

In-Guest UNMAP, EnableBlockDelete and VMFS-6

Original Article URL: <https://www.codyhosterman.com/2017/08/in-guest-unmap-enableblockdelete-and-vmfs-6/>

Credit: [Cody Hosterman](#)

EnableBlockDelete with VMFS-5

I have a Ubuntu VM with a thin virtual disk on a VMFS-5 volume.

Image not found or type unknown

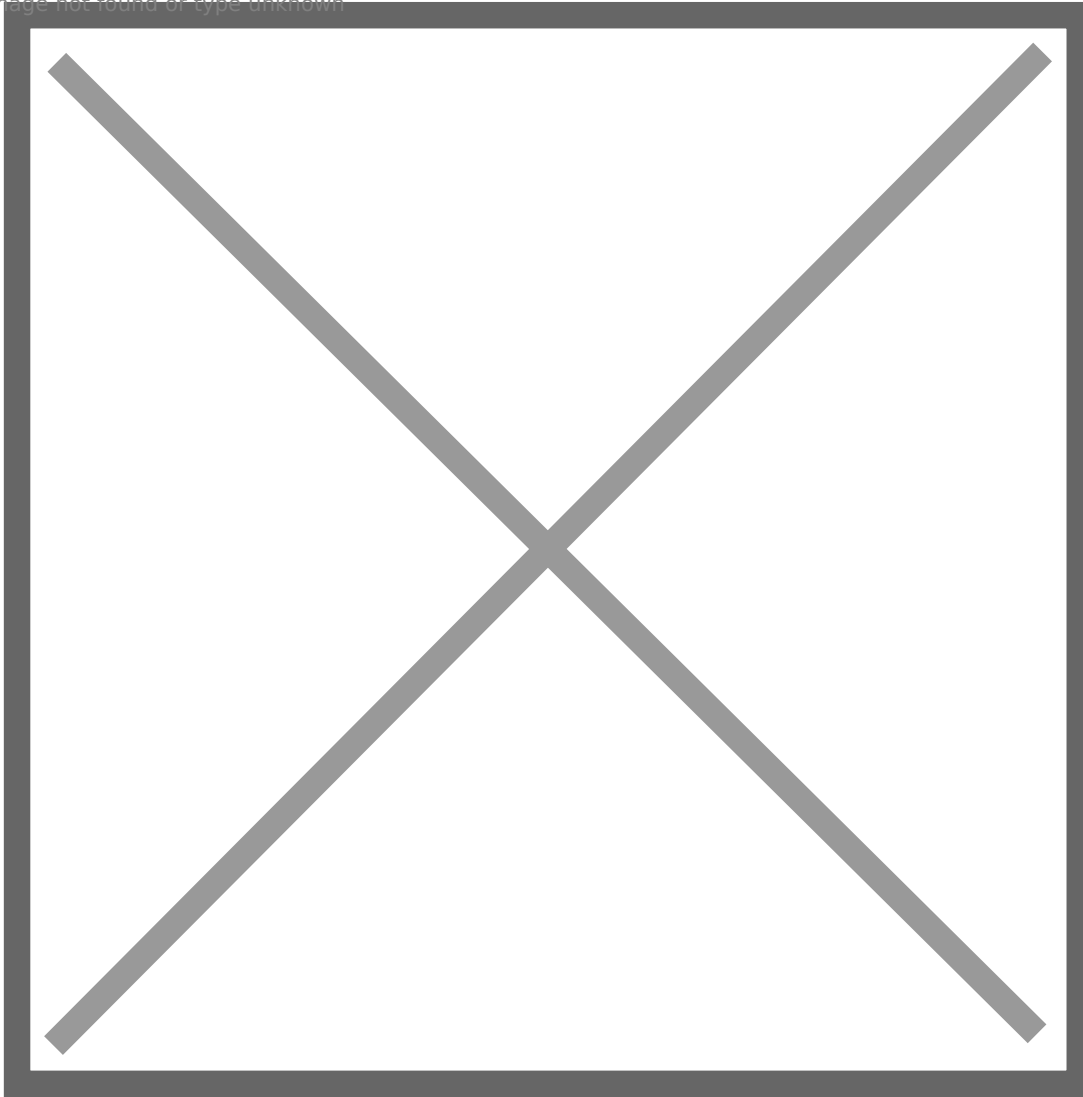
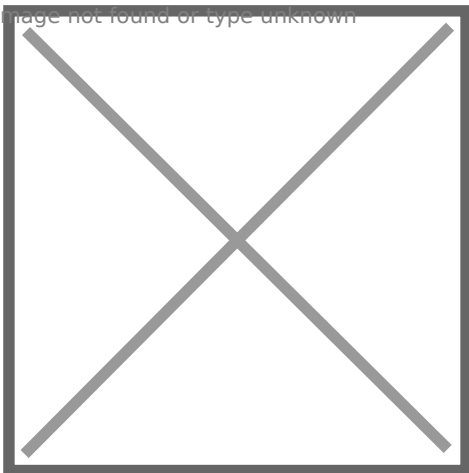
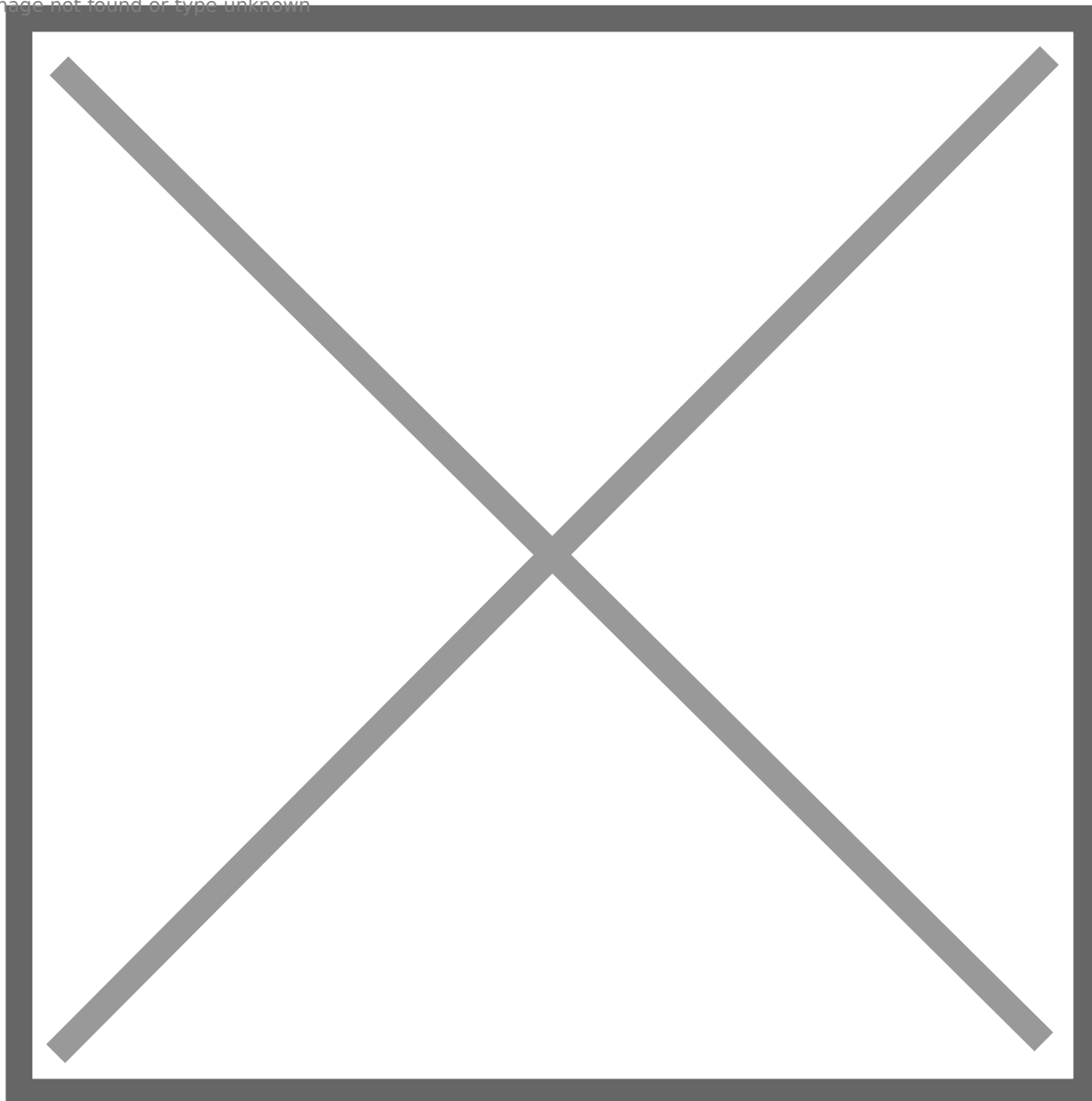


Image not found or type unknown



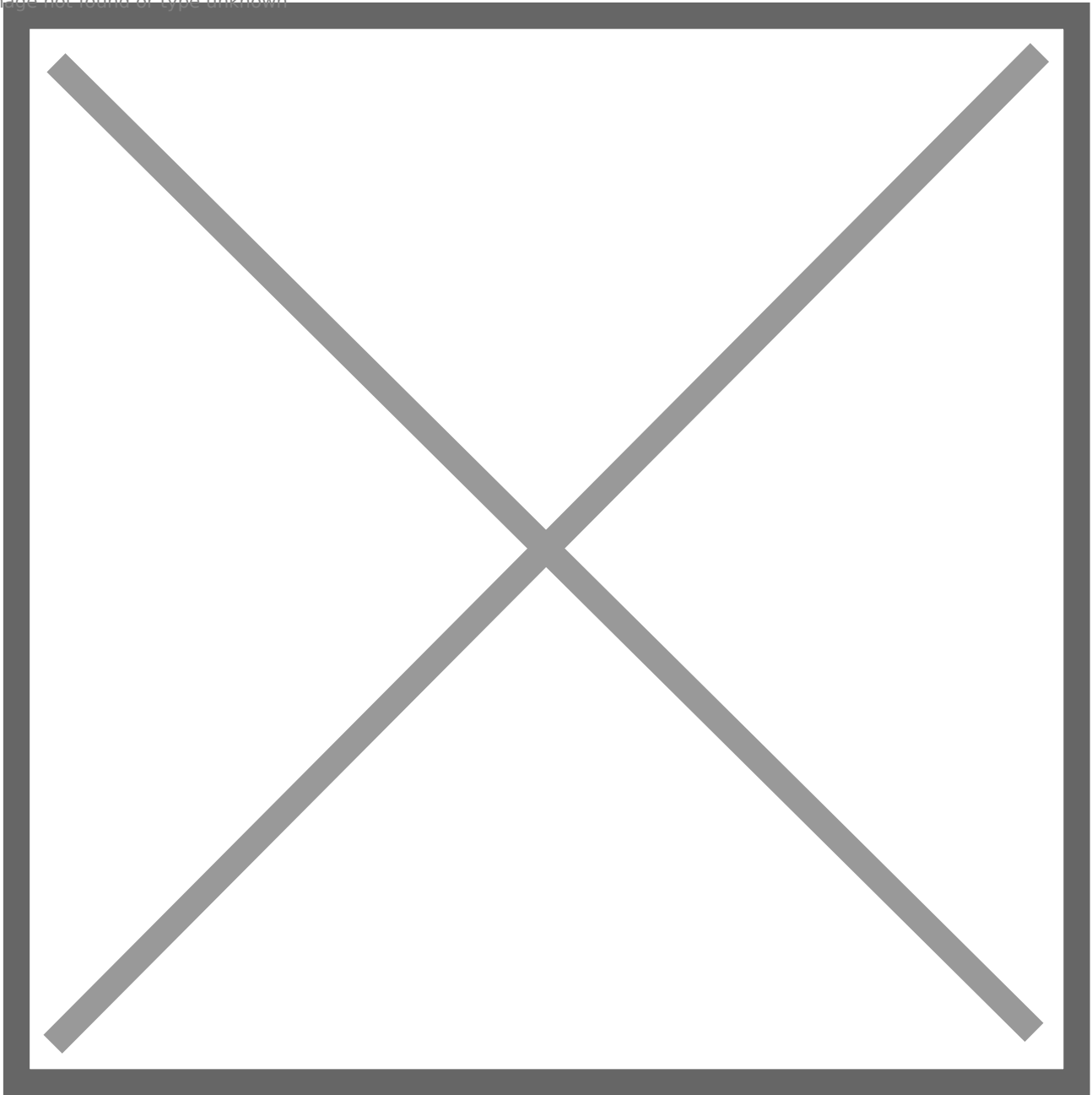
Furthermore, I have EnableBlockDelete DISABLED on the ESXi host (set to 0). It is important to note that this is a host-wide setting.

