F8-x86_64 on the Acer Ferrari 3400LMi

by

Sven-Göran Bergh

sgb@databa.se

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1 Introduction

This document is primarily designed for my own records for future use. However, it is always nice if it may help others to get started with Linux on their laptops. The steps to get things to play on the Acer Ferrari 3400 Lmi are described here. Most procedures are general and may be useful for other hardware as well.

! ! ! WARNING ! ! !

However, I must warn those of you that still enjoy the luxury of an independent mind and free will. Stay away! Do not ever lay your hands on the Ferrari.

The same warning applies to the GNU/Linux software platform in general. It was several years ago my self defense was totally broken.

The combination is truly devastating! I have noticed strange things happening to me since I got *My Precious...*

Please feel free to comment on any topic or possible improvements in this document.

1.1 Version

This is an updated version of this document. This time I have chosen to install Fedora 8 x86_64, and many things has really changed to the better. The first version dealt with FC4-x86_64, and there are no major changes for FC5-x86_64. Consequently, if you are heading for FC4 or FC5 you probably want to have a look at the previous version of this document. While some details may be specific for Fedora, most stuff should translate to other distributions as well.

1.2 Quick reference guide

I've got all of the hardware working. Although, somethings need some extra tweaks. A summary may be found in the table below

Hardware	***Status***	***Details***	***Notes***
CPU	OK	Mobile AMD Athlon 64 3000+	No configuration needed. Frequency scaling works out of the box.
PCI Bridge	OK	VIA VT8237 [K8T800/K8T890 South]	No configuration needed.
Display	OK	15” SXGA TFT (1400x1050)	No configuration needed.
Graphics card	OK	ATI Mobility Radeon 9700 128 MB, 8x AGP	Full functionality with the `radeon` driver, see below.
RAM	OK	512 MB DRAM (extended to 2GB)	No configuration needed.
Hard drive	OK	*Original:* Hitachi Travelstar 80 GB Ultra ATA 100, IC25N080ATMR04-0, 4200 rpm *Upgrade:* Seagate Momentus, 160 GB, ATA/ATAPI-6, 5400rpm, ST9160821A	No configuration needed.
NIC (wired)	OK	Broadcom NetXtreme BCM5788 Gigabit Ethernet	No configuration needed.
NIC (wireless)	OK	Broadcom BCM4306 802.11b/g W-LAN	Use kernel module `b43`, see comments below.
Modem	OK	VIA AC'97 56k Modem.	Unstable. See below for configuration.
DVD drive	OK	Matshita DVD-RAM UJ-825S (DVD/CD +/- R/W, DVD-RAM)	No configuration needed.
Sound	OK	VIA VT8233/A/8235/8237 AC97 Audio	No configuration needed.
Touchpad	OK	Synaptics SynPS/2 with 4 multi-buttons	No configuration needed. Multi-buttons works as well.
ACPI	OK	Suspend to RAM, Suspend to disk, etc.	No configuration needed. Works out of the box.
Special keys & buttons	OK	Mail, web, P1, P2, volume, mute, Fn-*, etc.	See below for configuration.

Hardware	***Status***	***Details***	***Notes***
PC-card	OK	Texas Instruments PCI4510 PC card/Cardbus	No configuration needed.
Bluetooth	OK	Cambridge Silicon Radio	No configuration needed, see comments below.
IEEE 1394 Firewire	OK	Texas Instruments PCI4510 IEEE-1394	No configuration needed, see comments below.
USB	OK	VIA, 4xUSB 2.0	No configuration needed.
Infrared	OK		See below for configuration.
Card reader	OK	5-in-1 (MMC, SM, SD, MS [Pro])	No configuration needed.

2 Installation

No special procedure is needed during the core installation of F8 x86_64. Partition the hard drive as desired and install the components that you like. However, some packages will make life easier when configuring your new laptop. These are mentioned in the corresponding sections below and may be installed afterwards.

2.1 Potential pitfalls

Depending on your setup there are some pitfalls you should know about.

2.1.1 Graphical installer

Fedora Core 5 installation and later runs without any problems, while Fedora Core 4 should be started with:

```
# linux nofb
```

This tells the installation to disable the frame buffer so you may use the graphical mode of the installer. Otherwise you will loose the display shortly after the installation enters graphical mode. This only applies to FC4 and earlier.

2.1.2 Disk size

However, depending on your hardware you might notice a strange disk size during the installation of F8. If you see a disk size less than expected you should pass the kernel option `libata.ignore_hpa=1` to the installation.

1. When you see the graphical boot screen, press tab.
2. Edit the boot command to look like:

```
        vmlinuz initrd=initrd.img libata.ignore_hpa=1
```

3 Hard drive

No hassle what so ever, but my own reflection is that the standard hard drive does not match the “high end gear” profile of this laptop. When the laptop was released 120 MB drives was the latest of the greatest and 100MB drives were off the shelf goods in most stores. However, a smaller drive would have been ok at a higher speed, at least 5400rpm.

3.1 Upgrading the drive

I am addicted to VMware and want extra of everything, size, speed, RAM, etc. Thus, I have replaced the original Hitachi Travelstar 80 GB (4200rpm) drive with a Seagate Momentus 160 GB (5400rpm, ATA/ATAPI-6, ST9160821A). What a difference! The higher speed, as well as the higher storage density, pays off in far better performance. Operating temperature is the same as for the original drive. According to the `smartmontools` it runs at 40-48 °C during normal load with peaks above 50 °C during heavy load. A highly recommended upgrade!

Depending on the hardware you might notice a strange disk size of your new drive. If you just plan to copy your existing installation to the new drive you need the following two lines in your `/etc/modprobe.conf` file:

```
alias scsi_hostadapter libata
options libata ignore_hpa=1
```

If you plan on installing a fresh system on the new drive take a look in the *2 Installation* section above. During the installation the proper entries are written to `/etc/modprobe.conf`.

4 IEEE 1394 Firewire

With FC5 and later there should not be any problems with the IEEE 1394 Firewire support. For me it works just as smooth as the USB support. If you are running kernel version 2.6.14 or later you may skip this section, unless you have specific interest in tweaking you Firewire settings.

A new alternative driver stack for Firewire support (a.k.a Juju) was introduced as experimental in kernel version 2.6.22. In Fedoras kernel configuration 2.6.23.9-85.fc8 the new IEEE1394 driver stack replaces the old drivers. The rest of this section deals with the old driver stack, i.e before Fedora kernel 2.6.23.9-85.fc8. For the most recent information please refer to http://www.linux1394.org.

However, on systems with kernel version 2.6.13 or earlier some might experience problems with the Firewire support due to different default values used in the kernel module. First a short description of the potential problems.

4.1 Potential problems

There are no problems regarding loading modules or mounting an external IEEE 1394 drive, and if you are patient you managed to browse the content as well. The problems starts when you try to transfer larger amounts of data. The process stalls and chokes up the system log with messages like:

```
kernel: ieee1394: sbp2: aborting sbp2 command
kernel: scsi1 : destination target 0, lun 0
kernel:         command: Write (10): 2a 00 02 e1 bc 58 00 00 10 00
kernel: ieee1394: sbp2: aborting sbp2 command
kernel: scsi1 : destination target 0, lun 0
kernel:         command: Write (10): 2a 00 02 e1 bc 58 00 00 10 00
kernel: ieee1394: sbp2: aborting sbp2 command
kernel: scsi1 : destination target 0, lun 0
kernel:         command: Test Unit Ready: 00 00 00 00 00 00
kernel: ieee1394: sbp2: reset requested
kernel: ieee1394: sbp2: Generating sbp2 fetch agent reset
redneck kernel: ieee1394: sbp2: aborting sbp2 command
kernel: scsi1 : destination target 0, lun 0
kernel:         command: Write (10): 2a 00 01 06 d0 df 00 00 03 00
kernel: ieee1394: sbp2: aborting sbp2 command
kernel: scsi1 : destination target 0, lun 0
kernel:         command: Write (10): 2a 00 01 06 d0 df 00 00 03 00
kernel: ieee1394: sbp2: aborting sbp2 command
kernel: scsi1 : destination target 0, lun 0
kernel:         command: Write (10): 2a 00 02 e1 bd b0 00 00 20 00
```

Seems to me like a hole bunch of timeouts with corresponding bus resets. These suspicions got even stronger after timing a read data transfer:

```
# time cp -rp /media/ieee1394disk/430MB_folder ~
real    20m29.516s
user    0m0.052s
sys     0m6.476s
```

Copying 430 MB takes 20 minutes 29 seconds (comparable to USB 1.0 performance). However, the “actual” time is less than 7 seconds. 20 minutes and 22 seconds are spent waiting. Waiting for what? I do not know, but obviously some bits and pieces fail during the transfer. Furthermore, I do not feel comfortable with the data integrity when I see these kind of results.

After some digging in the kernel documentation and a quick look in the `sbp2.c` source file it turned out that this problem probably is related to a “buggy IEEE 1394 chip” in the external device. The proposed solution is to load the `sbp2` module with the argument `serialize_io=1`. It turned out really well, so here are some tips regarding the IEEE 1394 configuration.

4.2 Configuring Firewire

If you experience the problems mentioned above, and you are running kernel version 2.6.13 or earlier, put the following line in your `/etc/modprobe.config`:

```
options sbp2 serialize_io=1 max_speed=2
```

The `serialize_io=1` option tells the scsi drivers to only send one scsi command at a time. Unfortunately, this setting has a small impact on performance, but it is the fix that makes things work.

In kernel version 2.6.14 the default value for `serialize_io` was changed from `0` to `1`. Thus, if you are running kernel version 2.6.14 or later you should not need do do anything, unless you want to optimize performance (see comments below) or fiddle with the other settings.

The `max_speed` option might be useful in rare occasions if you want to limit the maximum transfer rate to support "even more buggy" external hardware. Valid values for the `max_speed` option are:

0	100 mb
1	200 mb
2	400 mb (default)
3	800 mb

When timing the very same read transfer as above I now get the following result:

```
# time cp -rp /media/ieee1394disk/430MB_folder ~
real    0m24.871s
user    0m0.076s
sys     0m6.400s
```

That is what I call improvement! Going from over 20 minutes down to roughly 25 seconds.

4.3 Comments

After some further exercises with other external hard drives it turned out that the problem described in the previous section indeed seems to be related to the IEEE 1394 chip in the external drives. With some hardware it is quite possible to use the faster `serialize_io=0` option. The performance benefit is in the range 20-25%, so consider your options. If you only use IEEE 1394 for your own hardware and it works well with the faster setting, go for it. Otherwise, compatibility with other hardware might be more valuable. Personally, I think it was a wise decision to change the default setting in the `sbp2` module. After all those "buggy IEEE 1394 chips" seem to be quite common, and prior to start optimizing performance you just want things to work.

5 USB

USB support works as expected. I have noticed no problems what-so-ever with the USB ports. Especially with the desktop enhancements introduced with FC5 it works like a charm. Absolutely no configuration needed.

6 5-in-1 Card reader

The 5-in-1 card reader utilizes the USB interface and is operational right after installation. Analogous to the USB ports there is no hassle at all.

7 PC-card

I have only used the PC-card slot for a Compact Flash memory adapter and it just works. True plug-and-play.

8 Special keys & buttons

The special keys & buttons are some what confusing. Some of the special buttons do not need any additional configuration to work. Others need a key code mapping, while some even lack a scan code. The chain of scan codes and key codes translations starts in the core Linux kernel and ends in your X configuration. Some examples of confusion:

The Mail button gets a pre-configured key code of `155` by Linux, but with X loaded the key code is `236`. The buttons `WWW`, `Fn-F4`, `Fn-F5`, `Fn-F8`, `Fn-up` and `Fn-down` show similar behavior.

The buttons `P1`, `P2`, `Fn-F1`, `Fn-F2`, `Fn-F3` do not have pre-configured key codes, while their respective scan codes are `e074`, `e073`, `e025`, `e026` and `e027`. However, in single user mode they all lack scan-codes. I do not know why.

However, do not despair. It is possible to get all of the special keys & buttons working. Here is a short summary of my current status on this issue.

