ELLHNIKO LINUX Sound HOWTO

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To keimeno ayto perigrafei thn yposthrijh toy Linux gia hxo. Sygkekrimena, paroysiazei analytiko pinaka toy yposthrizomenoy hardware gia hxo, toy ported hardware hxoy, perigrafei pws na setarei kaneis toys drivers toy pyrhna, kai telos, apanta stis pio syxna diatypwmenes erwthseis. O skopos toy keimenoy aytou einai na boh8hsei toys neoys xrhstes kai na meiwsei to forto sta Usenet news groups kai tis listes allhlografias (mailing lists).

Contents

1 Eisagwgh

Ayto to keimeno einai to Linux Sound HOWTO. Einai ena suntomo egxeiridio poy kaluptei otidhpote xreiazetai kaneis na jerei gia thn egkatastash kai ru8mish hxoy katw apo Linux. Apantame stis pio syxna diatypwmenes erwthseis sxetika me thn yposthrijh hxoy se Linux, kai parapempoyme se alles phges plhroforias panw se diafora 8emata sxetika me ton hxo kai th moysikh poy paragetai apo ton ypologisth.

H estiash toy keimenoy ginetai gia kartes hxoy pertaining to Linux. Gia perissoteres plhrofories panw stis kartes hxoy kai th dhmioyrgia moysikhs, diabaste ta keimena poy anaferontai sto kefalaio *Parapompes*.

1.1 Eyxaristies

Oi perissoteres plhrofories prohl8an apo thn tekmhriwsh (documentation) poy yphrxe ston kwdika toy driver hxoy, poy egrace o Hannu Savolainen (`hannu@voxware.pp.fi`). Eyxaristoume ton Hannu kai oloys osoys aneptyjan toys drivers hxoy kai boh8htikes efarmoges (utilities) gia ton pyrhna toy Linux.

Xarh sto paketo `SGMLTools`, ayto to HOWTO diati8etai se diafora formats ta opoia parax8hkan ola apo ena koino arxeio phgaioy kwdika (source file).

1.2 Revision History

1h Ekdosh

. Stal8hke mono sth mailing list "SOUND channel of Linux activists"

Ekdosh 1.2

mikres allages. H prwth ekdosh dia8esimh se archive sites

Ekdosh 1.3

metatraphke se SGML. Dia8esimh pia se diafora formats xrhsimopoiwntas ta ergaleia Linuxdoc-SGML toy Matt Welsh's. allaje polu h emfanish logw toy neoy format, enw to periexomeno allaje elaxista

Ekdosh 1.4

minor tweaking of SGML. Proste8hke h apanthsh gia tis asymbatothtes toy PAS16 kai Adaptec1542A SCSI adaptor

Ekdosh 1.5

h ekdosh 2.5a toy driver hxoy perilambanetai stis dianomes me pyrhna 1.1. Shmeiwsh gia thn yposthrijh GUS-MAX. alles mikres allages

Ekdosh 1.6

proste8hke h plhroforia gia to la8os "no space on device". Pros8hkh shmeiwshs pws to Hacker's Guide brisketai se "krymmeno" directory. Pros8hkh erwthshs gia amfidromo (bidirectional) mode. Plhroforia gia ta la8h "device busy". alles mikres allages

Ekdosh 1.7

proste8hke plhroforia gia tis ASP kai AWE32. To VoxWare 2.9 einai dia8esimo. Apanthsh sthn erwthsh gia th xrhsh toy IRQ2. Anafores se Sound kai SCSI HOWTOs

Ekdosh 1.8

proste8hke h erwthsh gia la8h katw apo to DOS. Eginan polles mikres allages wste na tairiazei me thn ekdosh 2.90 toy driver hxoy. Plhrofories gia to DOOM. Apanthsh gia th meiwsh toy 8oruboy

Ekdosh 1.9

erwthseis gia thn hxografhsh kai gia clone cards

Ekdosh 1.10

anaferetai oti to HOWTO einai dia8esimo sto WWW, se ektypwmena antigrafa, kai se metafrash. Plhroforia gia to DMA conflict me ton QIC tape driver. Plhroforia gia thn Sound Galaxy NX Pro kai Logitech BusMouse

Ekdosh 1.11

Mia polu ka8ysterhmenh enhmerwsh (Hmoyn polu apasxolhmenos). To keimeno te8hke katw apo adeia GPL kai sygxronisthke me thn ekdosh 3.0 gia driver hxoy. Plhrofories gia drivers poy yposthrizoyn polles nees kartes hxoy. Perissoteres plhrofories gia configuration kai troubleshooting. Proste8hkan polla HTML links. Symmorfw8hke sumfwna me to format toy CD-ROM HOWTO

Ekdosh 1.12

Neoi drivers hxoy ston pyrhna 1.3.34. Nea onomata sound device. H 1542 address einai h 334 kai oxi h 333. Dieykrinisthke h katastash ths Creative Labs Emu kai ASP. Deikths pros ta Web sites ths Creative Labs kai MediaTrix

Ekdosh 1.13

Shmeiwsh gia to onoma VoxWare. Enhmerwsh me oles tis yposthrizomenes kartes hxoy kai tis epiloges stis ry8miseis. Erwthsh gia yposthrijh Plug and Play. Erwthsh gia to problhma toy block size. Nees epiloges sto xconfig kai menuconfig. To modutils exei yposthrijh gia sound device. Efyge h mailing list vger. Do8hke emfash sto Web site toy syggrafea. Diafores alles mikres allages

Ekdosh 1.14

H Audio Excell DSP16 den yposthrizetai gia thn wra (8a prepei na doylecei pali se merikous mhnes). Allages sto programma configure. Dia8esimh h ekdosh toy Italikou HOWTO. Texnasma gia na 8etoyme thn enisxysh toy mikth (mixer) otan fortwnetai to module toy hxoy. O teleytaios sta8eros pyrhnas einai o 2.0. Neo onoma gia to driver hxoy. Erwthsh gia ta dikaiwmata toy root sta arxeia sound device

Ekdosh 1.15

afaire8hkan kapoies erwthseis poy htan polu palies kai axrhstes pia. H nea hlektronikh dieu8ynsh toy syggrafea. Dior8w8hkan merika links poy deixnoyn sta pio prosfata paketa logismikou. Perissoteres plhrofories gia to biblio gia polymesa. Mikres allages sthn or8ografia kai th suntajh

Ekdosh 1.16

Polles allages kai dior8wseis apo ton Hannu Savolainen. Proste8hke ejamhniaia "uparjh-pio-prosfaths-ekdoshs-meta-apo" hmeromhnia. Nea URL se web selida gia to biblio. link sthn ispanikh metafrash. Mikres allages sthn or8ografia kai th suntajh

Ekdosh 1.17

Dia8esimh h kinezikh ekdosh. Enallaktikos GUS driver. Packet radio modem. To Linux Multimedia guide diati8etai sta gallika kai giapwnezika. Anafores se dyo sxetika mini-HOWTOs. Deikths gia to IBM ThinkPad

Ekdosh 1.18

Dia8esimh h koreatikh metafrash. Perissoteres plhrofories gia thn katastash sxetika me ton hxo sto MIPS. Enhmerw8hkan oi plhrofories gia yposthrijh pollaplwn kartwn hxoy. 8a prepei na eiste root otan trexete to fuser

Ekdosh 1.19

Proste8hkan eggrafes sto eyrethrio. Te8hke katw apo ka8estws LDP anti GPL

1.3 Nees ekdoseis toy keimenoy

Nees ekdoseis aytou toy keimenoy 8a stelnontai periodika sto `comp.os.linux.answers` newsgroup. Epishs, 8a stelnontai se diafora anwnyma ftp sites poy sygkentrwnoyn tetoies plhrofories opws kai to `<ftp://sunsite.unc.edu/pub/Linux/docs/HOWTO/>`.

Hypertext ekdoseis aytou kai allwn Linux HOWTOs einai dia8esimes se polla World-Wide-Web sites, symperilambanomenoy kai toy `<http://sunsite.unc.edu/LDP/>`. Oi perissoteres dianomes Linux CD-ROM periexoyn ta HOWTOs, synh8ws katw apo to directory `/usr/doc`, alla mporeite na agorasete kai typwmena antigrafa apo diaforoys pwlhtes. Merikes fores ta HOWTOs poy diati8entai apo toys promh8eytes twn CD-ROM, ftp sites, kai h ektypwmenh morfh einai parwxhmena. An h hmeromhnia aytou toy HOWTO einai palaioterh apo eji mhnes apo shmera, tote polu pi8ana mia neoterh ekdosh na brisketai sto Internet.

Gallikh metafrash toy keimenoy diati8etai sto `<ftp://ftp.ibp.fr/pub2/linux/french/docs/HOWTO/>`.

Giapwnezikh metafrash toy keimenoy diati8etai sto `<http://yebisu.ics.es.osaka-u.ac.jp/linux/>`.

Italikh metafrash toy keimenoy diati8etai sto `<http://www.psy.unipd.it/ildp/docs/HOWTO/Sound-HOWTO.html>`.

Ispanikh metafrash toy keimenoy diati8etai sto `<http://www.insflug.nova.es/howtos/online/sonido/sonido-COMO.html>`.

Kinezikh metafrash toy keimenoy diati8etai sto `<http://linux.ntcic.edu.tw/~yorkwu/linux/howto/sound/>`.

Koreatikh metafrash toy keimenoy diati8etai sto `<http://members.iWorld.net/mangchi/HOWTO/Sound-HOWTO.html>`.

Oi perissoteres metafraseis aytou toy keimenoy kai allwn Linux HOWTOs briskontai sto `<http://sunsite.unc.edu/pub/Linux/docs/HOWTO/translations/>` kai sto `<ftp://sunsite.unc.edu/pub/Linux/docs/HOWTO/translations/>`.

An metafrasete ayto to keimeno se allh glwssa, eidopoihste me wste na kanw mia anafora se ayto.

1.4 Feedback

Gia sxolia, parathrhseis, dior8wseis, enhmerwseis peri ths Ellhnikhs metafrashs aytou toy HOWTO, steilte email sthn Boula Sanida : `voulariba@hellug.gr` h ston Eyripidh Papakwsta : `evris@hellug.gr` kai enallaktika : `ep@rocketmail.com`

Ayto to HOWTO mporei na beltiw8ei kai na einai pragmatika xrhsimo me th boh8eia toy anagnwsth. An exete opoiadhpote protash, dior8wsh, h sxolia, parakalw steilte ta sto `tranter@pobox.com`, kai 8a prospa8hsw na ta enswmatwsw sthn epomenh ekdosh aytou toy keimenoy.

Eimai pro8ymos, an mporw, na apanthsw se genikes erwthseis sxetika me tis kartes hxoy katw apo to Linux. Prin me rwthsete, diabaste parakalw oles tis plhrofories poy parexei ayto to HOWTO, kai steilte moy leptomereis plhrofories gia to problhma sas. Parakalw mh me rwtate gia xrhsh kartwn hxoy se alla leitoyrgika systhmata ektos toy Linux.

Ean dhmosiopoihsete ayto to keimeno se CD-ROM h se xarti, 8a ektimousa thn apostolh enos antigrafoy. Gracte moy gia ton taxydromiko moy kwdika. Epishs analogis8eite thn periptwsh dwreas pros to Linux Documentation Project gia na sthrijete thn yposthrijh ths dwrean tekmhriwshs. Epikoinwnhste me ton syntonisth toy Linux HOWTO, Tim Bynum `<mailto:linux-howto@sunsite.unc.edu>`, gia perissoteres plhrofories.

1.5 Politikh Dianomhs

2 Texnologia kartwn hxoy

Se ayto to tmhma dinetai mia *basikh* perigrafh ths texnologias toy chfiakou hxoy, me skopo na boh8hsei sthn katanohsh twn ennoiwn poy 8a xrhsimopoih8oun parakatw sto keimeno. Gia kapoion poy 8elei na ma8ei perissotera, kalo 8a htan na symboyleytei ena biblio gia chfiako hxo h chfiakh epejergasia shmatos.

O hxos einai *analogikos*, mporei dhladh na labei opoiadhpote timh se mia synexh klimaka. Oi ypologistes einai *chfiakoi*, doyleuoyn dhladh me diakrites times. Oi kartes hxoy xrhsimopoioun mia syskeyh gnwsth ws *Metatropeas Analogikou Shmatos se Yhfiako Shma (Analog to Digital Converter (A/D h ADC))* gia na metatrepei ta plath (voltages) ths analogikhs hxhtikhs kymatomorfhs se chfiakes h ari8mhtikes times, oi opoies mporoun na apo8hkeytoun sth mnhmh. Paromoia, enas *Metatropeas Yhfiakou Shmatos se Analogiko (D/A h DAC)* metatrepei ari8mhtikes times se analogikh tash h opoia me th seira ths odhgei ena megafwno, paragontas hxo.

