USB-Storage devices under Linux

# BITS ARE BLUE

**It can be easier to get some USB devices to work under Linux than others. In this feature we'll look at seven USB-based mass-storage devices and see how well, or how badly, they like speaking Penguin.**

BY CHRISTIAN REISER

USB mass storage devices are particularly useful because they can easily be connected and disconnected from a computer. This makes physical installation very easy, and allows you to transfer data from one PC to the next very quickly, without resorting to network connections. Of course, all this is also possible using parallel port storage devices, but this isn't the most flexible way of doing things under Linux. In any case, even modern EPP and ECP parallel ports can't match the data transfer rates that are possible over a USB interface.

USB devices and Linux have not always seen eye to eye, though, and in fact Linux's USB support is still very much experimental. This is something that was reflected in the fact that during our tests we experienced quite a few crashes, many of which required a complete system restart to recover from. Thanks to our decision to use ReiserFS on the system this was always a quick process, mind you. Another wise decision on our part was to do most of our USB CD burner testing using CD-RW disks, as otherwise the entire editorial team would probably have new silver coasters on their desks.

Having said all that, it is possible to get some USB mass storage devices to work well and even reasonably reliably under Linux. We would recommend the latest developer kernel with the current pre-patches for best results, though, and be warned that mission-critical use of USB devices is something to be avoided, at least until kernel 2.4 has matured by a couple of patch levels. At the time of writing, Linux-2.4.0-test10-pre6 was the latest Kernel version available. This kernel also appears to be the most stable yet seen, when it comes to USB devices, but you shouldn't expect miracles. In version 2.4.0-test9, by the way, very few of the devices we looked at worked at all.

Not everybody will want to use 2.4, of course, so we have put together a small table for users of the USB backport patch for kernel 2.2, showing which devices **should** function with the old kernel, though there are no guarantees.

## Freecom Traveller

As its name implies, this CD burner is specifically designed for mobile use and can even be operated with batteries if need be. Its snazzy blue housing hides a 4x/4x/20x CD-RW drive with a proprietary D-Sub interface connection. Adapters for Firewire, PCMCIA, parallel port and USB can be attached to this, the latter being the one used during our testing.

Unfortunately the driver for this device is still at an early phase of development, so that it was not found even with the latest developer kernel with "prompt for development and/or incomplete code/drivers" option selected. In fact, after configuring the kernel, the *.config* file has to be edited so that after the *CONFIG_USB_STORAGE=m* line *CONFIG_USB_STORAGE_FREECOM=y* has to be added. However, after doing so on our test system, the drive was recognised as "CDR/RW RW8040A", and all was well. Or rather all was not well, as the driver turned out, as expected for an early development version, to be highly unstable. For this reason it was not possible to conduct performance tests on this drive, and indeed the only thing we could get the drive to do even slightly reliably was to display the contents of a CD. Unsurprisingly, it wasn't possible to write CDs


**Freecom Traveller: cool, but not stable under Linux**

[left]
Stable and reliable with Linux: Iomega's CD burner

[right]
Access to ZIP diskettes via USB

Great idea - Iomega's Click!40 media

with this device, although it is recognised by *cdrecord* (see *http://www.fokus.gmd.de/research/cc/glone/employees/joerg.schilling/private/cdrecord.html*) as SCSI-3/mmc-compatible.

## Iomega Zip CD 650

The Iomega Zip CD 650 worked very reliably in our tests. In fact it was the only USB CD burner whose driver never caused our test computer to crash at all. The fact that the burner is also suitable for writing to CD blanks under Linux, appears to be something Iomega is not aware of. In their Linux support forum (*http://forums.iomega.com/*), when questions were asked about burn suitability, the reply was that they were "working on it". But by specifying the device type as *generic-mmc-raw*, the drive functioned perfectly with *cdrdao* (*http://cdrdao.sourceforge.net/*). It can even burn quite happily at 4x speed, and, very impressively, we experienced no problems at all using it with the software-intensive UHCI controller, even though some 600 kilobytes per second are transferred at this write speed.

## Iomega Zip 250 USB

Unlike the external parallel port and SCSI variants of the drive, the USB version of the Iomega Zip 250 is a real beauty; in a similar way to the Freecom drive, it has obviously taken its design cues from Apple's iMac (and incidentally is also iMac compatible). Unfortunately, because its case is so small, there's no room left for an internal power supply. The drive is also rather noisy when in use – something we found a little irritating.

Under Linux the Zip drive is recognised as a removable hard disk, so preformatted media can easily be integrated into the system using *mount /dev/sda4 /mnt/zip*. The stability of the drive under Kernel 2.2.17 using the backport patch leaves something to be desired due to system freezes. But under 2.4.0-test10-pre5 the device ran perfectly, happily reading and writing both 250Mbyte and 100Mbyte media.

