README for the SCSI media changer driver

This is a driver for SCSI Medium Changer devices, which are listed with "Type: Medium Changer" in /proc/scsi/scsi.

This is for *real* Jukeboxes. It is *not* supported to work with common small CD-ROM changers, neither one-lun-per-slot SCSI changers nor IDE drives.

Userland tools available from here:
http://linux.bytesex.org/misc/changer.html

General Information

First some words about how changers work: A changer has 2 (possibly more) SCSI ID's. One for the changer device which controls the robot, and one for the device which actually reads and writes the data. The later may be anything, a MOD, a CD-ROM, a tape or whatever. For the changer device this is a "don't care", he *only* shuffles around the media, nothing else.

The SCSI changer model is complex, compared to - for example - IDE-CD changers. But it allows to handle nearly all possible cases. It knows 4 different types of changer elements:

media transport	this one shuffles around the media, i.e. the transport arm. Also known as "picker".
storage	a slot which can hold a media.
import/export	the same as above, but is accessible from outside, i.e. there the operator (you !) can use this to fill in and remove media from the changer. Sometimes named "mailslot".
data transfer	this is the device which reads/writes, i.e. the CD-ROM / Tape / whatever drive.

None of these is limited to one: A huge Jukebox could have slots for 123 CD-ROM's, 5 CD-ROM readers (and therefore 6 SCSI ID's: the changer and each CD-ROM) and 2 transport arms. No problem to handle.

How it is implemented

I implemented the driver as character device driver with a NetBSD-like ioctl interface. Just grabbed NetBSD's header file and one of the other linux SCSI device drivers as starting point. The interface should be source code compatible with NetBSD. So if there is any software (anybody knows ???) which supports a BSDish changer driver, it should work with this driver too.

Over time a few more ioctls where added, volume tag support for example wasn't covered by the NetBSD ioctl API.

Current State

Support for more than one transport arm is not implemented yet (and nobody asked for it so far...).

I test and use the driver myself with a 35 slot cdrom jukebox from Grundig. I got some reports telling it works ok with tape autoloaders (Exabyte, HP and DEC). Some People use this driver with amanda. It works fine with small (11 slots) and a huge (4 MOs, 88 slots) magneto-optical Jukebox. Probably with lots of other changers too, most (but not all :-) people mail me only if it does *not* work...

I don't have any device lists, neither black-list nor white-list. Thus it is quite useless to ask me whenever a specific device is supported or not. In theory every changer device which supports the SCSI-2 media changer command set should work out-of-the-box with this driver. If it doesn't, it is a bug. Either within the driver or within the firmware of the changer device.

Using it

This is a character device with major number is 86, so use "mknod /dev/sch0 c 86 0" to create the special file for the driver.

If the module finds the changer, it prints some messages about the device [try "dmesg" if you don't see anything] and should show up in /proc/devices. If not.... some changers use ID ? / LUN 0 for the device and ID ? / LUN 1 for the robot mechanism. But Linux does *not* look for LUNs other than 0 as default, because there are too many broken devices. So you can try:

1. echo "scsi add-single-device 0 0 ID 1" > /proc/scsi/scsi (replace ID with the SCSI-ID of the device)
2. boot the kernel with "max_scsi_luns=1" on the command line (append="max_scsi_luns=1" in lilo.conf should do the trick)

Trouble?

If you insmod the driver with "insmod debug=1", it will be verbose and prints a lot of stuff to the syslog. Compiling the kernel with CONFIG_SCSI_CONSTANTS=y improves the quality of the error messages a lot because the kernel will translate the error codes into human-readable strings then.

You can display these messages with the dmesg command (or check the logfiles). If you email me some question because of a

problem with the driver, please include these messages.

Insmod options

debug=0/1

Enable debug messages (see above, default: 0).

verbose=0/1

Be verbose (default: 1).

init=0/1

Send INITIALIZE ELEMENT STATUS command to the changer at insmod time (default: 1).

timeout_init=<seconds>

timeout for the INITIALIZE ELEMENT STATUS command (default: 3600).

timeout_move=<seconds>

timeout for all other commands (default: 120).

dt_id=<id1>,<id2>,... / dt_lun=<lun1>,<lun2>,...

These two allow to specify the SCSI ID and LUN for the data transfer elements. You likely don't need this as the jukebox should provide this information. But some devices don't ...

vendor_firsts=, vendor_counts=, vendor_labels=

These insmod options can be used to tell the driver that there are some vendor-specific element types. Grundig for example does this. Some jukeboxes have a printer to label fresh burned CDs, which is addressed as element 0xc000 (type 5). To tell the driver about this vendor-specific element, use this:

```
$ insmod ch                     \
        vendor_firsts=0xc000    \
        vendor_counts=1         \
        vendor_labels=printer
```

All three insmod options accept up to four comma-separated values, this way you can configure the element types 5-8. You likely need the SCSI specs for the device in question to find the correct values as they are not covered by the SCSI-2 standard.

Credits

I wrote this driver using the famous mailing-patches-around-the-world method. With (more or less) help from:

- Daniel Moehwald <moehwald@hdg.de>
- Dane Jasper <dane@sonic.net>
- R. Scott Bailey <sbailey@dsddi.eds.com>
- Jonathan Corbet <corbet@lwn.net>

Special thanks go to

- Martin Kuehne <martin.kuehne@bnbt.de>

for a old, second-hand (but full functional) cdrom jukebox which I use to develop/test driver and tools now.

Have fun,

Gerd

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