H diadikasia ths metatrophs toy analogikou shmatos se chfiako, gnwsth ws deigmatolhcia, eisagei kapoio sfalma. Duo paragontes ka8orizoyn poso kala to deigmatolhpthmeno shma antiproswpeuei to arxiko. O *ry8mos deigmatolhcias* einai o ari8mos twn deigmatwn poy phrame ana monada xronoy (synh8ws ekfrazetai se deigmata ana deyterolepto h Hertz). Enas xamhlos ry8mos deigmatolhcias antiproswpeuei me ligoterh akribeia to analogiko shma. Euros deigmatolhcias einai to euros twn timwn poy xrhsimopoieitai gia na antiproswpeuei ka8e deigma, syxna ekfrazetai se bits. Oso megalutero einai to euros deigmatolhcias, toso akribestero 8a einai to chfiako shma.

Oi kartes hxoy xrhsimopoioun synh8ws euros 8 h 16 bit deigmatwn me ry8mous deigmatolhcias apo 4000 mexri 44,000 deigmata to deyterolepto. Ta deigmata ayta mporoun na periexoyn ena kanali (mono) h duo (stereo). Sun8esh FM (FM Synthesis) einai mia palioterh texnikh gia paragwgh hxoy. Basizetai sto syndyasmo diaforetikwn kymatomorfwn (p.x hmitonikh, triangle, square). H FM synthesis einai aplousterh sthn ylopoihsh se hardware apo ton D/A metatropea, alla einai pio duskolh ston programmatismo ths kai ligotero eyelikth. Polles kartes hxoy parexoyn FM synthesis gia logoys symbatothtas me palioteres kartes kai logismiko. Dinontai synh8ws epishs kai polles anejarthtes gennhtries hxoy h *fwnhs*.

H sun8esh me bash pinakes kymatomorfwn (Wavetable Synthesis) syndyazei thn eyelijia toy metatropea D/A me thn ikanothta pollaplwn kanaliwn ths FM synthesis. Me ayto to sxhma oi chfiopoihmenes fwnes mporoun na apo8hkeuontai se eidika afierwmenh mnhmh, kai na paizontai, na syndyazontai, kai na metaballontai me mikrh epibarynsh ths CPU. Oi kartes hxoy teleytaias texnologias yposthrizoyn oles wavetable synthesis. Oi perissoteres kartes hxoy parexoyn th dynatothta gia *mijh (mixing)*, syndyasmo shmatwn apo diaforetikes phges eisodoy ka8ws kai elegxo ths sta8mhs enisxyshs twn shmatwn (gain levels). *MIDI* einai ta arxika toy Musical Instrument Digital Interface, to opoio einai ena ka8ierwmeno prwtokollo toso hardware oso kai software gia na epitrepei thn metaju twn moysikwn organwn epikoinwnia. Ta shmata poy stelnontai se ena

MIDI kanali (bus) mporoun na apo8hkeytoun san MIDI arxeia gia th metepeita epejergasia (editing) kai anaparagwgh (playback). Polles kartes hxoy parexoyn MIDI interface. Aytes poy de dinoyn, mporoun na paizoyn MIDI arxeia xrhsimopoiwntas tis on-board dynatothtes ths kartas hxoy. Ta *MOD* arxeia einai ena koino format gia tragoudia poy syn8etontai se ypologisth. Ta arxeia ayta periexoyn plhrofories gia tis notes poy 8a paixtoun ka8ws kai chfiopoihmena deigmata twn organwn (h fwnwn). Ta MOD arxeia prohl8an apo ta computers Amiga, alla paizoyn me to katallhlo logismiko kai se alla leitoyrgika, symperilambanomenoy toy Linux.

3 Yposthrizomeno Hardware

Se ayto to tmhma akoloy8ei mia lista twn kartwn hxoykai interfaces poy yposthrizontai mexri shmera apo to Linux. Oi plhrofories basizontai ston pio prosfato pyrhna Linux, th stigmh ths syggrafhs toy keimenoy.

O driver hxoy exei th dikh toy ari8mhsh ekdosewn (versioning). H pio prosfath ekdosh sta8erou pyrhna Linux einai h ekdosh 2.0.33, kai xrhsimopoiei ton driver hxoy me ekdosh 3.5.4-960630.

O Hannu Savolainen egrace ton driver hxoy kai dia8etei tis nees beta ekdoseis toy driver prin na enswmatw8oun se dianomh neoy sta8erou pyrhna Linux. H pio enhmerwmenh lista twn yposthrizomenwn kartwn hxoy brisketai sto `<http://www.4front-tech.com/ossfree/new_cards.html>` (USA) h sto `<http://personal.eunet.fi/pp/voxware/new_cards.html>` (Eyrwph). Aytes oi selides deixnoyn poia ekdosh toy driver hxoy apaiteitai gia to sygkekrimeno tupo kartas h an h yposthrijh ths kartas brisketai ypo kataskeyh - anaptyjh. To arxeio `/usr/src/linux/drivers/sound/Readme.cards`to opoio dianemetai me ton sound driver toy antistoixoy pyrhna periexei plhrofories gia tis yposthrizomenes kartes hxoy alla den einai panta h pio prosfath ekdosh.

Oi plhrofories se ayto to HOWTO einai egkyres gia Linux poy trexei se platforma Intel.

O driver hxoy prepei na doyleuei epishs me tis perissoteres kartes hxoy se platforma Alpha. Parola ayta, merikes kartes mporei na exoyn sugkroysh (conflict) me tis 8ures eisodoy-ejodoy (I/O ports) allwn syskeywn sta systhmata Alpha akomh kai an doyleuoyn teleia se mhxanes i386, gi' ayto genika den einai dynato na pei kaneis me sigoyria an mia sygkekrimenh karta 8a doylecei h oxi xwris na to dokimasei. Th stigmh poy grafetai to keimeno, o driver hxoy de doyleuei akomh gia thn ekdosh toy Linux gia PowerPC, alla sto mellon 8a yposthrizetai. H yposthrijh hxoy parexetai kai gia sthn metafora (port) toy Linux gia MIPs, kai merikes mhxanes MIPs exoyn EISA slots kai/h enswmatwmeno hardware hxoy. Plhroforh8hka pws h omada anaptyjhs toy Linux-MIPs endiaferetai na pros8esei sto mellon yposthrijh gia hxo.

O pyrhnas toy Linux perilambanei ena jexwristo driver gia Atari kai Amiga poy ylopoiei ena symbato yposunolo toy driver hxoy ths platformas Intel, xrhsimopoiwntas to enswmatwmeno (built-in) sound hardware aytwn twn mhxanwn.

H antistoixh metafora (port) toy Linux gia SPARC den yposthrizei hxo. Opws sthn Amiga kai sta Atari, oi mhxanes SPARC exoyn enswmatwmeno hardware hxoy, kai etsi h yposthrijh 8a mporouse na ginei me thn dhmioyrgia enos neoy driver (h eirwneia einai pws sto Linux to `/dev/dsp` prosomoiwnei to sound device toy SunOS!).

3.1 Kartes hxoy

- Oi parakatw kartes hxoy yposthrizontai apo ton Linux kernel sound driver:
- ATI Stereo F/X (den kataskeyazetai pia)
- AdLib (den kataskeyazetai pia)
- Ensoniq SoundScape (kai oi symbates poy kataskeyasthkan apo tis Reveal kai Spea)

- Gravis Ultrasound
- Gravis Ultrasound ACE
- Gravis Ultrasound Max
- Gravis Ultrasound me thn epilogh deigmatolhcias sta 16 bit
- Logitech Sound Man 16
- Logitech SoundMan Games
- Logitech SoundMan Wave
- MAD16 Pro (OPTi 82C928, 82C929, 82C930, 82C924 chipsets)
- Media Vision Jazz16
- MediaTriX AudioTriX Pro
- Microsoft Windows Sound System (MSS/WSS)
- Mozart (OAK OTI-601)
- Orchid SW32
- Personal Sound System (PSS)
- Pro Audio Spectrum 16
- Pro Audio Studio 16
- Pro Sonic 16
- Roland MPU-401 MIDI interface
- Sound Blaster 1.0
- Sound Blaster 16
- Sound Blaster 16ASP
- Sound Blaster 2.0
- Sound Blaster AWE32
- Sound Blaster Pro
- TI TM4000M notebook
- ThunderBoard
- Turtle Beach Tropez ("klassikh" alla oxi Plus)
- Turtle Beach Maui
- Yamaha FM synthesizers (OPL2, OPL3 kai OPL4)
- 6850 UART MIDI Interface

Prepei na shmeiw8ei oti oi Plug and Play (PnP) kartes hxoy den einai plhrws symbates me ta paliotera montela (mh PnP) ths idias syskeyhs. Gia paradeigma, h SoundBlaster16 PnP den einai plhrws symbath me thn SoundBlaster16. To idio isxuei gia tis kartes Soundscape PnP kai GUS PnP. Perissoteres plhrofories sxetika me tis Plug and Play kartes, 8a breite parakatw.

Oi parakatw kartes *den* yposthrizontai, eite giati einai polu palies eite epeidh o kataskeyasths den 8a ekdwsei tis programmatistikes leptomereies poy apaitountai gia na graftei enas driver:

- Pro Audio Spectrum (original)
- Pro Audio Spectrum+
- palies kartes hxoy (Sierra Aria based) ths Diamond

alles kartes hxoy poy isxyrizontai oti einai symbates me kapoia apo tis yposthrizomenes kartes hxoy *mporei* na doylecoyn an einai symbates se epipedo hardware (i.e. register level).

Parolo poy oi perissoteres kartes hxoy isxyrizontai oti einai symbates me th "SoundBlaster", polu liges ap' aytes einai eparkws symbates wste na doylecoyn me ton Linux SoundBlaster driver. Aytes oi kartes synh8ws doyleuoyn kalutera xrhsimopoiwntas ton MSS/WSS h MAD16 driver. Mono oi ay8entikes kartes SoundBlaster poy kataskeyazontai apo th Creative Labs, kai poy xrhsimopoioun ta Creative's custom chips (p.x. SoundBlaster16 Vibra), oi MV Jazz16 kai oi ESS688/1688 based kartes doyleuoyn me ton SoundBlaster driver. To na prospa8hsete na sthsete mia "16 bit karta hxoy symbath me SoundBlaster Pro" me ton SoundBlaster driver einai synh8ws xasimo xronoy.

O pyrhnas toy Linux yposthrizei th 8ura SCSI poy parexoyn merikes kartes hxoy (p.x. ProAudioSpectrum 16) kai to apokleistikhs texnologias (proprietary) interface gia merikous odhgous CD-ROM (p.x. Soundblaster Pro). Gia perissoteres plhrofories deite to `SCSIHOWTO` kai to `CDROMHOWTO`.

Ena loadable module toy pyrhna gia yposthrijh 8uras joystick, symperilambanomenhs kai ayths poy parexetai apo merikes kartes hxoy, einai epishs dia8esimo.

Shmeiwste epishs pws oi drivers gia SCSI, CD-ROM, joystick kai hxoy, einai entelws anejarthtoi metaju toys. Gia tis pio prosfates plhrofories sxetika me toys drivers twn kartwn hxoy deite to WWW site toy Hannu Savolainen poy anaferetai sto tmhma twn Parapompwn.

3.2 Enallaktikoi Drivers Hxoy

Yparxoyn merikoi "anepishmoi" drivers hxoy dia8esimoi, den symperilambanontai se epishmes dianomes Linux, kai xrhsimopoiountai anti toy ka8ierwmenoy driver hxoy.

Mia emporikh ekdosh toy Linux driver hxoy pwleitai apo th 4Front Technologies. Prosferei kapoia epipleon xarakthristika apo th dwrean ekdosh poy perilambanei o pyrhnas toy Linux. Gia perissoteres plhrofories episkefteite th Web selida ths 4Front Technologies sto `<http://www.4front-tech.com/>`.

O Markus Mummert (`mum@mmk.e-technik.tu-muenchen.de`) exei gracei ena paketo (package) gia driver twn kartwn hxoy Turtle Beach MultiSound (classic), Tahiti, kai Monterey. H tekmhriwsh toy anaferei:

> "Exei sxediastei gia ychlhs pistothtas anaparagwgh kai hxografhsh se sklhro disko xwris problhmata sygxronismou akoma kai se ena apasxolhmeno susthma. Alla xarakthristika opws wave synthesis, MIDI kai epejergasths chfiakou shmatos (digital signal processor - DSP) den mporoun na xrhsimopoih8oun. Epishs, h taytoxronh hxografhsh kai anaparagwgh den einai dynath. Mexri twra antika8ista to VoxWare kai exei dokimastei me diaforoys pyrhnes ekdoshs poy kymainetai apo 1.0.9 ews 1.2.1. Epishs, einai dynaton na egkatasta8ei se systhmata UN*X SysV386R3.2."

Mporeite na toys breite sto `<http://www.cs.colorado.edu/~mccreary/tbeach>`.