## Iomega Clik! 40

As well as Zip diskettes, Iomega also manufactures other removable media, such as its Clik!40 diskettes

### *USB Storage architecture in the Linux kernel*

*All the drives we looked at require the usb-storage.o kernel module, which emulates a SCSI host adapter. This means the attached USB mass storage devices present themselves to the user as SCSI devices. As a result, CD drives can be addressed via /dev/scd[0-9] and hard disks/diskettes as /dev/sd[a-z]. All hard disks and removable drives nearly always have a partition sector. This would not be absolutely necessary for operation under Linux, but it does allow the exchange of data with external operating systems (if the file system in use is recognised, that is). In the case of preformatted media, in most cases the last of four physical partitions is DOS-compatible and so be handled with VFAT \#208 all computers and operating systems ought to be able to cope with this.*

*For usb-storage to be loaded, the SCSI subsystem has to be in the kernel: either permanently compiled in, or as a loadable module scsi_mod.o. For CD-ROM drives the module sr_mod.o is also required. CD burners need sg.o, and hard disks (also including all diskette and removable media drives) rely on sd_mod.o..*

which have a capacity of 40 Mbytes. With dimensions of about 5x5cm the diskettes can fit into a PC card adapter for use with notebook PCs. Users of more conventional systems can still use the media, however, using Iomega's Clik! Dock PC, which connects via a USB interface.

On each of the Clik!40 diskettes there is a partition table, the fourth partition usually having been pre-formatted with a DOS-compatible file system. The drive is therefore addressed in the same way as similar devices such as SCSI hard disks, and so on a normal system a *mount /dev/sda4 /mnt/click* (or similar) ought to suffice.

Unfortunately we found that there was a lot of room for improvement on the stability front when using the drive with Linux. Indeed, after some intensive file copying and deleting it would refuse to respond until the USB sub-system had been unloaded and then reloaded.

## LaCie

Housed in a dark blue case, LaCie's transportable drive contains a 20 GByte hard disk – a Seagate Barracuda ST32042A. After some experimentation, however, we discovered that any other hard disk could also be used as long as care was taken to ensure that the new disk requires no more power and produces no more waste heat than the Seagate drive. In other words, you don't have to throw the entire unit away when you find you need a larger capacity device.

The unit's cooling fan, which is hidden behind some rounded ventilation slots, at first out of order on our review model, leading to the drive getting much hotter than it should. After quickly reaching for the screwdriver the problem became clear, though; one of the power cables had become caught in the fan's blades. This was easily fixed, and all was then well.

Although the transfer rate provided by the unit – almost one megabyte per second – is relatively high for USB, it would take over five hours to read the entire contents of a full drive. This is significantly slower than a conventional hard disk, so this drive is not suitable as a complete replacement for your system disk. It was never designed for such a purpose in the first place, of course, instead being aimed more at transporting multimedia data like films, music and images from PC to PC, or indeed just for adding some extra storage capacity to a single system.

Compatibility with Linux is, at least with Kernel 2.4.0-test10-pre5, very good. Indeed, during our testing we encountered no serious problems, though the disk was not automatically recognised when connected. By removing and then re-connecting the USB cable, however, this problem could very quickly be solved. Disappointingly, though, this device cannot be used with the backport patch.

## Mitsumi USB CR 4804 TU

The only product in this test not to boast a blue case, the Mitsumi external CD burner is fully CD-RW compatible and offers 4x CD-R and CD-RW write speeds and 8x CD-ROM read speeds.

As a CD-ROM the Mitsumi didn't do too badly, but when writing to blank media we encountered problems; quite often it simply stopped working. What's more, the device could often only be persuaded to start working again after a complete system re-start.

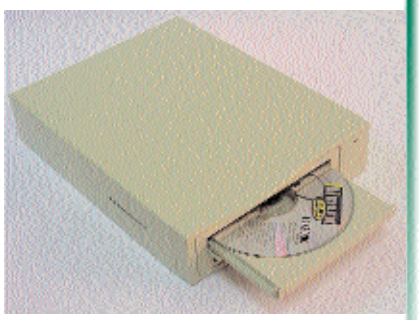
## Adaptec USB-X-Change

Adaptec's USB-X-Change is a very interesting product, but one that will have to go without more than a mention here as it simply refused to work with Linux; for reasons know only to itself, Adaptec decided to develop its own protocol for this product, without giving any thought to Linux drivers.

## Conclusion

So, although things have improved in leaps and bounds, there are still some issues to be addressed when it comes to using USB mass storage devices under Linux. Still, since this is an area that has been getting a lot of developer attention of late, it won't be too long before things will improve even more, eventually taking the sting out of the USB tail altogether.

Finally note how using OHCI controller architecture consistently produced better results than UHCI in our tests. ■



**[top]**
**Transportable hard drive from LaCia**

**[above]**
**The Mitsumi drive – not particularly stable with Linux.**

**The devices and their transfer rates at a glance**

| Manufacturer | Product | UHCI [KByte/s] | OHCI [KByte/s] | functions with backport-patch | media size |
|---|---|---|---|---|---|
| Adaptec | USB-X-Change | - | - | No | SCSI-Port |
| Freecom | Traveller | - | - | No | CD-RW |
| Iomega | ZIP CD 650 | 606 | 926 | Yes | CD-R |
| Iomega | ZIP 250 | 400 | 833 | Yes | 100/250 MB |
| Iomega | Clik! Dock | 200 | 274 | No | 40 MB |
| LaCie | 20GB Drive | 583 | 866 | No | 20 GB |
| Mitsumi | USB CR 4804 TU | 615 | 913 | No | CD-RW |
| (All performance tests under Kernel 2.4.0-test10-pre5) | | | | | |