Image not found or type unknown



In my VM, I will put ext4 on the virtual disk then mount it:

Image not found or type unknown

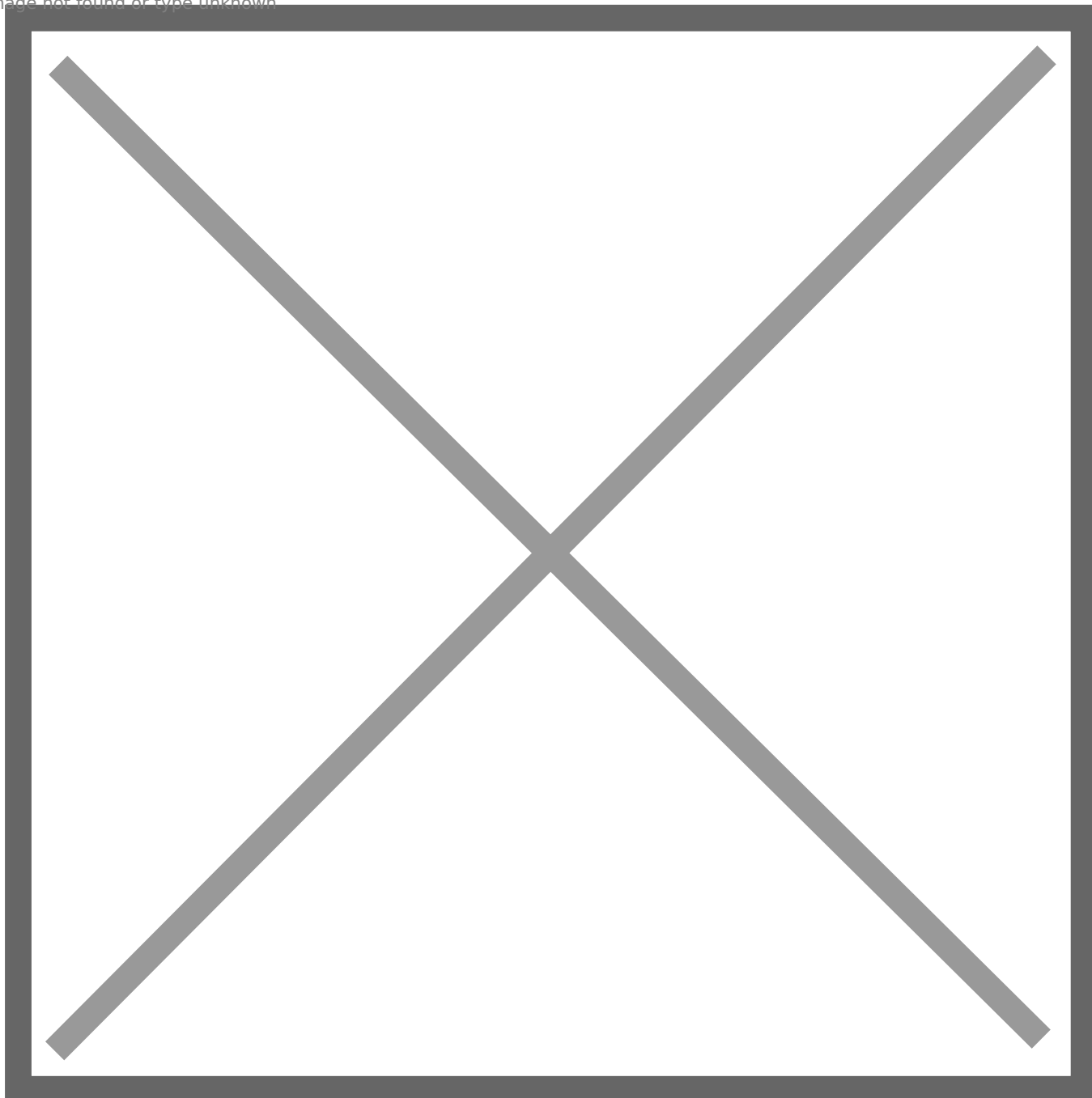


We can see through `sg_vpd` that UNMAP is supported on this virtual disk:

```
root@Ubuntu16:~# sg_vpd /dev/sdb -p lbpv |grep "Unmap"  
Unmap command supported (LBPU): 1
```

Now I will put some data on the file system. A couple of OVAs.

Image not found or type unknown

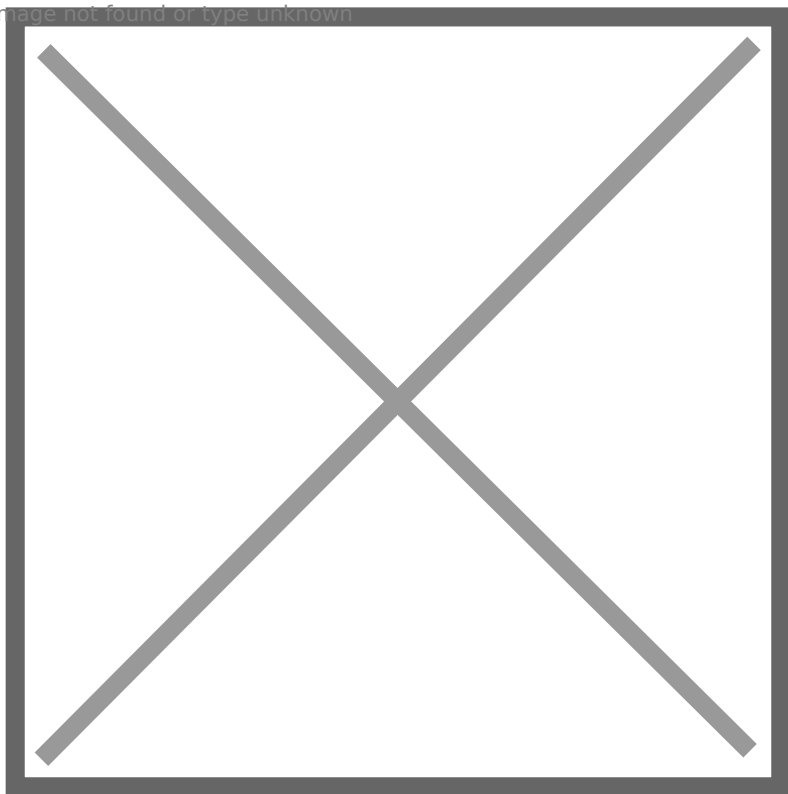


```
root@Ubuntu16:/mnt/unmap# df -h /mnt/unmap
```

Filesystem	Size	Used	Avail	Use%	Mounted on
/dev/sdb	16G	3.9G	11G	26%	/mnt/unmap

My file system reports as having 3.9 GB used. My VMDK is 4.4 GB in size.

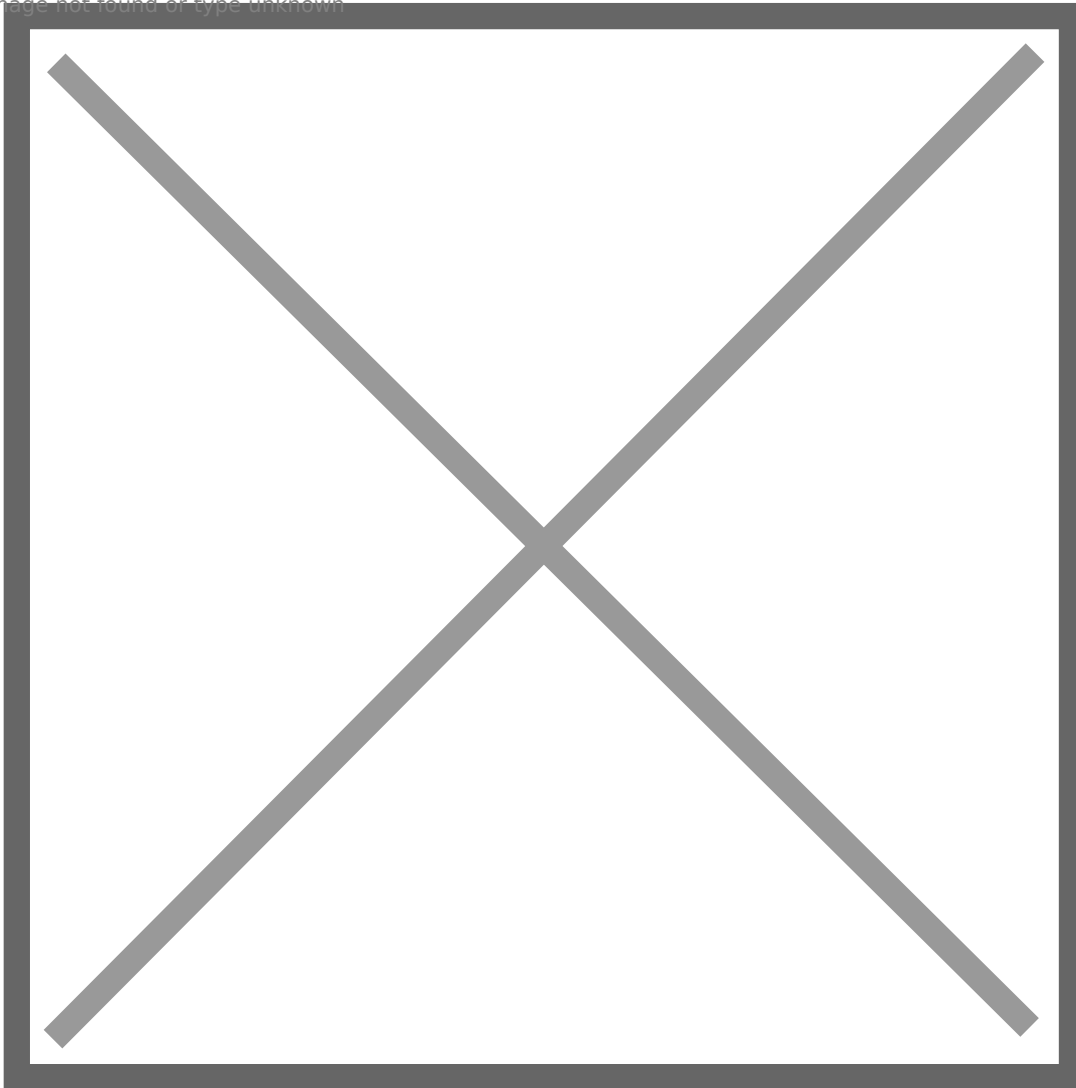
Image not found or type unknown



There is about 400 MB of capacity that was written when the file system was created, which explains the difference between those.

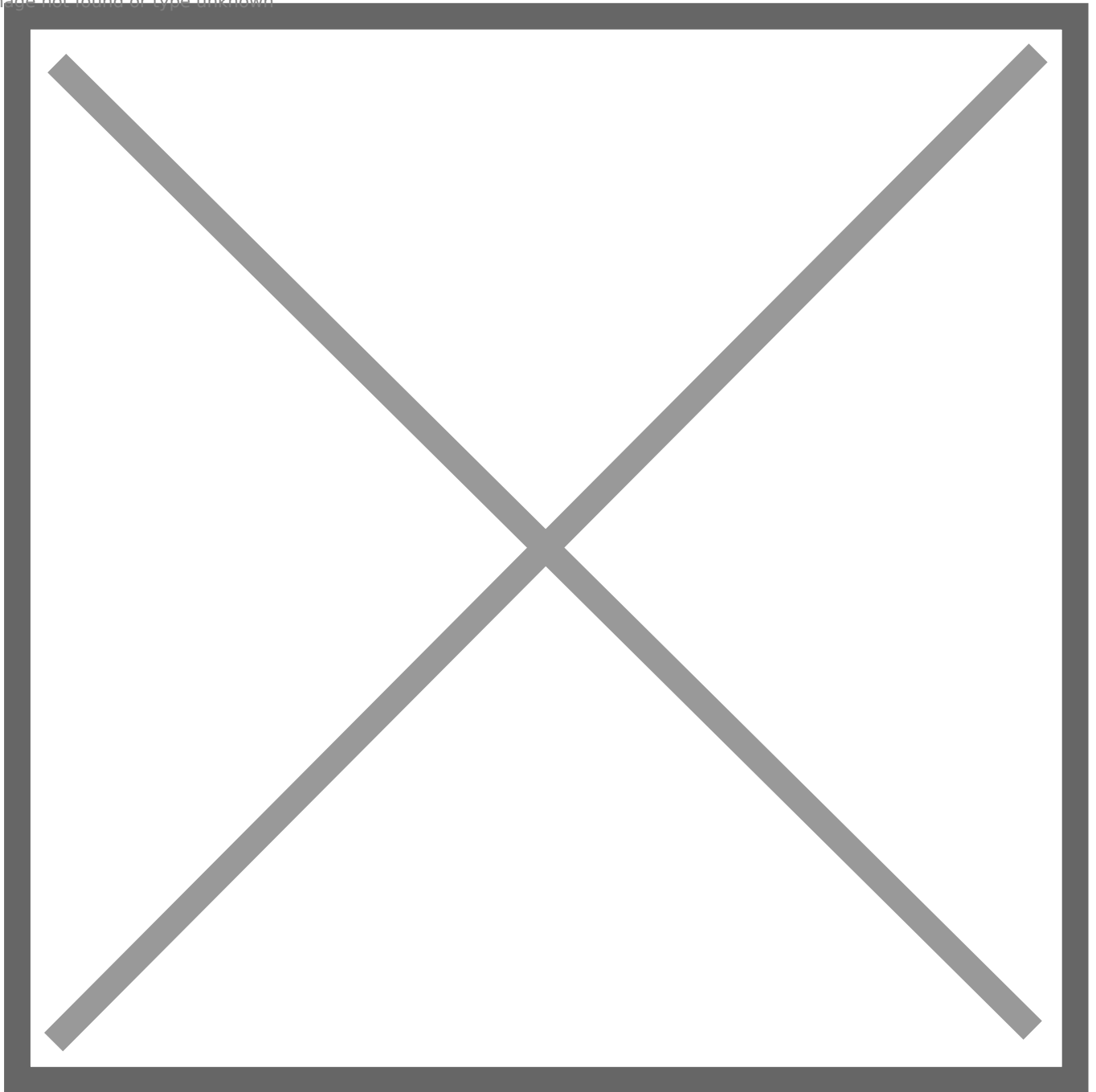
The underlying array reports 3.7 GB used. Smaller due to data reduction. Since the OVAs are compressed already, there isn't a ton of data reduction to do.