O Kim Burgaard (`burgaard@daimi.aau.dk`) exei gracei ena device driver kai boh8htika programmata (utilities) gia to MIDI interface Roland MPU-401. H antistoixh eggrafh sto Linux software map anaferei:

> "Enas device driver gia alh8ina symbata MIDI interfaces me to Roland MPU-401 (symperilambanomenoy toy Roland SCC-1 kai toy RAP-10/ATW-10). Diati8etai me mia xrhsimh syllogh apo boh8htikes efarmoges, symperilambanomenoy enos klassikou MIDI File player kai recorder.
>
> Polles beltiwseis exoyn ginei apo thn ekdosh 0.11a. Metaju twn allwn, o driver twra yposxetai politikh dynatothtas diamoirasmou IRQ (IRQ sharing policy) kai akoloy8ei ta standards toy neoy interface gia ta modules toy pyrhna. Uparjh metronomoy, dynatothta gia sygxronismo p.x. grafikwn ana xtupo (beat) xwris apwleia akribeias, proxwrhmeno interface replay/record/overdub kai polla, polla alla."

8a ton breite sto `<ftp://sunsite.unc.edu/pub/Linux/kernel/sound/mpu401-0.2.tar.gz>`.

O Jaroslav Kysela kai merikoi alloi egracan enan enallaktiko driver hxoy gia thn karta Gravis UltraSound. Plhrofories 8a breite sto `<http://romeo.pf.jcu.cz/~perex/ultra>`, thn home page toy Linux UltraSound Project.

Mia nea xrhsh gia karta hxoy katw apo Linux einai ws modem gia packet radio. Oi prosfatoi pyrhnes 2.1.x periexoyn ena driver poy doyleuei me th SoundBlaster kai tis symbates me Windows Sound System, poy ylopoiei ta prwtokolla 1200 bps AFSK kai 9600 bps FSK. Deite to Linux AX25 HOWTO gia leptomereies (Epi ti eykairia, eimai kai egw radioerasitexnhs – callsign VE3ICH).

3.3 Megafwno ypologisth

Enas enallaktikos driver hxoy einai dia8esimos, poy den apaitei epipleon hardware hxoy. Xrhsimopoiei to eswteriko hxeio toy ypologisth. Einai symbatos kyriws se epipedo software me ton driver ths kartas hxoy, alla, opws einai kai anamenomeno, parexei ejodo polu xeiroterhs poiothtas kai prokalei polu megaluterh epibarynsh sth CPU. Ta apotelesmata poikiloyn, kai einai analoga twn xarakthristikwn twn yparxontwn eswterikwn hxeiwn. Gia perissoteres plhrofories , deite thn tekmhriwsh poy parexetai me thn ekdosh toy driver.

H trexoysa ekdosh einai h 1.1, kai 8a th breite sto `<ftp://ftp.informatik.hu-berlin.de/pub/os/linux/hu-sound/>`

3.4 Parallhlh 8ura

Mia allh epilogh einai h dhmioyrgia enos chfioanalogikou metatropea xrhsimopoiwntas mia parallhlh 8ura ektypwth kai kapoia epipleon ylika. Ayto parexei ayjhmenh poiothta hxoy apo oti to eswteriko hxeio toy PC, alla dhmioyrgei epishs megalh epibarynsh sth CPU. O driver hxoy gia PC, poy anafer8hke parapanw, yposthrizei ayth th dynatothta kai symperilambanei odhgies gia thn kataskeyh toy anagkaioy hardware.

4 Egkatastash

Gia na ry8misete to Linux wste na yposthrizei hxo akoloy8eite ta parakatw bhmata:

1. Egkatasthste thn karta hxoy.

2. Ry8miste kai xtiste ton pyrhna wste na yposthrizei hxo.
3. Dhmioyrghste ta device files.
4. Epanekkinhsh toy pyrhna Linux kai elegxos ths egkatastashs.

Sta epomena tmhmata 8a paroysiasoyme ka8e ena apo ayta ta bhmata analytika.

4.1 Egkatastash ths Kartas Hxoy

Akoloy8hste tis odhgies toy kataskeyasth gia thn egkatastash toy hardware h zhthste apo ton antiproswpo poy agorasate th syskeyh na sas thn egkatasthsei.

Oi palioteres kartes hxoy exoyn synh8ws diakoptes h jumpers gia to IRQ, kanali DMA, klp. Katagracte tis times poy xrhsimopoihsate. An den eisaste sigoyroi, xrhsimopoihste tis proka8orismenes, apo to ergostasio, times. Prospa8hste na apofugete ta conflicts me alles syskeyes (p.x. kartes diktuoy ethernet , kartes SCSI, parallhles kai seiriakes 8ures) oso einai dynato.

Synh8ws 8a prepei na xrhsimopoihsete tis idies ry8miseis gia I/O port, IRQ, kai DMA, poy xrhsimopoieite sto DOS. Se merikes periptwseis, parola ayta, (eidika gia tis PnP kartes) isws xreiastei na xrhsimopoihsete diaforetikes ry8miseis gia na kanete ta pragmata na doylecoyn katw apo Linux.

4.2 Ry8mizontas ton Pyrhna

Me ka8e nea egkatastash Linux exete synh8ws ena precompiled pyrhna. Aytoi oi pyrhnes den yposthrizoyn hxo. Einai protimotero na kanete compile ton pyrhna monoi sas jana me toys drivers poy 8elete. Mporei na 8elete na kanete compile jana ton pyrhna gia na anaba8misteite se mia nea ekdosh h na eley8erwsete poroys mnhmhs mikrainontas to mege8os toy pyrhna.

8a prepei na symboyleyteite to *Linux Kernel HOWTO* `<http://sunsite.unc.edu/LDP/HOWTO/Kernel-HOWTO.html>` gia tis leptomereies toy xtisimatos enos pyrhna. 8a anaferw apla merika 8emata poy aptontai mono stis kartes hxoy.

An den exete ry8misei pote ton pyrhna wste na yposthrizei hxo, einai kalh idea na diabasete *ola* ta arxeia Readme poy symperilambanontai me toys drivers hxoy toy pyrhna, eidika tis plhrofories sxetika me ton tupo ths kartas sas. Ta parakatw arxeia tekmhriwshs briskontai sto kernel sound driver directory, synh8ws sto `/usr/src/linux/drivers/sound`:

```
CHANGELOG        - perigrafh twn allagwn ka8e ekdoshs
COPYING          - copying kai copyright restrictions
Readme           - ta pio prosfata kai shmantika nea
Readme.aedsp16   - plhrofories sxetika me thn karta hxoy Audio Excel DSP 16
Readme.cards     - parathrhseis gia th ru8mish sygkekrimenwn kartwn
Readme.linux     - parathrhseis gia thn egkatastash drivers hxoy diaforetikwn ekdosewn
Readme.modules   - pws na kanete build ena driver sa loadable kernel module
Readme.v30       - nea xarakthristika sthn ekdosh 3.0 toy driver hxoy
experimental.txt - parathrhseis se peiramatika xarakthristika
```

Akoloy8hste thn typikh diadikasia gia to xtisimo toy pyrhna. Yparxoyn ws twra 3 diaforetika interfaces gia th diadikasia ru8mishs. Grafontas "make xconfig", exete ena grafiko user interface poy trexei sta X11. Me thn entolh "make menuconfig" jekinate ena menu-based system poy xrhsimopoiei mono apeikonish menu kai keimenoy. H klasikh me8odos, xrhsimopoiwntas to "make config", prosferei ena aplo interface mono me keimeno.

8a prepei na prosejete idiaitera otan xrhsimopoieite to "make xconfig" h to "make menuconfig". Oles oi NAI/OXI erwthseis prepei na ejetastoun prosektika. H proepilegmenh apanthsh poy exoyn oi entoles einai panta OXI, to opoio den einai to katallhlo gia oles tis periptwseis. Sygkekrimena h epilogh "/dev/dsp kai /dev/audio support" (CONFIG_AUDIO) prepei na einai synh8ws NAI.

Ypo8etoyme oti xrhsimopoieite thn klassikh diadikasia gia na kanete compile, grafontas "make config", an kai h diadikasia einai paromoia gia ka8e periptwsh.

Yparxoyn epishs duo diaforetikoi tropoi gia na ry8misete ton hxo. O prwtos einai o "palios" tropos (o monos poy yphrxe prin toys pyrhnes 2.0.0). Xrhsimopoiei ena standalone programma to opoio einai meros toy driver hxoy. Ayth h me8odos doyleuei me tis perissoteres kartes hxoy ektos apo elaxistes poy apaitoun epipleon drivers "xamhlou epipedoy" (miroSOUND, AWE32, kai AEDSP16 cards).

O deuteros einai h "nea" kai kaluterh me8odos h opoia einai enswmatwmenh me to configuration meso menou poy xrhsimopoieitai kai gia ton ypoloipo pyrhna. Aytos o tropos de doyleuei me kartes hxoy poy zhtoun arxeio firmware. Ayto perilambanei tis kartes PSS, SM Wave, AudioTrix Pro kai TurtleBeach Tropez/Maui. Me aytes tis kartes prepei na xrhsimopoih8ei h palia me8odos.

H nea me8odos xrhsimopoieitai panta apo to "make xconfig". Otan xrhsimopoieite to "make menuconfig" mporeite na epilejete metaju toy "paliou" kai "neoy" tropoy sthn ypoo8onh gia hxo. Otan trexete "make config" xrhsimopoieitai aytomata h "palia" me8odos. Parola ayta, an exete xrhsimopoihsei th "nea" me8odo mia fora, 8a xrhsimopoih8ei kai apo to "make config" epishs. Mporeite na gyrisete ston palio tropo trexontas to "make menuconfig" kai epilegontas ton "palio" tropo.

O tropos poy proteinoyme einai h xrhsh toy "make menuconfig" mazi me thn "palia" me8odo ru8mishs hxoy. Polla problhmata egkatastashs ofeilontai (toylaxiston se kapoio pososto) se lan8asmenh xrhsh toy neoy tropoy.

Einai epishs dynato na fortwsete to driver hxoy san loadable module toy pyrhna. Synistw arxika na xtisete to driver ston pyrhna. Afou elegjete oti doyleuei, mporeite na peiramatisteite xrhsimopoiwntas thn epilogh kernel module.

Otan trexete `make config`, energopoihste thn yposthrijh hxoy apantwntas nai "y" sthn erwthsh

```
Sound card support (CONFIG_SOUND) [M/n/y/?]
```

Sto telos twn erwthsewn gia th ru8mish toy pyrhna, 8a ginei compile ena programma ru8mishs hxoy, 8a trejei, kai 8a sas rwthsei tis parametroys poy xreiazontai gia thn karta sas. Prosoxh stis apanthseis sas mia kai an apanthsete mia erwthsh la8os mporei na sas empodisei na apanthsete se merikes erwthseis poy akoloy8oun. Gia paradeigma, mhn apanthsete nai "yes" sthn prwth erwthsh (PAS16) an den exete PAS16. Mhn energopoieite perissoteres kartes hxoy apo oses xreiazeste, mia kai spataloun mnhmh. Epishs merikoi drivers (opws o MPU-401) mporei na kanoyn conflict me ton elegkth SCSI kai na empodizoyn ton pyrhna na kanei boot.

Parakatw paroysiazw mia suntomh perigrafh ka8e epiloghs. Se ka8e erwthsh mporeite na apanthsete "y" (nai) h "n" (oxi). H proka8orismenh apanthsh "[Y/n/?]" shmainei "y" kai h "[N/y/?]" shmainei pws h proka8orismenh apanthsh einai "n". Gia na dialejete thn proka8orismenh timh, apla pathste Enter, alla 8ymh8eite oti h proka8orismenh timh den einai aparaithta kai h swsth.

An gracete ena erwthmatiko ("?") 8a diabasete mia suntomh perigrafh gia th sygkekrimenh epilogh.

Shmeiwste epishs oti mporei na mhn erwth8eite oles tis erwthseis. To programma mporei na akyrwsei merikes erwthseis oi opoies ejartwntai apo nwriterh apanthsh sas. Mporei epishs na dialejei merikes epiloges gia sas, aytomata.

Old configuration exists in /etc/soundconf. Use it [Y/n/?]

An exete kanei compile prohgoymenws ton pyrhna me yposthrijh hxoy, tote h prohgoumenh sas ru8mish mporei na sw8ei. An 8elete na xrhsimopoihsete thn prohgoumenh egkatastash, pathste nai "y". An 8elete nea ru8mish h exete anaba8mistei se neo pyrhna, 8a prepei na apanthsete oxi "n" kai na synexisete th diadikasia egkatastashs.

ProAudioSpectrum 16 support [Y/n/?]

Apanthste nai "y" *mono* an exete a Pro Audio Spectrum *16*, ProAudio Studio 16 or Logitech SoundMan 16. Mhn apantate 'y' an exete kapoia allh karta kataskeyasmenh apo thn Media Vision h thn Logitech mia poy den einai symbates me PAS16.

SoundBlaster support [Y/n/?]

Apanthste nai "y" an exete mia gnhsia karta SoundBlaster ths Creative Labs h mia symbath 100% (opws h Thunderboard h h SM Games). An h karta sas einai sthn lista twn yposthrizomenwn kartwn koitajte tis odhgies gia aythn sto arxeio `Readme.cards` prin apanthsete se ayth thn erwthsh. Gia mia agnwsth karta mporeite na apanthsete "y"' an h karta isxyrizetai pws einai symbath me SoundBlaster.

Gravis Ultrasound support [Y/n/?]