		Config			
Button	***Work***	setkeycodes	Xmodmap	KDE	***Comments***
`Mail`	yes		x	x	E-mail button, ex: launch Thunderbird
`WWW`	yes		x	x	WWW button, ex: launch Firefox
`P1`	yes	x	x	x	User button, ex: launch NetBeans
`P2`	yes	x	x	x	User button, ex: launch VMware
`Fn-F1`	yes	x	x	x	User button, ex:
`Fn-F2`	yes	x	x	x	User button, ex:
`Fn-F3`	yes	x	x	x	User button, ex:
`Fn-F4`	yes				Sleep-button recognized by ACPI.
`Fn-F5`	yes		x	x	Toggle external display, XF86Display
`Fn-F6`	yes				Dim display, no configuration needed
`Fn-F7`	yes				Toggle touch-pad, no configuration needed
`Fn-F8`	yes		x	x	Toggle mute
`Fn-Home`	yes				Go home (XF86Home)
`Fn-End`	yes				Go to end (XF86End)
`Fn-up`	yes		x	x	Volume raise
`Fn-down`	yes		x	x	Volume lower
`Fn-left`	yes				Brightness lighter, no configuration needed
`Fn-right`	yes				Brightness darker, no configuration needed
`Bluetooth`	yes				No configuration needed
`WLAN`	yes				No configuration needed

8.1 Configuration procedure

It is a tedious procedure to find out the proper scan-codes, Linux key-codes and X key-codes. Yes, on top of the scan-codes there are both Linux and X key-codes to keep track of. I probably have it all confused, but here is how I did it:

8.1.1 X key-codes

1. Start by finding out what key-codes X already knows of. Here `xev` is a valuable friend. The buttons that had key codes configured by default for

me was:

Button	**X key-code**	**Default X key symbols**
Mail	236	-
WWW	178	-
Fn-F4	223	none, but triggers KPowersave suspend->RAM
Fn-F5	214	none, but generate a Capability changed event that is received by the X-server.
Fn-F8	160	-
Fn-NumLk	77	Num_Lock
Fn-Scr Lk	78	Scroll_Lock
Fn-Home	97	Home
Fn-End	103	End
Fn-up	176	-
Fn-down	174	-

These are the buttons that are the simplest to get working. Save these X key-codes for future use. First we need to get the other keys to show up under X as well. In order for them to do so they need properly configured Linux key-codes that they lack for the moment.

8.1.2 Scan-codes

This step is different and considerable easier under F8 than FC4 or FC5. There is no need to shutdown X now as before.

2. Just press the desired key, ex. `P1`. Then take look at the `dmesg` output:

```
# dmesg | tail
atkbd.c: Unknown key pressed (translated set 2, code 0xf4 on
isa0060/serio0).
atkbd.c: Use 'setkeycodes e074 <keycode>' to make it known.
atkbd.c: Unknown key released (translated set 2, code 0xf4 on
isa0060/serio0).
atkbd.c: Use 'setkeycodes e074 <keycode>' to make it known.
```

I got the following result:

Button	**scan-code**
P1	e074
P2	e073
Fn-F1	e025
Fn-F2	e026
Fn-F3	e027

8.1.3 Linux key-codes

3. Next, figure out what Linux key-codes that are available by looking at the Linux scan-code – key-code mapping.

```
# getkeycodes
Plain scancodes xx (hex) versus keycodes (dec)
for 1-83 (0x01-0x53) scancode equals keycode

 0x50:   80  81  82  83  99   0  86  87
 0x58:   88 117   0   0  95 183 184 185
 0x60:    0   0   0   0   0   0   0   0
 0x68:    0   0   0   0   0   0   0   0
 0x70:   93   0   0  89   0   0  85  91
 0x78:   90  92   0  94   0 124 121   0

Escaped scancodes e0 xx (hex)

e0 00:    0   0   0   0   0   0   0   0
e0 08:    0   0   0   0   0   0   0   0
e0 10:  165   0   0   0   0   0   0   0
e0 18:    0 163   0   0  96  97   0   0
e0 20:  113 140 164   0 166   0   0   0
e0 28:    0   0 255   0   0   0 114   0
e0 30:  115   0 172   0   0  98 255  99
e0 38:  100   0   0   0   0   0   0   0
e0 40:    0   0   0   0   0 119 119 102
e0 48:  103 104   0 105 112 106 118 107
e0 50:  108 109 110 111   0   0   0   0
e0 58:    0   0   0 125 126 127 116 142
e0 60:    0   0   0 143   0 217 156 173
e0 68:  128 159 158 157 155 226   0 112
e0 70:    0   0   0   0   0   0   0   0
e0 78:    0   0   0   0   0   0   0   0
```

4. First we need to set a Linux key-code for the keys that lack one. Add the following lines to `/etc/rc.d/rc.local` to set the key-codes after all services are started.

```
# Set Linux key-codes for special keys & buttons:
#
```

```
# Buttons:          P1            P2
setkeycodes      e074 151      e073 152
#
# Buttons:         Fn-F1         Fn-F2         Fn-F3
setkeycodes      e025 131      e026 132      e027 133
```

5. In order to avoid a restart to load these setting, issues the very same commands.

```
# setkeycodes e074 151 e073 152
# setkeycodes e025 131 e026 132 e027 133
```

8.1.4 X key-codes revisited

6. Repeat step 1 and use xev to figure out what X key-codes these buttons got. I got the following:

Button	**X key-code**
P1	201
P2	146
Fn-F1	135
Fn-F2	140
Fn-F3	248

7. Ok, now we have X key-codes for all special keys & buttons and need to map them to proper key-symbols. In order to do that put the following in the file /etc/X11/Xmodmap:

```
! Acer Ferrari 3400Lmi special keys & buttons
!
! Button    X key-code
! ------    ----------
! Mail      236
! WWW       178
! P1        201
! P2        146
! Fn-F1     135
! Fn-F2     140
! Fn-F3     248
! Fn-F5     214
! Fn-F8     160
! Fn-up     176
! Fn-down   174
!
keycode 236 = XF86Mail
keycode 178 = XF86WWW
keycode 201 = XF86Launch1
keycode 146 = XF86Launch2
```

```
        keycode 135 = XF86Launch3
        keycode 140 = XF86Launch4
        keycode 248 = XF86Launch5
        keycode 214 = XF86Display
        keycode 160 = XF86AudioMute
        keycode 176 = XF86AudioRaiseVolume
        keycode 174 = XF86AudioLowerVolume
```

8. The setting above are loaded the next time X is started, but to load them without a restart of X do:

```
# xmodmap -verbose /etc/X11/Xmodmap
...
!
! executing work queue
!
        keycode 0xec = XF86Mail
        keycode 0xb2 = XF86WWW
        keycode 0xc9 = XF86Launch1
        keycode 0x92 = XF86Launch2
        keycode 0x87 = XF86Launch3
        keycode 0x8c = XF86Launch4
        keycode 0xf8 = XF86Launch5
        keycode 0xd6 = XF86Display
        keycode 0xa0 = XF86AudioMute
        keycode 0xb0 = XF86AudioRaiseVolume
        keycode 0xae = XF86AudioLowerVolume
```

8.1.5 Configure actions

9. Finally it is time to configure the button actions. Actions for all but the audio control keys are easily configured in the KDE Control Center -> Regional & Accessibility -> Keyboard Shortcuts under the tab Command Shortcuts.
10. However, you probably also want to configure the audio control buttons. This is done in the same manner inside KMix. Fire up KMix and go to the menu Settings/Configure Global Shortcuts...
11. If you want to use the Fn-F5 key to manipulate the graphical output, refer to the section *10 Graphics* below.

9 CPU & ACPI support

A pleasant news is the advancements in ACPI support. Now all the desirable features are working right out of the box, without any configuration.

9.1 Suspend

I am glad to see that both Suspend to Disk and Suspend to RAM works like a charm. Previous there has been a lot of struggle, if at all possible, to get a stable and reliable ACPI support. OK, I know that suspend has been around for a while by now, but hand on the heart - has it been user friendly and reliable? I have not had that experience. So a reliable ACPI support right out of the box feels really luxurious.

Even the special sleep key, Fn-F4, is configured during the installation and works as expected (Suspend to RAM). The power button works of course as well, as it always has done.

9.2 CPU frequency scaling

The CPU frequency scaling has been working for quite some time now. So it is no big surprise that it works out of the box in F8 on this puppy. However, it is always nice to see things evolve and improve. The improvements of the suspend functionality mentioned above together with solid CPU frequency management really shows off in power management.

KPowersave now feels really mature and has three pre-configured CPU policies: Performance, Dynamic and Powersave. Dynamic is the default and there is no real reason to change it.

10 Graphics

The advancement of Xorg and its related drivers and modules has been enormous the last two years. Fedora 8 includes Xorg 7.2 which is a welcome improvement in X-server configuration. Furthermore, there is absolutely no need to use the ATI proprietary driver any more. This is a true liberation, for sure I will not miss all the violations the proprietary ATI driver did to my Xorg configuration.

The graphical hardware is properly identified and setup during the installation, so you will enjoy X11 right from the start.

Another nice thing is that the dim display button, Fn-F6, works without any configurations.

10.1 Basics

The Ferrari 3400 is equipped with a ATI Mobility Radeon 9700 chip. This chip has 128MB of memory and provides two external outputs, VGA-0 and S-video. The built-in display is called LVDS. These names refer to the definitions used by the `radeon` X driver.

The graphical chip has 2 CRTCs, eg pipeline for rendering graphics. This means that only two outputs may be active simultaneously, either LVDS + VGA-0, LVDS

+ S-video or VGA-0 + S-video. This is a common limitation for most graphics hardware.

Note: The output names differ depending on the driver used. The names used in this document relate to the `radeon` driver. If you use some other driver use `xrandr -q` to find out the proper names (provided that it supports RandR).

10.1.1 The `radeon` driver

Support for the ATI Mobility Radeon 9700 chip in the Ferrari is provided by the `radeon` driver. This driver supports all the features we want: the RandR extension (v 1.2), 3D acceleration (DRI) and TV-out.

There is also the `ati` driver, not to be confused with the proprietary `fglrx` driver. However, the `ati` driver is only a wrapper that auto-detects ATI cards and load the appropriate driver. In our case that will result in the `radeon` driver being loaded.

The main improvement in Xorg 7.2 is the arrival of version 1.2 of the X RandR (Resize and Rotate) extension. It provides automatic discovery of modes together with the ability to configure outputs dynamically. As of today only a few drivers support RandR 1.2. Fortunately, the `radeon` driver is one of them.

10.1.2 Simple configuration

If you are familiar with X configuration and take a look at the default `/etc/X11/xorg.conf` file, generated during the installation you will notice a significant change. Many of the traditional settings, sync and refresh rates, modes and modelines, are gone. All these settings are now auto-detected by RandR 1.2 and should only be present if you want to override the detected values. In some rare situations this might be needed, e.g. when an external monitor reports incorrect values.

In order to get full dual-head support you only need to add *one* line to the default X configuration. If you want to optimize 3D acceleration you need another line. That is a total of *two* lines for a full fledge X configuration supporting all features. Quite an improvement. Thank you all nice X guys!

The X server log file `/var/log/Xorg.0.log` will be your valuable companion when it comes to troubleshooting or just checking what configuration that is auto-detected.

For reference my `xorg.conf` is presented in *Appendix A*.

10.2 Dual-Head

The X Resize and Rotate (RandR) extension introduces a significant shift in dual-head configuration with its version 1.2. All your setting may now be altered on the fly by the command line tool `xrandr`, and there is no need to restart the X server.

10.2.1 Virtual screen size

RandR works its magic by means of a virtual screen that is larger than the a single monitor.

