TCP/IP-configuration under Linux

The embedded Linux for the DIL/NetPC consists of three basic modules: 1st a bootloader, 2nd the actual Linux-kernel and 3rd. the root file system. These three elements can be available in form of only one binary image–or also as separate files. In this case it is possible to boot the embedded Linux, e.g. from the DOS-command line.

The three files LOADLIN.EXE as bootloader, ZIMAGE as kernel and the root-file system stand by the starterkit ready for use in form of a file named RIMAGE.GZ. This compressed file include all directories and files which where after the boot procedure on the RAM-disk available.

Figure 1: RIMAGE.GZ include the complete root file system

Inside this root file system exist the subdirectory /etc/config with different files for the system configuration. The table 1 give you an overview about the files.

The embedded Linux boot Procedure

At first of every Linux system start, the bootloader will be activated. The bootloader loads the kernel into the main memory and starts it. Now the kernel uncompress itself and build the RAM-disk. On this disk the necessary root file system will be generated. For that, the file RIMAGE.GZ will be decompressed and copied into the empty RAM-disk. In other words: The RAM-disk builds an exact image of the files and directories in RIMAGE.GZ. In order to change a configuration file, this have to be done directly in the file RIMAGE.GZ.

Modifications on the files and directories of the RAM-disk have only temporary character. They get lost during the next boot procedure.

File name	Function	Content
ipaddr	IP address of the DIL/NetPC	192.168.0.126
broadcast	broadcast IP address	192.168.0.255
netmask	network mask for the IP address	255.255.255.0
network	network address	192.168.0.0
gateway	address of the gateway	192.168.0.254
hostname	name of the DIL/NetPC	emblinux
ssv_version	Version of the embedded Linux	0.04

Tabelle 1: Files in the subdirectory `/etc/config`

During the boot procedure the TCP/IP stack of the DIL/NetPC will be configured with the parameters of the files in the subdirectory /etc/config. These files may be considered as the TCP/IP configuration files for a DIL/NetPC.

Table 1 includes the values of the respective configuration file. These are the default settings by delivering of a DIL/NetPC-starterkit.
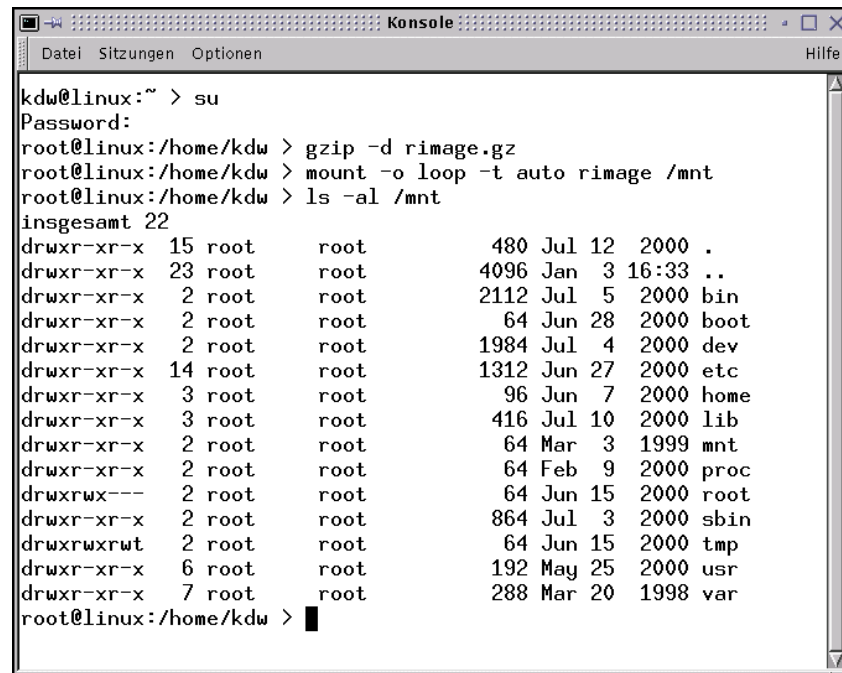
Edit the TCP/IP configuration file

The bootloader LOADLIN.EXE, the file ZIMAGE with the kernel, and the file RIMAGE.GZ as source for the root file system are stored in the FLASH of the DIL/NetPC. It is not possible to change these files directly on the DIL/Net without further activity.

For that, it is necessary to modify RIMAGE.GZ on a development system if it is required. This development system also have to run under Linux–so that the suitable tools and technologies are available. In total, there are five steps necessary:

1.) Uncompress RIMAGE.GZ with the program gzip.