Apanthste "y" an exete GUS h GUS MAX. Apanthste "n" an den exete GUS mia poy o driver katanalwnei polu mnhmh.

MPU-401 support (NOT for SB16) [Y/n/?]

Prosoxh se aythn thn erwthsh. To MPU-401 interface yposthrizetai apo oles sxedon tis kartes hxoy. Parola ayta, kapoies kartes poy yposthrizontai eggenws (natively)exoyn toys dikous toys drivers gia to MPU-401. H energopoihsh thn epilogh MPU-401 se aytes tis kartes 8a dhmioyrghsei conflict. Epishs, h energopoihsh toy MPU-401 se ena susthma poy den exei pragmatika MPU-401 8a mporouse na dhmioyrghsei kapoia problhmata. An h karta sas den einai sth lista twn yposthrizomenwn kartwn, koitajte tis odhgies gia thn sygkekrimenh karta sto arxeio `Readme.cards`. Einai asfales na apanthsete "y" an exete mia karta me alh8ino MPU-401 MIDI interface.

6850 UART Midi support [Y/n/?]

Einai asfales na apanthsete "n" se aythn thn erwthsh, se ka8e periptwsh. To 6850 UART interface spania xrhsimopoieitai.

PSS (ECHO-ADI2111) support [Y/n/?]

Apanthste "y" mono an exete Orchid SW32, Cardinal DSP16 h kapoia allh karta poy basizetai sto PSS chipset (AD1848 codec + ADSP-2115 DSP chip + Echo ESC614 ASIC CHIP).

16 bit sampling option of GUS (*not* GUS MAX) [Y/n/?]

Apanthste "y" an exete egkatesthmenh thn 16 bit sampling daughtercard sthn GUS. Apanthste oxi "n" an exete GUS MAX. Energopoiwntas ayth thn epilogh, apenergopoieitai h yposthrijh gia GUS MAX.

GUS MAX support [Y/n/?]

Apanthste "y" mono an exete GUS MAX.

Microsoft Sound System support [Y/n/?]

Skefteite prosektika kai edw, prin apanthsete "y" se ayth thn erwthsh. Einai asfales na apanthsete "y" an exete thn gnhsia Windows Sound System card ths Microsoft h ths Aztech, SG 16 Pro (h NX16 Pro). Epishs mporeite na apanthsete "y" se periptwsh poy h karta sas den anaferetai poy8ena mexri twra se ayto to keimeno. Gia kartes poy yposthrizoyn eggenws VoxWare, symboyleyteite tis odhgies tis sygkekrimenhs kartas sto `Readme.cards`. Merikoi drivers parexoyn dikia toys yposthrijh MSS kai energopoiwntas aythn thn epilogh 8a dhmioyrghsei conflict.

Ensoniq Soundscape support [Y/n/?]

Apanthste ”y” an exete karta hxoy basismenh sto chipset Ensoniq SoundScape. Tetoies kartes kataskeyazontai toylaxiston apo thn Ensoniq, Spea kai thn Reveal (h Reveal kataskeyazei epishs kai dikes ths kartes).

MediaTriX AudioTriX Pro support [Y/n/?]

Apanthste ”y” an exete thn AudioTriX Pro.

Support for MAD16 and/or Mozart based cards?

Apanthste ”y” an h karta sas dia8etei Mozart (OAK OTI-601) h MAD16 (OPTi 82C928 h 82C929) tsip hxoy. Ayta ta tsips einai pleon polu koina kai gi’ ayto einai dynaton polles anwnymes kartes na exoyn kapoia apo ta parapanw tsips. Epipros8eta, to tsip MAD16 xrhsimopoieitai kai se merikes kartes poy kataskeyazontai apo gnwstous kataskeyastes h Turtle Beach (Tropez), h Reveal (merika montela ths), h Diamond (ta pio prosfata).

Support for Crystal CS4232 based (PnP) cards [Y/n/?]

Apanthste ”y” an exete karta basismenh sto chipset Crystal CS4232.

Support for Turtle Beach Wave Front (Maui, Tropez) synthesizers [Y/n/?]

Apanthste ”y” an exete opoiadhpote apo aytes tis kartes.

SoundBlaster Pro support [Y/n/?]

Energopoihste ayth thn epilogh an h karta sas einai h SoundBlaster Pro h h SoundBlaster 16. Energopoihste thn epishs gia opoiadhpote symbath me SoundBlaster Pro. An apanthsete ”n” ejoikonomeite mnhmh, alla h asfalhs apanthsh edw einai ”y”.

SoundBlaster 16 support [Y/n/?]

Energopoihste thn epilogh an exete thn SoundBlaster 16 (symperilambanetai kai h AWE32).

Audio Excel DSP 16 initialization support [Y/n/?]

Energopoihste ayth thn epilogh an exete thn karta Audio Excel DSP16. Deite to arxeio `Readme.aedsp16` gia perissoteres plhrofories.

To programma 8a sas rwthsei merikes erwthseis sxetika me thn yposthrijh kapoiwn akoma yphresiwn. Sas synistoume na apanthsete ”y” se ka8e mia apo aytes tis erwthseis. Apanthste ”n” mono an gnwrizete oti de 8a xreiasteite ayth thn epilogh.

/dev/dsp and /dev/audio support (usually required) [Y/n/?]

An apanthsete ”n”, apenergopoieite ta `/dev/dsp` kai `/dev/audio`, toys metatropeis A/D kai D/A. Apanthste ”y”.

MIDI interface support [Y/n/?]

An apanthsete ”n”, apenergopoieite ta devices `/dev/midixx` kai thn prosbash se opoiesdhpote 8ures MIDI xrhsimopoiwntas ta `/dev/sequencer` kai `/dev/music`. Ayth h epilogh ephreazei epishs opoiadhpote syskeyh MPU-401 kai/h symbath me General MIDI.

FM synthesizer (YM3812/OPL-3) support [Y/n/?]

Edw apanthste ”y”.

/dev/sequencer support [Y/n/?]

An apanthsete ”n”, apenergopoieite ta `/dev/sequencer` kai `/dev/music`

Do you want support for the mixer of SG NX Pro ?

Apanthste "y" an exete thn karta hxoy Sound Galaxy NX Pro kai 8elete yposthrijh gia tis ejtra leitoyrgies toy mikth (extended mixer functions).

Do you want support for the MV Jazz16 (ProSonic etc.) ?

Apanthste "y" an exete thn karta hxoy MV Jazz16.

Do you have a Logitech SoundMan Games [Y/n/?]

Apanthste "y" an exete thn karta hxoy Logitech SoundMan Games.

Meta tis parapanw erwthseis gia kartes hxoy, to programma zhta plhrofories gia th ru8mish ths sygkekrimenhs kartas. Synh8ws zhteitai h dieu8ynsh I/O, oi times twn IRQ kai DMA. Gia merikes kartes, to programma zhta merika arxeia poy 8a xrhsimopoih8oun kata thn arxikopoihsh ths kartas. Ayta xrhsimopoiountai apo kartes poy dia8etoyn DSP h mikroepejergasth poy prepei na arxikopoih8ei "fortwnontas" ena arxeio (microcode) sthn karta. Se kapoies periptwseis to arxeio ayto grafetai sto a .h apo to programma ry8misewn kai meta enswmatwnetai ston driver kata to compile. Kai edw, diabaste tis sygkekrimenes plhrofories gia thn karta sas sto arxeio `Readme.cards`.

Sto telos 8a erwth8eite:

```
The sound driver is now configured.
Save copy of this configuration to /etc/soundconf [Y/n/?]
```

Fysiologika 8a apantousate "y" etsi wste an mellontika xreiastei na kanete jana compile ton pyrhna, na exete thn epilogh na xrhsimopoihsete to idio arxeio ry8misewn gia ton driver hxoy.

Ean anaba8mizete ton palio sas driver hxoy, sigoyreyteite oti ta arxeia `/usr/include/sys/soundcard.h` kai `/usr/include/sys/ultrasound.h` einai symbolika links sta antistoixa arxeia sto `/usr/include/linux`, h apla oti periexoyn tis grammes `#include <linux/soundcard.h>` kai `#include <linux/ultrasound.h>`, antistoixa.

Eiste twra etoimoi na kanete compile kai na sthsete to neo pyrhna.

4.3 Dhmioyrgia twn Device files

Gia swsth leitoyrgia, prepei na dhmioyrgh8oun device file entries gia ta sound devices. Ayta kanonika dhmioyrgountai gia sas kata thn egkatastash toy systhmatos Linux. Enas suntomos elegxos mporei na ginei xrhsimopoiwntas thn entolh poy fainetai parakatw. An to apotelesma einai ayto poy fainetai parakatw (h hmeromhnia 8a diaferei), tote ta device files einai sxedon sigoyra entajei.

```
% ls -l /dev/sndstat
crw-rw-rw-   1 root     root      14,   6 Apr 25  1995 /dev/sndstat
```

Shmeiwste oti to na exete ta swsta device files den eggyatai tipota apo mono toy. O driver toy pyrhna prepei epishs na fortw8ei h na ginei compile prin na doylecoyn ta devices (perissotera gi' ayto parakatw).

Se spanies periptwseis, an pisteuete oti einai la8os ta device files, mporeite na ta janadhmioyrghsete xrhsimopoiwntas to mikro shell script poy brisketai sto telos toy arxeioy `Readme.linux` sto directory `/usr/src/linux/drivers/sound`, trexontas to sa xrhsths root. Enallaktika, oi perissoteres dianomes Linux exoyn ena script /dev/MAKEDEV to opoio mporei na xrhsimopoih8ei gi' ayto to skopo.

An xrhsimopoieite to PC speaker sound driver, diabaste thn tekmhriwsh poy erxetai mazi me to paketo wste na apofasisete an prepei na dhmioyrgh8oun tipota device files.

4.4 Epanekkinhsh toy Linux kai Elegxos ths Egkatastashs

8a prepei twra na eiste etoimoi na jekinhsete to neo pyrhna kai na elegjete toys drivers hxoy. Akoloy8hste th synh8ismenh diadikasia egkatastashs kai epanekkinhshs toy neoy pyrhna (krathste fysika kapoy ton palio pyrhna gia tyxon problhmata).

Kata thn ekkinhsh, elegjte gia mhnyma san to parakatw on powerup (an ta mynhmata emfanizontai polu grhgora kai den prolabainete na ta diabasete, mporeite na ta deite grafontas thn entolh `dmesg`):

```
Sound initialization started
<Sound Blaster 16 (4.13)> at 0x220 irq 5 dma 1,5
<Sound Blaster 16> at 0x330 irq 5 dma 0
<Yamaha OPL3 FM> at 0x388
Sound initialization complete
```

Ayto 8a prepei na tairiazei me ton tupo ths kartas hxoy sas kai ta jumper settings (an yparxoyn).

Shmeiwste oti ta parapanw mhnumata den emfanizontai otan xrhsimopoieite loadable sound driver module (ektos kai an to energopoihsete, p.x. xrhsimopoiwntas to "insmod sound trace_init=1).

Otan o driver hxoy ginetai link ston pyrhna, prepei na emfanistoun ta mhnumata "Sound initialization started" kai "Sound initialization complete". An den typwnontai, shmainei oti den yparxei driver hxoy ston pyrhna. Se ayth thn periptwsh, 8a prepei na elegjete oti xrhsimopoieite pragmati ton pyrhna poy kanate compile otan energopoihsate to driver hxoy.

An den typwnetai tipota metaju twn grammwn "Sound initialization started" kai "Sound initialization complete", shmainei oti den anixneu8hkan syskeyes hxoy. Polu pi8ana, ayto shmainei oti den exete energopoihsei to swsto driver, h karta den yposthrizetai, to I/O port is bad h oti exete karta PnP h opoia den ry8misthke swsta.

O driver mporei epishs na emfanisei merika mhnumata la8oys kai proeidopoihseis (warnings) kata thn ekkinhsh (boot). Prosejte gia tetoia mhnumata otan jekina to susthma gia prwth fora meta th ru8mish toy driver hxoy.

To epomeno bhma einai na elegjete to device file `/dev/sndstat`. An diabasete to status device file toy driver hxoy 8a sas dwsei epipleon plhrofories gia to an o driver ths kartas hxoy exei arxikopoih8ei swsta. Ena typiko apotelesma 8a fainetai opws to parakatw:

```
% cat /dev/sndstat
Sound Driver:3.5.4-960630 (Sat Jan 4 23:56:57 EST 1997 root,
Linux fizzbin 2.0.27 #48 Thu Dec 5 18:24:45 EST 1996 i586)
Kernel: Linux fizzbin 2.0.27 #48 Thu Dec 5 18:24:45 EST 1996 i586
Config options: 0

Installed drivers:
Type 1: OPL-2/OPL-3 FM
Type 2: Sound Blaster
Type 7: SB MPU-401

Card config:
Sound Blaster at 0x220 irq 5 drq 1,5
SB MPU-401 at 0x330 irq 5 drq 0
OPL-2/OPL-3 FM at 0x388 drq 0

Audio devices:
0: Sound Blaster 16 (4.13)
```

```
Synth devices:
0: Yamaha OPL-3

Midi devices:
0: Sound Blaster 16

Timers:
0: System clock

Mixers:
0: Sound Blaster
```

H parapanw entolh mporei na anaferei merika mhnumata la8oys. To "No such file or directory" deixnei oti prepei na dhmioyrghsete ta device files (deite to tmhma 4.3). To "No such device" shmainei oti o driver hxoy den einai fortwmenos h den exei ginei link ston pyrhna. Epistrecte sto tmhma 4.2 gia na to dior8wsete.