The size of the virtual screen is reported as the maximum value by the command:

```
# xrandr -q
Screen 0: minimum 320 x 200, current 1400 x 1050, maximum 1400 x 1200
...
```

In this case the size is 1400x1200, which is the default virtual screen size for this setup. The default screen size is too small for serious dual-head configurations. This value needs to be increased by setting the Virtual option in the Display sub-section in `/etc/X11/xorg.conf`:

```
    SubSection "Display"
        Viewport   0 0
        Depth      24
        Virtual    3000 2000
    EndSubSection
```

This is the most (only) important setting needed in `xorg.conf`. However, in order to enjoy hardware support for 3D acceleration the virtual screen may not be larger than 3000x2000. This limitation differs for the various driver, but for the `radeon` driver the limitation is 3000x2000. This is sufficient for having an external monitor running at 1600x1200 side-by-side with your internal display as 1400x1050.

After modifying `xorg.conf` you need to restart your X server, ie. logout and logon again. Now, check your settings once again:

```
# xrandr -q
Screen 0: minimum 320 x 200, current 1400 x 1050, maximum 3000 x 2000
VGA-0 connected (normal left inverted right x axis y axis)
   1280x1024      59.9
   1152x864       75.0     74.8
   1024x768       84.9     75.1     70.1     60.0     43.5
   832x624        74.6
   800x600        84.9     72.2     75.0     60.3     56.2
   640x480        84.6     75.0     72.8     66.7     60.0
   720x400        87.8     70.1
LVDS connected 1400x1050+0+0 (normal left inverted right x axis y axis)
0mm x 0mm
   1400x1050      60.0*+
   1360x768       59.8     60.0
   1280x800       60.0
   1152x864       60.0
   1280x768       60.0
   1280x720       60.0
   1024x768       60.0
   800x600        60.3
   640x480        59.9
S-video disconnected (normal left inverted right x axis y axis)
```

In the `xrandr -q` output above we see that the new virtual screen size is recognized in the maximum value. Furthermore, we see our three supported outputs, VGA-0 (external display), LVDS (internal display), S-video (TV-out). For the report above an external monitor is connected but not activated. Still `xrandr -q` reports its supported modes. Neat!

10.2.2 The `xrandr` tool

It is highly recommended that you read through the man page for `xrandr` and play with it a bit to get to know it. A good place to start is at the debian wiki http://wiki.debian.org/XStrikeForce/HowToRandR12. It is a great tool that you most likely will find useful. Connect an external monitor and try the following commands.

Get a full report of the current status by:

```
# xrandr --verbose
```

Activate the external monitor with its default mode and mirror the internal display:

```
# xrandr --output VGA-0 --auto
```

Put the external monitor to the left of the internal panel with:

```
# xrandr --output VGA-0 --left-of LVDS
```

Change resolution and refresh rate of the external monitor:

```
# xrandr --output VGA-0 --mode 1024x768 --rate 60
```

Turn off the external monitor:

```
# xrandr --output VGA-0 --off
```

Set the TV-output in PAL mode instead of the default NTSC:

```
# xranrd --output S-video --set tv_standard pal
```

10.2.3 Fn-F5 button

Once the virtual screen is configured and we feel confident in `xrandr`, it is time to focus on the Fn-F5 special button. By default it does nothing, but now we have the tools to configure it the way we want it to work.

First the Fn-F5 button needs to be recognized, so please refer to the section *8 Special keys & buttons* above for the basic setup of the Fn-F5 button. After that we design a script to run once Fn-F5 is pressed.

The Fn-F5 button should provide a simple, basic and robust functionality that works for any external monitor. I prefer to toggle through the available connected external outputs, while keeping the internal monitor alive. Furthermore, each connected external output is present in two operating modes. First the external output mirrors the internal display, then it extends the desktop by operating side-by-side with the internal display. When both VGA-0 and S-video are connected the following operation modes are toggled each time Fn-F5 is pressed.

- LVDS (single head)
- LVDS + VGA-0 (mirror)
- LVDS + VGA-0 (side-by-side)
- LVDS + S-video (mirror)
- LVDS + S-video (side-by-side)

If a certain external device is not connected those modes are skipped. Consequently, the sequence above will only appear when both VGA-0 and S-video are connected. With only VGA-0 connected the sequence will only include the first three modes from above.

Notice that the internal monitor may be dimmed at any time by pressing the Fn-F6 button. Thus, turning off the internal monitor is not included in the script. The script is outlined in *Appendix B* and may be downloaded at http://ferrari.database.se/3400/f8/dual-head.sh.

The script also includes some other common operation to manipulate the graphical outputs. To see all supported operations, try:

```
dual-head.sh help
```

Binding this script to the Fn-F5 button is then configured in the KDE Control Center -> Regional & Accessibility -> Input Actions.

If you run a more permanent dual-head setup you may want to configure the preferred default settings in xorg.conf. This is done by the Monitor sections and the lines

```
Option ”Monitor-<output>” “...”
```

in the Device section of the `xorg.conf` file.

10.3 3D acceleration

3D hardware acceleration is provided by the `dri` module. This module is loaded by default by the `radeon` driver, so no additional configuration is needed in `xorg.conf` to get hardware support for 3D. However, any possible optimizations that might improve performance are desirable.

10.3.1 Simple benchmark

In order to compare different settings we need some kind of benchmark tool. A simple tool that comes with the `glx-utils` package found in most distributions is `glxgears`. It may be rough, rudimentary and lacking a lot of hype features, but it is present and sufficient for our needs.

An interesting exercise is to explicitly disable hardware acceleration and comparing the result with the default `xorg.conf`. Without hardware acceleration `glxgears` clocks in around a modest frame rate of 150 FPS, compared with approximately 2050 FPS for the default configuration. This is quite a difference, and it verifies that the `radeon` driver really does its job.

10.3.2 Optimization

The default values for most settings work well and there is no needed to modify `xorg.conf`. Furthermore, most of the other settings are correctly auto-detected, such as AGP 8x and memory. All this is reported by the X server in its log file `/var/log/Xorg.0.log` during startup.

The options of most interest for performance are `AccelMethod` (default XAA), `AGPMode` (auto-detected), `ColorTiling` (default on) and `EnablePageFlip` (default off). The first three are correct by default, but due to instability in rare cases `EnablePageFlip` is disabled by default.

Turning on the option `EnablePageFlip` in `xorg.conf` reveals no flaws. I have not noticed any glitches with this option on my setup so I feel confident in recommending it. Then the obvious question *How good is it?* It is good!

`glxgears` gives us an indication. By enabling `EnablePageFlip` performance is increased from 2050 FPS to about 3270 FPS. A significant boost for tweaking one single option.

You only need to add one line to the Device section in the default `xorg.conf` to boost 3D performance:

```
Section "Device"
        Identifier  "Videocard0"
        Driver      "radeon"
        Option      "EnablePageFlip"    "1"
EndSection
```

10.3.3 Other observations

During the optimization procedures a few interesting observations were made. Primarily the CPU speed does not seem to matter. Most tests were run with the CPU frequency first set to 800MHz, then repeated at 2000MHz. No significant difference related to the CPU speed was noticed.

Furthermore, the size of the configured virtual screen does not affect performance. The tests has been run with the default size (1400x1200) and with 3000x2000, but no difference has been noticed. However, increasing the virtual screen to more than 3000x2000 will disable hardware acceleration and of course cripple performance completely.

These observations verifies that hardware 3D acceleration is really working and that the `radeon` driver is taking care of business the way we want it to.

10.4 TV-out

TV output is available through the S-video connector on the rear of the Ferrari. Furthermore, no special settings are needed in order to use it. It is immediate available and may be controlled by `xrandr`. However, the tips below might help to get you started.

10.4.1 Load detection

The external outputs have a property called `load_detection`, that controls whether RandR should try to auto-detect the output or not. Usually it is a good thing to be able to auto-detect the different output features. However, there are situations when you do not want auto-detection.

Remember that we have three outputs, but only two rendering pipelines (CRTCs). What would then happen if we try to auto-detect and configure all available outputs, `xrandr --auto`, with both VGA-0 and S-video connected? We actually do not know. The internal display may only use the first pipeline, CRTC 0, but that might be allocated by either VGA-0 or S-video. Furthermore, we will have a race condition between the two remaining outputs for the second pipeline, CRTC 1. In order to avoid potential conflicts like that, auto-detection is disabled by default for S-video.

Thus, we first have to enable `load_detection` in order to use the TV-output. That is done by:

```
# xrandr --output --set load_detect 1
```

10.4.2 NTSC or PAL

The graphics chip defaults to NTSC, so those of us how want PAL need to explicitly specify this. To change the TV mode to PAL use:

```
# xrandr --output S-video --set tv_standard pal
```

10.4.3 Initialization

The script for dual head management presented in *Appendix B* assumes that all external outputs may be auto-detected. Thus, if you want the script to consider TV-out as a possible external output you need to enable auto-detection for TV-out.

Consequently, we need to initialize some settings before TV-out is automatically handled by the script. The script includes an initialization option that may be used for this. Put the following line in the file `/etc/rc.local`:

```
    /usr/local/bin/dual-head.sh init
```

11 Touch-pad

The Synaptics touch-pad is properly configured during the installation, and works well. I use it in conjunction with a USB mouse and both works well in parallel. I have seen some reports on problems with the touch-pad 4-way multi-button, but it works without any hassle for me. Likewise does the mouse wheel.

The InputDevice section in `xorg.conf` configured during the installation works well and needs no modification:

```
Section "InputDevice"
    Identifier  "Synaptics"
    Driver      "synaptics"
    Option       "Device" "/dev/input/mice"
    Option       "Protocol" "auto-dev"
    Option       "Emulate3Buttons" "yes"
EndSection
```

For a complete reference you find my `/etc/X11/xorg.conf` file in *Appendix A*.

The special key to toggle the touch-pad (Fn-F7) also works without any special configurations.

12 Wireless NIC

When it comes to the Broadcom BCM4306 802.11b/g WLAN chip on the Ferrari you have two choices. The traditional NdisWrapper or the kernel module `b43`. When I first got this laptop there was no other option than NdisWrapper, but lately the kernel module `b43` has evolved and matured.

As its name implies NdisWrapper is a wrapper for NDIS drivers, meaning that you use a corresponding Windows driver instead of a Linux driver. For some WLAN chips this is still the only option, but lately many chips enjoy almost native Linux support by means of kernel modules. I say "almost" because many chips need to be fed with proprietary firmware in order to operate. Anyway, this is a step in the right direction, and the final goal must be to free the firmware as well.

With FC4 NdisWrapper was the obvious choice, but during FC5 its configuration was (deliberately?) broken by the updates. Most FC5 updates re-installed the now deprecated `bcm43xx` kernel module, even though it was previously disabled and blacklisted. Thus, for most FC5 updates I had to disable the kernel module once again and re-install NdisWrapper. In my opinion, the `bcm43xx` kernel module was not mature enough to compete with NdisWrapper at that time. So this was an endless struggle to keep my WLAN support alive.

However, with F8 the `b43` kernel module is mature, stable and ready for production. How to get the `b43` kernel module to work is described below. To use the NdisWrapper please refer to the FC4 version of this document, found at http://ferrari.databa.se/3400/fc4/.

12.1 Installing WLAN

First we need to check and install some software so we have the tools we need.

12.1.1 WLAN tools

1. First we needed to make sure that the `b43` kernel module is compiled and properly loaded during system startup. For standard F8 kernels this is the case, but if you compile your own brew you need to build it as a module:

```
# dmesg | grep b43
b43-phy0: Broadcom 4306 WLAN found
b43-phy0 debug: Found PHY: Analog 2, Type 2, Revision 2
b43-phy0 debug: Found Radio: Manuf 0x17F, Version 0x2050, Revision 2

# lsmod | grep b43
b43                   150001  0
rfkill                 14801  1 b43
mac80211              127949  1 b43
input_polldev          12113  1 b43
ssb                    38725  1 b43
```

2. Next we need to make sure that the `wireless-tools` package is installed on our system:

```
# rpm -q wireless-tools
wireless-tools-29-0.2.pre22.fc8
```

   If not, we need to install it:

```
# yum install wireless-tools
```

   or

```
# rpm -Uvh wireless-tools-29-0.2.pre22.fc8.x86_64.rpm
```

3. Finally we will need the `b43-fwcutter` package. Make sure that it is installed:

```
# rpm -q b43-fwcutter
b43-fwcutter-008-1.fc8
```

   or install it:

```
# yum install b43-fwcutter
```

12.1.2 WLAN firmware

4. Now we need to download the Broadcom driver, so we may extract the

firmware from it later. Download it at:

http://downloads.openwrt.org/sources/broadcom-wl-4.80.53.0.tar.bz2

or I keep a local copy, just in case:

http://ferrari,databa.se/3400/fc8/broadcom-wl-4.80.53.0.tar.bz2

5. Uncompress the driver:

```
# tar jxf broadcom-wl-4.80.53.0.tar.bz2
```

6. Extract and install the firmware from the Broadcom driver as root:

```
# cd broadcom-wl-4.80.53.0/kmod/
# b43-fwcutter -w /lib/firmware wl_apsta.o
```

12.2 Get started with WLAN

Now that we have all the pieces we need installed, it is time to check the functionality and get things working.

