Debian Installer for Buffalo Linkstation NAS Install Debian to headless device

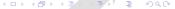
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- Background
 - History of Buffalo Linkstation NAS
 - What is Debian Installer
 - What is GNU/Screen
- How to install Debian to Buffalo Linkstation
 - How to boot Linkstation by Debian Installer image
 - Detailed steps to boot Linkstation by Debian Installer images
 - Some tips during the installation
 - Settings after the installation
- 3 Buffalo Linkstation Support Status
- Demo



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Background

History of Buffalo Linkstation NAS

- 0 Generation Kuro-Box
- 1st Generation Linkstation HG / Kuro-Box HG
 - Powerpc architecture
 - ▶ IDE interface only there's no native SATA support!!
 - Life is hard for this kind of hardware nowadays
- 2nd Generation¹ Kuro-Box Pro / Linkstation Live/LS-GL/LS-WTGL/LS-QL
 - ► ARM architecture
 - ★ Untel Etch: arm OABI (Old ABI)
 - ★ Since Lenny: armel EABI (new Embedded ABI)
 - Marvell orion5x 5182 chipset
 - SATA interface

¹There's ever MIPS model before 2nd generation, however it's very rare and got discontinued soon.

Background (cont.)

History of Buffalo Linkstation NAS (cont.)

- 3rd Generation Linkstation LS-XHL/LS-CHL/LS-WXL & LS-VL/LS-WVL/LS-QVL, etc
 - Marvell kirkwood 6281 / 6282 chipset
 - armel architecture
 - kernel image is compatible with 2nd generation (linux-image-marvell) 1
 - Jessie/Stretch supports very well
 - After Stretch plan² is still under discussion
- 4th Generation LS-210/LS-220/LS-410/LS-420, etc
 - Marvell armada-370 chipset
 - armhf architecture (hard-float)
 - Sorry not supported yet. Problem probably in u-boot and Kernel DTS. No serial console. Please help!

¹Before installing HDD to a device of different model, you need to use flash-kernel to generate boot image (ulmage.buffalo) by adding target device's DTB.

https://lists.debian.org/debian-devel/2016/12/msg00135.html

What is Debian Installer

- Debian Installer a.k.a. D-I
- A bootabe Debian environment, which is minimized
- Partitioner (or even RAID or/and dm-crypt)
- Debootstrap
- Install boot loader, e.g. Grub/EFI, flash-kernel
- Supports various OS, including kFreeBSD and GNU/Hurd
- Install media is not limited to CD/DVD, but also PXE netboot, u-boot, etc
- For headless device, such as NAS, network-console image can be used to install via SSH connection

What is GNU/Screen

- Terminal multiplexer virtual terminals in one terminal
- Switch virtual terminal by key shortcut
- Screen uses: Ctrl-A [Number]
- There're a few alternatives, such as Tmux, which uses Ctrl-B [Number]

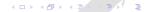
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Where to put boot images

Buffalo Linkstation u-boot, the bootloader, reads boot images on 1st partition

- boot images³
 - ulmage.buffalo
 - ▶ initrd.buffalo
- 1st partition^{4 5}
 - /dev/sda1
 - /dev/md0



³The image files can be symbolic link.

⁴Some models doesn't support GPT partition.

⁵It must be ext2 or ext3 format.

Where to download boot images

Most Linkstation support started from Stretch D-I alpha7, and GNU/Screen support was added in alpha8, but due to a bug alpha8 network-console image doesn't work, so please try daily images if you want to use GNU/Screen.

- orion5x models
 - https://d-i.debian.org/daily-images/armel/daily /orion5x/network-console/buffalo
- kirkwood models
 - https://d-i.debian.org/daily-images/armel/daily /kirkwood/network-console/buffalo

Create partitions

Unplug HDD of your Linkstation, and connect it to your PC via SATA-USB adapter. Suppose the connected device is /dev/sdc. If your Linkstation is RAID type, models such as LS-WXL/WSXL/WVL/QVL, partition should be the same for all HDDs.

```
$ sudo parted /dev/sdc
(parted) mklabel gpt
(parted) mkpart boot 2048s 1024MiB
(parted) mkpart root 1024MiB 6144MiB
(parted) mkpart swap 6144MiB 6400MiB
(parted) mkpart data 6400MiB -1
### Below commands are necessary for RAID models only. ###
(parted) set 1 raid on
(parted) set 2 raid on
(parted) set 3 raid on
(parted) set 4 raid on
```