Image not found or type unknown



Okay, so let's delete the OVAs.

Image not found or type unknown



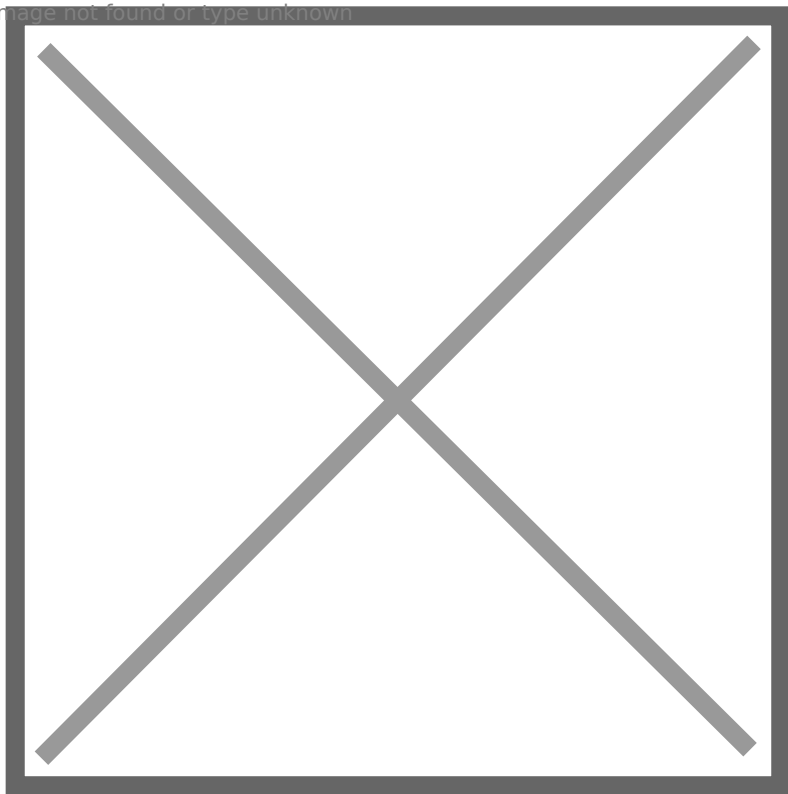
We can see the file system is now down to 44 MB used:

```
root@Ubuntu16:/mnt/unmap# df -h /mnt/unmap
```

Filesystem	Size	Used	Avail	Use%	Mounted on
/dev/sdb	16G	44M	15G	1%	/mnt/unmap

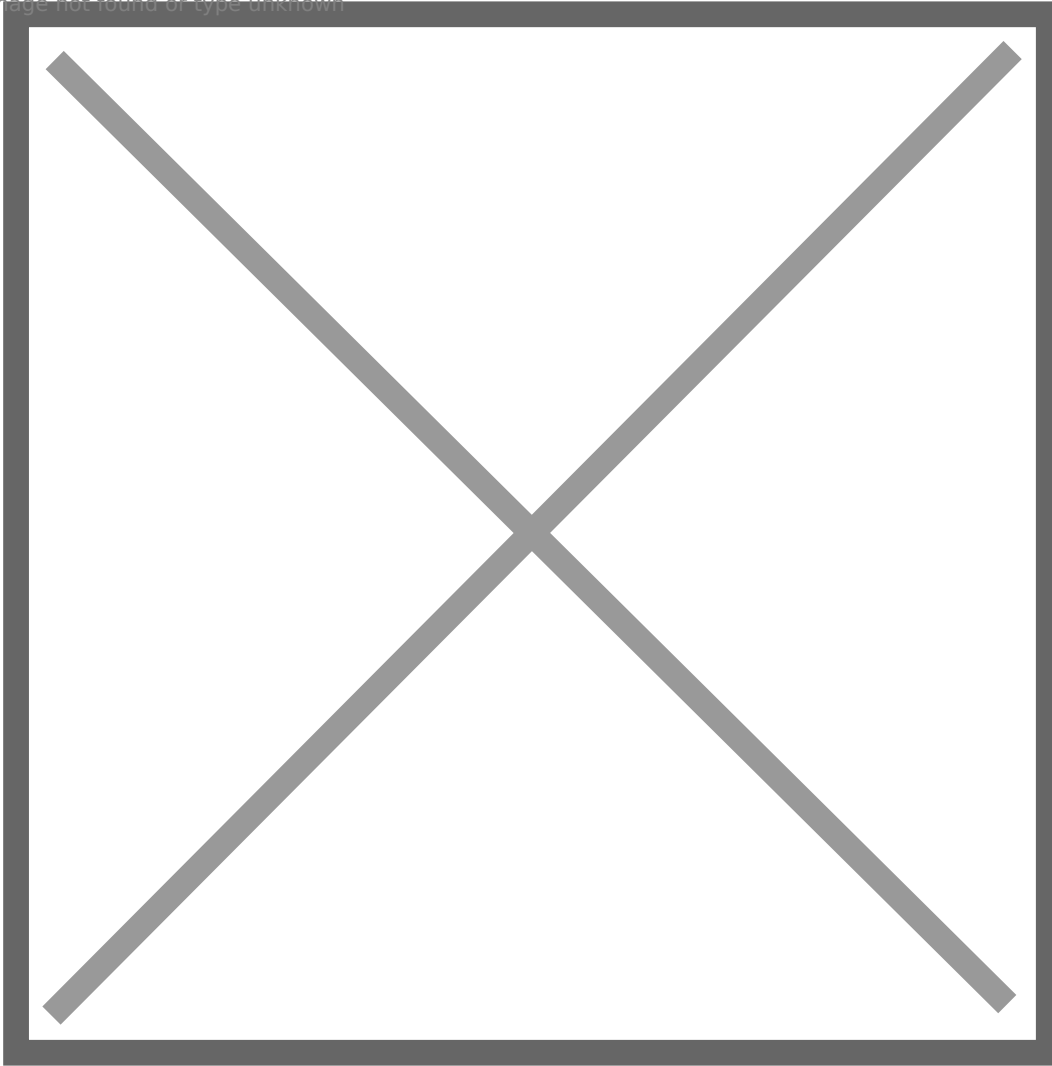
But if we look at the VMDK, it is still 4.4 GB:

Image not found or type unknown



And the array is unchanged too.

Image not found or type unknown



So we now have dead space in the VMDK and on the array, because those blocks are no longer in use by the guest. So, in Linux, to reclaim space you can either mount the file system with the discard option so UNMAP is triggered immediately upon file deletion, or you can manually run it with fstrim. I did not mount with the discard option, so I will run fstrim.

Image not found or type unknown

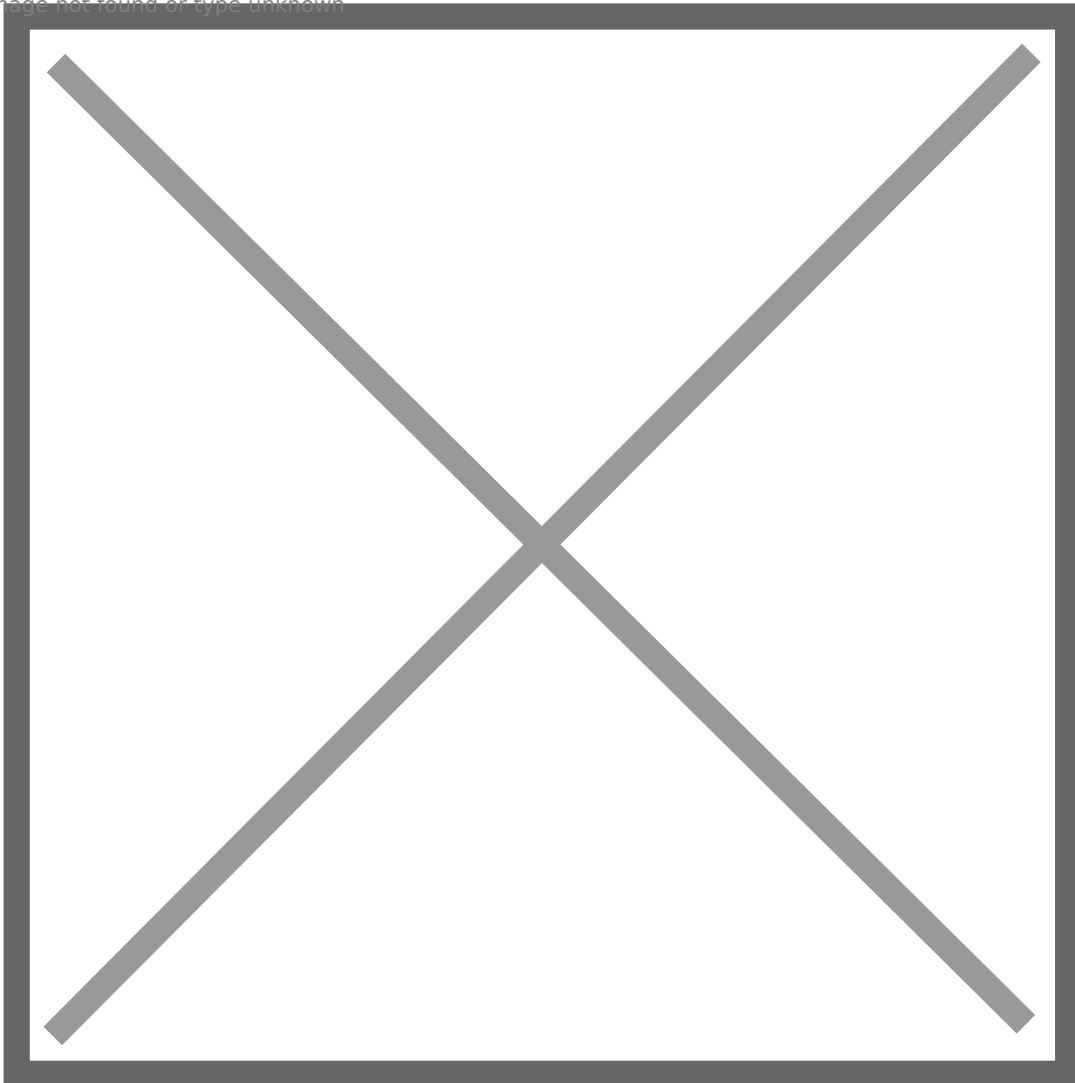
```
root@Ubuntu16:/mnt/unmap# fstrim /mnt/unmap -v  
/mnt/unmap: 3.9 GiB (4131360768 bytes) trimmed
```

Now if we look at my VMDK, we will see it has shrunk to 400 MB:

Image not found or type unknown

But my array is still reporting it as used. This is because EnableBlockDelete is not turned on. The UNMAP in the guest only makes the VMDK size accurate by shrinking it down. But the underlying physical device is not told.

