Motherboard	Network adapter Broadcom BCM5721 2 ports	**Installation guide** pp. 13 Supported by driver tg3 3.43b
CPU	Intel Pentium D 920	Not supported by ESX (but I guess there is a mistake in the **installation guide**
Memory	DDR2	No specific requirements
Storage	2 x SATA Drive	Supported. The statement made by VMware in the **installation guide** pp. 26 is irrelevant in this particular configuration. SCSI controller LSI 1068 is supported regardless of the physical disk types. This is similar to iSCSI SAN based on SATA disks.

I decided to use a brand-new motherboard from ASUS P5M2/SAS. This MB

- supports any dual core Intel processor
- has two Broadcom network Gigabit Ethernet adapters (supported by ESX)
- is ATX form factor
- has SAS interface based on supported by ESX LSI Logic 1068 chip.

The last point is the most interesting one. As you probably know, SAS has a native support for SATA by design.
The motherboard fits into an ordinary desktop case. I didn't have to adjust any BIOS settings. During installation, ESX 3.0.1 detected everything correctly with the default settings. It looked like everything was working, except for one thing.
The Virtual Infrastructure Client couldn't find any local VMFS storage. Having spent a few hours recreating partitions by fdisk and vmkfstools and reinstalling the system, I decided to compare vmkernel logs with the logs from our production server.

```
Feb 13 16:40:16 esx3 vmkernel: 0:00:00:19.294 cpu1:1031)<6>Fusion MPT misc
device (ioctl) driver 2.06.34.13
Feb 13 16:40:16 esx3 vmkernel:   Vendor: ATA       Model: ST380211AS        Rev:
B
Feb 13 16:40:16 esx3 vmkernel:   Type:   Direct-Access                      ANSI
SCSI revision: 05
Feb 13 16:40:16 esx3 vmkernel: 0:00:00:19.298 cpu1:1031)LinSCSI: 689: Queue
depth for device vmhba0:0:0 is 64
Feb 13 16:40:16 esx3 vmkernel: VMWARE SCSI Id: Supported VPD pages for
vmhba0:0:0 : 0x0 0x80 0x83 0x89
Feb 13 16:40:16 esx3 vmkernel: VMWARE SCSI Id: Device id info for vmhba0:0:0:
0x2 0x1 0x0 0x44 0x41 0x54 0x41 0x20 0x20 0x20 0x20 0x20 0x53 0x54 0x33 0x38
0x30 0x32 0x31 0x31 0x41 0x53 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20
0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x2
Feb 13 16:40:16 esx3 vmkernel: 0 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20
0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x35 0x50 0x53 0x30
0x32 0x45 0x54 0x35
Feb 13 16:40:16 esx3 vmkernel: VMWARE SCSI Id: Id for vmhba0:0:0 0x20 0x20 0x20
0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x35 0x50 0x53 0x30 0x32 0x45 0x54
0x35 0x53 0x54 0x33 0x38 0x30 0x32
Feb 13 16:40:16 esx3 vmkernel: 0:00:00:19.302 cpu1:1031)SCSI: 1540: Device
```

```
vmhba0:0:0 has not been identified as being attached  to an active/passive SAN.
It is either attached to an active/active SAN or is a local device.
Feb 13 16:40:16 esx3 vmkernel: 0:00:00:19.378 cpu1:1031)Mod: 471: Initialization
for mptscsi_2xx succeeded.
Feb 13 16:40:16 esx3 vmkernel: 0:00:00:19.378 cpu1:1031)Module loaded
successfully.
```

As you can see from the log, the ID looks pretty unusual. These 0x20 codes made me think that the ID was just an encoded text string. Having decoded the data, I discovered the product ID and the serial number of my disk to be "DATA ST380211AS 5PS02ET5". I saw the ID was wrong and couldn't be correctly interpreted by ESX drivers.
I made an assumption that if I integrated two SATA disks into RAID (it makes no difference what type of RAID you use; as for me, I chose RAID 0 to make full use of the disk's capacity), the system will detect this storage. I was right. The logs looked pretty normal, as you can see below.

```
Feb 14 23:44:38 esx3 vmkernel: 0:00:00:19.814 cpu0:1032)<6>Fusion MPT misc
device (ioctl) driver 2.06.34.13
Feb 14 23:44:38 esx3 vmkernel:   Vendor: LSILOGIC  Model: Logical Volume    Rev:
3000
Feb 14 23:44:38 esx3 vmkernel:   Type:   Direct-Access                      ANSI
SCSI revision: 02
Feb 14 23:44:38 esx3 vmkernel: 0:00:00:19.815 cpu0:1032)LinSCSI: 1665: Device
does not appear to support REPORT LUNS cdb.
Feb 14 23:44:38 esx3 vmkernel: 0:00:00:19.820 cpu0:1032)LinSCSI: 689: Queue
depth for device vmhba0:0:0 is 64
Feb 14 23:44:38 esx3 vmkernel: VMWARE SCSI Id: Supported VPD pages for
vmhba0:0:0 : 0x0 0x83
Feb 14 23:44:38 esx3 vmkernel: VMWARE SCSI Id: Device id info for vmhba0:0:0:
0x1 0x3 0x0 0x10 0x60 0x5 0x8 0xe0 0x0 0x0 0x0 0x0 0x6a 0xc4 0xb3 0x2d 0xce 0x9a
0xd9 0xa
Feb 14 23:44:38 esx3 vmkernel: VMWARE SCSI Id: Id for vmhba0:0:0 0x60 0x05 0x08
0xe0 0x00 0x00 0x00 0x00 0x6a 0xc4 0xb3 0x2d 0xce 0x9a 0xd9 0x0a 0x4c 0x6f 0x67
0x69 0x63 0x61
Feb 14 23:44:38 esx3 vmkernel: 0:00:00:19.821 cpu0:1032)SCSI: 1540: Device
vmhba0:0:0 has not been identified as being attached  to an active/passive SAN.
It is either attached to an active/active SAN or is a local device.
Feb 14 23:44:38 esx3 vmkernel: 0:00:00:19.907 cpu0:1032)Mod: 471: Initialization
for mptscsi_2xx succeeded.
Feb 14 23:44:38 esx3 vmkernel: 0:00:00:19.907 cpu0:1032)Module loaded
successfully.
```

I didn't investigate any further, but the conclusion I came up with was: everything works as soon as we are using RAID.

The table below shows approximate prices for the components I used to build the system:

		Price (USD)	Piece	Total
Motherboard	ASUS P5M2/SAS	354	1	354
CPU	Pentium D 920	121	1	121
Memory	1GB DDR2 800 (PC2 6400)	125	2	250
Case		40	1	40
HDD		40	2	80
DVD		30	1	30
				875

As you can see, the total price is about $875.

Using the above-said hardware and a software based iSCSI SAN on the Linux machine, I was able to set up ESX cluster and try all the VI3 features, including VMotion. Having the cluster at home helped me a lot with the certification. So far everything runs smoothly and I found no issues related to the hardware. The servers are easy to assemble as ASUS P5M2/SAS has everything I needed on board and I had no extra devices to buy/install and configure.

Another thing I like about the hardware is the fact that it's up to date and after I finish playing with ESX, I'll reuse the servers and will replace my and my wife's three-year-old desktops with it.

In the end, I'd like to ask you to share your experience in building inexpensive ESX servers and provide comments to the article. I will do my best to update the article based on your feedback and my own findings.