12.2.1 The manual way

First we do it manually, to make sure we get the results and feedback that we expect. This is to verify the functionality and simplify troubleshooting, if needed.

7. The WLAN interface should show up:

```
# iwconfig wlan0
wlan0  IEEE 802.11g  ESSID:""
       Mode:Managed  Channel:0  Access Point: Not-Associated
       Tx-Power=0 dBm
       Retry min limit:7   RTS thr:off   Fragment thr=2352 B
       Encryption key:off
       Link Quality:0  Signal level:0  Noise level:0
       Rx invalid nwid:0 Rx invalid crypt:0 Rx invalid frag:0
       Tx excessive retries:0  Invalid misc:0   Missed beacon:0
```

8. Turn on the WLAN chip and bring up the interface:

```
# ip link set wlan0 up
```

9. OK, now it is time to find out what's in the air:

```
# iwlist wlan0 scan
wlan0 Scan completed :
      Cell 01 - Address: 00:E0:63:50:98:B0
                ESSID:"Perspektiv"
                Mode:Master
                Channel:1
                Frequency:2.412 GHz (Channel 1)
                Quality=88/100 Signal level=-25 dBm Noise level=-71
dBm
                Encryption key:off
```

```
                    Bit Rates:1 Mb/s; 2 Mb/s; 5.5 Mb/s; 11 Mb/s
                    Extra:tsf=000000a1f76c1da7
          Cell 02 - Address: 00:18:F8:D2:9E:F4
                    ESSID:"Secret Net"
                    Mode:Master
                    Channel:4
                    Frequency:2.427 GHz (Channel 4)
                    Quality=81/100 Signal level=-25 dBm Noise level=-71
    dBm
                    Encryption key:on
                    Bit Rates:1 Mb/s; 2 Mb/s; 5.5 Mb/s; 11 Mb/s; 18 Mb/s
                              24 Mb/s; 36 Mb/s; 54 Mb/s; 6 Mb/s; 9 Mb/s
                              12 Mb/s; 48 Mb/s
                    Extra:tsf=0000003b0068b719
          Cell 03 - Address: 00:11:6B:25:87:18
                    ESSID:"minideon"
                    Mode:Master
                    Channel:11
                    Frequency:2.462 GHz (Channel 11)
                    Quality=68/100 Signal level=-25 dBm Noise level=-71
    dBm
                    Encryption key:off
                    Bit Rates:1 Mb/s; 2 Mb/s; 5.5 Mb/s; 11 Mb/s; 6 Mb/s
                              9 Mb/s; 12 Mb/s; 18 Mb/s; 24 Mb/s; 36 Mb/s
                              48 Mb/s; 54 Mb/s
                    Extra:tsf=0000008de44c3d92
```

10. Choose a network you want to connect to and set the ESSID of your W-LAN interface:

```
# iwconfig wlan0 essid Perspektiv
```

11. Your WLAN interface should now be associated with the access point:

```
# iwconfig wlan0
wlan0 IEEE 802.11g ESSID:"Perspektiv"
      Mode:Managed Frequency:2.412 GHz Access Point:
00:E0:63:50:98:B0
      Bit Rate=1 Mb/s   Tx-Power=27 dBm
      Retry min limit:7   RTS thr:off   Fragment thr=2352 B
      Encryption key:off
      Link Quality=63/100 Signal level=-63 dBm Noise level=-58 dBm
      Rx invalid nwid:0  Rx invalid crypt:0  Rx invalid frag:0
      Tx excessive retries:0  Invalid misc:0   Missed beacon:0
```

Now you are ready to start using your new interface. Most likely your first step will be to request IP setting from an DHCP server (`dhclient -1 wlan0`). The next step is probably to permanent your preferences in the file `/etc/sysconfig/network-scripts/ifcfg-wlan0`.

For further information on wireless networking under Linux, please refer to the numerous HOWTOs on the internet. A good place to start is http://www.hpl.hp.com/personal/Jean_Tourrilhes/Linux/Wireless.html.

12.2.2 The GUI way

Once you have verified that you have the wireless network chip operational, as described in the previous sections, it is time to have a look at a GUI that will help you with all these steps and some other valuable tasks. The NetworkManager is a service with a corresponding applet that will dock into your panel. It is included in most distributions nowadays and is started by:

```
    # service NetworkManager start
    # service NetworkManagerDispatcher start
```

Try it out and play with it, if you like it and want it to start at system startup type:

```
    # chkconfig --add NetworkManager
    # chkconfig --add NetworkManagerDispatcher
    # chkconfig --level 5 NetworkManager on
    # chkconfig --level 5 NetworkManagerDispatcher on
```

13 Bluetooth

No special actions were needed for me to get Bluetooth up and running. It was truly amazing how easy it was. However, in order to be complete the details are summarized below.

13.1 Verify installation

Make sure that you have the bluez-utils package installed:

```
# rpm -q bluez-utils
bluez-utils-2.25-4
```

Also make sure that it is configured to start at boot time:

```
# chkconfig --list bluetooth
bluetooth      0:off  1:off  2:on   3:on   4:on   5:on   6:off
```

If not, you need to add it to the runlevel system:

```
# chkconfig --add bluetooth
```

Now watch your system log while you push the bluetooth button on the front of your laptop to activate your bluetooth circuities:

```
# tail -f /var/log/messages
```

```
...
... kernel: usb 4-2: new full speed USB device using uhci_hcd and
address 4
... kernel: usb 4-2: configuration #1 chosen from 1 choice
... hcid[1963]: HCI dev 0 registered
... hcid[1963]: HCI dev 0 up
... hcid[1963]: Device hci0 has been added
... hcid[1963]: Starting security manager 0
... hcid[1963]: Device hci0 has been activated
...
```

The blue led indicator should start blinking as well. Now verify that your bluetooth device is up and running:

```
# hciconfig -a
hci0:   Type: USB
        BD Address: 00:0E:9B:87:3B:90 ACL MTU: 192:8 SCO MTU: 64:8
        UP RUNNING PSCAN
        RX bytes:940 acl:0 sco:0 events:23 errors:0
        TX bytes:586 acl:0 sco:0 commands:22 errors:0
        Features: 0xff 0xff 0x0f 0x00 0x00 0x00 0x00 0x00
        Packet type: DM1 DM3 DM5 DH1 DH3 DH5 HV1 HV2 HV3
        Link policy: RSWITCH HOLD SNIFF PARK
        Link mode: SLAVE ACCEPT
        Name: 'redneck.superwise.net-0'
        Class: 0x100100
        Service Classes: Object Transfer
        Device Class: Computer, Uncategorized
        HCI Ver: 1.1 (0x1) HCI Rev: 0x20d LMP Ver: 1.1 (0x1) LMP Subver:
0x20d
        Manufacturer: Cambridge Silicon Radio (10)
```

If you have come this far without any problems you are all set and ready to go.

13.2 Using a phone modem

To help get you started I have summarized the basic steps to hook up your bluetooth capable phone as a modem. I am using a Sony Ericsson P900 myself, but the steps are general so it should work for most bluetooth phones.

The steps below are exactly the same whether you intend to connect to a remote modem or connect over GPRS. When connecting over GPRS the phone also needs to be connected and recognized as a modem. It is the actual dialing later on in the process that differs.

With FC4 and FC5 I experienced some issues with the PIN-helper, i.e. the dialog window that prompts for a PIN code. However, no such issues has been observed with Fedora 8.

13.2.1 Prepare the phone

First you need to configure your phone so it is available to your laptop. These steps may vary in detail depending on vendor and model, so the user manual for your phone may be handy.

Start by activating bluetooth on your phone and scan for other devices. You should now be able to see your computer.

Add your computer as a known bluetooth device to your phone. The phone will ask you for the pin code to connect to your computer. By default it is `BlueZ`, but you may modify it in `/etc/bluetooth/hcid.conf`. Use the same pin code when the computer prompts you whether to allow the incoming connection.

For convenience you should now configure your phone to allow this device (your computer) to connect without prompting for a pin code.

13.2.2 Prepare the laptop

Now we are ready to configure the laptop. Start by scanning for bluetooth devices in your surrounding:

```
# hcitool scan
Scanning ...
        00:0A:D9:E9:D8:4F       S-Gs P900
```

The first field is the bluetooth address of your phone. The second field contains its given name. You should also be able to ping it by its address:

```
# l2ping 00:0A:D9:E9:D8:4F
Ping: 00:0A:D9:E9:D8:4F from 00:0E:9B:87:3B:90 (data size 44) ...
0 bytes from 00:0A:D9:E9:D8:4F id 0 time 60.87ms
0 bytes from 00:0A:D9:E9:D8:4F id 1 time 27.77ms
0 bytes from 00:0A:D9:E9:D8:4F id 2 time 36.54ms
3 sent, 3 received, 0% loss
```

Note that you should use your own phones address instead. (My phone will probably be out of range :-)

Now it is time to find out what services your phone provides:

```
# sdptool browse 00:0A:D9:E9:D8:4F
Browsing 00:0A:D9:E9:D8:4F ...
Service Name: Voice gateway
Service Description: Voice gateway
Service Provider: Sony Ericsson
Service RecHandle: 0x10000
Service Class ID List:
  "Headset Audio Gateway" (0x1112)
  "Generic Audio" (0x1203)
Protocol Descriptor List:
  "L2CAP" (0x0100)
  "RFCOMM" (0x0003)
```

```
    Channel: 8
Language Base Attr List:
  code_ISO639: 0x656e
  encoding:    0x6a
  base_offset: 0x100
Profile Descriptor List:
  "Headset" (0x1108)
    Version: 0x0100

Service Name: OBEX Object Push
Service RecHandle: 0x10001
Service Class ID List:
  "OBEX Object Push" (0x1105)
Protocol Descriptor List:
  "L2CAP" (0x0100)
  "RFCOMM" (0x0003)
    Channel: 1
  "OBEX" (0x0008)
Profile Descriptor List:
  "OBEX Object Push" (0x1105)
    Version: 0x0100

Service Name: OBEX File Transfer
Service RecHandle: 0x10002
Service Class ID List:
  "OBEX File Transfer" (0x1106)
Protocol Descriptor List:
  "L2CAP" (0x0100)
  "RFCOMM" (0x0003)
    Channel: 2
  "OBEX" (0x0008)

Service Name: Bluetooth Serial Port
Service Description: Bluetooth Serial Port
Service Provider: Symbian Ltd.
Service RecHandle: 0x10003
Service Class ID List:
  "Serial Port" (0x1101)
Protocol Descriptor List:
  "L2CAP" (0x0100)
  "RFCOMM" (0x0003)
    Channel: 3
Language Base Attr List:
  code_ISO639: 0x656e
  encoding:    0x6a
  base_offset: 0x100

Service Name: Dial-up Networking
Service Description: Dial-up Networking
Service Provider: Sony Ericsson
Service RecHandle: 0x10004
Service Class ID List:
  "Dialup Networking" (0x1103)
Protocol Descriptor List:
  "L2CAP" (0x0100)
  "RFCOMM" (0x0003)
    Channel: 4
Language Base Attr List:
  code_ISO639: 0x656e
  encoding:    0x6a
  base_offset: 0x100
Profile Descriptor List:
  "Dialup Networking" (0x1103)
    Version: 0x0100
```

To use the phone as a modem the service of interest is the Dial-up Networking, so note its channel number.

