

U-Boot

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Bootstrapping

Der Bootloader u-boot

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Bootloader bei eingebetteten Systemen

Reset →	fsbl	<i>first stage bootloader</i>
	sbl	ev. weitere bootloader <i>second stage bootloader</i>
	u-boot	Hier haben wir Zugriff
	kernel	Konfiguration/Parametrisierung
	linux	

Bootloader beim *Host*

Reset →	BIOS	<i>first stage bootloader</i>
	grub	<i>second stage bootloader</i>
	kernel	Konfiguration/Parametrisierung
	linux0	kleines GNU/Linux im RAM
	linux	grosses GNU/Linux auf Festplatte

Übergang U-Boot-Kernel

Bootargs

```
bootargs  
'root=/dev/mmcblk0p2 rw rootdelay=1 init=linuxrc console=tty00,115200n8'
```

▶ `kernel-source/Documentation/kernel-parameters.txt`

Die Kernel messages

Starting kernel ...

Booting Linux on physical CPU 0x0

Initializing cgroup subsys cpuset

Initializing cgroup subsys cpu

Initializing cgroup subsys cpuacct

...

Kernel command line: root=/dev/mmcblk0p2 rw rootdelay=1 init=linuxrc console=tt

...

Waiting 1 sec before mounting root device...

EXT4-fs (mmcblk0p2): couldn't mount as ext3 due to feature incompatibilities

EXT4-fs (mmcblk0p2): couldn't mount as ext2 due to feature incompatibilities

EXT4-fs (mmcblk0p2): mounted filesystem with ordered data mode. Opts: (null)

VFS: Mounted root (ext4 filesystem) on device 179:2.

www.denx.de/wiki/U-Boot/WebHome

ein typischer Bootloader für eingebettete Systeme

- ▶ Kommandozeilen
- ▶ Verbindung zum *Host* via RS232/USB
 - ▶ *Host*: `minicom -D /dev/ttyUSB N , $N = 0, 1..$`
 - ▶ 115200 Baud 8N1
 - ▶ **NO** Handshaking
- ▶ Kopiert Daten von
 - ▶ SD-Karten
 - ▶ Netz

in das Memory vom **BBB**

Ein paar typische Befehle

- ▶ `help`
- ▶ `printenv` Zeigt die Umgebung
- ▶ `md addr` Memory display
- ▶ `fatls mmc p vfat sd-card partition p`
- ▶ `fatload mmc p memAddr file`
- ▶ `tftpboot [loadAddress] [[hostIPAddr:]bootfilename]`
- ▶ `bootz kernelAddr - fdt`

U-Boot Bedienung

Siehe `tools/u-boot-copy-paste.cmd`

► copy paste

Remark: kann sich ändern

Verzeichnisstruktur

```
4-uboot ..... u-boot section
├── tc ..... link to toolchain
├── tools ..... scripts
├── config ..... configuration
├── build ..... home of binaries
│   ├── MLO ..... second stage bootloader
│   └── u-boot.img ..... the U-Boot
```

Herstellung

- ▶ Repository `git.denx.de/u-boot.git`
- ▶ Script `tools/u-boot.sh what`
 - ▶ `what:am335x_boneblack_defconfig, all, help, distclean`

SD-Karte:Partitionierung

► Partitionen: `fdisk`

Device	Boot	Start	End	Sectors	Size	Id	Type
/dev/mmcblk0p1	*	2048	36863	34816	17M	b W95	FAT32
/dev/mmcblk0p2		36864	299007	262144	128M	83	Linux

► Filesysteme

- Partition 1: vfat: `mkfs.vfat` für U-Boot
- Partition 2: ext4: `mkfs.ext4`

Partition 1

Die U-Boot Files

```
76048 Oct 17 11:41 MLO
376224 Oct 17 11:41 u-boot.img
```

Für GNU/Linux

```
9941512 Oct 17 17:52 zImage
56658 Oct 17 12:21 am335x-boneblack-wireless.dtb
```