

Linux for Tegra on NVIDIA shield android TV (SATV):

As a prelude, I found it necessary to use a usb-hub on the USB-port closest to the HDMI-port on the Shield due to it being the only one that will accept the USB thumb drives, the mouse and a keyboard. The farthest USB port from the HDMI will be used to connect an auxiliary computer responsible for sending adb/fastboot commands via a male to male USB cable. Also, the ADB/fastboot commands below are specific to the windows environment, they may need to be tweaked for UNIX systems.

1.) Enable Developer Mode

- a.) To get into developer mode on the Shield TV, go to settings >> about and tap Build 7 times to unlock developer mode. You will be greeted by a pop-up confirming developer mode is enabled.
- b.) Now go to developer mode under setting and turn on USB debugging. This will allow you to connect a computer to the shield to device.

2.) Download ADB and Fastboot.

- a.) You can download ADB and fastboot for command line in Windows or for Terminal in the Unix environment (ie, Linux or Mac). (I don't remember where I found my copy but a quick internet search will turn up several sources)
- b.) Install ADB and fastboot
- c.) Ensure that the shield family of drivers for fastboot and ADB are extracted somewhere on your system and you know where they are.
- i.) DRIVERS: <http://nvidiashieldzone.com/download/shield-family-drivers/>

3.) Unlock bootloader:

- a.) Plug your Shield TV into the PC with USB cable. (I used USB to micro USB and it worked well)
- (b) Launch ADB and Fastboot and type the command `adb devices`. If you see a device show up, then you have the drivers installed, otherwise you'll need to go to device manager and find the yellow (!) ADB device.
 - i. Right click the device and select Update Driver.
 - ii. When offered, browse your computer for the driver and point it to the Shield Family Drivers folder you extracted
 - iii. When finished with the driver install, the yellow (!) should be gone
- (c) Next, double check that ADB detects your device: type `adb devices`. and a long string of number and letters will display signaling that your device is detected.
- (d) Now you'll need access to the bootloader; so type the code: `adb reboot bootloader` . This will bring your Shield TV to a boot screen with several options. You will be interacting with the Shield mostly through the command line, so you won't need to select any of these.
- (e) At this point you'll need to verify that fastboot drivers are installed as well.
 - i. On your PC, go to Device Manager. See if a yellow (!) exists that mentions FASTBOOT (similar to before)
 - ii. Right click the device and select Update Driver.
 - iii. When offered, browse your computer for the driver and point it to the Shield Family Drivers folder you extracted
 - iv. When finished with the installing the driver, the yellow (!) should be gone.
 - v. Type `fastboot devices` and make sure your Shield TV is visible.
- (f) Now, to unlock the bootloader, make sure that you enter fastboot (run `adb/fastboot` then reboot the bootloader again) you should see that fastboot is prompting you for a command. If so, type `fastboot oem unlock`
- (g) The shield might require you to acknowledge and agree to the unlock, you can follow the instructions on the shield. Now you might see a PLEASE WAIT . . . appear on the Shield TV screen. This will take several minutes.

(h) Once done, you will have officially unlocked the bootloader. You'll now need to sign back into the Shield and enable developer mode (the same as before) and re-enable USB debugging.

4.) Download the latest L4T (Linux for Tegra) release package for your developer system and the sample file system: This will need to be done on a Unix machine as ext4 formatting will be used

(a) Jetson **TX1** 64-bit Driver Package:

<https://developer.nvidia.com/embedded/dlc/l4t-jetson-tx1-driver-package-24-2>

(b) 64-bit Sample Root Filesystem: <https://developer.nvidia.com/embedded/dlc/l4t-sample-root-filesystem-24-2>

(c) (You'll find the up-to-date version here under Tegra X1:

<https://developer.nvidia.com/embedded/linux-tegra-archive>)

5. Untar the files and assemble the rootfs: (replace the file names with the up to date version you've downloaded):

(a) `cd <L4T_install_folder>`

(b) `sudo tar xpf Tegra210_Linux_R24.2.0_aarch64.tbz2`

(c) `cd Linux_for_Tegra/rootfs/`

(d) `sudo tar -jxpf ../../Tegra_Linux_Sample-Root-Filesystem_R24.2.0_aarch64.tbz2`