The next step will be to create a virtual serial device and connect it to your phone:

```
# rfcomm connect 1 00:0A:D9:E9:D8:4F 4
Connected /dev/rfcomm1 to 00:0A:D9:E9:D8:4F on channel 4
Press CTRL-C for hangup
```

A short explanation of the command above:

```
rfcomm connect 1 00:0A:D9:E9:D8:4F 4
                 |         |         |
 /dev/rfcomm1 _|         |         |_ Channel for the Dial-up
                     Your phones        Networking service
                 bluetooth address
```

That is about it. Now your phone is analogue to an external modem connected to your virtual serial device, /dev/rfcomm1. Configure ppp to make use of it and you are done.

13.2.3 Static configuration

Ok, now what? Do I need to repeat all the steps above each time I want to use my phone as a modem? No, for convenience you may configure your system for all this to take place automatically. However, the method you should use depends a bit on your phone.

The preferred method is to edit the `rfcomm.conf` file so a `/dev/rfcomm`*X* port automatically binds to the DUN service on your phone when the bluetooth service starts. This means that the virtual serial device will be created and properly configured, but not connected. The actual connection will happen automagically when the virtual serial device is accessed.

Edit the file `/etc/bluetooth/rfcomm.conf` to contain a section similar to this:

```
rfcomm1 {
        # Automatically bind the device at startup
        bind yes;
        # Bluetooth address of the phone
        device 00:0A:D9:E9:D8:4F;

        # RFCOMM channel for the Dial Up Networking service
        channel 4;

        # Description of the connection
        comment "Modem on my phone";
}
```

13.2.4 Dynamic routine

If the method above works, you are all set and done. I started out that way and everything worked great for a while. Then all of a sudden I was unable to connect. It turned out that the DUN channel on my phone had changed!?! Instead of 4 as in the example above it showed up as channel 2, and later on as channel 3...

The statical configuration done by editing the `rfcomm.conf` file cannot handle this confusion. Instead I needed to dynamically decide which channel my phone used for the DUN service today and bind to it.

This is done in a simple shell script, that is called just before I intend to connect. Personally, I use Kppp and find it great for both modem-to-modem dial-ups and GPRS connections. So, I have configured KDE to call my script just before Kppp is opened.

First I was a bit suspicious about this method to work all the time, but I have not had any trouble this far and I have been using it for years now. You may find a printout of the script in *Appendix C*, or download it from http://ferrari.databa.se/3400/f8/dun-bind.sh. Obviously, you will need to change the name of the bluetooth device, `BTNAME`, and maybe the port to connect it to, `RFPORT`. Once that is done you may test run it:

```
# wget http://ferrari.databa.se/3400/f8/dun-bind.sh
# chmod +x dun-bind.sh
# ./dun-bind.sh
Checking for local Bluetooth device...                      [  OK  ]
Checking that /dev/rfcomm1 is free...                       [  OK  ]
Searching for remote Bluetooth device S-Gs P900...          [  OK  ]
Searching for Dial Up Networking service...                 [  OK  ]
Binding /dev/rfcomm1 to DUN channel 3...                    [  OK  ]

# rfcomm -a
rfcomm1: 00:0A:D9:E9:D8:4F channel 3 clean
```

Now all you need to do when you want to use your phone as a modem are the most basic steps:

- Turn on bluetooth on your phone
- Turn on the bluetooth hardware on your laptop
- Dial!

13.2.5 GPRS

As mentioned earlier the only difference between dialing modem-to-modem or using the phone as a GPRS gateway to internet is just a matter of configuration. Basic knowledge about modem commands and dialing is assumed, so modem-to-modem dialing is not described here. However, some short hints on GPRS connections are given below.

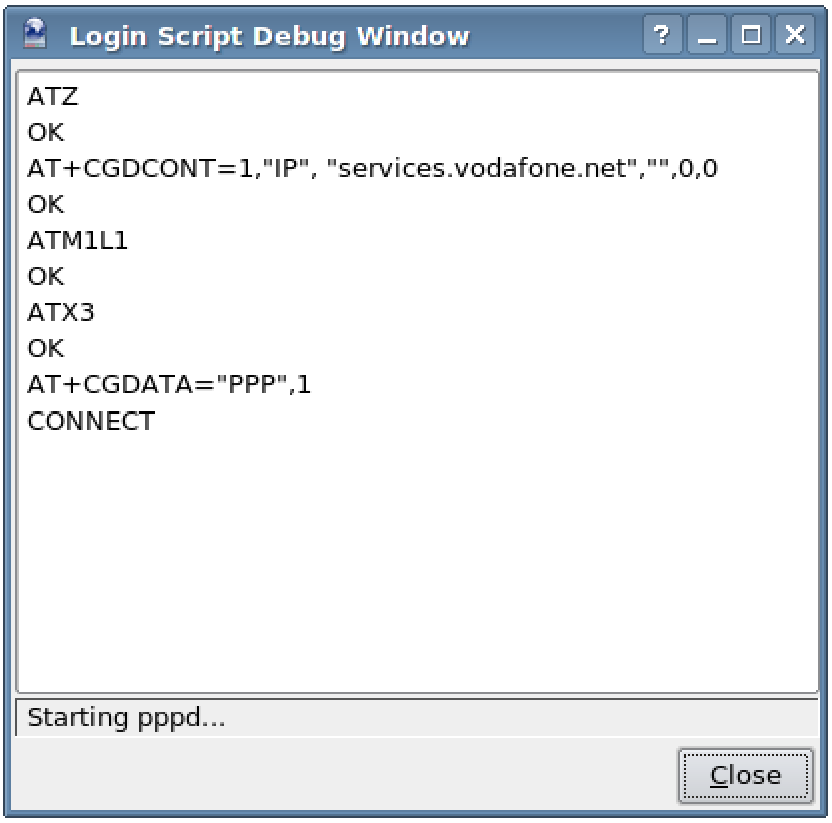
A GPRS connection is established by means of modem configuration rather than actual dialing. Two AT command strings are vital for GPRS connections. First a configuration string is used to specify things like protocol and network provider. This string is passed during modem initialization and in my case it is:

```
AT+CGDCONT=1,”IP”,”services.vodafone.net”,””,0,0
```

After initialization the actual dialing is substituted by sending a connection request to the network provider. The request contains the type of connection you want to use, e.g PPP. It should look similar to:

```
AT+CGDATA=”PPP”,1
```

When used in a connection tool like Kppp the sequence of AT commands may look similar to the one in the snapshot below.



```
ATZ
OK
AT+CGDCONT=1,"IP", "services.vodafone.net","",0,0
OK
ATM1L1
OK
ATX3
OK
AT+CGDATA="PPP",1
CONNECT
```

Starting pppd...

Notice the two AT strings discussed above. The other commands are mainly cosmetic and may differ depending on your tool and its configurations.

13.3 Sending files

To send files to your OBEX (Object Exchange) capable phone you need the packages openobex and openobex-apps.

```
# obex_push 3 00:0A:D9:E9:D8:4F test.jpg
            |         |
            |         |_ Bluetooth address to send to
            |
            |_Channel for the OBEX Object Push service
```

A more convenient way to do this is to use the KDE extension KBluetooth described in its own section below.

13.4 Mouse & keyboard

Once you have got bluetooth working it is a breeze to use a bluetooth mouse and/or keyboard, a.k.a Human Input Device. First you need to scan for your device. Make sure that bluetooth is activated on both the laptop and the mouse/keyboard. Then press the setup button on the mouse/keyboard to make it announce itself and type:

```
# hidd --search
Searching ...
        Connecting to device 00:0A:94:C1:B6:5D
```

In the next section you will find a more user friendly and persistent way of connecting your bluetooth mouse/keayboard.

13.5 KBluetooth

If you are running KDE, there is a Bluetooth extension called KBluetooth available. There is a similar package available for Gnome users, but KBluetooth is discussed here. Before starting to explore it you should make sure that all the details work. For this reason it is recommended that you start out with only the basic bluez-utils package as described in the sections above. Once your bluetooth works as expected, go ahead and install KBluetooth.

13.5.1 Installation

Once the details are in place and you know how things work, you may start to play around with KBluetooth. First verify that it is installed by:

```
# rpm -q kdebluetooth
kdebluetooth-1.0-0.37.beta8.fc8
```

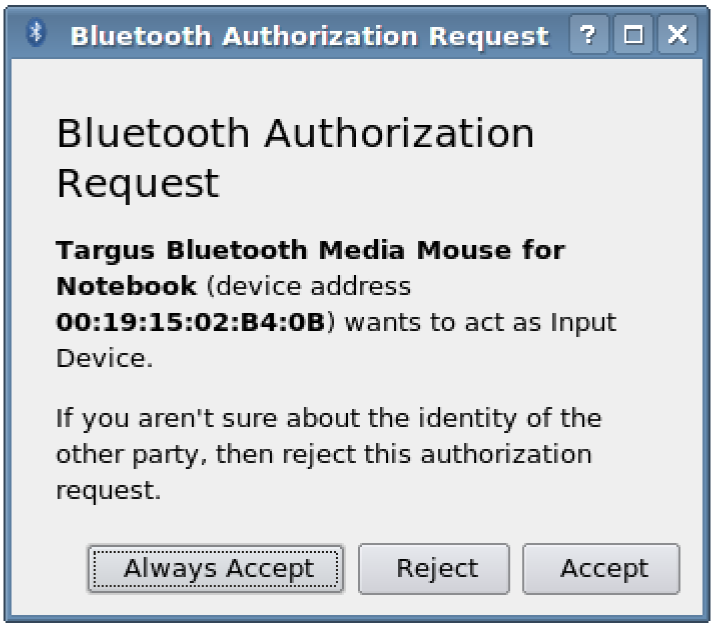
or install it with:

```
# yum install kdebluetooth
```

After installing kdebluetooth you need to restart KDE, by logging out and back on again. Once KDE is restarted KBluetooth will show up as a bluetooth icon in the panel. It offers several useful features.

13.5.2 Mouse & keyboard

Connecting a bluetooth mouse or keyboard with KBluetooth is really simple. Activate the mouse and move it around and it will be detected automatically. The first time it is detected an authentication dialog is raised.



Bluetooth Authorization Request

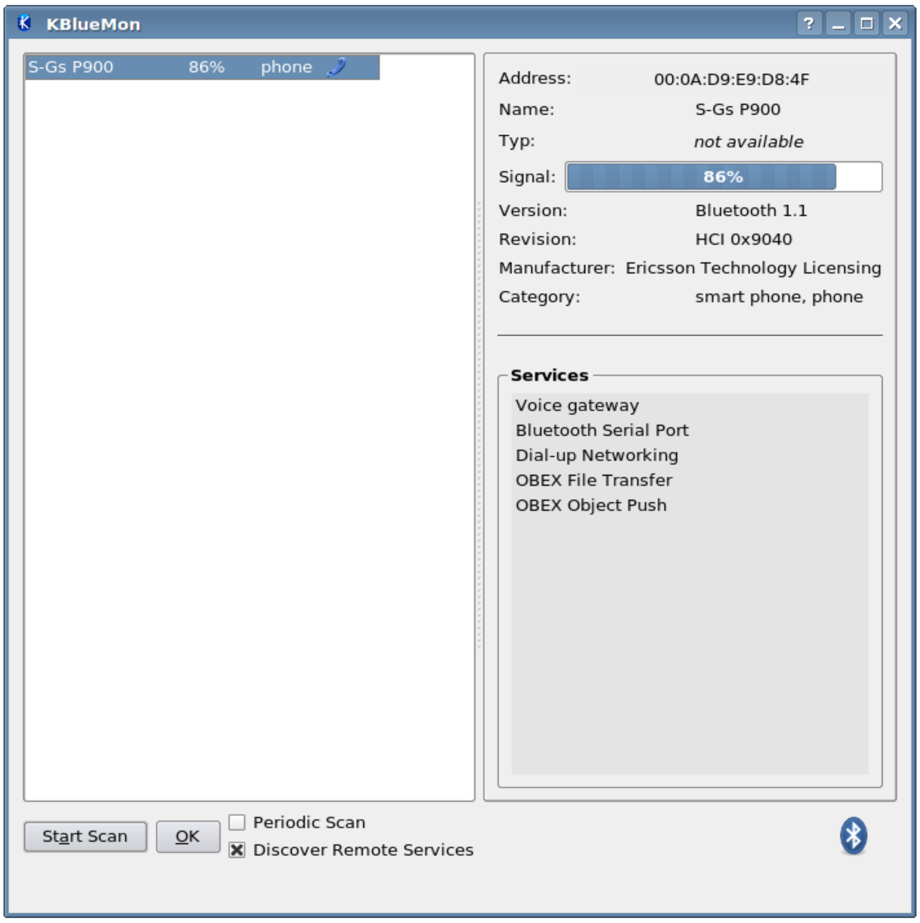
Targus Bluetooth Media Mouse for Notebook (device address **00:19:15:02:B4:0B**) wants to act as Input Device.

