

Debian Installer for Buffalo Linkstation NAS

Install Debian to headless device

Roger Shimizu

Debian Maintainer

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Outline

- 1 Background
 - History of Buffalo Linkstation NAS
 - What is Debian Installer
 - What is GNU/Screen
- 2 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
- 4 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.

²<https://lists.debian.org/debian-devel/2016/12/msg00135.html>

What is Debian Installer

- Debian Installer a.k.a. D-I
- A bootable 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
 - ▶ ulimage.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.

³<https://bugs.debian.org/815569>

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.³

- ▶ 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.

Roger Shimizu

rogershimizu@gmail.com

<https://wiki.debian.org/RogerShimizu>

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Stefano Zacchioli

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