a particular query, but many lead you to off site resources, some of which are no longer available on the Internet.

What I hope to do is provide a document which will demonstrate the core concepts of virtual disk management. This document will concern itself primarily with the **qemu-img** tool and common GNU/Linux disk utility tools like **fdisk**. Most importantly to me, in the case of non-trivial examples, I hope to identify what the relevant technical concepts are how they work up to the final result of each example.

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# List of Examples

# Chapter 1. Basic Operations

## Creating a simple image

The simplest operation (next to deleting an image) you can do is creating a new virtual disk image. There are several options one could consider when creating an image: which format, to use encryption, to use compression, or even what existing image to base this new disk off of. In this example we will limit our concern to creating a simple basic image capable of being used as a boot disk for a qemu/kvm virtual machine. The resulting image will not be able to be mounted on your local filesystem without additional work, this is covered in the Advanced Operations section below.

```
tbielawa@fridge:~$ qemu-img create /srv/images/webserver.raw 10G
Formatting '/srv/images/websserver.raw', fmt=raw, size=10485760 kB
```

From the 'fmt' description above we can tell that the type of virtual disk crated is 'raw'. Likewise, we can confirm from the output that the size of the created disk is 10 gigabytes.

## Retreiving information about an existing image

How to get more information about a disk image.

**Example 1.1. qemu-img `info` usage**

```
tbielawa@fridge:~$ qemu-img info /srv/images/webserver.raw
image: /srv/images/webserver.raw
file format: raw
virtual size: 10G (10737418240 bytes)
disk size: 0
```

The information provided with the `info` option is pretty sparse but helpful. You will find that that if you're using a filesystem that supports files with holes in them, and the qcow image format type, that the filesize supplied by the **ls** command does not match the size you have made the file. Using **qemu-img** `info` will correctly provide the virtual disks size.

Additionally, the disk size field above shows the actual space used on your hard disk by the virtual disk. This is similar to using the **ls** command with the `-s` option.

## Mounting a Disk Image

Mounting a disk image is fairly trivial if you're using a format without holes in it, like raw which we used above. Use the **qemu-img** command to find out what kind you're using if you're not sure. Additional caveat, the image can only contain one partition, Disks with multiple partitions will be discussed in the Advanced Virtual Disk Operations section below.

### Example 1.2. Mounting a Disk Image

```
tbielawa@fridge:~$ mkdir /tmp/image
tbielawa@fridge:~$ mount -o loop /srv/storage/webserver.img /tmp/image
tbielawa@fridge:~$
```

# Chapter 2. Advanced Operations

## Creating a Mountable Disk

In the previous section I went through creating a disk that you can use as the boot disk for a virtual machine. In that example it was expected that you would configure your virtualization software to use that disk and then the operating system installation would take care of creating the disk label and file systems. In this section I'll show you the steps required to do that by yourself.

I've chosen to break this section up into separate parts to clearly show simpler methods apart from the more advanced methods. Each method presented grows in complexity as the virtual disk created becomes more indistingushable from a real hard drive.

## Cloning a Physical Disk

> "Everything's a file"
>
> — Unknown

It is also possible to clone an existing physical hard disk using the **qemu-img** `convert` option. This is possible in part due to the original philosophy laid down by Dennis Ritchie and Ken Thompson when they first created Unix that everything's treated as a file. The syntax for the `convert` is below.

```
convert [-c] [-e] [-6] [-f fmt] [-O output_fmt] [-B output_base_image] \
 filename [filename2 [...]] output_filename
```

I never fully grasped the "everything's a file" concept until I tried (expecting to fail) to use the `convert` option to create a virtual disk image of an actual hard drive. This section explains how to do just that.

**Example 2.1. Making a virtual disk from a physical disk**