(e) `cd ../`

(f) `sudo ./apply_binaries.sh`

6. Copy L4T rootfs to **two** USB flash drives, (one will be used for boot into linux and the other will be used to copy linux to the shield). You'll need an ext4 formatted (first partition) 8gb+ drive with which to copy the rootfs. I had trouble un-tar-ing the rootfs to the drive, but copying the files directly worked for me using the following approach:

(a) you can skip this (part a) if you've already formatted the drive, also sdb1 is just used as an example directory to the sdc card, substitute it for the appropriate one you'll be using. `sudo mkfs.ext4 /dev/sdb1`

(b) mount the drive with `sudo mount /dev/sdb1 /mnt`

(c) and copy rootfs to the USB drive with `sudo cp -a rootfs/* /mnt && sync`

7. Now that the root file system is copied to the drive you can eject it from the computer and insert it in the Shield. Next you'll need to copy a database file for your specific version of the Shield located in rootfs/boot that you have just built

(a) to find the appropriate file name, you'll need to access the bootloader via adb and fastboot:

(b) type `adb reboot bootloader` if not already in fastboot

(c) type **fastboot oem dtbname** to retrieve the full name of your device

(d) search for a database file in the rootfs/boot that shares the exact same name as the one retrieved above.

(e) Copy this file to an easily accessible directory on the system with which you run adb and fastboot.

(f) from adb and fastboot type `adb reboot bootloader` to enter fastboot

(g) now you need to flash the database file to the shield with the following code `fastboot flash dtb <full path to dtb file>`

8. Next you'll need to download the appropriate boot image.

(a) The link I used is now dead, but a search online should return the appropriate image files. I've attached the relevant ones I used on the SATV 2017.

The SATV2 has a different directory structure than the original and the user partition is found on mmcbk0p33, this boot image is not listed below, **but it is attached to the email.**

(b) The purpose of each boot image is as follows:

"mmcbk1p1.img" is for booting to rootfs on external SD card. (you'll probably need this one)

"sda1.img" is for booting to rootfs on external USB drive (or SD card in USB adapter), or internal SATA HDD of modified 16GB SATV.

"mmcblk0p29.img" is for booting to rootfs on partition 29 (User Data) of internal eMMC of 16GB SATV if only Ubuntu is needed.

"mmcblk0p1.img" is for boot to rootfs on partition 1 of internal eMMC of SATV Pro.

"sda32.img" is for booting to rootfs on partition 32 (User Data) of HDD of 500GB SATV Pro if only Ubuntu is needed.

"sda33.img" is for booting to rootfs on partition 33 of HDD of 500GB SATV Pro for Ubuntu (modification of HDD partition table is needed).

"sda34.img" is for booting to rootfs on partition 34 of HDD of 500GB SATV Pro for Ubuntu (modification of HDD partition table is needed).

(c) download the appropriate image onto the system with adb and fastboot. (if booting from sdcard then mmcblk1p1.img)

(d) you'll need to get back to the bootloader if you're not already there (adb reboot bootloader). From fastboot you're going to boot the Shield into ubuntu using the boot image with the following command: fastboot boot <path to boot image> .

(e) This will cause the shield to reboot into ubuntu, this may take several minutes. You will have two accounts:

nvidia and ubuntu, the user name is also the password by default. I could only ever log into the ubuntu account

(f) before updating or upgrading anything on the system, you will need to execute the following command with terminal to prevent the NVIDIA drivers from being overwritten: sudo apt-mark hold xserver-xorg-core

(g) and to check the integrity of the NVIDIA files run sha1sum -c /etc/nv_tegra_release.

9.) Copy linux to a native partition. (cd /)

a.) Boot into linux on the shield using adb and fastboot (fastboot boot <path to boot image>) while only one USB drive is connected

b.) Once booted, ensure that now both L4T usb drives are connected to the shield

c.) locate the second USB drive and copy its contents to a local partition (if running Linux natively is intended, then mount the boot partition and copy the usb to the boot directory

example:

```
Sudo mount mmcblk0p33 /mnt
```

```
Sudo cp -a /media/ubuntu/sdb1/* /mnt && sync
```

d.) **flash** the appropriate boot image (link found in part 8) however, I would suggest **booting** from the boot image first to ensure that the image works appropriately.

Example:

```
Fastboot boot <image path> if linux starts normally then flash the image
```

```
Fastboot flash boot <image path>
```

e.) run **sudo apt-mark hold xserver-xorg-core** again before updating the OS.

f.) The SATV should reboot into linux once restarted