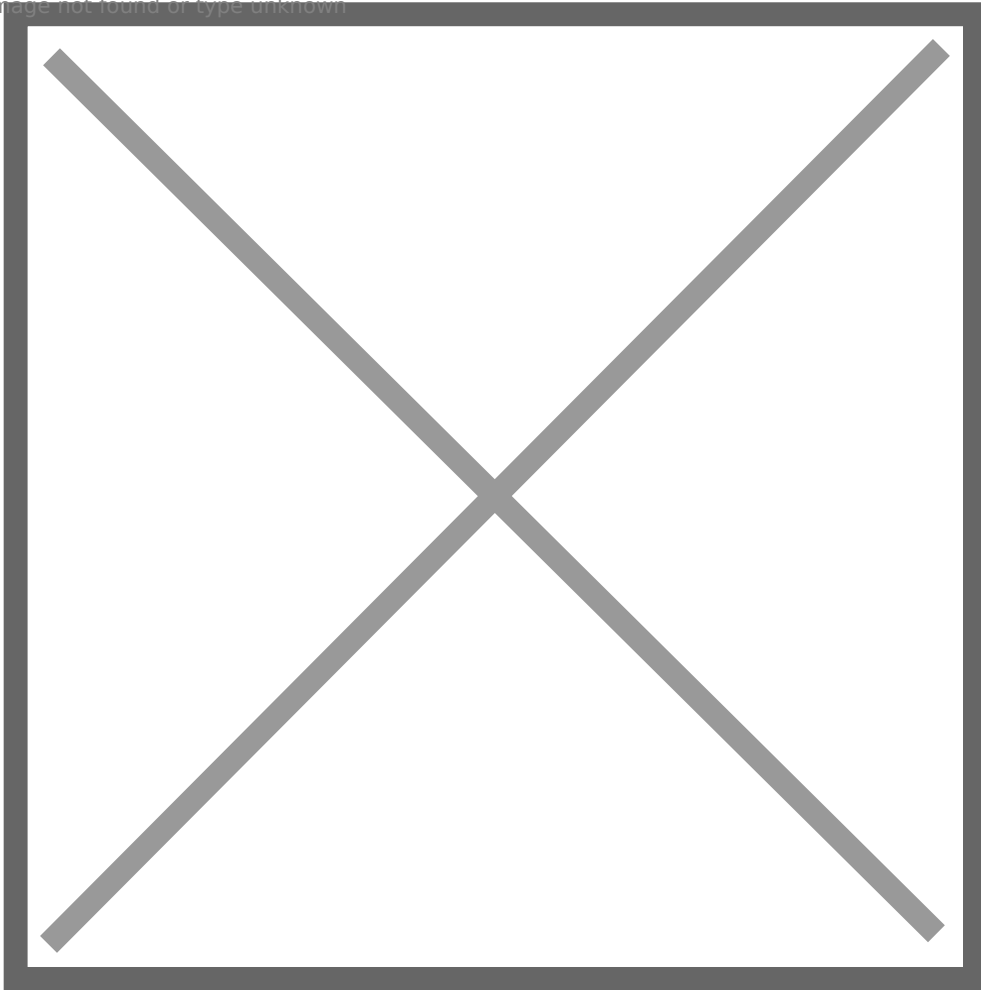
Image not found or type unknown



So at this point (since it is VMFS-5) I have to run `esxcli storage vmfs unmap` to reclaim it.

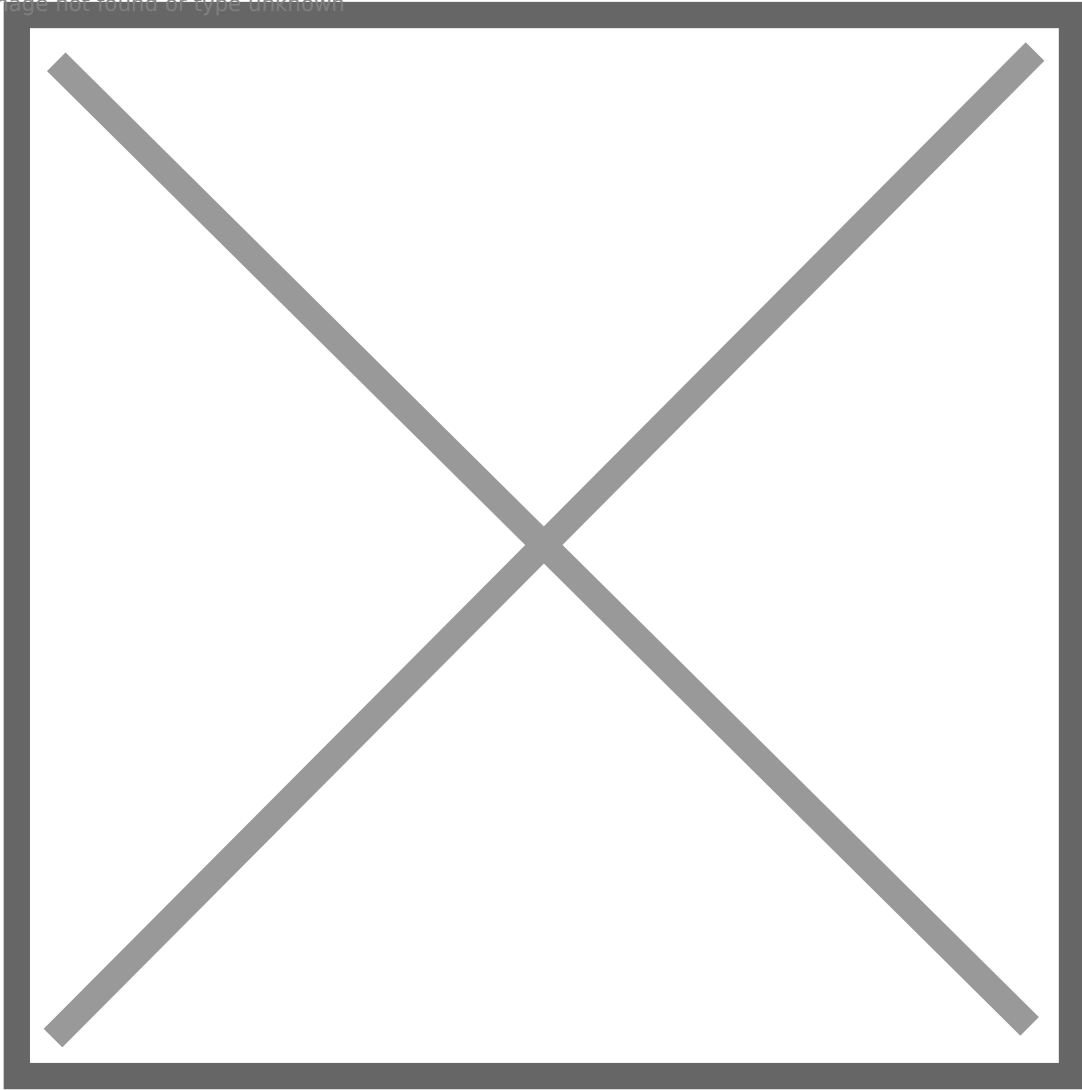
```
esxcli storage vmfs unmap -l vmfs5
```

Image not found or type unknown



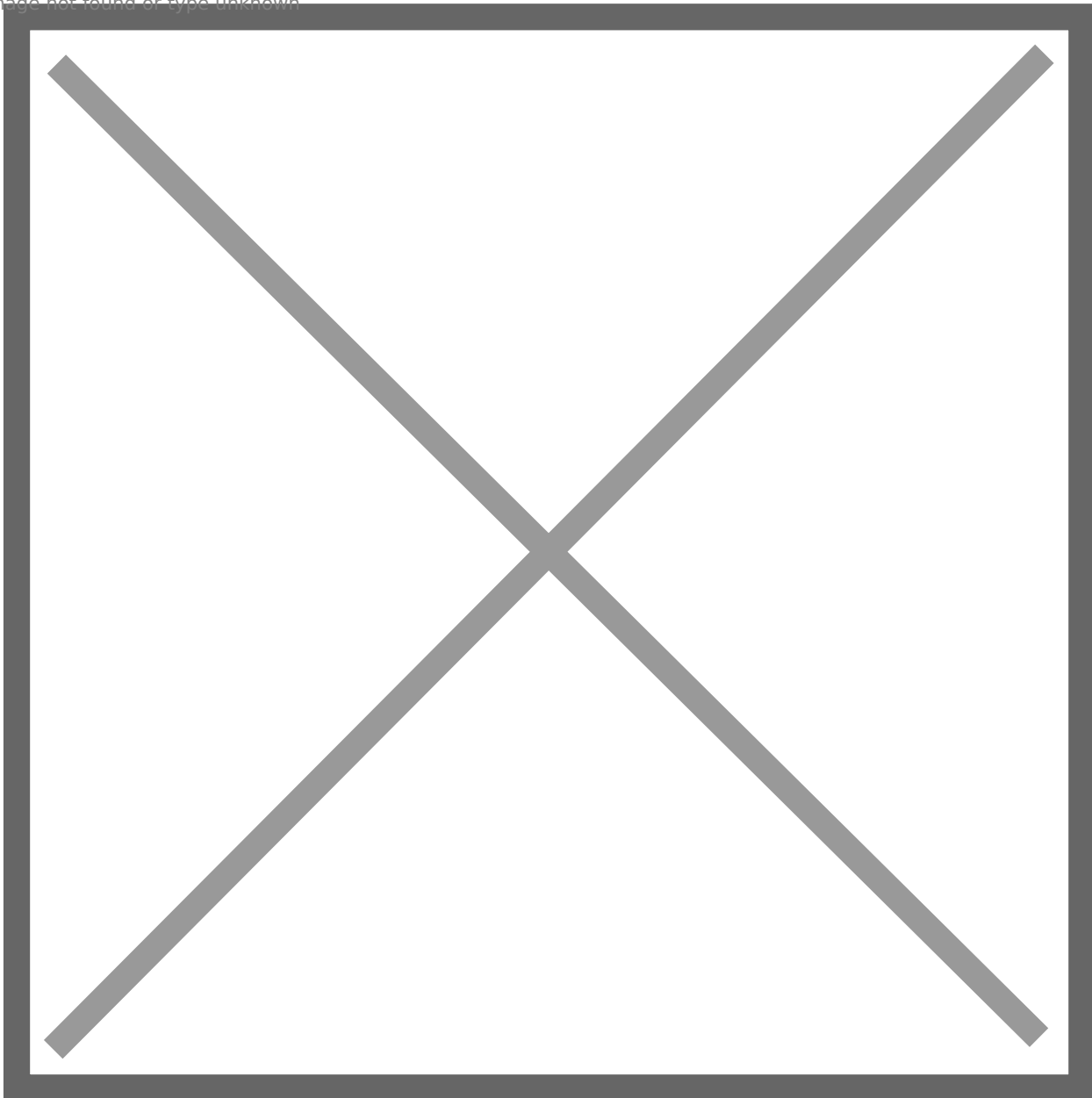
Once complete, we can see the capacity reclaimed on the array:

Image not found or type unknown



So this is the default behavior. Let's enable `EnableBlockDelete` and repeat the process.

Image not found or type unknown



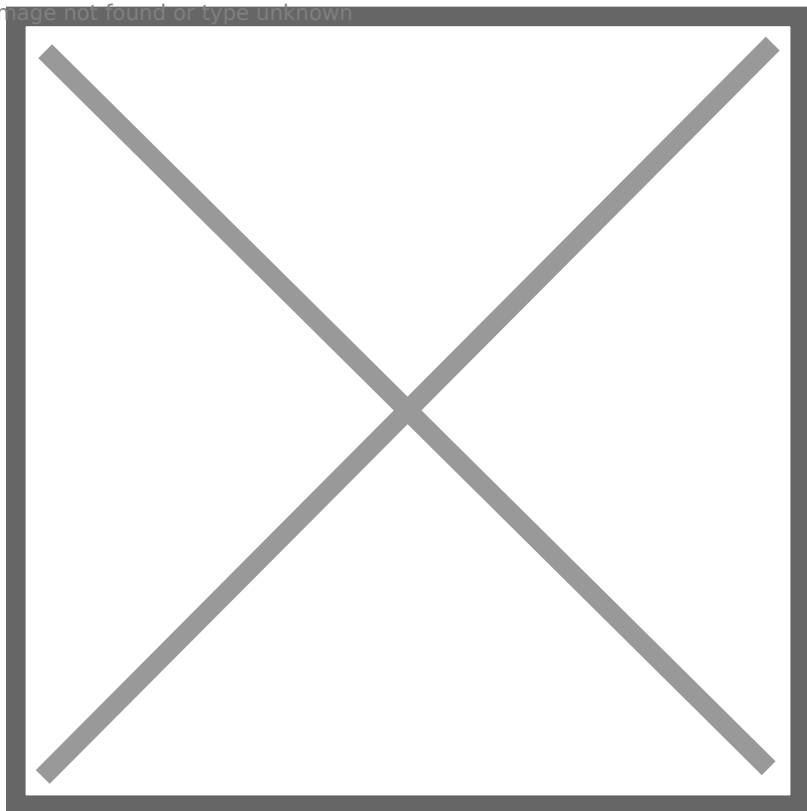
I will copy the data back to the file system, which will grow the virtual disk again and write data back to the FlashArray. We can see we have 3.9 GB used again on my file system.

```
root@Ubuntu16:/mnt/unmap# df -h /mnt/unmap
```

```
Filesystem Size Used Avail Use% Mounted on
/dev/sdb 16G 3.9G 11G 26% /mnt/unmap
```