2.) "Mounting" the uncompressed file to allow the access.

3.) Execute the desired changes for example with an editor.

4.) "Unmounten" RIMAGE again (please do not forget this step).

5.) Generate a new file RIMAGE.GZ with the program gzip.

Every single step is supposed to be described in detail. The modification of the IP address from "192.168.0.126" to"192.168.0.127" should serve as an example. Fundamentally you can change all other parameters for the TCP/IP stack onto the same kind and manner. Possibly you have to know the details of IP-addressing at an earlier moment.

First of all, you have to guarantee, that the file RIMAGE.GZ is available on your development system. Among others, you find the original file on the starterkit CD-ROM in the directory /LINUX .

```
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 Datei  Sitzungen  Optionen                                          Hilfe

kdw@linux:~ > su
Password:
root@linux:/home/kdw > gzip -d rimage.gz
root@linux:/home/kdw > mount -o loop -t auto rimage /mnt
root@linux:/home/kdw > ls -al /mnt
insgesamt 22
drwxr-xr-x  15 root     root          480 Jul 12  2000 .
drwxr-xr-x  23 root     root         4096 Jan  3 16:33 ..
drwxr-xr-x   2 root     root         2112 Jul  5  2000 bin
drwxr-xr-x   2 root     root           64 Jun 28  2000 boot
drwxr-xr-x   2 root     root         1984 Jul  4  2000 dev
drwxr-xr-x  14 root     root         1312 Jun 27  2000 etc
drwxr-xr-x   3 root     root           96 Jun  7  2000 home
drwxr-xr-x   3 root     root          416 Jul 10  2000 lib
drwxr-xr-x   2 root     root           64 Mar  3  1999 mnt
drwxr-xr-x   2 root     root           64 Feb  9  2000 proc
drwxrwx---   2 root     root           64 Jun 15  2000 root
drwxr-xr-x   2 root     root          864 Jul  3  2000 sbin
drwxrwxrwt   2 root     root           64 Jun 15  2000 tmp
drwxr-xr-x   6 root     root          192 May 25  2000 usr
drwxr-xr-x   7 root     root          288 Mar 20  1998 var
root@linux:/home/kdw > █
```

Figure 2: Uncompress and mount from RIMAGE

Please open a terminal window and enter to Linux with root rights–means as system administrator–on the development system. Now, execute the following command from the directory with the file RIMAGE.GZ:
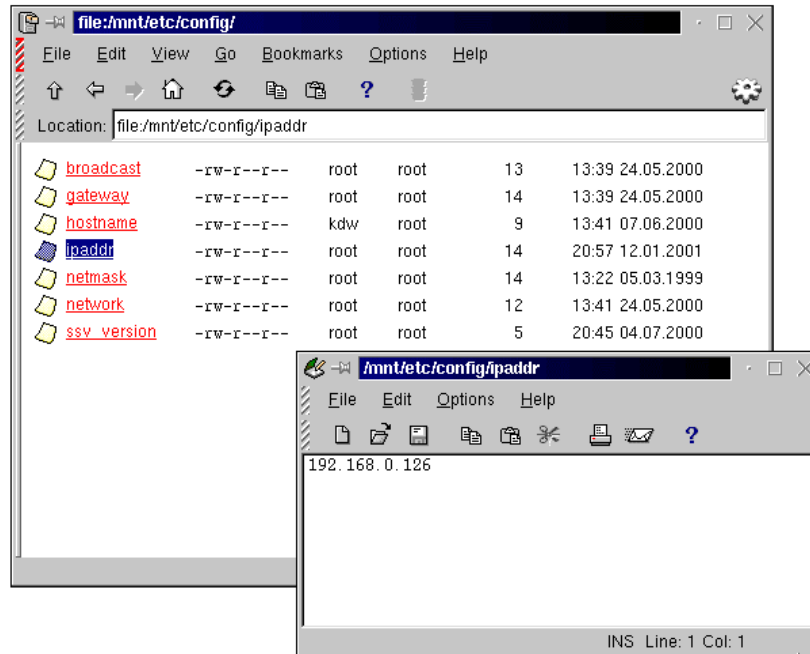
```
gzip -d rimage.gz
```

The file RIMAGE.GZ will be uncompressed by the program gzip. During this process the file RIMAGE.GZ disappears. There is now a file RIMAGE with the approx. large of 3 Mbyte. Now you can mount this uncompressed file as a further file system:

```
mount -o loop -t auto rimage /mnt
```

To execute the mount- command it is necessary to have root rights. After the successful execution you decree about a further directory named /mnt, which you can access. Figure 2 shows some details about this steps.