An oi grammes sto "Card config:" gia to /dev/sndstat briskontai entos paren8eshs (opws: "(SoundBlaster at 0x220 irq 5 drq 1,5)"), shmainei pws h syskeyh ayth parolo poy ry8misthke, den entopisthke apo to susthma.

Twra 8a prepei na eisaste etoimoi na paijete ena aplo arxeio hxoy. Breite ena tetoio arxeio kai steilte to sthn karta, san ena basiko test ths dynatothtas paragwghs hxoy, p.x.:

```
% cat endoftheworld >/dev/dsp
% cat crash.au >/dev/audio
```

(Sigoyreyteite pws den paraleicate to ">" stis parapanw entoles).

Shmeiwste pws genika, h xrhsh toy `cat` den einai o katallhlos tropos na paizete arxeia hxoy, alla apla ena grhgoro test. 8a xreiastei na breite ena pragmatiko programma hxoy (8a perigrafoun argotera) poy 8a kanei kaluterh doyleia.

Ayth h entolh 8a doylecei mono an yparxei toylaxiston mia syskeyh sto tmhma me ta audio devices toy /dev/sndstat. An to tmhma twn audio devices einai adeio, prepei na elegjete giati h syskeyh den entopisthke.

An oi parapanw entoles epistrefoyn "I/O error", 8a prepei na koitajete sto telos twn mhnymatwn toy pyrhna poy emfanizontai me thn entolh "dmesg". Einai polu pi8ano ena mhnyma la8oys na emfanizetai ekei. Polu syxna to mhnyma einai "Sound: DMA (output) timed out - IRQ/DRQ config error;". To parapanw mhnyma shmainei oti o driver den elabe to anamenomeno interrupt apo thn karta hxoy. Stis perissoteres periptwseis ayto shmainei oti to IRQ h to kanali DMA poy ry8misthke ston driver de doyleuei. O kaluteros tropos na to kanete na doylecei einai na dokimaste ola ta pi8ana DMAs kai IRQs poy yposthrizontai apo th syskeyh.

llos pi8anos logos einai oti h syskeyh den einai symbath me th syskeyh gia thn opoia ry8misthke o driver. Ayth einai sxedon panta h periptwsh otan mia ypoti8emenh "symbath me SoundBlaster (Pro/16)" karta hxoy de doyleuei me to driver gia SoundBlaster. Se ayth thn periptwsh, dokimaste na breite th syskeyh me thn opoia h karta hxoy sas einai symbath (stelnontas, gia paradeigma, mhnyma sto newsgroup comp.os.linux.hardware).

Merika deigmata arxeiwn hxoy 8a breite sto url="ftp://tsx-11.mit.edu/pub/linux/packages/sound/snd-data-0.1.tar.Z">

Twra mporeite na elegjete thn hxografhsh hxoy. An exete dynatothta gia eisodo hxoy (sound input), mporeite na kanete ena grhgoro test xrhsimopoiwntas tis entoles:

```
# hxografei 4 deyt/pta hxoy apo to mikrofwno
EDT% dd bs=8k count=4 </dev/audio >sample.au
4+0 records in
4+0 records out
```

```
# play back sound
% cat sample.au >/dev/audio
```

Fysika gia na doylecei kati tetoio, xreiazeste ena mikrofwno syndedemeno sthn karta hxoy sas kai 8a prepei na milhsete s' ayto. Mporei na xreiasteite ena programma mixer gia na 8esete to mikrofwno ws thn phgh eisodoy kai na ry8misete thn entash ths hxografhshs.

An ta test ayta oloklhrw8oun epityxws, mporeite na eisaste hsyxoi, se logika plaisia bebaia, pws ta D/A kai A/D hardware kai software doyleuoyn. An antimetwpisete problhmata, diabaste to epomeno tmhma aytou toy keimenoy.

4.5 Troubleshooting

An akoma antimetwpizete problhmata parolo poy akoloy8hsate tis odhgies toy HOWTO, edw yparxoyn merika pragmata poy mporeite na elegjete. Oi elegxoi anagrafontai me aujoysa seira polyplokothtas. An enas elegxos apotuxei, luste to problhma prin proxwrhsete sto epomeno bhma.

4.5.1 Bhma 1: Bebaiw8eite pws pragmatika trexete ton pyrhna poy kanate compile.

Mporeite na elegjete to date stamp toy pyrhna gia na deite oti xrhsimopoieite ayton poy kanate compile me yposthrijh hxoy. Ayto mporeite na to kanete me thn entolh `uname`:

```
% uname -a
Linux fizzbin 2.0.0 #1 Tue Jun 4 16:57:55 EDT 1996 i386
```

h koitwntas to arxeio `/proc/version`:

```
% cat /proc/version
Linux version 2.0.0 (root@fizzbin) (gcc version 2.7.0) #1 Tue Jun 4 16:57:55 EDT 1996
```

An to date stamp den tairiazei me thn hmeromhnia poy kanate compile ton pyrhna, tote trexete enan palio pyrhna. Kanate reboot; An xrhsimopoieite LILO to janaegkatasthsate (typika trexontas `/etc/lilo/install`); An jekinhsete apo disketa, dhmioyrghsate nea boot disketa kai an nai, thn xrhsimopoihsate kata thn ekkinhsh;

4.5.2 Bhma 2: Bebaiw8eite pws oi drivers hxoy toy pyrhna symperilhf8hsan sto compile.

O aplousteros tropos gia ayto, einai na elegjete thn ejodo toy "dev/sndstat" opws perigrafhke nwritera. An h ejodos den einai h anamenomenh tote kati phge la8os me tis ry8miseis toy pyrhna h to build toy. Arxiste jana thn diadikasia egkatastashs, jekinwntas apo to configuration kai to xtisimo toy pyrhna.

4.5.3 Bhma 3: Anagnwrise o pyrhnas thn karta hxoy kata thn ekkinhsh;

Bebaiw8eite pws h karta hxoy entopisthke apo ton pyrhna kata thn ekkinhsh. 8a prepei na eidate kapoio mhnyma kata thn ekkinhsh. An ta mhnumata kanane scroll ejw apo thn o8onh sas, mporeite na ta janadeite me thn entolh `dmesg`:

```
% dmesg
```

h

```
% tail /var/adm/messages
```

An h karta hxoy sas den bre8hke tote kati paei la8os. Bebaiw8eite pws exei alh8ina egkatasta8ei. An h karta hxoy doyleuei se DOS tote mporeite na eisaste sxetika sigoyroi pws to hardware doyleuei, kai ara prokeitai gia problhma stis ry8miseis toy pyrhna. H dhlwsate thn karta sas ws la8os tupo, h me la8os parametroys, h h karta hxoy sas den einai symbath me kanenan driver kartas hxoy toy pyrhna toy Linux.

Mia pi8anothta einai oti h karta hxoy sas einai mia apo tis "symbatou" tupoy poy xreiazetai arxikopoihsh apo to DOS driver. Dokimaste na ekkinhsete DOS kai na fortwsete to driver poy parexetai apo ton pwlhth ths karta hxoy. Meta epanekkinhste (soft boot) se Linux patwntas `Control-Alt-Delete`. Sigoyreyteite oti h dieu8ynsh I/O ths kartas hxoy, oi ry8miseis DMA kai IRQ sto Linux einai idies opws kai sto DOS. Diabaste to arxeio `Readme.cards` apo th dianomh toy phgaioy kwdika toy driver ths kartas hxoy gia tyxon ypodeijeis gia th ru8mish kartas hxoy aytou toy tupoy.

An h karta hxoy sas de symperilambanetai se ayto to keimeno, einai pi8ano oti oi Linux drivers den thn yposthrizoyn. Mporeite na to elegjete me kapoies apo tis parapompes poy briskontai gia boh8eia sto telos toy keimenoy.

4.5.4 Bhma 4: Mporeite na diabasete dedomena apo to dsp device ;

Prospa8hste na diabasete apo th syskeyh `/dev/audio` xrhsimopoiwntas thn entolh `dd` poy paroysiasthke nwritera se ayto to keimeno. H entolh prepei na trexei xwris la8h.

An de doyleuei, tote to pi8anotero einai pws to problhma einai IRQ h DMA conflict h kapoio eidos asymbatothtas se epipedo hardware (h syskeyh den yposthrizetai apo to Linux h o driver exei ry8mistei gia la8os syskeyh).

Mia mikrh pi8anothta einai h uparjh elattwmatikou hardware. Dokimaste na elegjete thn karta hxoy sto DOS, an einai dynato, wste na ejaleicete ayth thn pi8anothta.

4.5.5 Otan ola exoyn apotuxei

.

An ejakoloy8eite na exete problhmata, deite parakatw merikes telikes protaseis gia to ti mporeite na dokimasete:

- janadiabaste prosektika ayto to HOWTO
- diabaste tis parapompes poy yparxoyn sto telos toy keimenoy, eidika tis web selides toy Hannu Savolainen's kai ta sxetika Readme arxeia toy phgaioy kwdika toy pyrhna
- steilte mia erwthsh se ena newsgroup toy `comp.os.linux` h kapoio allo Usenet newsgroup (to comp.os.linux.hardware einai mia kalh epilogh. Ejaitias toy megaloy fortoy se ayta ta gkroyp boh8aei na balete th lejh "sound" sthn epikefalida toy subject toy mhnumatos etsi wste na to doyn oi katallhloi eidikoi)
- To na xrhsimopoihsete mia Web/Usenet search engine me ejypna dialegmena krithria anazhthshs mporei na sas dwsei polu kala apotelesmata kai grhgora. Mia tetoia epilogh einai to `<http://www.altavista.digital.com>`
- Dokimaste na xrhsimopoihsete ton pio prosfato pyrhna Linux (alla mono san ustath prospa8eia, oi pio prosfatoi ypo anaptyjh pyrhnes mporei na einai asta8eis)
- steilte mail sto syggrafea toy driver hxoy

- steilte mail sto syggrafea toy Sound HOWTO
- shkwste to emacs kai gracte `Esc-x doctor` :-)

Paroysiazw edw ena deigma toy tupoy twn efarmogwn poy pi8ana 8a 8elete an exete egkatasthsei karta hxoy se Linux. Mporeite na elegjete to Linux Software Map, ta Internet archive sites, kai/h ta arxeia sto Linux CD-ROM poy exete gia pio prosfates plhrofories .

Polu pi8ana 8a 8elete na apokthsete toylaxiston tis parakatw efarmoges :

- boh8htikh efarmogh gia metatroph format hxoy (p.x. `Sox`)
- boh8htikh efarmogh mikth (mixer utility) (p.x. `aumix` h `xmix`)
- player/recorder chfiopoihmenwn arxeiwn (p.x. `play` h `wavplay`)
- MOD file player (p.x. `tracker`)
- MIDI file player (p.x. `playmidi`)

Yparxoyn text-based alla kai GUI-based ekdoseis gia ta perissotera apo ayta ta ergaleia. Yparxoyn epishs merikes perissotero esoteric efarmoges (p.x. anagnwrish kai sun8esh fwnhs) poy isws 8elete na dokimasete.

5 Apanthseis se Syxna Diatypwmenes Erwthseis

Ayto to tmhma apanta se erwthseis poy ginontai syxna sta Usenet news groups kai tis mailing lists.

Apanthseis se perissoteres erwthseis 8a breite sth web selida toy OSS driver hxoy.

5.1 Ti einai ta sound device files;

Ayta einai pio "stantar" onomata twn device files, merikes dianomes Linux mporei na xrhsimopoihsoyn ligo diaforetika onomata.

/dev/audio

kanonika ena link sto `/dev/audio0`

/dev/audio0

audio device symbato me Sun workstation (merikh mono ylopoihsh, den yposthrizei Sun ioctl interface, mono kwdikopoihsh u-law)

/dev/audio1

deutero audio device (an yposthrizetai apo thn karta hxoy h an exoyn egkatasth8ei perissoteres apo mia kartes hxoy)

/dev/dsp

kanonika ena link sto `/dev/dsp0`

/dev/dsp0

prwth syskeyh chfiakhs deigmatolhcias (digital sampling)

/dev/dsp1

deuterh syskeyh chfiakhs deigmatolhcias (digital sampling)

/dev/mixer
: kanonika ena link sto `/dev/mixer0`

/dev/mixer0
: prwtos mikths (mixer) hxoy

/dev/mixer1
: deutero mikths (mixer) hxoy

/dev/music
: high-level sequencer interface

/dev/sequencer
: low level MIDI, FM, kai GUS access

/dev/sequencer2/
: kanonika ena link sto `/dev/music`

/dev/midi00
: prwth 8ura raw MIDI

/dev/midi01
: deuterh 8ura MIDI

/dev/midi02
: trith 8ura MIDI

/dev/midi03
: tetarth 8ura MIDI

/dev/sndstat
: emfanizei thn katastash toy driver hxoy otan diabastei

O PC speaker driver parexei ta parakatw devices :

/dev/pcaudio
: isodunamo me to /dev/audio

/dev/pcsp
: isodunamo me to /dev/dsp

/dev/pcmixer
: isodunamo me to /dev/mixer

5.2 Pws mporw na paijw enan hxo ;

Ta Sun workstation (.au) arxeia hxoy mporoun na paixtoun stelnontas ta sto `/dev/audio` device. Ta raw samples mporoun na staloun sto `/dev/dsp`. Omws, ayto 8a dwsei genika ftwxo apotelesma, kai h xrhsh enos programmatos opws to `play` einai protimoterh, mia kai 8a anagnwrisei toys perissoteroys tupoys arxeiwn kai 8a 8esei thn karta hxoy sto swsto ry8mo deigmatolhcias, klp.