If you aren't sure about the identity of the other party, then reject this authorization request.

If you want to use the same device in the future without a new acknowledge press Always Accept, otherwise just press Accept. Could it be easier?

13.5.3 Scan for devices

KBlueMon is a basic tool to scan for bluetooth devices nearby. It reports both device address and name, signal strength as well as what services the device provides.



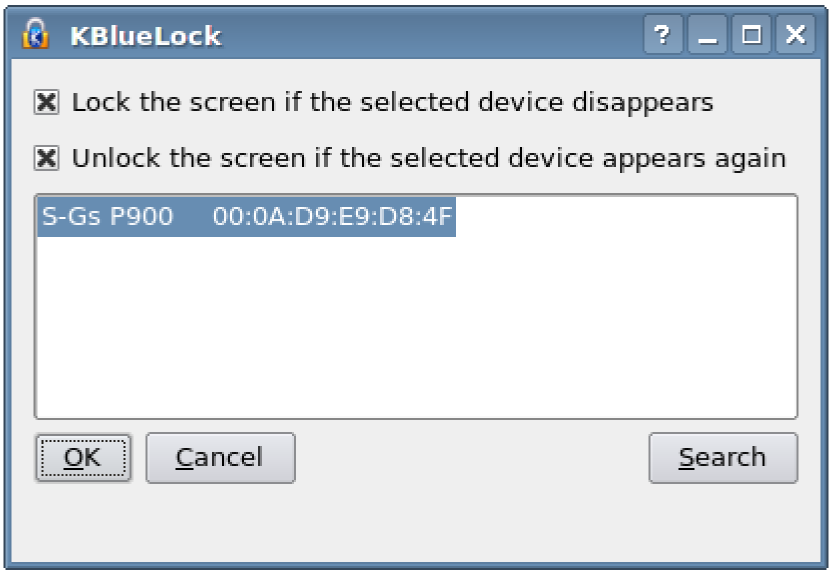
Address: 00:0A:D9:E9:D8:4F
Name: S-Gs P900
Typ: *not available*
Signal: 86%
Version: Bluetooth 1.1
Revision: HCI 0x9040
Manufacturer: Ericsson Technology Licensing
Category: smart phone, phone

Services:
Voice gateway
Bluetooth Serial Port
Dial-up Networking
OBEX File Transfer
OBEX Object Push

[ ] Periodic Scan
[✓] Discover Remote Services

13.5.4 Lock screen

KBlueLock may be used to lock the screen whenever a bluetooth device becomes unreachable. Once the device appears again the screen is unlocked. This is a very convenient security measure to prevent others from fiddling with your *Precious* when you leave it unattended.

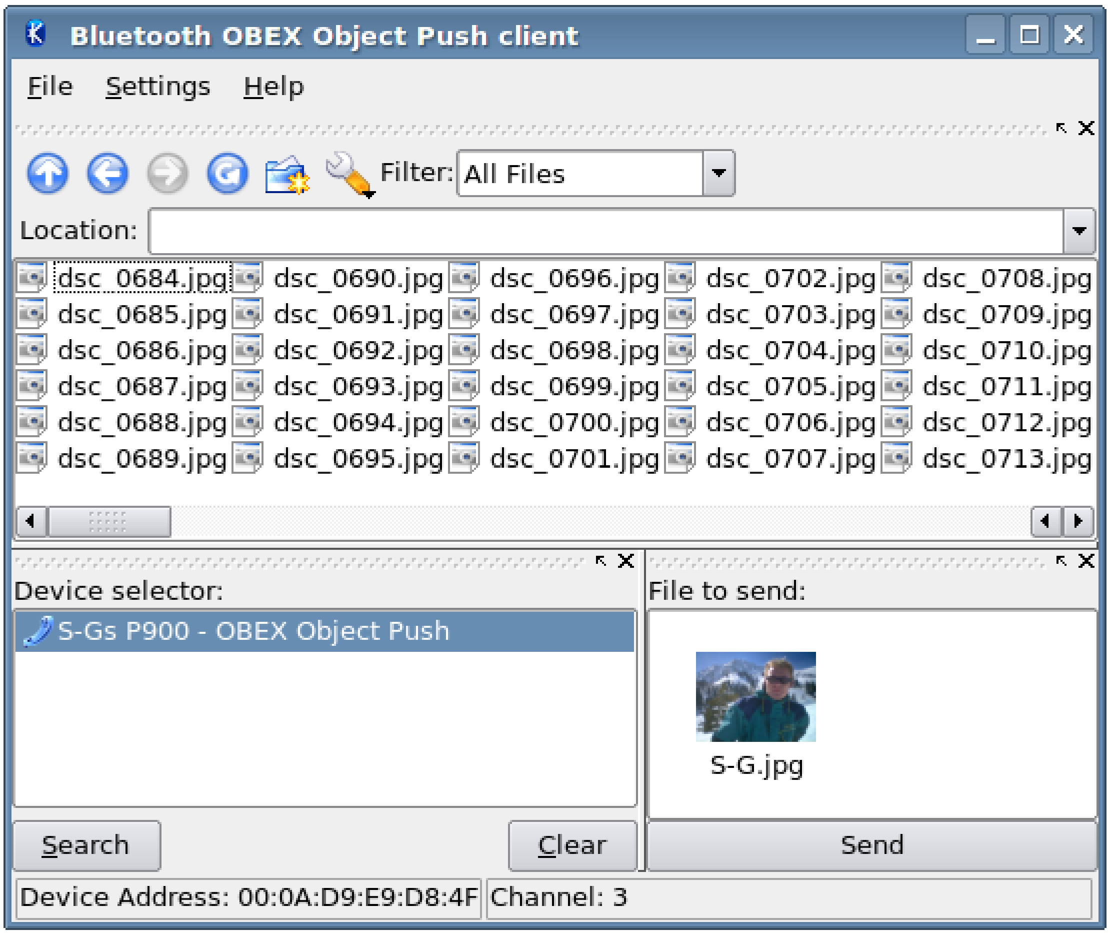


[✓] Lock the screen if the selected device disappears
[✓] Unlock the screen if the selected device appears again

S-Gs P900 00:0A:D9:E9:D8:4F

13.5.5 Transfer files

The *Bluetooth OBEX Object Push client* may be used to transfer files from the computer to your phone or other bluetooth device.



dsc_0684.jpg	dsc_0690.jpg	dsc_0696.jpg	dsc_0702.jpg	dsc_0708.jpg
dsc_0685.jpg	dsc_0691.jpg	dsc_0697.jpg	dsc_0703.jpg	dsc_0709.jpg
dsc_0686.jpg	dsc_0692.jpg	dsc_0698.jpg	dsc_0704.jpg	dsc_0710.jpg
dsc_0687.jpg	dsc_0693.jpg	dsc_0699.jpg	dsc_0705.jpg	dsc_0711.jpg
dsc_0688.jpg	dsc_0694.jpg	dsc_0700.jpg	dsc_0706.jpg	dsc_0712.jpg
dsc_0689.jpg	dsc_0695.jpg	dsc_0701.jpg	dsc_0707.jpg	dsc_0713.jpg

Device selector:
S-Gs P900 - OBEX Object Push

File to send:

Device Address: 00:0A:D9:E9:D8:4F
Channel: 3

14 Infrared

IrDA support is provided by means of the package `irda-utils`, so first make sure that this package is installed on your system.

My first attempt started with changing the `DEVICE` in `/etc/sysconfig/irda` to `/dev/ttyS1` and fire up the IrDA service (`/etc/init.d/irda start`). Voilà! Watching the log messages verified that all modules were loaded and I had got a new device, `irda0`, to play with. The device showed up with `ifconfig` as well. It was just too easy! And yes, although all looked perfect it did not work. Trying the `irdadump` reviled just a big silence.

14.1 Configuring IrDA

To make a long story short, the IR-chip in the Ferrari supports FIR (as well as SIR) and FIR is the default, while IrDA by default uses SIR. FIR is what you want to go for since it is faster than SIR and there is a stable Linux FIR driver available for this IR-chip. Below I'll walk you through the steps that got it working for me.

1. Start with grabbing a pen and a piece of paper and restart your *Precious*. Yes, this is one of those few occasions when you need to restart you Linux system. Press `F2` during boot-up to enter the BIOS and note the settings for your IR-port. You do not need to change anything, but you need to know your exact setting. I will use my own setting through out this example:

   ```
   Base I/O address:  [2F8]
   Interrupt:         [IRQ 3]
   DMA channel:       [DMA 1]
   ```

   Once you have noticed your corresponding setting just exit the BIOS without saving and start your system.

2. Make sure that no other services use IRQ 3. Most likely your setting is also IRQ 3, so start looking in the `/etc/pcmcia/config.opts` file. Here you need to uncomment or insert the line

   ```
   exclude irq 3
   ```

   to prevent the pcmcia service from intervening.

3. Now we want a module capable of handling FIR on the Ferrari chip to be loaded when the IrDA service is started. The module of choice is `nsc-ircc`, so add the following two lines in `/etc/modprobe.conf`:

   ```
   alias irda0 nsc-ircc
   options nsc-ircc dongle_id=0x09 io=0x2f8 irq=3 dma=1
   ```

   Pay attention to use the settings from your own BIOS for the last three parameters.

4. We also need to tell the IrDa service to attach directly to the device for our FIR capable module, so make sure to change the `DEVICE` setting in `/etc/sysconfig/irda` to:

   ```
   DEVICE=irda0
   ```

5. Then we do not want the generic Linux serial driver to interfere. One way of doing that is to add the following line in `/etc/init.d/irda`:

   ```
   setserial /dev/ttyS1 uart none
   ```

   The line should be place just before

   ```
   daemon /usr/sbin/irattach ${DEVICE} ${ARGS}
   ```

6. While you are at it you might as well disable SIR by commenting out the tty lines. A short snippet of the final `/etc/init.d/irda`:

   ```
   ...
   #   /sbin/modprobe ircomm-tty 2>/dev/null
   ```

```
#    /sbin/modprobe irtty-sir 2>/dev/null
     /sbin/modprobe irnet 2>/dev/null
     setserial /dev/ttyS1 uart none
     daemon /usr/sbin/irattach ${DEVICE} ${ARGS}
...
```

That is about it, You are done with the configuration.

