Build and Install Pie for the Nintendo Switch

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This guide is provided to you as-is by **@EpicLPer** with the help of folks over on the Switchroot Discord.

The following guide is only meant for serious testers to report issues with the Android Pie build.
DO NOT ATTEMPT THESE STEPS IF YOU'VE NEVER WORKED WITH LINUX BEFORE!
I know that you'd love to test the current version of Pie but there are still a few nasty bugs and issues which will make your journey a bit unpleasant (to say the least). If you want to use it for gaming, emulation, Android games and more please wait for a stable, official release from Switchroot instead.

Guide Changelog

- 2020-01-16: Initial Version

Prerequisites

- **Read through the whole guide before you start!**
  - There are quite a few handy tips I've included in the sub-points I made so be sure to read it fully and then start working on building Android, will make it a bit easier afterwards ;)
- Ubuntu 19.10 (x64)
  - This guide was written for and tested on Ubuntu 19.10, you can of course build it with another version/distro too but you'll be on your own then.
- A somewhat modern CPU
  - The older the CPU the longer your build times are, simple as that. Tested on an i7 3770K.
- At least 8GB RAM
  - The more the better. Tested with 16GB RAM. SWAP is ultra slow for building things.
- ~200GB free space
  - The repo is about 20-30GB big and after building it'll blow up to around 150GB.
- Minimum 8GB MicroSD
  - You need a spare one since you'll wipe the whole card later on.
- A lot of patience
  - Test-Build took around 2:30 hours, excluding all the prep work which took around 2 hours.

Preparing

1. Update Ubuntu to have the latest package versions.
   `sudo apt update && sudo apt upgrade`
2. Follow the first few steps from https://wiki.lineageos.org/devices/foster/build but stop before you come to the "*Prepare the device-specific code*" section.
   a. At "*Install the SDK*" for downloading and unzipping you can also just run the following commands, then continue on the site with adding it to PATH:
   ```
   cd ~/Downloads/ && wget
   https://dl.google.com/android/repository/platform-tools-latest-linux.zip && unzip platform-tools-latest-linux.zip -d ~
   ```
   b. At "*Install the build packages*" you **HAVE** to choose OpenJDK 1.9 however on 19.10 it's not easily available anymore. To still install it simply use the following commands:
   ```
   wget
   https://download.java.net/java/GA/jdk9/9.0.4/binaries/openjdk-9.0.4_linux-x64_bin.tar.gz
   tar -C ~/ -zxvf openjdk-9.0.4_linux-x64_bin.tar.gz
   nano ~/.profile
   ```
   c. Now at the very end of the file add the following:
   ```
   # set PATH so it includes OpenJDK 9
   if [ -d "$HOME/jdk-9.0.4/bin" ] ; then
       PATH="$HOME/jdk-9.0.4/bin:$PATH"
   fi
   ```
   d. Run `source ~/.profile`, to check run `which java` and you should get some output in return. If not you've probably skipped a step.
   e. When you're at the step "*Initialize the LineageOS source repository*" replace 15.1 with 16.0, making the full string at the end "*lineage-16.0*".
   f. If you get a "*/usr/bin/env: 'python': No such file or directory*" just run `sudo apt install -y python`
   g. --- (((I know this step may not be needed but just in case I'll include it here))) ---
   If you get a "*fatal: unable to auto-detect email address*" simply run `git config --global user.email "fake@name.com" && git config --global user.name Fake Name` and run the repo init command again.
   h. When doing "*repo sync*" you can ignore the 404 messages popping up from time to time. Also, this step will take a long time (downloads around 12GB of data). Just to be sure run the "*repo sync*" command a few times in case files have been skipped.
   i. After that continue with the Lineage OS guide and stop before the "*Prepare the device-specific code*" section.
3. Enter the following commands:
   ```
   cd .repo
   git clone https://gitlab.com/switchroot/android/manifest.git
   local_manifests
   repo sync
   ```
4. For repopick use the following commands:
   ```
   cd ~/android/lineage
   ~/android/lineage/vendor/lineage/build/tools/repopick.py -t
   nvidia-enhancements-p
   ```

