How to Build & Install
CyanogenMod 10 (Jellybean)
from source
for Nexus 7/"grouper"

(a WIP by fattire)

(BTW: I'm @fat__tire on Twitter)

1/1/13: THESE INSTRUCTIONS HAVE BEEN PORTED TO THE CYANOGENMOD WIKI. USE THAT VERSION INSTEAD.

http://wiki.cyanogenmod.org/index.php?title=Build_for_grouper

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(This is the **LINUX** edition-- *if you're using Windows or OS X, you may try running Linux from within a safely sandboxed virtual machine such as the free Virtualbox. That way, you can run a "computer within a computer" and experience Linux from the comfort of your own host machine. See more below. Additionally, OS X users can build Android natively on their Macs, but this document doesn't go into it too much.)*

*Also, feel free to post your own comments, suggestions, and/or corrections in this document (if viewing w/a web browser). Just highlight the area you want to annotate and right-click, then select "**Comment**")*

FOR DEVELOPER TYPES AND THOSE WHO WANT TO LEARN/EXPERIMENT ONLY.

READ THESE INSTRUCTIONS CAREFULLY BEFORE YOU BEGIN AS IT REFERS TO THE

REGULAR HOW-TO-BUILD CYANOGENMOD INSTRUCTIONS. ALSO, UNDERSTAND THAT YOU ARE DOING THIS ENTIRELY AT YOUR OWN RISK AND ASSUME ALL RESPONSIBILITY FOR ANY NEGATIVE CONSEQUENCES, INCLUDING DAMAGE TO YOU, YOUR EQUIPMENT, YOUR DATA, YOUR FAMILY, AND/OR YOUR PETS. PLEASE READ AND AGREE TO ALL APPLICABLE LICENSES.

ALSO- You're discouraged from "romming" or "kanging" (that is, releasing your build to everyone) at this point. There's no reason to do so, as cm10 is in a rapid state of change. Rather, consider contributing any fixes or features to the wider effort before kanging. Otherwise people may get confused between official/unofficial releases. Thanks!

If you want assistance, you'll have to turn to the development community. Hopefully, as with other devices, people will be helpful in assisting others and solving issues. See more below.

SO YOU WANT TO BUILD CYANOGENMOD 10 FROM SOURCE...

The Nexus 7 (codename: "grouper") is an amazing computer, especially for $200. It is the perfect device for hacking around, and represents a wonderful opportunity for learning. To those unfamiliar with CyanogenMod, it is perhaps the most popular community-supported distribution of Android, and you can read more about it on Wikipedia or the official CyanogenMod site.

These instructions will hopefully assist you to start with a stock Nexus 7, unlock the bootloader, and then download the required tools as well as the very latest source code for CyanogenMod 10 (based on Google's Android operating system). Using these, you can build both CyangenMod 10 and ClockworkMod recovery image from source code, and then install them both to your device.

What you'll need:

- A Nexus 7 (8GB or 16GB)
- A relatively recent computer (Linux, OS X, or Windows) w/a reasonable amount of RAM and storage. The less RAM you have, the longer the build will take. Using SSDs results in faster builds than traditional hard drives.
- A micro USB cable (comes with the Nexus 7)
- A decent Internet connection & reliable electricity :)
- Some familiarity with basic Android operation and terminology. It would help if you've installed custom roms on other devices and are familiar with what a recovery image such as ClockworkMod is, for example. It may also be useful to know some basic command line concepts such as `cd` for "change directory", the concept of directory hierarchies, that in Linux they are separated by `/`, etc.

If you are not accustomed to using Linux-- this is an excellent chance to learn. It's free-- just download

and run a virtual machine (VM) such as Virtualbox, then install a Linux distribution such as Ubuntu. Version 12.04, 64-bit version works great. Using a VM allows Linux to run as a guest inside your host computer-- a computer in a computer, if you will. If you hate Linux for whatever reason, you can always just uninstall and delete the whole thing. (There are plenty of places to find instructions for setting up Virtualbox with Ubuntu, so I'll leave it to you to do that.)

It is difficult to say how much experience is necessary to follow these instructions. While this guide is certainly not for the very very very uninitiated, these steps shouldn't require a PhD in software development either. Some readers will have no difficulty and breeze through the steps easily. Others may struggle over the most basic operation. Because people's experiences, backgrounds, and intuitions differ, it may be a good idea to read through just to ascertain whether you feel comfortable or are getting over your head.

Remember, you assume all risk of trying this, but you will reap the rewards! It's pretty satisfying to boot into a fresh operating system you baked at home :) And once you're an Android-building ninja, there will be no more need to wait for "nightly" builds from anyone. You will have at your fingertips the skills to build a full operating system from code to a running device, whenever you want. Where you go from there-- maybe you'll add a feature, fix a bug, add a translation, or use what you've learned to build a new app or port to a new device-- or maybe you'll never build again-- it's all really up to you.

So let's begin!

UNLOCKING YOUR NEXUS 7

What does that mean?