14.2 Testing IrDA

Now start the IrDA service and watch the system log. Hopefully, you should see something similar the the following:

```
# service irda start
Starting IrDA:                                                [  OK  ]
# dmesg | tail
...
ttyS1: LSR safety check engaged!
pnp: Device 00:09 activated.
nsc-ircc, chip->init
nsc-ircc, Found chip at base=0x02e
nsc-ircc, driver loaded (Dag Brattli)
IrDA: Registered device irda0
nsc-ircc, Using dongle: IBM31T1100 or Temic TFDS6000/TFDS6500
```

This verifies that you have got the proper modules in place. The last step is to verify that we are able both of transmitting and receiving traffic. So activate IR on the remote device, e.g. your phone, and place the two IR-ports eye-to-eye. Then do a dump of the traffic:

```
# irdadump -i irda0
...xid:cmd 62a9cc0d > ffffffff S=6 s=5 (14)
...xid:cmd 62a9cc0d > ffffffff S=6 s=* redneck hint=0400 [ Computer ]
(23)
...xid:cmd ffffffff < 6f700c8d S=1 s=0 (14)
...xid:rsp 62a9cc0d > 6f700c8d S=1 s=0 redneck hint=0400 [ Computer ]
(23)
...xid:cmd ffffffff < 6f700c8d S=1 s=* P900 hint=9325 [ PnP PDA/Palmtop
Modem Telephony IrCOMM IrOBEX ] (21)
```

You're all set! The first I did after this was to use `irobex_palm3 <SIS-file>` to upload and install GnuBox and some other programs on my phone. To do this you need to have the openobex and openobex-apps packages installed and your phone must supports the OBEX protocol. Pretty neat!

15 Modem

The Ferrari 3400 has a Smart Link soft modem installed. After the Ferrari 3400 was produced Smart Link was acquired by Conexant. Conexant has a strange policy when it comes to providing drivers for it products. Linux drivers are not provided by Conexant, but by Linuxant. If you want all the features, fax, 56k, etc., they will charge you for it. Although, a crippled version is free. I do not like that philosophy at all. First you pay for the product, then they make you pay again if you want to use it...

Fedora x86_64 has the ALSA kernel module `snd_via82xx_modem` pre-compiled. That module is capable of handling the internal soft-modem. Furthermore, this module is properly loaded at startup. However, the modem is still a Smart Link soft-modem so we need a corresponding user space daemon that utilize this ALSA support for our modem.

Notice that the source code distributed by Linuxant is divided in two parts, one general modem daemon and hardware specific drivers in the form of kernel modules. Since we already have an ALSA driver for our model we only need the modem daemon compiled with ALSA support.

That part is provided by Linmodems (http://linmodems.technion.ac.il). They do a great job in providing binary modem daemons, by regular compiles of the Linuxant code. This daemon may very well be compiled as a 32-bit executable. Even if we are running on a 64-bit platform.

Note: Unfortunately the modem support is still unstable. Depending on the versions of the modem daemon and the kernel it might work. Even though, it is very fragile and might very well break on the next kernel update.

Since I do not use the modem I can live with this situation, but I am not happy about it. The installation is not too complicated and is outlined below.

15.1 Installing daemon

Here are the basic steps to get the modem daemon up and running:

1. Start by checking that the `alsa-utils` package is installed:

   ```
   # rpm -q alsa-utils
   alsa-utils-1.0.15-1.fc8
   ```
   otherwise install it like this:

   ```
   # yum install alsa-utils
   ```

2. Verfiy that the proper ALSA kernel module is loaded and recognizes the modem:

   ```
   # aplay -l
   ...
   card 1: modem [VIA 82XX modem], device 0: VIA 82XX modem [VIA 82XX
   modem]
     Subdevices: 1/1
     Subdevice #0: subdevice #0
   ```

3. Download the compiled modem daemon, `SLMODEMD.gcc4.2.tar.gz`, or

later from http://linmodems.technion.ac.il/packages/smartlink/.

4. Unpack and install the daemon:

```
# tar zxf SLMODEMD.gcc4.2.tar.gz
# cd  SLMODEMD.gcc4.2
# install -m 755 slmodemd /usr/sbin/slmodemd
```

5. Verify that the SmartLink driver is able to find and configure an interface for the modem:

```
# slmodemd --country=SWEDEN --alsa --nortpriority
symbolic link `/dev/ttySL0' -> `/dev/pts/5' created.
modem `modem:1' created. TTY is `/dev/pts/5'
Use `/dev/ttySL0' as modem device, Ctrl+C for termination.
```

You may see a complete list of recognized countries by:

```
# slmodemd --countrylist
```

6. For convenience I want the modem driver configured as a service that is started by the Sys V init system. However, the `scripts/slmodemd` file shipped with the package needs to be modified a bit in order to accomplish this. You will find my modified version in *Appendix D*.
7. Download and add this script as a service to the Sys V system:

```
# wget http://ferrari.databa.se/3400/f8/slmodemd-sysv-init.sh
# chmod u+x  slmodemd-sysv-init.sh
# ./slmodemd-sysv-init.sh install
```

8. Now edit your configuration options in `/etc/sysconfig/slmodemd`:

```
# A list of all supported country names can be retrieved
# by calling "slmodemd --countrylist" from the shell prompt.
SLMODEMD_COUNTRY="SWEDEN"

# No additional device needed for ALSA mode
SLMODEMD_DEVICE=

# If set to yes the Advanced Linux Sound Architecture
# subsystem is used to make your modem working.
USE_ALSA="yes"

# Other options, see slmodemd --help for details
SLMODEMD_OPTS="--nortpriority"
```

9. Verify that the new service starts correctly:

```
# service slmodemd start
Starting SmartLink Modem driver:                             [  OK  ]
# service slmodemd status
slmodemd (pid 8356) is running...
```

and look in `/var/log/messages`:

```
# tail /var/log/messages
...slmodemd: symbolic link `/dev/ttySL0' -> `/dev/pts/6' created.
...slmodemd: modem `modem:1' created. TTY is `/dev/pts/6'
...slmodemd: Use `/dev/ttySL0' as modem device, Ctrl+C for
termination.
```

Just as the system log says you may now find the modem at `/dev/ttySL0`. However, before starting to use the modem you should continue to read about a potential issue.

15.2 Potential issue

As mentioned in the beginning of this section there might be a potential problem. It was noticed in my previous attempts to get the modem working and it still exists. It all depends on your setup. If you get it to play there should be no problems, until your next update... Otherwise, you will likely notice something similar to the descriptions below.

15.2.1 Connecting

The problem might occur while establishing a connection. The best way to observe this is to start `slmodemd` manually with the debug flag set:

```
# service slmodemd stop
Shutting down SmartLink Modem driver:                      [  OK  ]
# slmodemd -d=1 --alsa --country="SWEDEN" --nortpriority
```

Once the daemon is running in debug mode, dial the preferred number. The modem goes on-line, dials the number and the other end answers. Before the connection is established the daemon bails out during the negotiation with the other part.

It starts to flood the console with the following messages:

```
...
<212.190899> main: alsa xrun: try to recover...
<212.191065> main: alsa xrun: recovered.
<212.191069> main: dev read = 0
<212.191185> main: alsa xrun: try to recover...
<212.191351> main: alsa xrun: recovered.
<212.191355> main: dev read = 0
...
```

The `slmodemd` process is stopped with Ctrl-C or `service slmodemd stop` from another console window.

15.2.2 Disconnecting

If you are lucky the modem might be connecting properly and you may use it to take care of business. Dialing and connecting works fine and the debug output looks ok. However, when the session is disconnected the debug output goes south. It will start to flood the console with the exact same messages as seen above during a connect. In this case we may actually use the modem but need a small tweak.

My temporary fix for the problem in this case is to restart the `slmodemd` service right after disconnecting a session. I configure my dial-up client, Kppp, to execute `/etc/init.d/slmodemd restart` upon disconnect. Unarguable this is a really dirty fix, but works quite well.

15.2.3 System hang

The issue reported above together with the fact that `slmodemd` runs with real-time priority by default may be devastating. When the modem daemon goes insane it will hug your CPU and squeeze it all real hard.

If the daemon has real-time priority you will have a hard to get control over you system again and a forced shutdown might be the only way out.

Note: You should *always* run `slmodemd` with the `--nortpriority` option set. Failing to do so might hang your entire system.

16 References

This document is a revised version of

FC4-x86_64 on the Acer Ferrari 3400LMi

http://ferrari.databa.se/3400/fc4/

Below are the links I found most useful when I originally sat up *my Precious.* Thank you guys:

XStrikeForce/HowToRandR12 - Debian Wiki
Brice Goglin
http://wiki.debian.org/XStrikeForce/HowToRandR12

Linux IEEE 1394 drivers
http://www.linux1394.org

Fedora Core 1 on the Acer Ferrari 3000LMi
Evan
http://ferrari.kicks-ass.org/

SuSE 9.1 Pro on the Acer Ferrari 3000LMi
Dirk Praet
http://www.designisdead.com/ferrari/

Wireless LAN resources for Linux
Jean Tourrilhes

http://www.hpl.hp.com/personal/Jean_Tourrilhes/Linux/Wireless.html

Appendix A - /etc/X11/xorg.conf

```
# Xorg 7.2 configuration for Acer Ferrari 3400 LMi
#
# Available at http://ferrari.databa.se/3400/f8/xorg.conf

Section "ServerLayout"
        Identifier  "Default Layout"
        Screen    0 "Screen0"          0 0
        InputDevice "Keyboard0"        "CoreKeyboard"
        InputDevice "Synaptics"        "CorePointer"
EndSection

Section "InputDevice"
        Identifier  "Keyboard0"
        Driver      "kbd"
        Option      "XkbModel"         "pc105"
        Option      "XkbLayout"        "se"
EndSection

Section "InputDevice"
        Identifier  "Synaptics"
        Driver      "synaptics"
        Option      "Device"           "/dev/input/mice"
        Option      "Protocol"         "auto-dev"
        Option      "Emulate3Buttons"  "yes"
EndSection

Section "Monitor"
        Identifier  "Internal Panel"
        VendorName  "Acer"
        ModelName   "Ferrari 3400 LMi"
#        Option      "PreferredMode"    "1400x1050"
EndSection

Section "Monitor"
        Identifier  "External VGA Monitor"
#        Option      "LeftOf"           "Internal Panel"
EndSection

Section "Monitor"
        Identifier  "External TV"
#        Option      "RightOf"          "Internal Panel"
EndSection

Section "Device"
        Identifier  "Videocard0"
        Driver      "radeon"
        Option      "Monitor-LVDS"      "Internal Panel"
        Option      "Monitor-VGA-0"     "External VGA Monitor"
        Option      "Monitor-S-video"   "External TV"

#       Option      "AccelMethod"       "XAA"
#       Option      "AGPMode"           "1"
#       Option      "ColorTiling"       "1"
        Option      "EnablePageFlip"    "1"
EndSection

Section "Screen"
        Identifier "Screen0"
        Device     "Videocard0"
        DefaultDepth     24
        SubSection "Display"
                Viewport   0 0
                Depth     24
                Virtual   3000 2000
        EndSubSection
EndSection
```

