

*By Falko Timme*

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# How To Make Your Xen-PAE Kernel Work With More Than 4GB RAM (Debian Etch With GRUB)

Version 1.0

Author: Falko Timme <ft [at] falkotimme [dot] com>

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If you have a server with more than 4GB RAM and want to install a 32bit Debian Etch on it (following this tutorial: [Debian Etch And Xen From The Debian Repository](#)), you'd expect the Xen-PAE kernel to see all your RAM because the Xen-PAE kernel supports up to 64GB RAM. In fact, it recognizes only about 3.3GB RAM due to a bug in the GRUB bootloader. This article explains how you can fix GRUB so that all your RAM gets recognized.

I do not issue any guarantee that this will work for you!

## 1 Preliminary Note

This bug exists on 64bit Debian systems as well - the default Debian Xen kernel also recognizes only 3.3GB of RAM. It's possible that the following procedure works for 64bit Debian Etch systems as well, although I have tested it only on a 32bit Debian Etch system.

I assume that you have already set up Xen on your system according to this tutorial: [Debian Etch And Xen From The Debian Repository](#)

I have tested this on a system with 6GB RAM.

Don't follow this tutorial if you're using another bootloader than GRUB (e.g. lilo)!

## 2 Check Your Memory

You can run

```
cat /proc/meminfo
```

to see how much memory your system recognizes:

```
Debian-40-etch-32-minimal:~# cat /proc/meminfo
MemTotal:      3468288 kB
MemFree:       3237948 kB
Buffers:       55884 kB
Cached:        46124 kB
SwapCached:    0 kB
Active:        68820 kB
Inactive:      41412 kB
HighTotal:     2731012 kB
HighFree:      2667548 kB
LowTotal:      737276 kB
LowFree:       570400 kB
SwapTotal:     2104440 kB
SwapFree:      2104440 kB
Dirty:         3524 kB
Writeback:     0 kB
AnonPages:     8196 kB
Mapped:        3932 kB
Slab:          10140 kB
PageTables:    304 kB
NFS_Unstable:  0 kB
Bounce:        0 kB
CommitLimit:  3838584 kB
Committed_AS: 50368 kB
VmallocTotal: 116728 kB
VmallocUsed:   3776 kB
VmallocChunk: 112612 kB
Debian-40-etch-32-minimal:~#
```

As you see, only about 3.3GB are recognized by the system...

### 3 Rebuild GRUB

Now let's rebuild the GRUB bootloader. We need the package `dpkg-dev` for it:

```
apt-get install dpkg-dev
```

Then we download the GRUB sources...

```
apt-get source grub
```

... and install all requirements to rebuild GRUB:

```
apt-get build-dep grub
```

We must modify the `stage2/common.c` file in the GRUB source directory. First we make a copy of that file:

```
cd grub-0.97/  
  
cp -a stage2/common.c stage2/common.c.original
```

Then we open it:

```
vi stage2/common.c
```

Around line 143, you should find this section:

```
[...]  
#ifndef STAGE1_5  
    unsigned long cont, memtmp, addr;  
    int drive;  
#endif  
[...]
```

Modify it as follows:

```
[...]  
#ifndef STAGE1_5  
    unsigned long memtmp, addr;  
    volatile unsigned long cont;  
    int drive;  
#endif  
[...]
```

Save the file, then build the new GRUB package:

```
debian/rules binary
```

Afterwards we can install the new GRUB package as follows:

```
dpkg -i ../grub_0.97-27_i386.deb
```

Now we must install GRUB on our hard drives. I'm using two hard drives, `/dev/sda` and `/dev/sdb` (for software RAID1), so I run

```
grub-install /dev/sda
```

```
grub-install /dev/sdb
```

If you only got one hard drive, then run `grub-install` only once. Make sure that you use the correct device name for your hard drive (for example, instead of `/dev/sda`, yours might be `/dev/hda` - you can find out about the hard drive names by running

```
fdisk -l
```

).

Finally, it's time to reboot:

```
reboot
```

## 4 Check Your Memory Again

After the reboot, it's time to check the memory again. If everything went well, the system should now recognize the full amount of RAM:

```
cat /proc/meminfo
```

```
Debian-40-etch-32-minimal:~# cat /proc/meminfo
MemTotal:      6067200 kB
MemFree:       5902700 kB
Buffers:       1596 kB
Cached:        13964 kB
SwapCached:    0 kB
Active:        19316 kB
Inactive:      4408 kB
HighTotal:     5329732 kB
```

```
HighFree:      5299600 kB
LowTotal:      737468 kB
LowFree:       603100 kB
SwapTotal:     2104440 kB
SwapFree:      2104440 kB
Dirty:         784 kB
Writeback:     0 kB
AnonPages:     8160 kB
Mapped:        3932 kB
Slab:          8616 kB
PageTables:    324 kB
NFS_Unstable:  0 kB
Bounce:        0 kB
CommitLimit:   5138040 kB
Committed_AS:  50388 kB
VmallocTotal:  116728 kB
VmallocUsed:    3776 kB
VmallocChunk:  112612 kB
Debian-40-etch-32-minimal:~#
```

As you see, my system is now recognizing my full 6GB of RAM.

## 5 Links

- Debian: <http://www.debian.org>