Programmata opws to wavplay h to vplay (mesa sto paketo snd-util) 8a dwsoyn kalutera apotelesmata me ta arxeia WAV files. Parolayta, den anagnwrizoyn ta WAV arxeia me sympiesh Microsoft ADPCM. Epishs, palioteres ekdoseis toy play (apo to paketo Lsox) de doyleuoyn kala me WAV arxeia 16 bit.

H entolh splay poy perilambanetai sto paketo snd-util mporei na xrhsimopoih8ei gia na paijete ta perissotera arxeia hxoy an do8oun oi katallhloi parametroi me to xeri se command line.

5.3 Pws mporw na hxografhsw enan hxo ;

An diabasete to `/dev/audio` h to `/dev/dsp` 8a sas epistrecei sampled data ta opoia mporoun na staloun se ena arxeio. Ena programma san to vrec kanei eykolotero ton elegxo toy ry8mou deigmatolhcias, ths diarkeias, klp. Mporei na xreiasteite epishs ena programma mikth (mixer) gia na epilegete thn katallhlh syskeyh eisodoy.

5.4 Mporw na exw perissoteres apo mia kartes ;

Me ton trexonta driver hxoy einai dynato na exete thn idia stigmh sto susthma diafores kartes opws SoundBlaster, SoundBlaster/Pro, SoundBlaster16, MPU-401 h MSS. H egkatastash duo kartwn SoundBlaster einai dynath alla apaitei na orisete xeirokinhta ta macros SB2_BASE, SB2_IRQ, SB2_DMA kai (se merikes periptwseis) SB2_DMA2 anoigontas se enan editor to `local.h`. Einai epishs dynato na exete mia SoundBlaster thn idia stigmh me ena PAS16.

Me toys neoys pyrhnes 2.0.x poy ry8mizoyn ton hxo me thn entolh make config, anti na gracete sto arxeio `local.h`, prepei na anoijete to arxeio `/usr/include/linux/autoconf.h`. Meta to tmhma poy exei tis parakatw grammes :

```
#define SBC_BASE 0x220
#define SBC_IRQ (5)
#define SBC_DMA (1)
#define SB_DMA2 (5)
#define SB_MPU_BASE 0x0
#define SB_MPU_IRQ (-1)
```

pros8este aytes tis grammes (me tis katallhles times gia to susthma sas):

```
#define SB2_BASE 0x330
#define SB2_IRQ (7)
#define SB2_DMA (2)
#define SB2_DMA2 (2)
```

Oi parakatw drivers den epitrepoyn pollapla instances:

- GUS (periorismos apo driver)
- MAD16 (periorismos apo hardware)

- AudioTrix Pro (periorismos apo hardware)
- CS4232 (periorismos apo hardware)

5.5 Error: No such file or directory for sound devices

Xreiazetai na dhmioyrghsete ta device files toy driver hxoy. Deite to tmhma sxetika me th dhmioyrgia device files. An exete device files, sigoyreyteite oti exoyn to swsto megisto kai elaxisto ari8mo syskeyhs (device) (merikes palioteres dianomes CD-ROM Linux mporei na mh dhmioyrgoun ta swsta device files kata thn egkatastash).

5.6 Error: No such device for sound devices

Den exete jekinhsei me pyrhna poy periexei ton driver hxoy h h ru8mish ths I/O dieu8ynshs den tairiazei me to hardware. Elegjte oti trexete ton pyrhna poy molis kanate compile kai epibebaiwste oti oi ry8miseis poy dwsate kata th ru8mish toy driver hxoy symfwnoun me to hardware setup.

5.7 Error: No space left on device for sound devices

Ayto mporei na symbei an prospa8hsate na hxografhsete hxo sto `/dev/audio` h `/dev/dsp` xwris na exete prwta dhmioyrghsei ta aparaithta device files. H syskeyh hxoy einai twra ena kanoniko arxeio, kai exei gemisei to partition toy sklhrou sas diskoy. 8a prepei na trejete to script poy perigrafetai sto tmhma "Dhmioyrgia twn Device files" aytou toy keimenoy.

Ayto mporei na symbei epishs me to Linux 2.0 kai megalutero an den yparxei arketh eleu8erh mnhmh (RAM) sto susthma otan anoigei h device. O driver hxoy apaitei toylaxiston duo selides (8k) fysikhs synexomenhs RAM gia ka8e kanali DMA. Ayto symbainei merikes fores se mhxanes me ligoterh apo 16M mnhmh h poy trexoyn gia megalo xroniko diasthma. Einai dynato na eley8erwsete ligh mnhmh kanontas compile kai trexontas to parakatw C programma prin na prospa8hsete na anoijete jana to device :

```
main() {
  int i;
  char mem[500000];
  for (i = 0; i < 500000; i++)
    mem[i] = 0;
  exit(0);
}
```

5.8 Error: Device busy for sound devices

Mono mia diadikasia mporei na anoijei mia dosmenh syskeyh hxoy thn idia stigmh. Polu pi8ana merikes alles diergasies xrhsimopoioun th syskeyh gia thn opoia ginetai logos. Enas tropos na bebaiw8eite einai na xrhsimopoihsete thn entolh fuser :

```
% fuser -v /dev/dsp
/dev/dsp:            USER       PID ACCESS COMMAND
                     tranter    265 f....  tracker
```

Sto parapanw paradeigma, h entolh `fuser` edeije oti h diadikasia (process) 265 eixe th syskeyh anoikth. An perimenete th diadikasia na oloklhrw8ei h th skotwsete 8a mporeite meta na exete jana prosbash sth syskeyh hxoy. 8a prepei na trejete thn entolh fuser sa root etsi wste na anaferetai h xrhsh kai apo alloys xrhstes ektos apo esas.

5.9 Ejakoloy8w na blepw device busy errors!

Sumfwna me ton Brian Gough, gia tis kartes SoundBlaster poy xrhsimopoioun to DMA kanali 1 yparxei mia pi8anh potential sugkroysh (conflict) me ton tape driver QIC-02, poy xrhsimopoiei epishs to DMA 1, prokalwntas la8h "device busy". An xrhsimopoieite FTAPE, mporei na exete energopoihsei ayto to driver. Sumfwna me to FTAPE-HOWTO o driver QIC-02 den einai aparaithtos gia th xrhsh toy FTAPE; mono o driver QIC-117 apaiteitai. An ry8misete jana ton pyrhna wste na xrhsimopoiei ton QIC-117 kai oxi ton QIC-02, to FTAPE kai o driver hxoy 8a mporoun na synyparxoyn.

5.10 Merikh ektelesh toy (Partial playback) chfiopoihmenoy hxoy

To sumptwma einai synh8ws oti ena deigma hxoy (sound sample) paizei peripoy gia ena deyterolepto kai meta stamata teleiws h anaferei kapoio mhnyma la8oys opws "missing IRQ" h "DMA timeout". Polu pi8ana den exete swstes ry8miseis IRQ h sto kanali DMA. Bebaiw8eite oti oi ry8miseis toy pyrhna symfwnoun me ta jumper settings ths kartas hxoy kai oti de dhmioyrgeitai kapoio conflict me allh karta.

llo sumptwma einai deigmata hxoy (sound samples) poy epanalambanontai synexeia ("loop"). Ayto synh8ws ofeiletai se IRQ conflict.

5.11 Yparxoyn diakopes otan paizw MOD arxeia

Gia na paijete arxeia MOD files apaiteitai shmantikh CPU power. Mporei na trexete polles diadikasies h o ypologisths sas na einai polu argos gia na paijei se pragmatiko xrono (real time). Oi epiloges poy exte einai :

- dokimaste na paijete me mikrotero ry8mo deigmatolhcias h se mono mode
- ligostecte tis alles diadikasies
- agoraste ena kalutero ypologisth
- agoraste mia isxyroterh karta hxoy (p.x. Gravis UltraSound)

An exete karta Gravis UltraSound, 8a prepei na xrhsimopoieite enan apo toys mod file players poy exoyn graftei eidika gia kartes GUS (p.x. `gmod`).

5.12 La8h compile kata to compilation efarmogwn hxoy

H ekdosh 1.0c kai palioteres toy driver hxoy xrhsimopoiousan ena diaforetiko kai asumbato `ioctl()` sxhma. Apokthste ena pio prosfato phgaio kwdika h kante tis aparaithtes allages kai prosarmoste tis sto neo driver hxoy. Deite to`Readme` arxeio toy driver hxoy gia perissoteres leptomereies.

Epishs sigoyreyteite oti xrhsimopoihsate thn pio prosfath ekdosh toy `soundcard.h` kai `ultrasound.h` otan kanate compile thn efarmogh. Deite tis odhgies egkatastashs sthn arxh aytou toy keimenoy.

5.13 SEGV otan trexw ektelesima arxeia hxoy ta opoia douleyan paliotera

Ayto to problhma einai pi8anws to idio me ayto poy perigracame sthn prohgoumenh erwthsh.

5.14 Poia bugs h periorismoi einai mexri twra gnwsta stoys drivers hxoy;

Deite to arxeio `Readme` kai ta arxeia `CHANGELOG` poy perilambanontai ston phgaio kwdika toy driver hxoy.

5.15 Pou brisketai h tekmhriwsh twn sound driver ioctls() klp. ;

Ayta exoyn tekmhriw8ei merika sto *Hacker's Guide to VoxWare*, ta opoia einai dia8esima se draft morfh. H pio prosfath ekdosh einai to draft 2, kai mporeite na th breite sto `<ftp://nic.funet.fi/pub/Linux/ALPHA/sound/>`. Shmeiwste oti to directory einai "kryfo" kai de 8a emfanistei sta periexomena toy directory. An kanete "cd" se ayto to directory kai xrhsimopoihsete thn FTP entolh "dir", ta arxeia einai ekei.

To diasthma poy grafetai ayto to keimeno, ena neo keimeno tekmhriwshs einai dia8esimo sto Web site ths 4Front Technologies.

llh phgh plhroforias einai to Linux Multimedia Guide, to opoio perigrafetai sto tmhma "Parapompwn".

5.16 Ti CPU resources apaitountai wste na paizw h na hxografw hxoys xwris diakopes;

Den yparxei apanthsh se ayth thn erwthsh, ka8ws ejartatai apo to:

- an xrhsimopoieite PCM sampling h sun8esh FM
- ry8mo kai euros deigmatolhcias
- poia efarmogh xrhsimopoieitai gia na anaparagete h na hxografeite hxo
- to hardware ths kartas hxoy
- o ry8mos I/O diskoy, taxuthta CPU clock, mege8os cache, klp.

Genika, opoiadhpote mhxanh 386 8a prepei na mporei na paizei me eykolia hxoys h moysikh FM synthesized me mia 8 bit karta hxoy. To na paijete, omws, MOD arxeia apaitei megalh ypologistikh isxu. Merikes peiramatikes metrhseis edeijan oti to na paizeis sta 44kHz apaitei perissotero apo 40% ths taxuthtas enos 486/50 kai enas 386/25 mporei na paizei me ta bias grhgorotera apo 22 kHz (me karta hxoy 8 bit opws mia SoundBlaster). Mia karta san thn Gravis UltraSound ektelei perissoteres leitoyrgies sto hardware, kai 8a apaitei ligoterh ypologistikh isxu.

Gia ta parapanw ypo8etoyme oti o ypologisths den ektelei alles ypologistika kopiastikes leitoyrgies.

H metatroph arxeiwn hxoy h h pros8hkh effe xrhsimopoiwntas mia boh8htikh efarmogh opws to `sox` einai epishs polu pio grhgorh an exete ma8hmatiko synepejergasth (h CPU me on board FPU). O driver toy pyrhna apo monos toy den kanei ypologismous kinhths ypodiastolhs.

5.17 Problhmata me ton PAS16 kai ton Adaptec 1542 SCSI host adaptor

(h parakatw ejhghsh do8hke apo to `seeker@indirect.com`)

To Linux mono anagnwrizei ton 1542 sth dieu8ynsh 330 (default) h 334, kai o PAS epitrepei thn prosomoiwsh MPU-401 mono sto 330. Akomh ki an apenergopoihsete to MPU-401 apo to software, kati ejakoloy8ei na kanei conflict me ton 1542 an exei thn default dieu8ynsh. Allajte th dieu8ynsh toy 1542 se 334 kai 8a leitoyrgoun ola mia xara

.