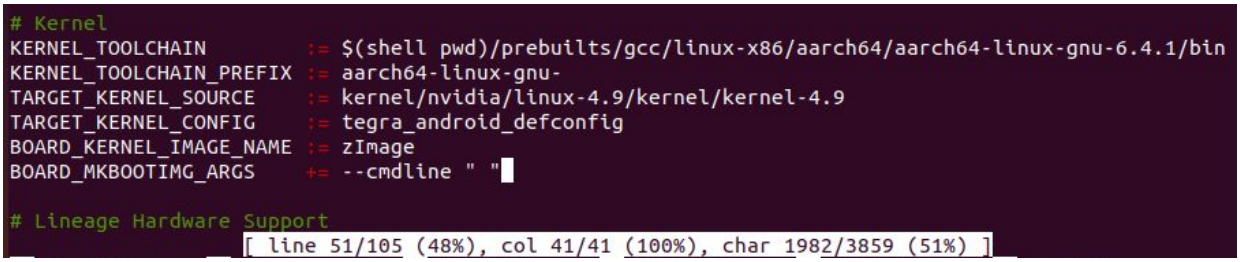
```
~/android/lineage/vendor/lineage/build/tools/repopick.py -t joycon-p
~/android/lineage/vendor/lineage/build/tools/repopick.py -t icosa-bt
```

5. Lets patch some files!
```
cd vendor/lineage
patch -p1 < ../../.repo/local_manifests/patches/vendor_lineage-kmod.patch
cd ../../frameworks/native && patch -p1 <
../../.repo/local_manifests/patches/frameworks_native-hwc.patch
cd ../../
```
6. The following steps are optional:
```
cd framework/base
patch -p1 <
../../.repo/local_manifests/patches/frameworks_base-rsmouse.patch
cd ../../vendor/nvidia
patch -p1 <
../../.repo/local_manifests/patches/0001-HACK-use-platform-sig-for-shield
tech.patch
cd ../../
cp .repo/local_manifests/patches/NvShieldTech-hack.apk
vendor/nvidia/shield/shieldtech/app/NvShieldTech.apk
```

Building

If you restart, close the terminal etc. when doing Step 2 you'll have to start that step again!

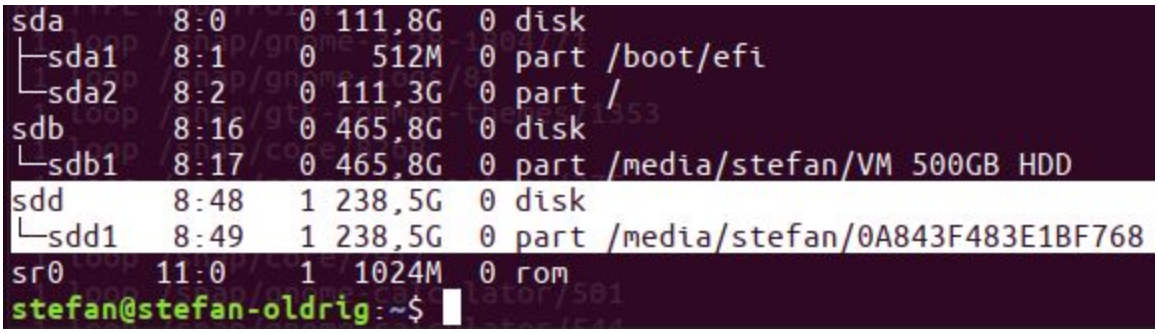
1. Before we start you need to install some additional packages and create a folder:
```
sudo apt install libtinfo5 libncurses5
mkdir -p
~/android/lineage/out/target/product/foster_tab/vendor/lib/modules
```
2. Let's start with actually building the ROM now!
```
cd ~/android/lineage
source build/envsetup.sh
export USE_CCACHE=1
ccache -M 50G
lunch lineage_foster_tab-userdebug
make systemimage -j$(nproc) && make vendorimage -j$(nproc)
```
This will take some time now, around 2-6 hours depending on your hardware. Go drink a coffee, go out with your friends or take a quick nap.
3. Next you'll need to add text to a file after line 50.
```
nano -c ~/android/lineage/device/nvidia/foster/BoardConfig.mk
```
The line you have to add is: `BOARD_MKBOOTIMG_ARGS    += --cmdline " "`
And after doing so it should look like this:



4. Now run `make bootimage -j$(nproc)`

5. Congrats! You've just successfully built Android Pie for the Nintendo Switch :)

Format MicroSD Card

1. Run the following commands:
   `mkdir -p ~/Downloads/SwitchAndroid/Format_SDCard/ && cd ~/Downloads/SwitchAndroid/Format_SDCard`
   `wget https://cdn.discordapp.com/attachments/604648722491768883/662677413037080600/part.sh`
   `chmod +x part.sh`
2. Plug the MicroSD card you wanna use in and determine what name it got. To see what devices are currently plugged into your PC use `lsblk`. You should see a few devices listed there but the one we're interested in are the "*sd…*" devices.
   The MicroSD card I want use is roughly 256GB big so I look for a device with about that size.
   