Confirm created partitions

```
(parted) print
Model: SAMSUNG HM250HI (scsi)
Disk /dev/sdc: 250GB
Sector size (logical/physical): 512B/512B
Partition Table: gpt
Disk Flags:
Num Start End Size File sys Name Flags
1 1049kB 1074MB 1073MB boot raid
2 1074MB 6442MB 5369MB root raid
3 6442MB 6711MB 268MB swap raid
4 6711MB 250GB 243GB data raid
### Exit parted at the end. ###
(parted) quit
```

Copy boot images

```
$ sudo mkfs.ext3 /dev/sdc1
$ sudo mount /dev/sdc1 /mnt
$ wget https://d-i.debian.org/daily-images/armel/daily
/kirkwood/network-console/buffalo/ls-wxl/uImage.buffalo
$ wget https://d-i.debian.org/daily-images/armel/daily
/kirkwood/network-console/buffalo/ls-wxl/initrd.buffalo
$ sudo cp *.buffalo /mnt
$ sudo umount /mnt
```

Boot Linkstation and connect via SSH

- Move the HDDs back to Linkstation, then boot the device.
- Wait for a while (2 minutes?), then you can find IP address of your device, allocated by DHCP, by port scanner.
 - ► Fing App in Andoird/iOS can scan port in local network
- Use SSH client to connect to Linkstation

▶ Port: 22

Username: installer

Password: install

SSH Command:

\$ ssh installer@<IP address of Linkstation>

Some tips during the installation

Skip this 2 pages if you're using non-RAID models such as LS-GL/CHL/XHL/VL.

 If you don't find your RAID in Partman, you can <Go Back>, then choose "Download installer components", and then check "partman-md" and "sata-modules", etc.

Some tips during the installation (cont.)

 If you need to create new array, you need to set /dev/md0 as metadata=0 (version 0.90). Because u-boot cannot load boot images on 1st partition in. partman-md cannot do this now, so you need to do it yourself³.

```
# mdadm --create /dev/md0 --level=1 --raid-devices=2
--metadata=0 /dev/sda1 /dev/sdb1
```

or, you want to set up the 2nd HDD later:

```
# mdadm --create /dev/md0 --level=1 --raid-devices=2
--metadata=0 /dev/sda1 missing
```

partman-md can set up /dev/md1, /dev/md2, etc. with no problem.

Some tips during the installation (cont.)

 RAID will start to resync after creation, which slow down the installation, so it's better to limit the resync speed except for /dev/md0:

```
# echo 100 >/sys/block/md{1,2,3}/md/sync_speed_max
```

 RAID re-sync will be restarted after rebooting, so no much worry about it.

Settings after the installation

- Command fw_printenv / fw_setenv is needed to check/modify u-boot variables.
 - Should be effective to any Linkstation:
 - \$ sudo echo /dev/mtd2 0x00000 0x10000 0x10000
 >/etc/fw_env.config
 - ▶ Though Kuro-Box Pro is a bit different:
 - \$ sudo echo /dev/mtd5 0x00000 0x10000 0x10000
 - >/etc/fw_env.config

³If you screw up u-boot variable and failed to boot, there's no recovery method. So be careful!!

Settings after the installation(cont.)

- Boot log of Linkstation can be redirected to other device, which is called netconsole. It's useful as a debug/rescue method.
 - Setting on Linkstation side:

```
$ sudo cat <<EOT >>/etc/initramfs-tools/modules
marvell
mv643xx_eth
netconsole netconsole=@192.168.11.5/,6666@192.168.11.1/
mvmdio
EOT
$ sudo update-initramfs -u
```

Other device on the same network can get the log by:

```
$ sudo ip a add 192.168.11.1/24 dev eth0
$ nc -l -u -p 6666 |tee ~/netconsole.log
```

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Buffalo Linkstation Support Status

The supported Buffalo Linkstation list:

- Kuro-Box Pro / Linkstation Pro/Live
- Linkstation LS-GL / LS-WSGL / LS-WTGL
- Linkstation LS-XHL / LS-CHLv2 / LS-WXL / LS-WSXL / LS-VL / LS-WVL / LS-QVL
 - =>So almost all armel 2nd/3rd generation are supported!

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Debian Install Demo for Buffalo Linkstation

Device: 2-Bay 2.5' HDD model Linkstation LS-WSXL

Thanks for coming!

Any question or comment would be appreciated.

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