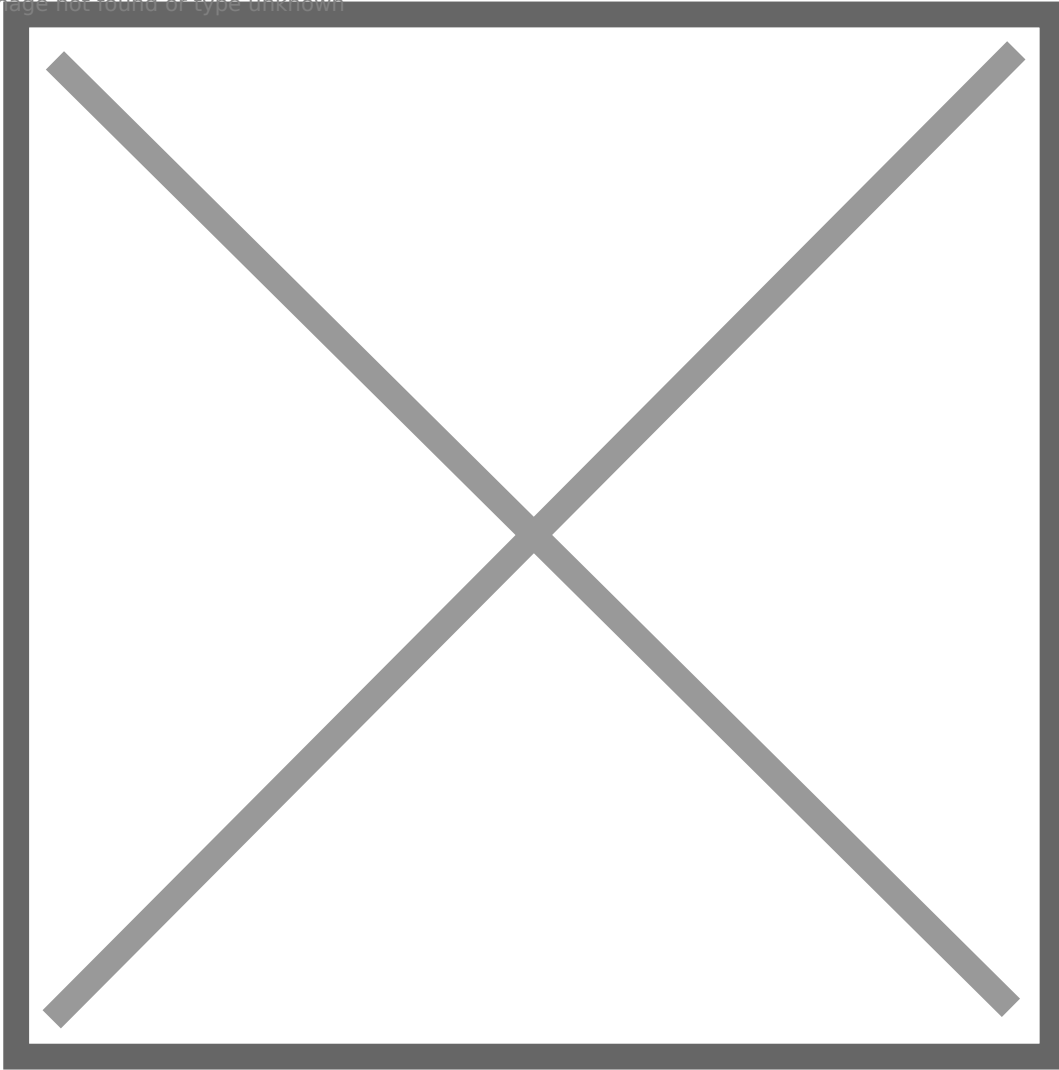
My virtual disk is back to 4.4 GB:

Image not found or type unknown



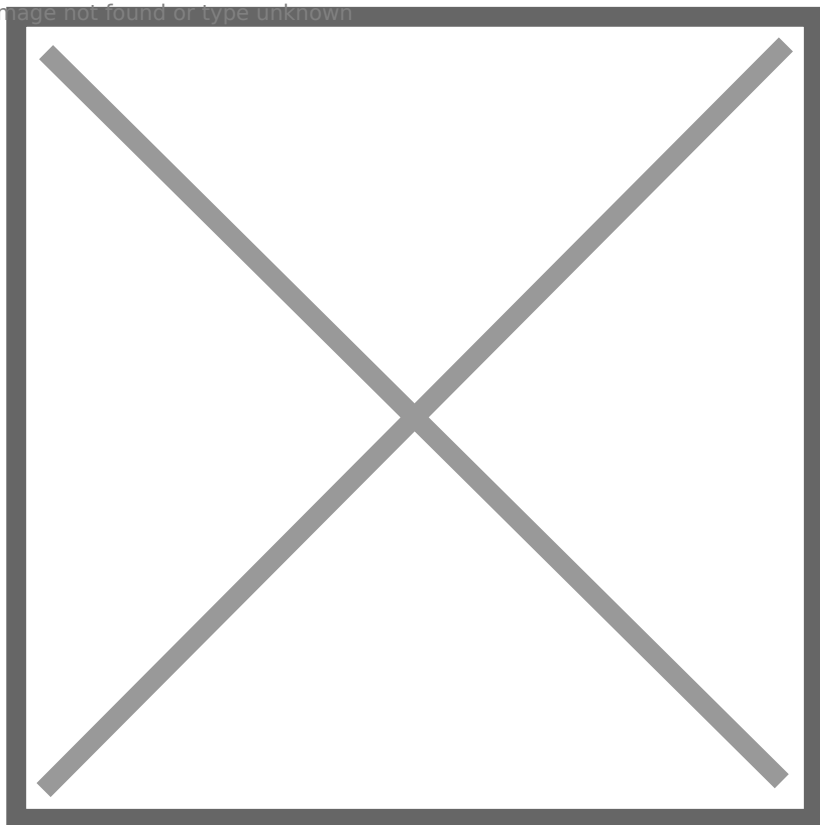
My array reduced it to 1.7 GB:

Image not found or type unknown



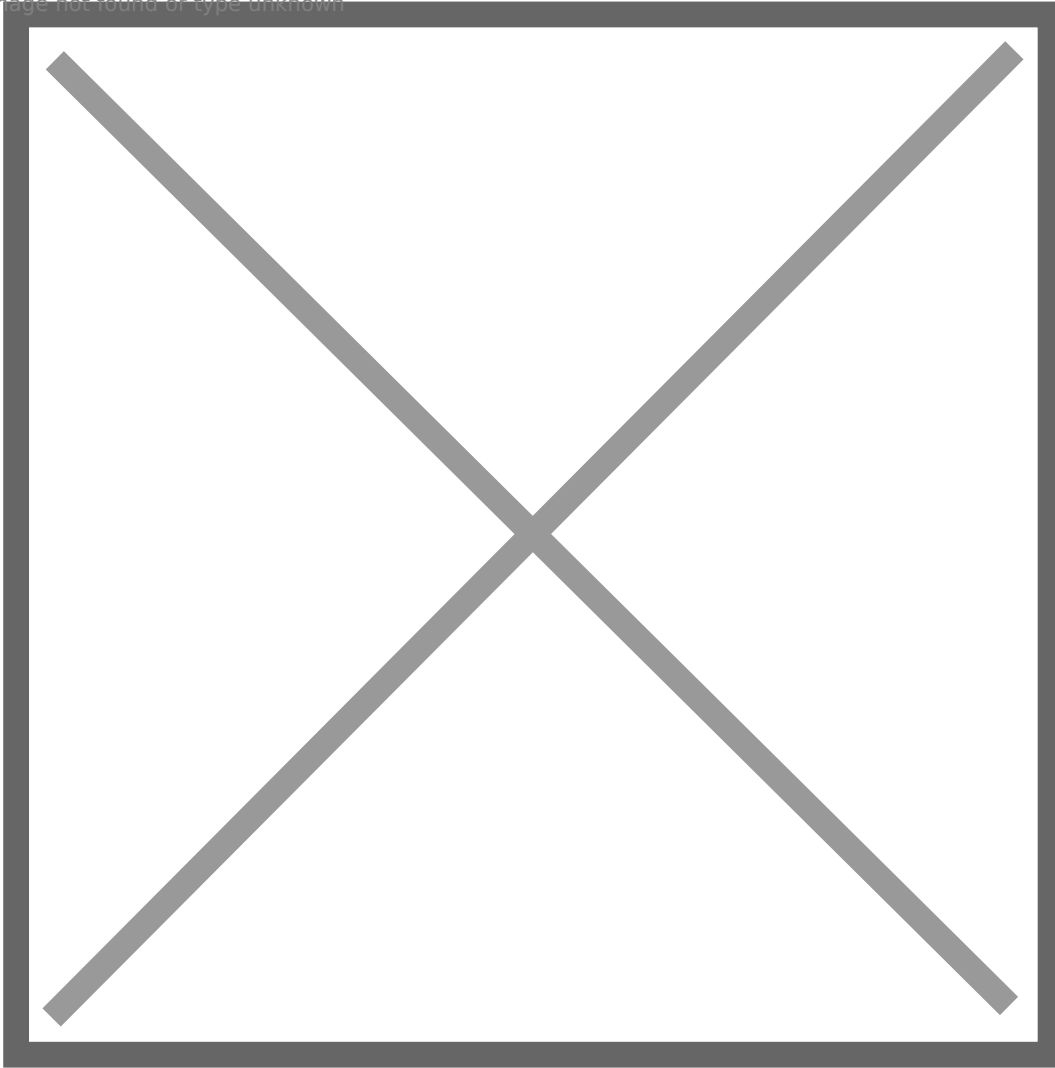
So now to delete the data and run fstrim. My virtual disk shrinks to 400ish MB again:

Image not found or type unknown



My space on my array is reclaimed immediately this time! No need to run `excli` to unmap.

Image not found or type unknown



I ran `fstrim` at 12:33:00 and the space was reclaimed on the array automatically by 12:33:55.

Great! So now, back to the original question, what about VMFS-6?

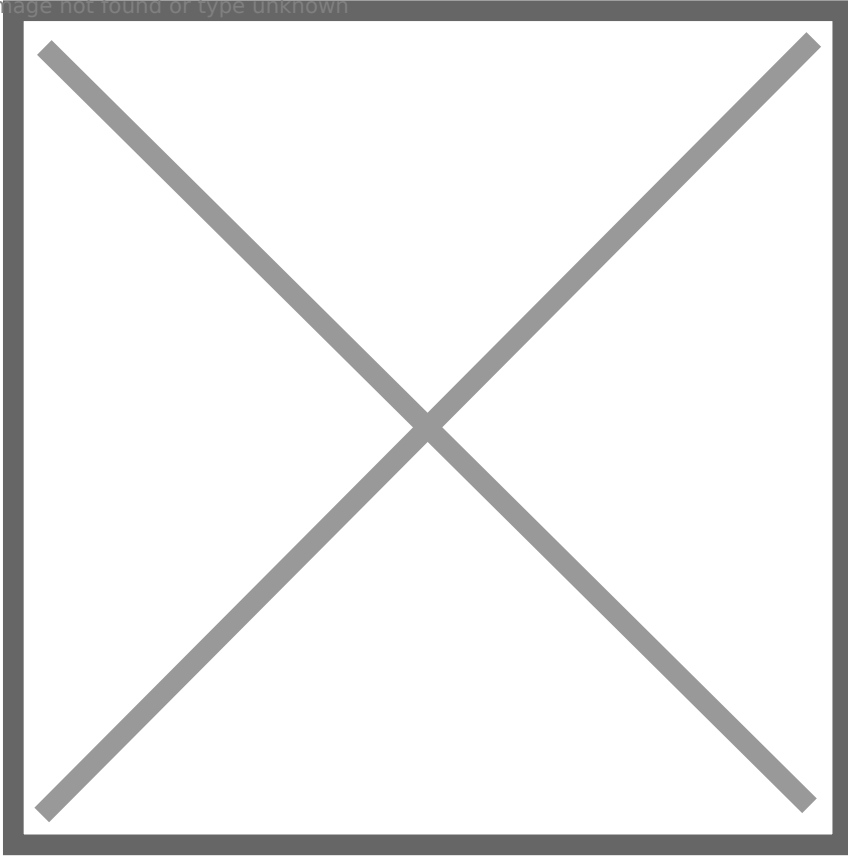
EnableBlockDelete and VMFS-6

As you are likely aware, VMFS-6 introduced automatic UNMAP. So you no longer need to ever use `esxcli` to run UNMAP on the VMFS.

So let's repeat the test.

I moved my VMDK to my VMFS-6 datastore:

Image not found or type unknown



I will not go through every step again, let's just start from the "we just deleted the files" step, but we have yet to run fstrim. So we have dead space.