Epipleon, kai o 1542 kai o PAS-16 kanoyn 16-bit DMA, gi' ayto an deimatolhpthsete (sample) sta 16-bit 44 KHz stereo kai apo8hkeusete to arxeio sto SCSI drive poy kremetai apo ton 1542, 8a exete problhmata. Ta DMAs epikaluptontai kai den yparxei arketos xronos gia RAM refresh, etsi 8a parete to dread mhnyma "PARITY ERROR - SYSTEM HALTED", xwris na exete idea ti to prokalese. To 8ema ginetai akoma xeirotero mia poy merikoi deyterogeneis promh8eytes QIC-117 tape drives synistoun na 8etete toys xronoys on/off toy diauloy (bus) wste o 1542 na menei se on akoma perissotero apo to kanoniko. Parte to programma SCSISEL.EXE apo th BBS ths Adaptec h apo kapoy sto internet, kai meiwste to xrono BUS ON h ayjhste to xrono BUS OFF mexri otoy na ejafanistei to problhma, meta ayjhste ton kata mia klimaka h kai perissoteres. To SCSISEL allazei tis ry8miseis ths EEPROM, gi' ayto einai perissotero monimo ap' oti ena patch sth grammh toy DOS driver sto CONFIG.SYS, kai 8a doylecei an jekinhsete swsta se Linux (anti8eta me to DOS patch).

Teleytaio problhma - ta paliotera Symphony chipsets meiwsan dramatika to xronismo twn kuklwn I/O , wste na epitaxunoyn toys xronoys prosbashs sto diaylo. Kanena apo ta diafora boards me ta opoia exw paijei den eixe problhma me to meiwmeno xronismo ektos apo to PAS-16. H Media Vision's BBS dinei to SYMPFIX.EXE to opoio ypoti8etai oti dior8wnei to problhma antistrefontas ena bit poy xrhsimopoieitai gia diagnwstikous logoys ston elegkth diauloy toy Symphony, alla den einai kai sigoyrh egguhsh. Mporei na xreiastei na :

- zhthsete apo ton promh8eyth ths mhtrikhs na antikatasthsei thn palioterh ekdosh toy tsip toy diauloy,
- antikatasthste th mhtrikh, h
- agorasete mia diaforetikhs markas karta hxoy.

H Young Microsystems 8a anaba8misei ta boards poy eisagei gia peripoy $30 (US). lloi promh8eytes mporei na kanoyn paromoiws an mporoun na entopisoyn poios kataskeuase h eishgage tis mhtrikes (kalh tuxh). Ap' oti gnwrizw to problhma einai sto ProAudio's bus interface chip. Kaneis den agorazei mia karta hxoy $120 kai thn kollaei se ena 6MHz AT. Oi perissoteroi paizoyn me 25-40MHz 386/486, kai 8a prepei logika na mporoun na antimetwpisoyn taxuthtes diauloy twn 12MHz an ta tsipakia einai sxediasmena swsta.

To prwto problhma ejartatai apo to chipset poy xrhsimopoiei to motherboard sas, thn taxuthta diauloy kai alles ry8miseis toy BIOS, kai thn fash toy feggariou. To deutero problhma ejartatai apo thn timh ths epiloghs refresh (hidden h synchronous), to ry8mo toy 1542 DMA kai (pi8anws) to ry8mo toy diauloy I/O. To trito mporei na ka8oristei epikoinwnwntas me thn Media Vision kai rwtwntas poia ekdosh toy tsip Symphony den einai symbato me ton argh ylopoihsh toys. Sas proeidopoiw, parolayta- 3 h 4 texnikoi me toys opoioys milhsa eixan egkefalikes blabes. 8a hmoyn filupoptos sxetika me o,tidhpote poyn gia kapoioy alloy to hardware, mia poy den jeroyn kala oute kan to diko toys.

5.18 Einai dynato na diabazw kai na grafw deigmata (samples) taytoxrona;

Logw periorismwn hardware, ayto den einai dynato me tis perissoteres kartes hxoy. Merikes neoteres kartes to yposthrizoyn. Deite to tmhma "bidirectional mode" sto *Hacker's Guide* to Voxware gia perissoteres plhrofories.

5.19 H SB16 moy exei IRQ 2, alla to configure den epitrepei ayth thn timh

Stis mhxanes '286 kai argotera, to interrupt IRQ 2 dinetai ston deutero interrupt controller. Isodynamei me to IRQ 9.

5.20 Yposthrizetai h "SoundBlaster AWE32" h h "SoundBlaster16 ASP";

Paliotera, h Creative Labs den htan pro8ymh na dhmosiopoihsei plhrofories gi' aytes tis kartes. Shmera exoyn allajei politikh kai o AWE driver perilambanetai stoys Linux pyrhnes 2.1.x.

5.21 An trejw Linux kai meta jekinhsw me DOS, pairnw la8h kai/h oi efarmoges hxoy poy exw den doyleuoyn swsta

Ayto symbainei meta apo ena soft reboot sto DOS. Merikes fores to mhnyma la8oys paraplanhtika anaferetai se kako, lan8asmeno arxeio `CONFIG.SYS`.

Oi perissoteres sugxrones kartes hxoy exoyn programmatizomenes apo software ry8miseis IRQ kai DMA. An xrhsimopoieite diaforetikes ry8miseis metaju Linux kai MS-DOS/Windows, mporei na sas dhmioyrghsei problhmata. Merikes kartes hxoy de dexontai nees parametroys xwris plhrh epanekkinhsh (p.x. kleiste to reuma h xrhsimopoihste to koympi hardware reset).

Mia grhgorh lush se ayto to problhma einai na kanete mia plhrh epanekkinhsh xrhsimopoiwntas to koympi reset h to diakopth reumatos anti mia malakh epanekkinhsh (p.x. Ctrl-Alt-Del).

H swsth lush einai na bebaiw8eite oti xrhsimopoieite tis idies ry8miseis IRQ kai DMA kai sto MS-DOS kai sto Linux (h mh xrhsimopoihsete DOS :-).

5.22 Problhmata me to DOOM katw apo Linux

Oi xrhstes ths metaforas toy paixnidiou DOOM ths ID gia Linux mporei na endiaferontai gia tis parakatw shmeiwseis.

Gia swsth ejodo hxoy xreiazeste to driver hxoy me ekdosh 2.90 h neoterh. Yposthrizei real-time ”DOOM mode”.

Ta deigmata hxoy einai 16-bit. An exete 8-bit karta hxoy mporeite na thn kanete na paijei xrhsimopoiwntas ta diafora programmata poy einai dia8esima sto <ftp://sunsite.unc.edu/pub/Linux/games/doom>.

An h apodosh sto DOOM einai mikrh sto susthma sas, h apenergopoihsh toy hxoy (allazontas to onoma toy arxeioy `sndserver`) mporei na ferei beltiwsh.

Apo default to DOOM den yposthrizei hxo (opws sthn ekdosh gia DOS). To programma `musserver` 8a pros8esei yposthrijh gia hxo sto DOOM katw apo Linux. 8a to breite sto url=”ftp://pandora.st.hmc.edu/pub/linux/musserver.tgz”>.

5.23 Pws mporw na meiwsw to 8orybo poy kanei h karta hxoy moy;

Xrhsimopoiwntas kalhs poiothtas monwmena kalwdia kai dokimazontas thn karta hxoy se diaforetika slots mporei na sas boh8hsei sth meiwsh toy 8oruboy. An h karta hxoy exei ry8misth entashs hxoy, mporeite na dokimasete diaforetikes ry8miseis (to megisto einai mallon to kalutero).

Xrhsimopoiwntas ena programma mijhs mporeite na sigoyreyteite oti oi anepi8umhtes eisodoi (p.x. mikrofwno) exoyn mhdenikh enisxysh.

Merikes kartes hxoy apla den exoyn kataskeyastei me kalh monwsh kai geiwsh kai einai epirrepeis se 8oruboys.

Telos, brhka oti sto susthma moy h kernel command line option `no-hlt` elattwnei to 8orybo. Ayth h entolh leei ston pyrhna na mh xrhsimopoihsei thn entolh halt otan trexei to idle process loop. Mporeite na to dokimasete xeirokinhta otan jekinate to susthma, h na to 8esete xrhsimopoiwntas thn entolh `append="no-hlt"` sto arxeio LILO configuration.

5.24 Mporw na paijw hxoys, alla oxi na hxografhsw

An mporeite na paijete hxo alla oxi na hxografhsete, dokimaste ta akoloy8a bhmata:

- xrhsimopoihste ena programma mikth gia na dialejete thn katallhlh syskeyh (p.x. mikrofwno)

- xrhsimopoihste to mikth gia na 8esete thn eyais8hsia ths eisodoy sto megisto
- An mporeite, prospa8hste na elegjete an hxografei h karta hxoy sto MS-DOS gia na diapistwsete an to problhma einai mhxaniko. Merikes fores xrhsimopoioume diaforetiko DMA kanali gia hxografhsh hxoy ap' oti gia anaparagwgh. Se ayth thn periptwsh, o pio pi8anos logos einai oti to DMA ths eggrafhs den exei te8ei swsta.

5.25 H "symbath" karta hxoy moy doyleuei mono an thn arxikopoihsw prwta sto MS-DOS.

Stis perissoteres periptwseis mia karta "symbath me SoundBlaster" 8a leitoyrgei kalutera katw apo Linux an ry8mistei me ena diaforetiko driver apo ths SoundBlaster. Oi perissoteres kartes hxoy isxyrizontai oti einai symbates (p.x. "16 bit SB Pro compatible" h "SB compatible 16 bit") alla synh8ws to SoundBlaster mode einai apla ena "hack" poy dinetai gia symbatothta me DOS paixnidia. Oi perissoteres kartes exoyn 16 bit native mode to opoio yposthrizetai pi8ana apo prosfaths ekdoshs pyrhnes Linux (2.0.1 kai meta).

Mono me merikes kartes (synh8ws palies) einai aparaithto na dokimasete na doylecoyn se SoundBlaster mode. Oi mones nees kartes poy apoteloun ejairesh se ayton ton kanona einai oi basizomenes se tsip Mwave.

5.26 H karta hxoy moy, h opoia einai symbath me thn 16-bit SoundBlaster, doyleuei mono se 8-bit mode katw apo Linux.

Oi 16-bit kartes hxoy poy perigrafontai sa symbates me SoundBlaster einai pragmatika symbates mono me thn 8-bit SoundBlaster Pro. Exoyn typika ena 16-bit mode poy den einai symbato me thn SoundBlaster 16 kai ton driver hxoy toy Linux.

Mporei na kanete thn karta na doylecei se 16-bit mode xrhsimopoiwntas to driver gia MAD16 h MSS/WSS.

5.27 Pou mporw na brw efarmoges hxoy gia Linux ;

Edw 8a breite merika kala sites gia na cajete efarmoges gia Linux eidika gia hxo:

- `<ftp://sunsite.unc.edu:/pub/Linux/kernel/sound/>`
- `<ftp://sunsite.unc.edu:/pub/Linux/apps/sound/>`
- `<ftp://tsx-11.mit.edu:/pub/linux/packages/sound/>`
- `<ftp://nic.funet.fi:/pub/Linux/util/sound/>`
- `<ftp://nic.funet.fi:/pub/Linux/xtra/snd-kit/>`
- `<ftp://nic.funet.fi:/pub/Linux/ALPHA/sound/>`

5.28 Mporw na kanw compile to driver ths kartas hxoy wste na fortwnetai sa module;

Me toys prosfatoys pyrhnes o driver hxoy yposthrizetai san kernel loadable module.

Diabaste ta arxeia `/usr/src/linux/drivers/sound/Readme.modules` kai `/usr/src/linux/Documentation/modules.txt` (h `/usr/src/linux/README`) gia perissoteres leptomereies.

5.29 Mporw na xrhsimopoihsw thn karta hxoy gia na antikatasthsw to mpip ths konsolas toy systhmatos;

Dokimaste to programma `oplbeep` , 8a to breite sto `<ftp://sunsite.unc.edu/pub/Linux/apps/sound/oplbeep-alpha.tar.gz>`

llh epilogh einai to programma `beep`, 8a to breite sto url="ftp://sunsite.unc.edu/pub/Linux/kernel/patches/misc/modreq_beep.tgz">

To paketo `modutils` exei ena programma - paradeigma kai ena patch gia ton pyrhna poy yposthrizei thn klhsh enos tyxaioy ejwterikou programmatos gia thn paragwgh hxwn an zhth8ei apo ton pyrhna.

Enallaktika, me merikes kartes hxoy mporeite na syndesete thn ejodo twn hxeiwn toy ypologisth sthn karta hxoy etsi wste oloi oi hxoi na erxontai apo ta hxeia ths karta hxoy.