If you are not familiar with the Linux file system, because you have worked under Windows before, the mount procedure of RIMAGE may look a little confusingly.

First of all you have to realize that a Linux file system does not know any disk drives. The entire file system basically exists only from subdirectories and files. In addition, it does not play any role onto which disk-drive a directory is located. The file system should be extended at every time by using the `mount`-command.

Figure 3: Working on the file ipaddr

At first, a functional unit (device) with own file system–for example a floppy disk or CD-ROM–will be added (mounted). The added file system is an integral component of the entire Linux file system after mounting.

Not only floppy or CD-ROM drives can be added by the mount-command under Linux, but even a file which contains a file system. The file RIMAGE contains a file system, so the mount-command will append this file at the existing system. In other words: The DIL/NetPC file system is available as a directory called /mnt within the development system. All embedded Linux directories of a DIL/NetPC are existing within the directory /mnt.

In order to change a configuration file with any editor you can access now onto the respective file in /mnt/etc/config to change the IP address to the value "192.168.0.127". The figure 3 shows this procedure. In this case you should also have root-rights. Otherwise you receive an error report during the editors try to write the changed configuration file.

As long as /mnt is a component of the Linux operating system on the development system every Linux command can be applied onto the files in the DIL/NetPC file system.

After you have made all changes in the configuration files you have to disconnect again from the file system (unmount). It is necessary to use the following command:
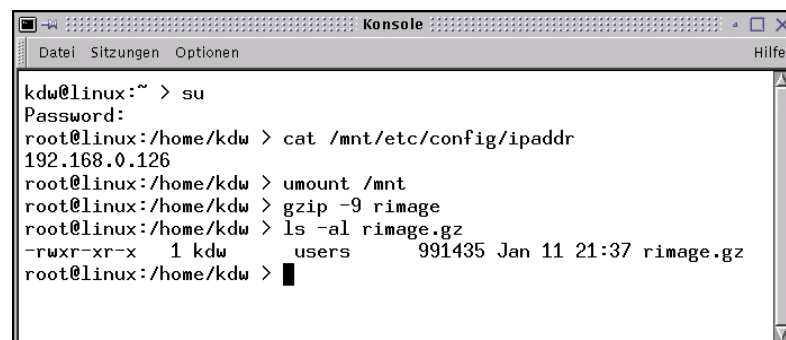
```
umount /mnt
```

Figure 4 act as an example. After this step, RIMAGE is not coupled anymore onto the Linux file system of the development system. By using the gzip-program a new compressed RIMAGE.GZ-file can be made. Please use the following necessary command:

```
gzip -9 rimage
```

This file must be transmitted into the DIL/NetPC FLASH. The changes become valid after the next boot procedure.

Note: If you forget the unmount-instruction before using the gzip-command, the file system in RIMAGE.GZ will be damaged. You will notice this problem not immediately and you will not receive any error report. But later it can result in considerable problems on the DIL/NetPC. Please execute the individual steps with the greatest possible care.

```
kdw@linux:~ > su
Password:
root@linux:/home/kdw > cat /mnt/etc/config/ipaddr
192.168.0.126
root@linux:/home/kdw > umount /mnt
root@linux:/home/kdw > gzip -9 rimage
root@linux:/home/kdw > ls -al rimage.gz
-rwxr-xr-x   1 kdw     users      991435 Jan 11 21:37 rimage.gz
root@linux:/home/kdw > █
```

Figure 4: Creating a new file RIMAGE.GZ

Table 2 shows the individual steps again in a clear form. Through that, the changes of the TCP/IP configuration for a DIL/NetPC under embedded Linux should be practicable without problems.

Command Line	Function
`gzip -d rimage.gz`	uncompress RIMAGE.GZ
`mount -o loop -t auto rimage /mnt`	mount file system
`umount /mnt`	unmount file system
`gzip -9 rimage`	compress RIMAGE.GZ

Table 2: Input Overview

Naturally the content of every other arbitrary file can also be modified by this way.

General Note

It is basically possible to change a complete file in RIMAGE.GZ. You are able–instead of the IP address change with an editor–to change the complete file. A file with the same name have to be copied into the appropriate directory.

If you use Linux on your development system with a desktop like KDE, please do not copy files to the subdir /mnt by using a file manager like e.g. KDF. For copying please use the Linux-cp (copy)-command as command line into a console.

We have found out, that if KDF were used for file copying and later you execute the unmount-command, the file system in RIMAGE.GZ is damaged.

Figures

Tables

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Document History (Emblinx6e.doc)

Revision	Date		Name
1.00	17.08.2001	First version.	JNE