   ```
   sda      8:0    0 111,8G  0 disk
   ├─sda1   8:1    0   512M  0 part /boot/efi
   └─sda2   8:2    0 111,3G  0 part /
   sdb      8:16   0 465,8G  0 disk
   └─sdb1   8:17   0 465,8G  0 part /media/stefan/VM 500GB HDD
   sdd      8:48   1 238,5G  0 disk
   └─sdd1   8:49   1 238,5G  0 part /media/stefan/0A843F483E1BF768
   sr0     11:0    1  1024M  0 rom
   stefan@stefan-oldrig:~$
   ```
   In my case the device's name is "*sdd*" so we'll use that in the next step. In some cases the card will show up as a "*mmcblk*" device which is fine too, just use that name then.
3. **!!!THE FOLLOWING STEPS WILL WIPE ALL DATA FROM YOUR MICROSD CARD!!!**
   Use the following command and replace the "*xxx*" part with the name you determined in the previous step, in my example "*/dev/sdd*".
   `sudo umount /dev/xxx`
   `sudo parted /dev/xxx --script mklabel gpt`
   `sudo ./part.sh /dev/xxx`
4. Un- and replug your card to get it mounted again.

Prepare MicroSD Card

1. Download Hekate from https://github.com/CTCaer/hekate/releases and put the files on the root of the "*hos_data*" partition. Put it on the partition that's around 2.1GB big, if you see multiple you have to choose the fat32 one (*Right Click > Properties > Bottom right should say "msdos"*).
2. Go to "*/bootloader/ini*" and put this file in there:
   https://cdn.discordapp.com/attachments/667093920005619742/667095553145962518/00-android.ini
   On the root of the card create a new folder called "*switchroot_android*" and put those 2 files in it:
   https://cdn.discordapp.com/attachments/667093920005619742/667095483520516126/boot.scr
   https://cdn.discordapp.com/attachments/667093920005619742/667095406399848461/coreboot.rom

3. (OPTIONAL) If you want to get Google Apps running go to https://opengapps.org/ and choose "*ARM64*", "*9.0*" and "*nano*", then put the ZIP file onto the root of the card.
4. Unmount the card via the "*Eject*" button.

Fastboot Flashing

1. Insert the card and boot Hekate on your Switch (*insert jig > press Vol+ & Power > run exploit*)
2. Go to "*More Configs*".
3. Hold Vol+ & Vol- and tap on "*Switchroot Android*", keep holding the Vol keys for ~10 seconds.
4. Check if the Switch is in fastboot mode via `fastboot devices`, you should see an entry now.
5. Run the following commands:
   ```
   cd ~/android/lineage/out/target/product/foster_tab/
   fastboot flash boot boot.img
   fastboot flash vendor vendor.img
   fastboot flash system system.img
   fastboot flash dtb obj/KERNEL_OBJ/arch/arm64/boot/dts/tegra210-icosa.dtb
   ```
   If you also want TWRP recovery download this file and flash it too:
   https://drive.google.com/file/d/1KUaQThm6S2xYPYD98qxZsb4JPeRJAM5K/view
   ```
   fastboot flash recovery TWRP.img
   fastboot reboot
   ```
   The reboot command may not work. Just hold power and launch Hekate again.

6. (OPTIONAL) If you want to get Google Apps up and running launch Hekate > "*More Configs*" and hold Vol+ while tapping on "*Switchroot Android*". After a few seconds you should see TWRP booting up. If it doesn't and stays at a black screen just force power off the Switch and try again.
    a. Swipe to allow modifications.
    b. Go to "*Install*" and on the left choose "*Up A Level*" > "*external_sd*" and tap on the ZIP file.
    c. Swipe to confirm Flash.
    d. After it finished choose "*Reboot System*" but this may fail. Simply force power off and launch Hekate again.
7. In Hekate go to "*More Configs*" and this time tap on "*Switchroot Android*" without holding any buttons.
8. If everything went right, you should now see Android booting. After a few minutes you can finally enjoy Android Pie on your Nintendo Switch!

Known Issues (and a few Fixes)

- Navigation buttons are on the right / Lockscreen is in the wrong orientation
    a. On Android go to "*Settings*" > "*About*" > Tap a few times on "*Build number*"
    b. Go one step back and choose "*System*" > "*Advanced*" > "*Developer options*"
    c. Enable "*Android debugging*"
    d. Connect via USB to your PC and run `adb shell wm density 192`
- Switch won't go into Sleep mode
    a. Don't let the JoyCons plugged in, then press the power button. It still won't work 100% of the time but hey we warned you it's only a Tester ROM ;)
- NVidia App crashing
    a. Go to App settings and disable the app
- Touchscreen stopped working
    a. Known, try putting your Switch to sleep a few times (with or hard-reboot it by holding power
- -