5.30 Ti einai to VoxWare

;

Oi drivers hxoy toy pyrhna yposthrizoyn arketa diaforetika leitoyrgika systhmata Unix basismena se Intel, kai mporeite na ta apokthsete san ena paketo diaforetiko apo ton pyrhna toy Linux. Mexri to Febroyario 1996 o syggrafeas eixe apokalesei to logismiko "VoxWare". Dystyxws ayto to onoma exei hdh xrhsimopoih8ei apo th `VoxWareIncorporated`, kai prepei na yparjei allh onomasia. To neo onoma toy driver einai OSS/Free.

O Open Sound System (OSS) einai enas emporika dia8esimos driver hxoy gia ton pyrhna diaforwn systhmatwn Unix, kai pwleitai apo thn 4Front Technologies. H dwrean ekdosh, gnwsth ws OSS/Free 8a synexisei na diati8etai dwrean gia systhmata Linux.

lla onomata poy mporei na synanthsete kai exoyn xrhsimopoih8ei sto parel8on gia na anafer8oun ston idio driver hxoy einai to TASD (Temporarily Anonymous Sound Driver) kai USS (Unix Sound System).

Gia perissoteres plhrofories deite th Web selida ths 4Front Technologies sto `<http://www.4front-tech.com/>`. Exw gracei ena review toy OSS/Linux sto teuxos Ioynioy 1997 toy `LinuxJournal`.

5.31 Yposthrizontai Plug and Play kartes hxoy;

Plhrhs yposthrijh gia Plug and Play prepei na yparxei sthn Linux ekdosh 2.1. Sto metaju, yparxei plh8wra parakamcewn, texnasmatwn gia na kanete na doylecoyn oi kartes hxoy Plug and Play. An exete ena neo Pentium susthma me Plug and Play BIOS, 8a prepei na analabei mono toy na ry8misei thn karta. Bebaiw8eite oti exete ry8misei ton Linux driver hxoy etsi wste na xrhsimopoiei thn idia I/O dieu8ynsh, tis parametroys IRQ, kai toy kanaliou DMA opws kai to BIOS.

Yparxei ena paketo me ergaleia Plug and Play gia Linux ta opoia mporei na xrhsimeusoyn sthn egkatastash ths kartas. Mporeite na to breite sto Web site ths Red Hat sto `<http://www.redhat.com/>` (mporei epishs na symperilambanetai sth dianomh Linux poy exete).

An xrhsimopoieite thn karta se Windows95, mporeite na xrhsimopoihsete to device manager gia na egkatasthsete thn karta, meta epanekkinhste me soft boot se Linux xrhsimopoiwntas to programma LOADLIN. Sigoyreyteite oti ta Windows95 kai to Linux xrhsimopoioun tis idies parametroys egkatastashs.

An xrhsimopoieite thn karta se DOS, mporeite na xrhsimopoihsete to `icu` utility poy erxetai me tis kartes SoundBlaster16 PnP wste na th ry8misete se DOS, meta epanekkinhste me soft boot se Linux xrhsimopoiwntas to programma LOADLIN. Pali, sigoyreyteite oti to DOS kai to Linux xrhsimopoioun tis idies parametroys egkatastashs.

O emporikos OSS driver hxoy yposthrizei thn karta hxoy SoundBlaster16 PnP. Mporeite na agorasete ton driver apo thn 4Front Technologies.

5.32 To Sox/Play/Vplay bgazei mhnyma "invalid block size 1024"

Mia allagh ston driver hxoy sthn ekdosh 1.3.67 kremaei merika programmata ekteleshs hxwn poy (lan8asmena) elegjan pws to apotelesma ths SNDCTL_DSP_GETBLKSIZE ioctl htan megalutero apo 4096. Ta programmata ayta poy perilambanontai sto prosfato paketo snd-util-3.x.tar.gz (sto `<ftp://ftp.4front-tech.com/ossfree>`.) twra pia to antimetwpizoyn swsta. H pio prosfath ekdosh driver hxoy exei epishs dior8w8ei wste na apofeugei na ekxwrei kommatia mikrotera apo 4096 bytes pragma poy lunei to problhma me tis palies ekdoseis aytwn twn programmatwn.

5.33 Giati o driver hxoy exei to diko toy programma gia setarisma;>

Etsi. O driver hxoy yposthrizei polles diaforetikes parametroys ru8mishs. To programma `configure` poy perilambanetai me ton driver hxoy elegxei gia polles ejarthseis (dependencies) metaju parametrwn. Ta ergaleia poy xrhsimopoiountai gia th ru8mish toy pyrhna den yposthrizoyn ayto to epipedo leitoyrgias.

Telika: oi prosfatoi pyrhnes pragmati epitrepoyn kat' epilogh na xrhsimopoiountai ta klassika ergaleia ru8mishs toy pyrhna me ton driver hxoy (deite to prohgoumeno tmhma sto "Setarisma toy pyrhna".

5.34 Oi ry8miseis toy mixer arxikopoiountai ka8e fora poy fortwnw to module toy driver hxoy

Mporeite na fortwsete ton driver hxoy sa loadable module kai na xrhsimopoihsete ton `kerneld` gia na to fortwnete kai na to jefortwnete aytomata. Ayto mporei na paroysiasei ena problhma - ka8e fora poy fortwnetai to module, oi ry8miseis toy mixer epistrefoyn stis default times toys. Gia merikes kartes hxoy ayto mporei na einai polu dynata(p.x. SoundBlaster16) h polu siga. O Markus Gutschke ((`gutschk@uni-muenster.de`) brhke ayth th lush. Xrhsimopoihste mia grammh sto arxeio `/etc/conf.modules` opws h parakatw:

```
options sound dma_buffsize=65536 && /usr/bin/setmixer igain 0 ogain 0 vol 75
```

Ayto prokalei thn ektelesh toy programmatos mijhs (se ayth thn periptwsh to setmixer) amesws meta to fortwma toy driver hxoy. H parametros dma_buffsize einai apla mia eikonikh (dummy) timh poy xreiazetai epeidh h entolh option apaitei mia timh sth grammh entolhs. Allajte th grammh opws apaitei to programma mixer kai oi times enisxyshs/eyais8hsias.

An exete kanei compile ton driver hxoy ston pyrhna kai 8elete na 8esete tis times toy mixer kata thn ekkinhsh mporeite na kalesete to mixer programma se ena arxeio poy ekteleitai kata thn ekkinhsh toy systhmatos opws to `/etc/rc.d/rc.local`.

5.35 Mono o xrhsths root mporei na hxografhsei hxo

To script poy dhmioyrgei ta sound device files kai brisketai sto arxeio Readme.linux, apo default epitrepei sta devices na diabazontai apo ton `root`. Ayto symbainei gia na apofeyx8ei mia pi8anh trupa asfaleias. Se ena diktyako periballon, ejwterikoi xrhstes 8a mporousan kakoboyla na kanoyn log in apo makria se ena Linux PC me mia karta hxoy kai mikrofwno kai na kryfakousoyn. An den anhsyxeite gia kati tetoio, mporeite na allajete ta permissions poy xrhsimopoiountai sto script.

Me th default egkatastash, oi xrhstes mporoun na paijoyn arxeia hxoy. Ayto den apotelei kindyno asfaleias alla einai pi8anh phgh anohsiwn.

5.36 Yposthrizetai hxos sto IBM ThinkPad;

8a breite plhrofories gia to pws na xrhsimopoihsete thn karta hxoy mwave se ena IBM ThinkPad laptop computer katw apo Linux sto `<http://www.screamin.demon.co.uk/>`.

6 Parapompes

An exete karta hxoy poy yposthrizei CD-ROM h SCSI interface, to Linux `SCSIHOWTO` kai to Linux `CD-ROMHOWTO` exoyn epipleon plhrofories oi opoies mporei na sas fanoun xrhsimes.

To `SoundPlayingHOWTO` perigrafei pws na paizete diaforoys tupoys hxoy kai arxeia moysikhs sto Linux.

To `UltrasoundPlug'n'playMini-HOWTO` perigrafei pws na kanete na doylecei sto Linux mia plug and play karta hxoy Gravis Ultra.

To `LinuxSoundBlaster16PnPMini-HOWTO` perigrafei pws na kanete na doylecei sto Linux mia plug and play SoundBlaster 16.

To `LinuxSoundBlasterAWE64PnPMini-HOWTO` perigrafei pws na kanete na doylecei sto Linux mia plug and play SoundBlaster AWE64.

Yparxei ena palio keimeno poy legetai the *Hacker's Guide to VoxWare*, dia8esimo apo to `<ftp://nic.funet.fi/pub/Linux/ALPHA/sound/>`. Oi perissoteres plhrofories s' ayto exoyn antikatasta8ei apo ta neotera keimena sto `<http://www.4front-tech.com/pguide>`, alla to tmhma sxetika me to `/dev/sequencer` mporei na fanei xrhsimo.

Ta akoloy8a FAQs stelnontai taktika sto Usenet newsgroup `news.announce` kai kratountai epishs sto `<ftp://rtfm.mit.edu/pub/usenet/news.answers>`:

- PCsoundcards/generic-faq (Generic PC Soundcard FAQ)
- PCsoundcards/soundcard-faq (comp.sys.ibm.pc.soundcard FAQ)
- PCsoundcards/gravis-ultrasound/faq (Gravis UltraSound FAQ)
- audio-fmts/part1 (perigrafh toy Audio file format)
- audio-fmts/part2 (perigrafh toy Audio file format)

Ta FAQs exoyn epishs lista mailing lists kai archive sites gia diafora sygkekrimena proionta. Ta parakatw Usenet news groups syzhtoun gia 8emata sxetika me hxo kai/h moysikh :

- `alt.binaries.sounds.*` (diafora groups gia arxeia hxoy)
- `alt.binaries.multimedia` (gia Multimedia arxeia)
- `alt.sb.programmer` (8emata gia programmatismo ths Soundblaster)
- `comp.multimedia` (8emata gia polymesa)
- `comp.music` (8ewria gia Moysikh H/Y kai ereyna)
- `comp.sys.ibm.pc.soundcard.*` (diafora groups xrhstwn gia kartes hxoy se IBM/PCs)

Ena Web site eidika gia polymesa 8a breite sto `<http://viswiz.gmd.de/MultimediaInfo/>`. H Creative Labs exei Web site sto `<http://www.creaf.com/>`. To Web site ths MediaTrix einai to `<http://www.mediatrix.com/>`.

H Linux mailing list exei megalo ari8mo "kanaliwn" afierwmena se diafora 8emata, kai gia hxo. Gia na breite pws 8a symmetasxete se ena kanali, steilte mhnyma me th lejh "help" san message body sto `majordomo@vger.rutgers.edu`. Aytes oi mailing lists de synistountai gia erwthseis sxetika me egkatastash se kartes hxoy klp., exoyn san skopo th syzhthsh sxetika me anaptyjh.

Opws exei hdh anafer8ei arketes fores, o driver hxoy toy pyrhna perilambanei polla `Readme` arxeia poy periexoyn xrhsimes plhrofories sxetika me ton driver hxoy ths kartas. Ayta 8a ta breite sto directory `/usr/src/linux/drivers/sound`.

Mporeite na epikoinwnhsete me to syggrafea toy driver hxoy toy pyrhna, Hannu Savolainen me email `hannu@voxware.pp.fi`. Exei, epishs, Web site sto `<http://personal.eunet.fi/pp/voxware>`. To Web site einai h kaluterh phgh gia na breite thn pio prosfath katastash yposthrizomenwn kartwn hxoy, gnwsta problhmata, kai dior8wseis bugs.

Plhrofories gia to OSS, ton emporiko driver hxoy gia Linux kai alla leitoyrgika systhmata symbata me Unix, 8a breite sth Web selida ths 4Front Technologies, sto `<http://www.4front-tech.com/>`.

To *Linux Software Map* (LSM) einai anektimhto boh8hma gia thn euresh logismikou gia Linux. Enas kalos tropos gia na breite efarmoges sxetika me hardware hxoy einai na cajete to LSM me keywords opws *sound*. To LSM 8a to breite se diafora anwnyma FTP sites, symperilambanomenoy toy `<ftp://sunsite.unc.edu/pub/Linux/docs/LSM/>`.

To Linux Documentation Project exei paragei diafora biblia gia Linux, symperilambanomenoy toy *Linux Installation kai Getting Started*. Ayta diati8entai dwrean me anonymous FTP apo megala Linux archive sites h mporeite na ta agorasete ektypwmena.

Telos, mia jediantroph embolimh dhlwsh: An 8elete na ma8ete polu perissotera sxetika me ta polymesa sto Linux (eidika gia CD-ROM kai efarmoges kai programmatismo gia kartes hxoy), diabaste to biblio moy *Linux Multimedia Guide, ISBN 1-56592-219-0*, poy exei ekdo8ei apo toys O'Reilly and Associates. Opws kai h gnhsia agglikh ekdosh, exei typw8ei h gallikh kai giapwnezikh metafrash. Gia perissoteres leptomereies, kaleste to 800-998-9938 sth Notia Amerikh h deite th Web selida `<http://www.ora.com/catalog/multilinux/noframes.html>` h th dikh moy selida `<http://www.pobox.com/~tranter>`.