VMFS-6: EnableBlockDelete Disabled, Auto-UNMAP Enabled

In this test, I have EnableBlockDelete disabled on my host and auto-UNMAP enabled on the datastore.

Image not found or type unknown

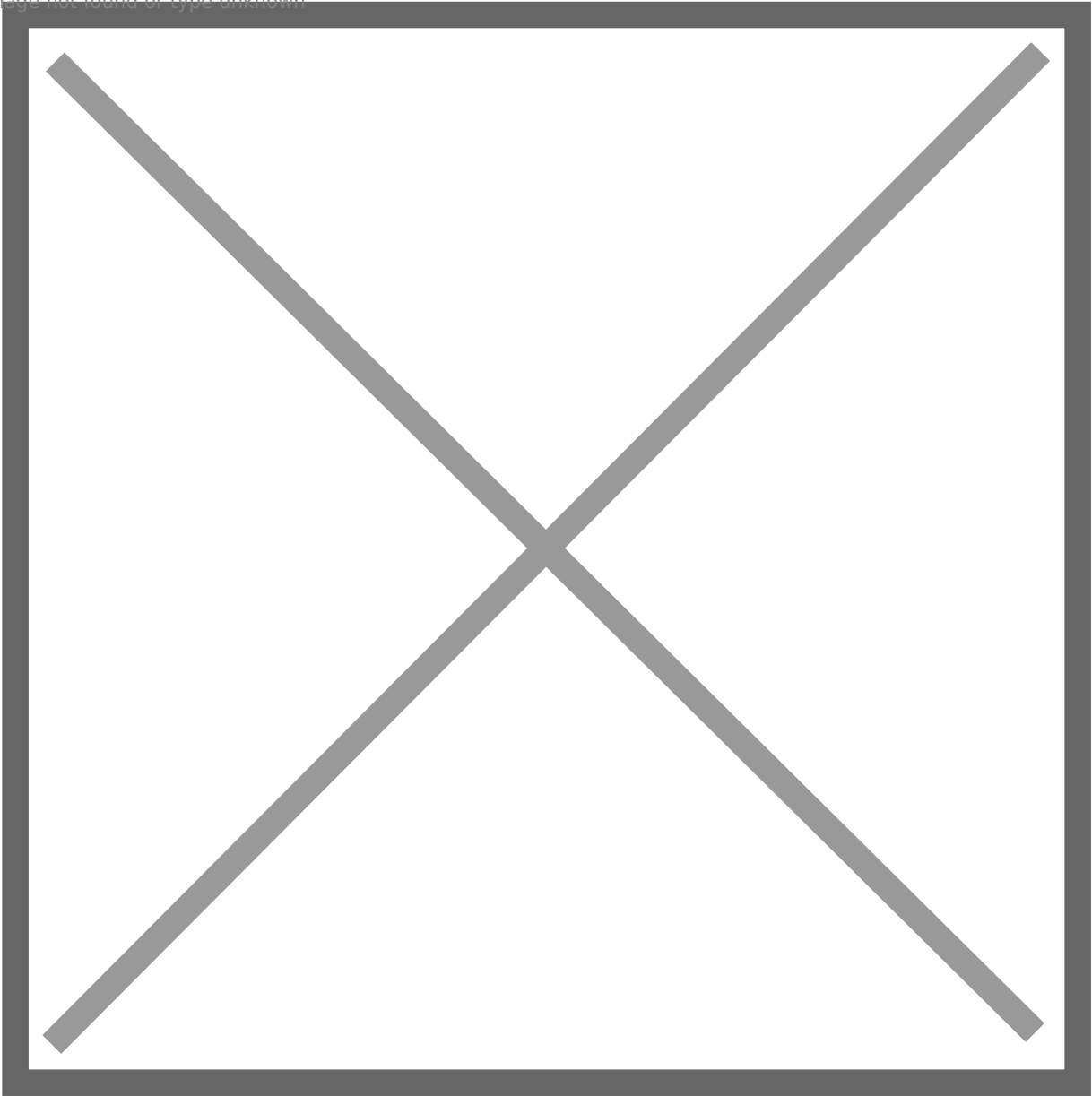
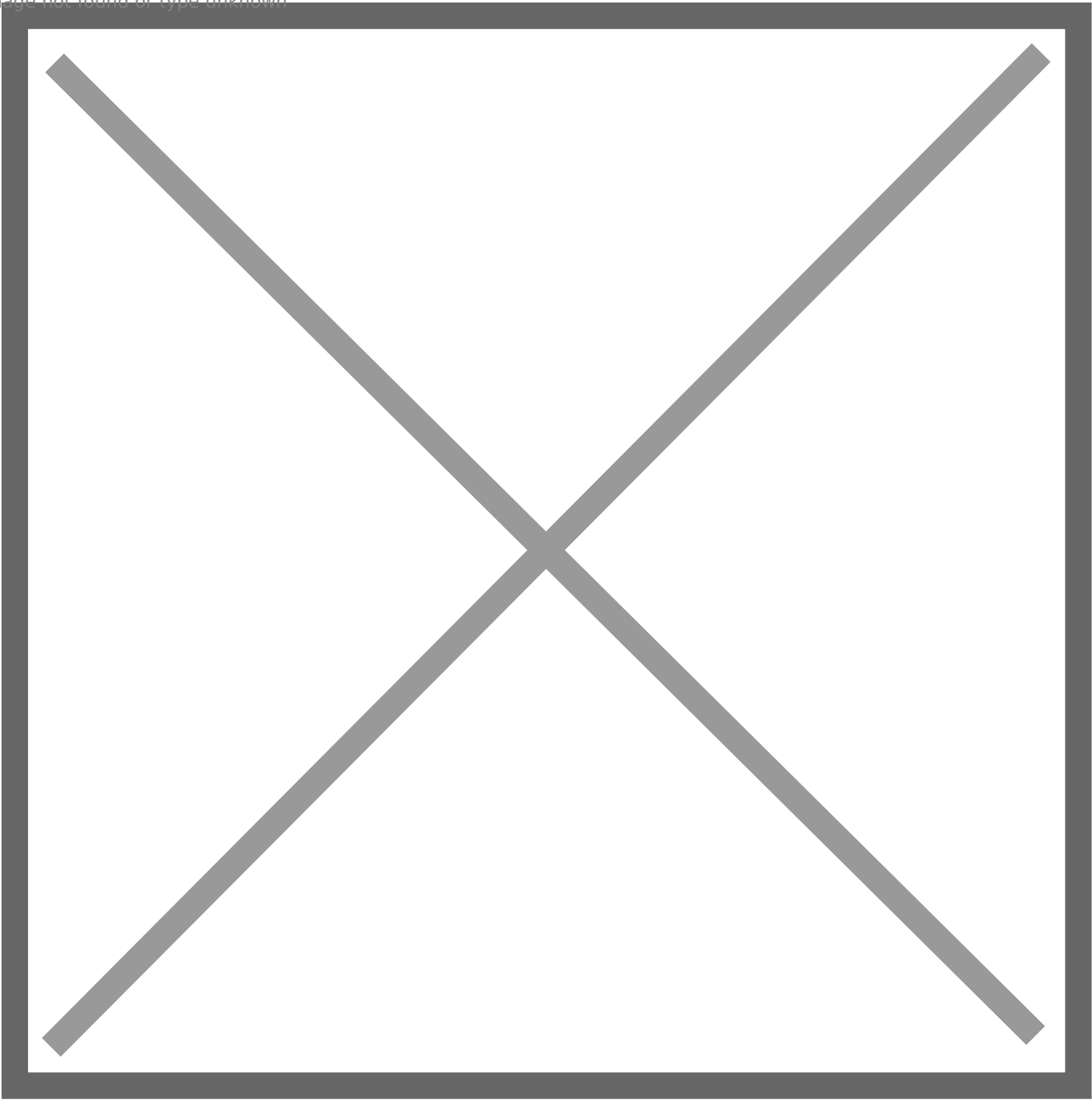
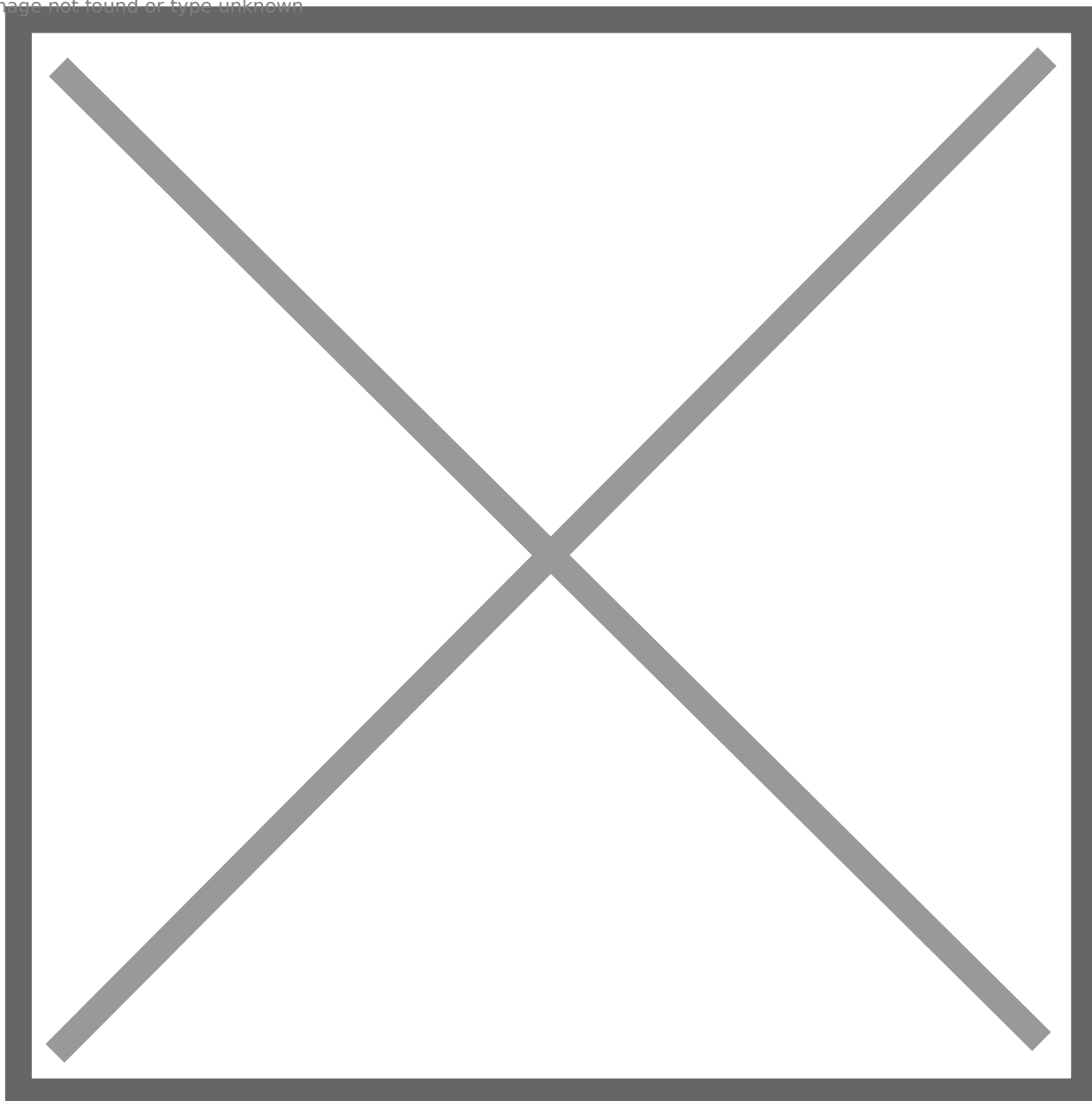


Image not found or type unknown



If I use vsish, I can see no automatic UNMAPs have been issued to this datastore from my host.