Appendix B - dual-head.sh

```
#!/bin/bash
#
# Available at http://ferrari.databa.se/3400/f8/dual-head.sh
#
# A script to manipulate connected graphical outputs,
# including TV-out. It includes the most common operations
# and may also be configured to run on an XF86Display event.
# Typically Fn-F5 or similar on a laptop.
#
# Prerequisites:
# This script will work with one graphics card only.
# Furthermore it will only work with two CRTCs,
# i.e. two outputs may be simultaneous active.
#
# Comments:
# In order to optimize performance and minimize flicker
# xrandr is at most called twice. Once to read the current
# state and once for setting the new state. Thus, some code
# may look strange at the first glance.
#
# By Sven-Göran Bergh, 2008-01-01
#

### Edit user settings here: #####################################
                        #
DEFAULTACTION="toggle" # May be changed with argument 1
DEFAULTSIDE="left"     # May be changed with argument 2
                        #
##################################################################

### Edit hardware specific settings here: ########################
                        #
INTERNAL="LVDS"         # Specify the name of the internal display
TVOUTPUT="S-video"      # Specify the name of the TV-output
TVMODE="pal"            # Specify TV mode, PAL or NTSC
                        #
##################################################################

# Get X user
#XUSER=$(w | awk '$3 ~ /^:[0-9]$/ {print $1; nextfile}')

# Get X display (current or first running)
DISPLAY=${DISPLAY:= \
    $( w | awk '$3 ~ /^:[0-9]$/ {print $3; nextfile}' )}

# Quit if no X-server is running
[ "${DISPLAY}" ] || exit 1
```

```
function usage() {
    printf "Usage: %s [init|toggle|status|internal|tv [side]]\n" \
        "`basename $0`"
}

ME=`basename $0 .sh`

# What to do?
ACTION="${1:-$DEFAULTACTION}"

# Which side of $INTERNAL should the external output be shown?
SIDE="${2:-$DEFAULTSIDE}"

# If invalid action or help, quit before calling xrandr
case `echo "$ACTION" | tr A-Z a-z` in
    init | toggle | status | internal | tv )
        # Recognized actions. Do nothing and continue...
        ;;
    help | usage )
        usage
        exit 0
        ;;
    * )
        printf "%s: Unknown operation, %s\n" "$ME" "$ACTION"
        usage
        exit 1
        ;;
esac

# Get information about all outputs
ALLINFO=( $( \
      xrandr -q \
    | awk -- '/connected/ {
              printf " %s", $1;
                if ($2 !~ /dis/) {
                  if ($3 ~ /[0-9]+x/)
                    printf "@%s", $3;
                  else
                    printf "@";
                }
              }' \
    ) )

# Initialize some useful variables
for (( i=0; i<${#ALLINFO[*]}; i++ )) {
    # Array with all outputs
    ALLOUT[$i]=$( \
          echo "${ALLINFO[$i]}" \
        | awk -F@ -- '{print $1}' \
        )
    # Array with all connected outputs
    CONCTD[$i]=$( \
          echo "${ALLINFO[$i]}" \
        | awk -F@ -- '/@/ {print $1}' \
        )
    # Array with all active outputs
    ACTIVE[$i]=$( \
          echo "${ALLINFO[$i]}" \
        | awk -F@ -- '/@[0-9]+x/ {print $1}' \
        )
    # Array with all resolutions
    ALLRES[$i]=$( \
          echo "${ALLINFO[$i]}" \
        | awk -F@ -- '{print $2}' \
        | awk -F+ -- '{print $1}' \
        )
    # Array with all positions
    ALLPOS[$i]=$( \
          echo "${ALLINFO[$i]}" \
        | awk -F@ -- '{print $2}' \
        | awk -F+ -- '/+/ {print $2 "+" $3}' \
        )
    # Index for the internal output
    [ "${ALLOUT[$i]}" == "$INTERNAL" ] && INTNDX=$i
    # Index for the currently active external output
    [ "${ACTIVE[$i]}" -a "${ACTIVE[$i]}" != "$INTERNAL" ] \
        && CURNDX=$i
}

CURNDX=${CURNDX:-$INTNDX}
CURRENT=${ALLOUT[$CURNDX]}

case `echo "${SIDE}" | tr A-Z a-z` in
    left)
        LOCATION="--left-of $INTERNAL"
        ;;
    right)
        LOCATION="--right-of $INTERNAL"
        ;;
    top|above)
        LOCATION="--above $INTERNAL"
        ;;
    bottom|below)
        LOCATION="--below $INTERNAL"
        ;;
esac

function run() {
    EXEC="$*"
    logger -t $ME "Executing: $EXEC"
    $EXEC | logger -t $ME
}

function init() {
    # Set load detection on all external outputs
    for out in ${ALLOUT[*]}; do
        [ "$out" != "$INTERNAL" ] && \
            INIT="$INIT --output $out --set load_detection 1"
        [ "$out" == "$TVOUTPUT" ] && \
            INIT="$INIT --set tv_standard $TVMODE"
    done
    run xrandr $INIT
}

function status() {
    printf "%-10s%-11s%-8s%-10s%-10s\n" \
        "Output" "Connected" "Active" "Position" "Resolution"
    for (( i=0; i<${#ALLOUT[*]}; i++ )) {
        [ "${CONCTD[$i]}" ] && c="yes" || c="no"
        [ "${ACTIVE[$i]}" ] && a="yes" || a="no"
        printf "%-13s%-9s%-7s%-10s%-10s\n" \
            "${ALLOUT[$i]}" "$c" "$a" \
            "${ALLPOS[$i]}" "${ALLRES[$i]}"
    }
}

function internal() {
    # Internal output always active
    INT="--output $INTERNAL --auto --pos 0x0"

    # Turn off currently active external output
    [ "$CURRENT" != "$INTERNAL" ] && \
        OFF="--output $CURRENT --off"

    run xrandr $INT $OFF
}

function tvout() {
    # If TV-output already active, exit
    [ "$CURRENT" == "$TVOUTPUT" ] && exit 0

    # Internal output always active
    INT="--output $INTERNAL --auto"

    # Turn off currently active external output
    [ "$CURRENT" != "$INTERNAL" ] && \
        OFF="--output $CURRENT --off"

    TV="--output $TVOUTPUT --auto $LOCATION"

    run xrandr $INT $TV $OFF
}

function toggle() {
# Go to the next connection mode in the toggle sequence:
#   LVDS        (single)      =>
#   LVDS+S-video (mirror)       =>
#   LVDS+S-video (side-by-side) =>
#   LVDS+VGA-0   (mirror)       =>
#   LVDS+VGA-0   (side-by-side) =>
#   LVDS         (single)       =>
#   ...
# Connection modes that include not connected outputs are skipped.
# Ex: with only VGA-0 connected it is only three connection modes:
#
    if [ "$CURRENT" != "$INTERNAL" -a \
         "${ALLPOS[$INTNDX]}" == "${ALLPOS[$CURNDX]}" ]; then
        NEXT=$CURRENT
    else
        for (( i=0; i<${#ALLOUT[*]}; i++ )) {
            [ "${CONCTD[$i]}" == "${CURRENT}" ] && break
        }
        until [ "$NEXT" ]; do
            i=$(( ($i+1)%${#ALLOUT[*]} ))
            NEXT=${CONCTD[$i]}
        done
    fi

    # Internal output always active
    INT="--output $INTERNAL --auto"

    # Turn off currently active external output
    [ "$CURRENT" != "$INTERNAL" -a "$CURRENT" != "$NEXT" ] && \
        OFF="--output $CURRENT --off"

    # Turn on next connected external output
    [ "$NEXT" != "$INTERNAL" ] && \
        ON="--output $NEXT --auto"

    # If mirror mode, reposition internal output.
    # Otherwise position external output
    [ "$NEXT" != "$CURRENT" ] \
        && INT="$INT --pos 0x0" \
        || ON="$ON $LOCATION"

     run xrandr $INT $OFF $ON
}

case `echo "$ACTION" | tr A-Z a-z` in
    init)
        init
        ;;
    toggle)
        toggle
        ;;
    status)
        status
        ;;
    internal)
        internal
        ;;
    tv)
        tvout
        ;;
    *)
        usage
        ;;
esac
```

Appendix C - `dun-bind.sh`

```
#!/bin/sh
#
# Available at http://ferrari.databa.se/3400/f8/dun-bind.sh
#
# A verbose sample script for finding the Dial Up Networking
# channel on a Bluetooth device and binding a /dev/rfcomm port to it.
#
# By Sven-Göran Bergh, 2005-11-03
# Update 2007-04-03 Added release of passive/closed rfcomm port.
#

# Use this /dev/rfcomm port
RFPORT=1

# Name of Bluetooth device to bind to:
BTNAME="S-Gs P900"

success() {
    echo -e $"\\033[60G[  \\033[1;32mOK\\033[0;39m  ]"
    return 0
}

failure() {
    echo -e $"\\033[60G[\\033[1;31mFAILED\\033[0;39m]"
    exit 1
}

# Check that local Bluetooth device is active
echo -n $"Checking for local Bluetooth device..."
hciconfig | grep 'UP RUNNING' &> /dev/null \
    &&  success || failure

# If the rfcomm port exists but is currently not in use, try to release
it
if [ "`rfcomm show ${RFPORT} 2> /dev/null | awk -- '{print $5}'`" ==
"closed" ];
then
    echo -n $"Trying to free closed port /dev/rfcomm${RFPORT}..."
    rfcomm release ${RFPORT} &> /dev/null \
        &&  success || failure
fi

# Check if the rfcomm port is free
echo -n $"Checking that /dev/rfcomm${RFPORT} is free..."
rfcomm show ${RFPORT} &> /dev/null \
    && failure || success

# Check for the remote Bluetooth device
```

```
echo -n $"Searching for remote Bluetooth device ${BTNAME}..."
BTADDR=`hcitool scan | grep "${BTNAME}" | awk -- '{print $1}'`
[ "${BTADDR}" ] && success || failure

# Find the Dial Up Networking channel
echo -n $"Searching for Dial Up Networking service..."
DUN=`sdptool search --bdaddr ${BTADDR} DUN \
    | awk -- '/Channel/ {print $2}'`
[ "${DUN}" ] && success || failure

# Bind the rfcomm port to the DUN channel
echo -n $"Binding /dev/rfcomm${RFPORT} to DUN channel ${DUN}..."
rfcomm bind ${RFPORT} ${BTADDR} ${DUN} \
    && success || failure
```

Appendix D - /etc/init.d/slmodemd

```
#!/bin/sh
#
# Available at http://ferrari.databa.se/3400/f8/slmodemd-sysv-init.sh
# Use slmodemd-sysv-init.sh install to install it.
#
# slmodemd:    Starts the SmartLink Modem Daemon
#
# chkconfig:   345 90 10
# description: This is the user space part of the SmartLink Modem driver
# processname: slmodemd
# config:      /etc/sysconfig/slmodemd

# Source function library.
. /etc/init.d/functions

PROG=slmodemd
RETVAL=0

# Default configuration
SLMODEMD_DEVICE=
SLMODEMD_OPTS=
SLMODEMD_COUNTRY=SWEDEN
USE_ALSA="yes"

# Source configuration
CONFIG=/etc/sysconfig/${PROG}
if [ -f $CONFIG ]; then
    . $CONFIG
    # override default group and permissions if defined in $CONFIG;
    # other valid options also can be put into SLMODEMD_OPTS variable
    [ "$GROUP" ] \
        && SLMODEMD_OPTS="$SLMODEMD_OPTS --group=$GROUP"
    [ "$PERMS" ] \
        && SLMODEMD_OPTS="$SLMODEMD_OPTS --perm=$PERMS"
fi

# Do not try to start on a kernel which does not support it
if [ $USE_ALSA != "yes" ]; then
    grep -q 'slamr\.o' /lib/modules/`uname -r`/modules.dep || exit 0
fi

if [ $USE_ALSA = "yes" ]; then
    SLMODEMD_OPTS="$SLMODEMD_OPTS --alsa"
else
    SLMODEMD_OPTS="$SLMODEMD_OPTS $SLMODEMD_DEVICE"
fi

start() {
    echo -n "Starting SmartLink Modem driver: "
    ${PROG} --country=$SLMODEMD_COUNTRY $SLMODEMD_OPTS 2>&1 \
        | logger -t ${PROG} &
    PID=`pidof ${PROG}`
    RETVAL=$?
    [ $RETVAL -eq 0 ] \
        && success $"${PROG} startup" \
        || failure $"${PROG} startup"
    echo
    [ $RETVAL -eq 0 ] \
        && touch /var/lock/subsys/${PROG}
    return $RETVAL
}

stop() {
    echo -n "Shutting down SmartLink Modem driver: "
    killproc ${PROG}
    RETVAL=$?
    [ $RETVAL -eq 0 ] && rm -f /var/lock/subsys/${PROG}
    echo
    return $RETVAL
}

# See how we were called.
case "$1" in
    start)
        start
        ;;
    stop)
        stop
        ;;
    status)
        status ${PROG}
        RETVAL=$?
        ;;
    restart|reload)
        stop
        start
        RETVAL=$?
        ;;
    condrestart)
        if [ -f /var/lock/subsys/${PROG} ]; then
            stop
            start
            RETVAL=$?
        fi
        ;;
    install)
        install -t -m 755 $0 /etc/init.d/${PROG} &> /dev/null
        chkconfig --add ${PROG}
        ;;
    *)
```

```
        echo "Usage: ${PROG} {start|stop|status|restart|condrestart|
install}"
        exit 1
esac

exit $RETVAL
```