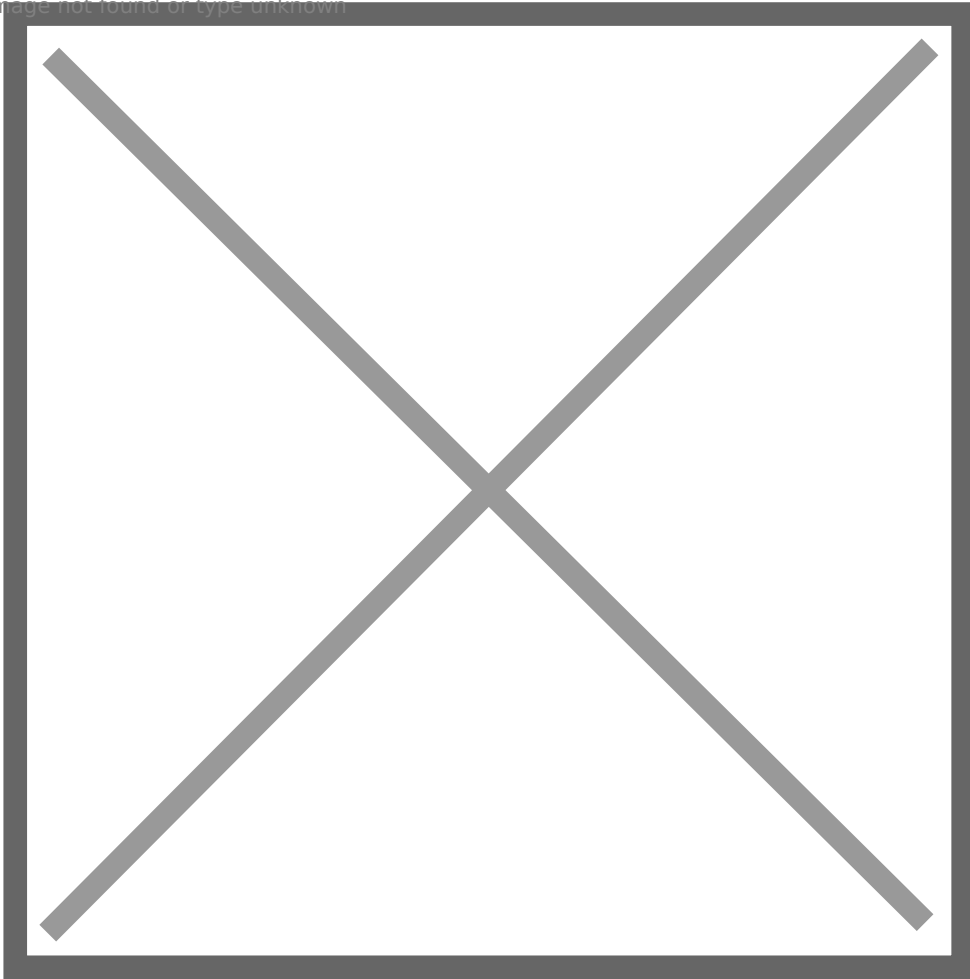
Image not found or type unknown



Note “UNMAP IOs” and “Unmapped blocks” are both zero.

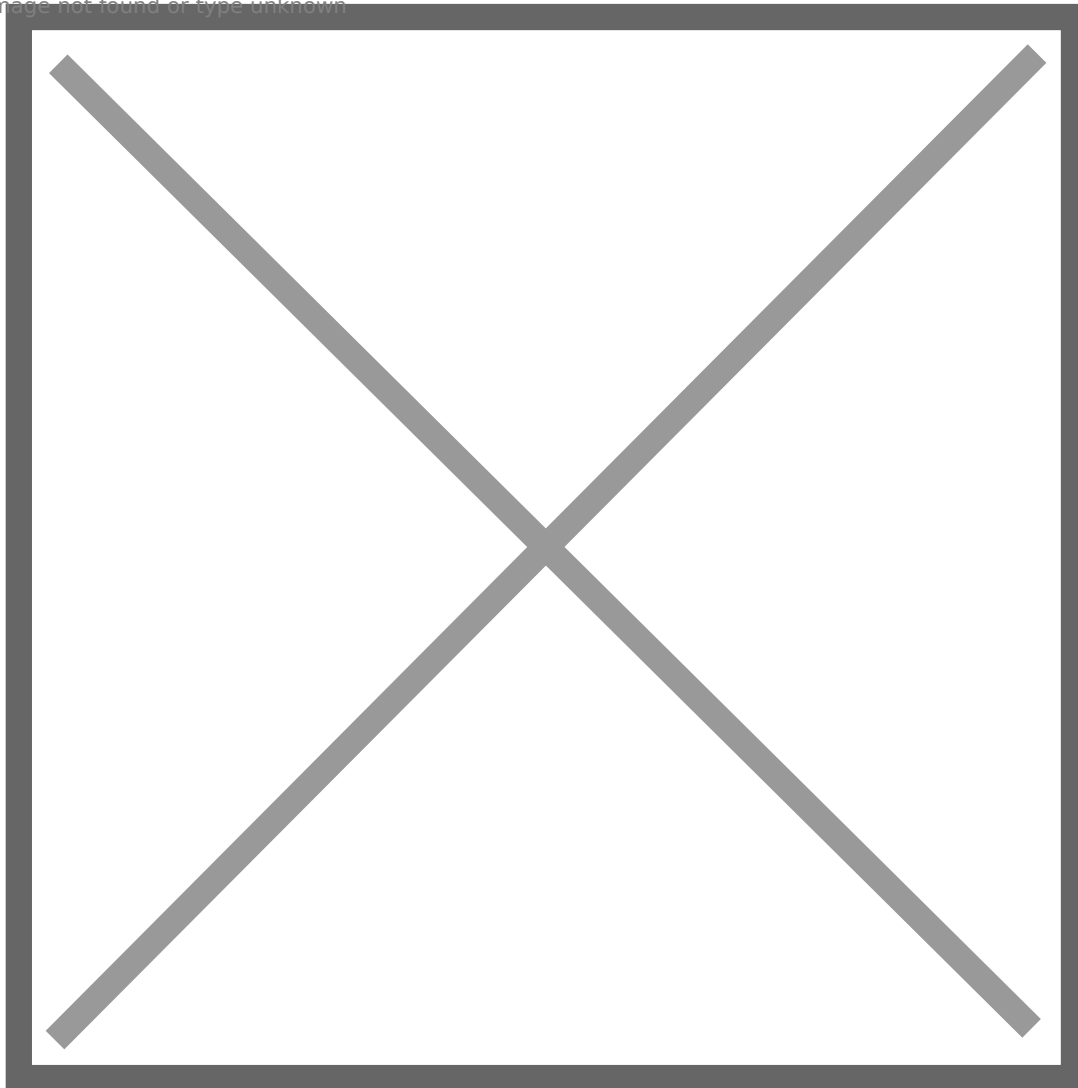
So I run fstrim. My VMDK is back down to 400 MB:

Image not found or type unknown



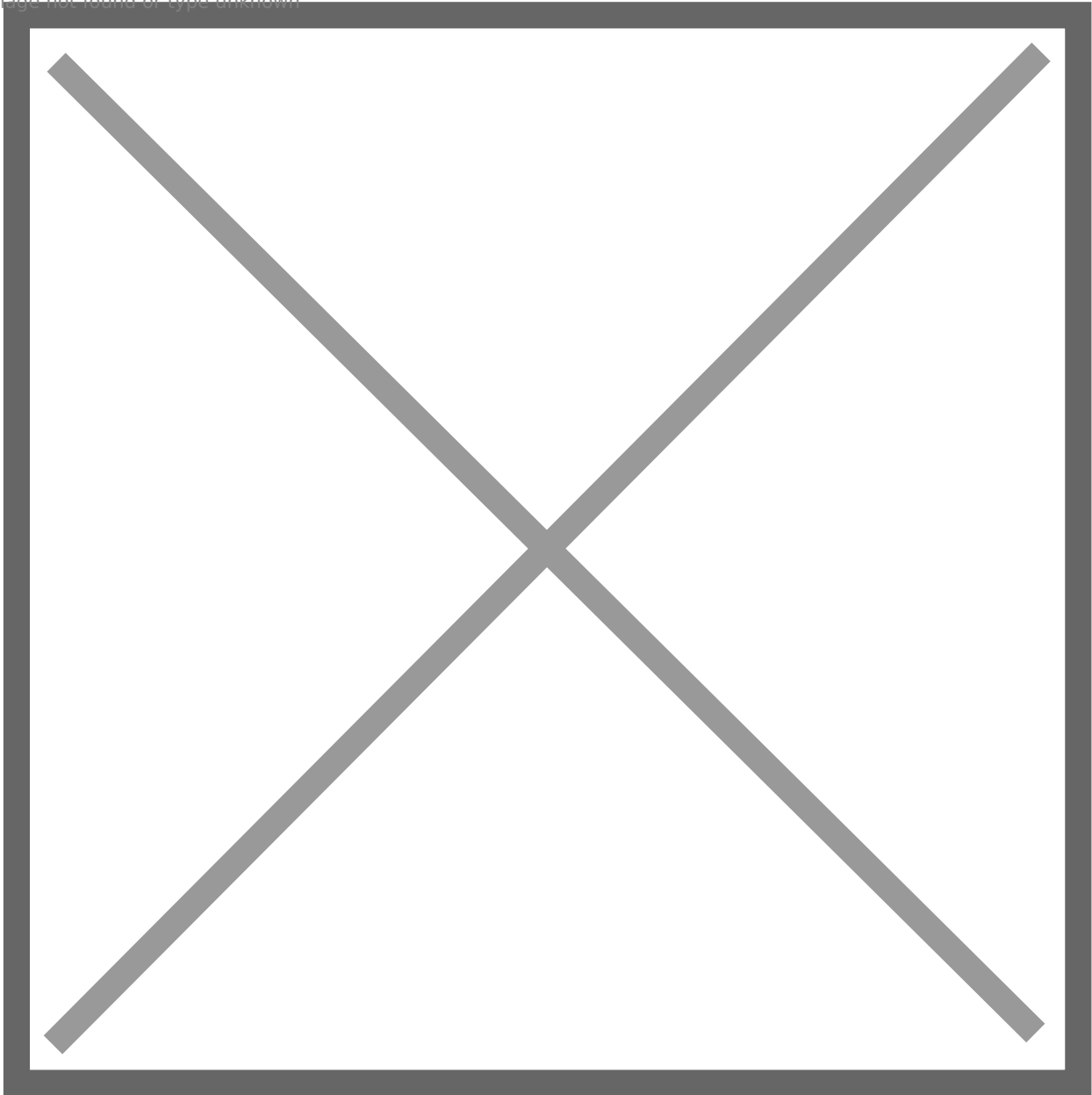
If we look back at the array, we see the space reclaims, but not quite as fast, took a few minutes.

Image not found or type unknown



Since EnableBlockDelete was disabled and auto-unmap was enabled we can see this was auto-unmap. We can further show that by looking back at vsish:

Image not found or type unknown

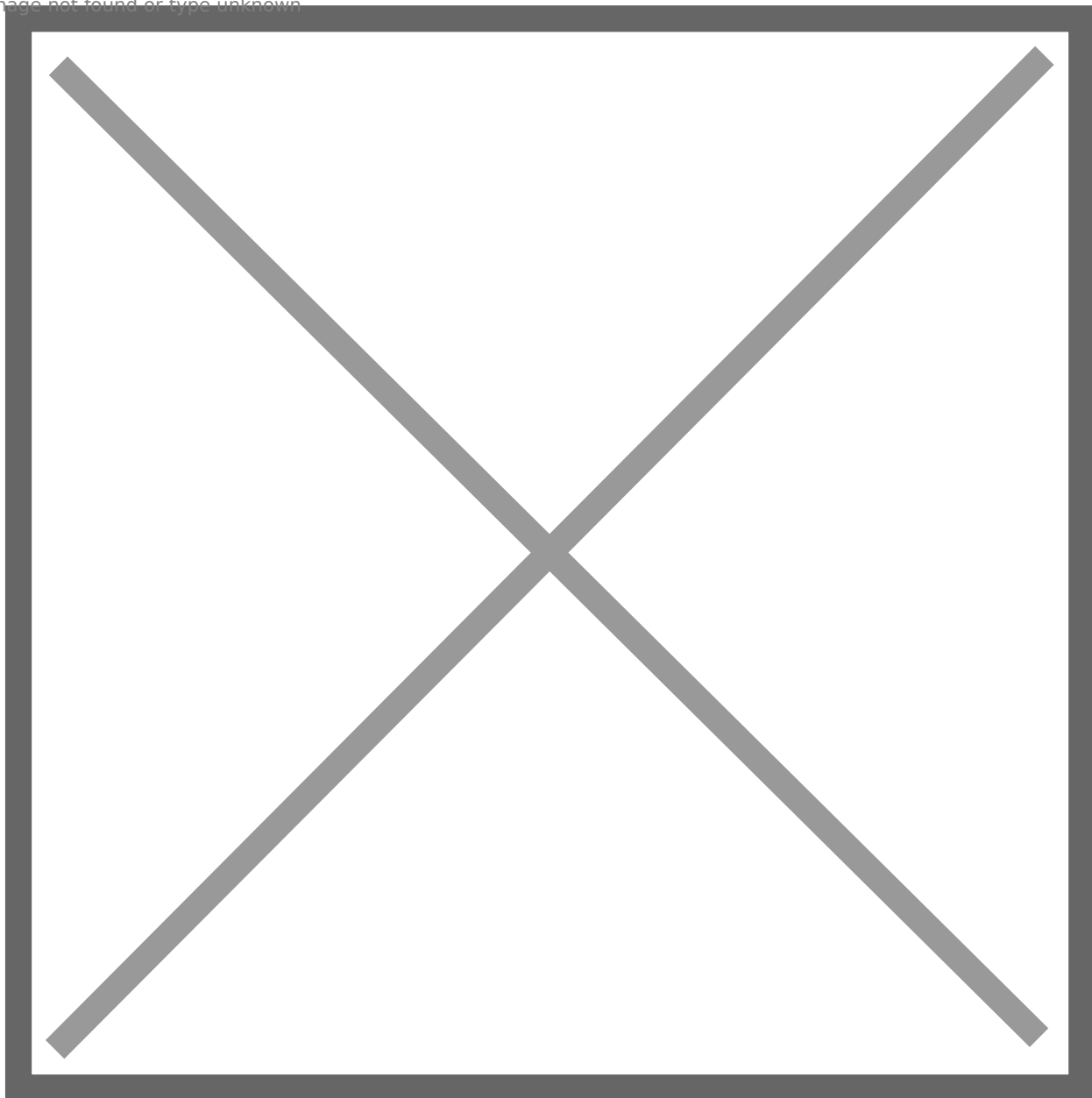


62 UNMAP I/Os and 3878 blocks reclaimed. So we don't need to turn on EnableBlockDelete in the case of VMFS-6!

VMFS-6: EnableBlockDelete Enabled, Auto-UNMAP Disabled

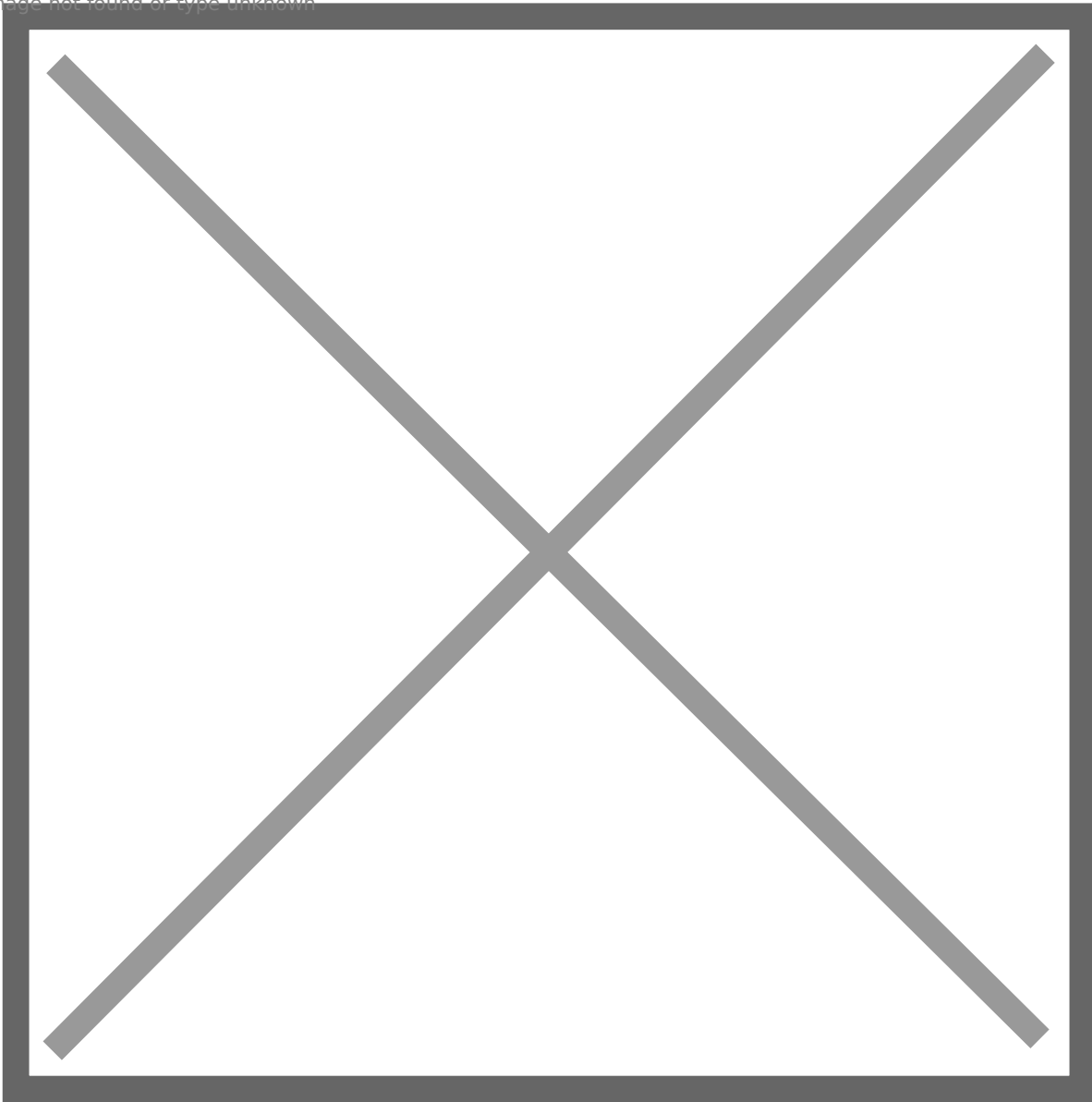
In this test, I have EnableBlockDelete enabled on my host...

Image not found or type unknown



...and auto-UNMAP disabled on the datastore:

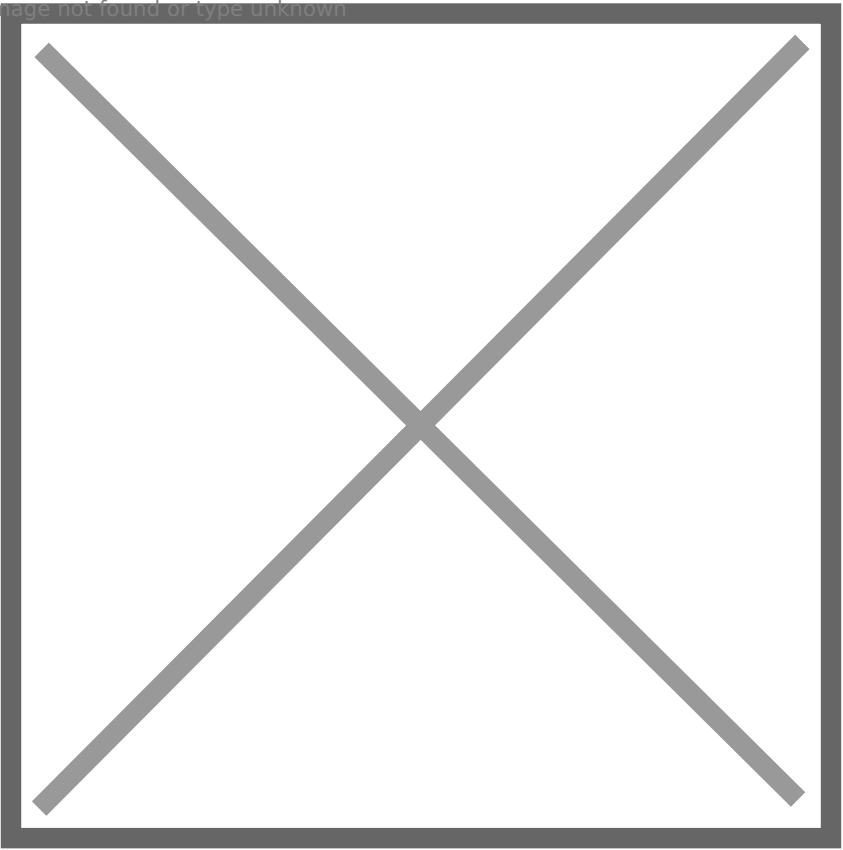
Image not found or type unknown



Let's run through the process again. I refreshed my environment so counters are reset etc. Add the VMDK, put data on it, delete the data and run fstrim:

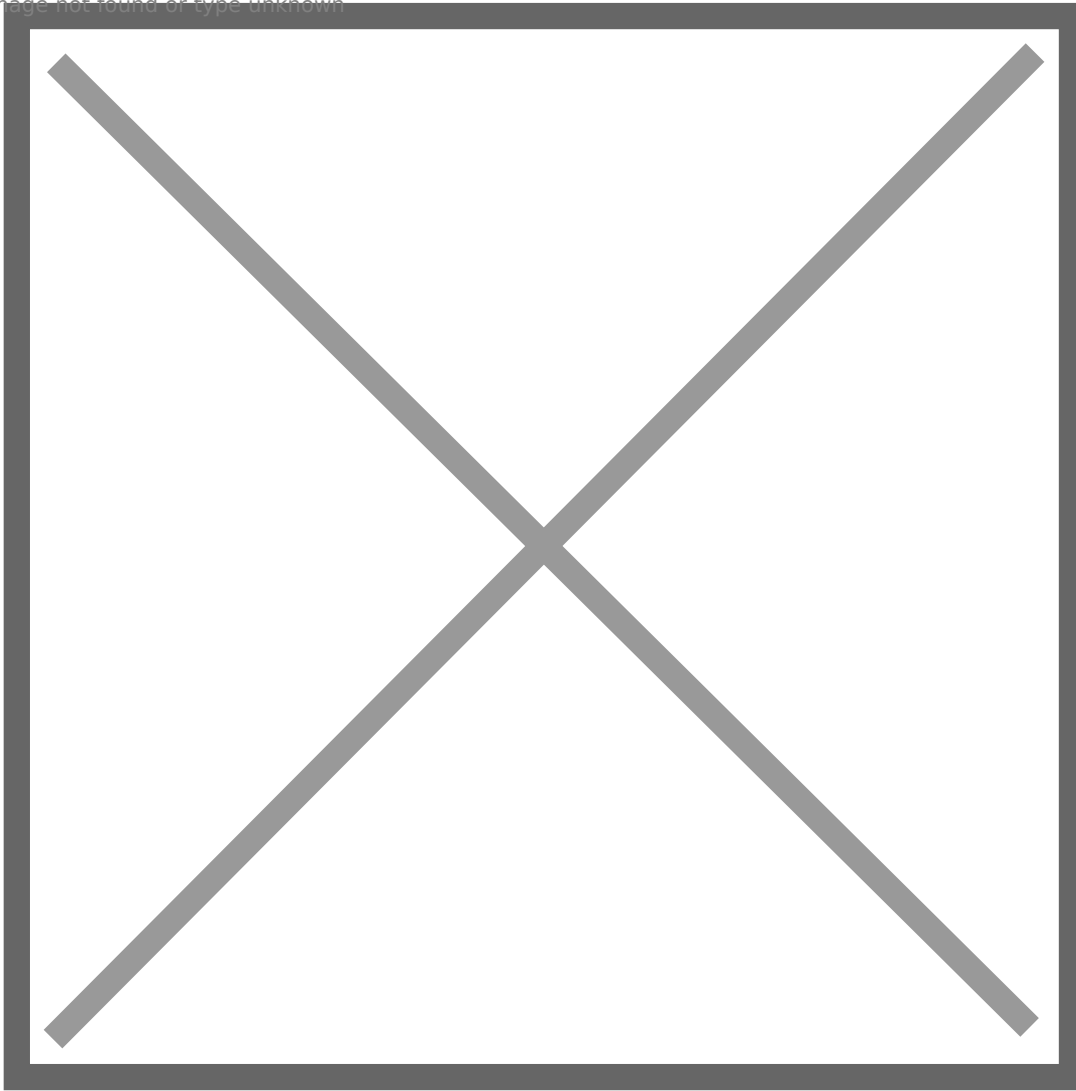
The VMDK shrank back down:

Image not found or type unknown



But if we look at the array, nothing happens.

Image not found or type unknown



So this shows that EnableBlockDelete is ignored for VMFS-6 volumes. So in this situation we would have to enable automatic UNMAP to reclaim this space, or run the standard esxcli manual UNMAP.

Conclusion

So what does this tell us. A couple things.

- In order to have full end-to-end UNMAP with VMFS-5 volumes, you need to enable EnableBlockDelete.
- For VMFS-6 automatic UNMAP takes care of the VMFS reclamation portion for you.

An interesting thing here is that automatic UNMAP invokes fairly quickly. When you delete a VM or a virtual disk, automatic UNMAP can possibly take 12-24 hours to reclaim the space. But with in-guest UNMAP, as soon as the VMDK shrinks, automatic UNMAP kicks in fairly quickly—in a few minutes. Mimicking the behavior of EnableBlockDelete. Which is great—you don't lose functionality

by moving to VMFS-6.

I will note, that this was done with 6.5 U1. From my understanding there was a bug in 6.5.0 that EnableBlockDelete was actually honored with VMFS-6 and it would issue UNMAP when a VMDK shrank when the setting was enabled. The problem was that UNMAP was issued twice, as the EnableBlockDelete-invoked UNMAP did not prevent the automatic async UNMAP from issuing reclaim. So UNMAP was issued twice.

This behavior was changed in 6.5 P1 and of course in 6.5 U1.

Revision #2

Created 28 May 2023 11:08:09 by Dino Edwards

Updated 28 May 2023 11:13:05 by Dino Edwards