Note: ***If you've already installed CM10 or another ROM on your Nexus 7, your device is already unlocked. Assuming you also have*** `adb` ***and*** `fastboot` ***installed on your computer, you can skip this whole section and proceed to the HOW TO BUILD section below.***

The first step in putting any custom operating system on your Nexus 7 is to unlock the bootloader. A bootloader is the very first program that runs when you turn on your device. The bootloader initializes some hardware and then loads the kernel and ramdisk, and gets the boot process going. If the bootloader is in locked mode, it will ensure that only Google's stock operating system can run. Since you will be installing your *own* operating system, you need to turn this off. Luckily, Google and Asus make it easy.

Note that **THE PROCESS OF UNLOCKING THE BOOTLOADER WILL ERASE ALL YOUR PERSONAL DATA FROM THE DEVICE.**

Okay. I'm in. What do I need to do this?

To unlock your bootloader, you'll first need a program on your computer called **fastboot**. One way to get fastboot is to download and install the Android SDK (Software Developer Kit) from Google. The SDK is used by app developers when they're writing programs for Android, and who knows, you may want to write apps someday. But the SDK also contains two great tools that are useful even to non-developers. They are:

- **adb** - Android Debug Bridge - this is a program that lets your computer "talk" to your Nexus 7 while the device is running. Among the many things you can do with adb-- you can push files from your computer to the device or pull files from the device to your computer, you can get a running real-time log of Android activity (which is very useful for debugging or having others help you debug), you can create an interactive "shell" session (similar to Linux or OS X) to type commands to your device, and much more.

- **fastboot** - Fastboot works a little bit like adb, except it's often used at a much earlier point in the boot process, even before Android or any operating system loads. You can put your Nexus 7 into a "fastboot" mode, whereby, if you are connected via USB cable, you can copy entire partitions from your computer (usually in the form of an image file, such as `boot.img` or `recovery.img`) over to the device, wiping over whatever happened to be there. Fastboot is able to do more than that, however. It's also used to send special commands to the device to do things such as unlock your bootloader.

How do I do the actual unlocking?

So this should be a one time thing. To unlock your Nexus 7, you will need fastboot installed. Go ahead and download the SDK, per the steps on Google's SDK web page. Then install it by following the specific instructions for your computer.

Once it's installed:

1. Use the MicroUSB cable to connect the Nexus 7 to your computer.

2. Start the Nexus 7 into fastboot mode. To do this, go to the Settings section on your Nexus 7, and then under the **Developer options** section, ensure that **USB Debugging** is checked.

3. From a terminal on your computer, type this command:

   ```
   adb reboot bootloader
   ```

   The computer should immediately reboot into the bootloader (it should say "`FASTBOOT MODE`" in red text in the bottom left). If it doesn't work, giving you a "`command not found`" type of error, see below as you may not have the `adb` command in your path of execution.

4. From a terminal on our computer, type this command:

   ```
   fastboot oem unlock
   ```

5. The Nexus 7 should warn you that you are about to unlock and wipe your device. It also gives instructions to use the volume keys and power buttons to confirm. Select "**Yes**" and press the power button to reboot. When it reboots, you should see an open lock icon under the google logo, indicating that the bootloader is unlocked.

Note: If you have issues with `fastboot` or `adb` not being found, make sure that the Android SDK folder `/platform-tools`, which contains the `adb` and `fastboot` files, are in the path of execution for commands typed at the terminal. Usually typing something like `PATH=$PATH:/your/specific/path/to/android/sdk/platform-tools/` will work for that terminal session.

You'll be using `fastboot` again to install ClockworkMod recovery.

HOW TO BUILD CYANOGENMOD AND CLOCKWORKMOD RECOVERY

So we're going to use the older Cyanogenmod.com wiki instructions as a "base". Only those instructions are for the NookColor (aka "encore"). We're building for the Nexus 7 (aka "grouper"). So whenever you see "encore", just replace it with "grouper".

1. So set up the Android SDK, the build packages, and create the directories as described. Also see http://source.android.com/source/initializing.html which lists needed packages.

2. When you get to the instruction that says to enter...

   ```
   repo init -u git://github.com/CyanogenMod/android.git -b gingerbread
   ```

   ...use **`-b jellybean`** instead of `-b gingerbread` at the end for the jellybean branch.

   December 2012 UPDATE: IF YOU WANT TO BUILD CYANOGENMOD 10.1 (based on AOSP 4.2.1) instead of CyanogenMod 10.0, use **`-b cm-10.1`** instead of **`-b jellybean`**.

3. Now do a `repo sync -j16` per the regular instructions to start the download of all the source code to your computer. the "`-j16`" part means that there will be 16 simultaneous threads/connections. If you experience problems syncing, you can lower this to `-j5` or `-j3` or even just `repo sync` by itself.

   Prepare to wait a long time while the source code downloads.

Helpful Tip! The `repo sync` command is used to update the latest source code from CyanogenMod and Google. Remember it, as you can do it every few days to keep your code base fresh and up-to-date.

4. After the source downloads, type `lunch`. You should see a list of devices, including something like `cm_grouper-userdebug`. Select it by typing its number. If all goes well, you should see that grouper-specific directories are downloaded automatically.

   Helpful Tip! If you get a **command not found** error for `lunch`, be sure you've done the "`. build/envsetup.sh`" command.

5. Now ensure that your Nexus 7 is connected to your computer via the USB cable and that you are in the `~/android/system/device/asus/grouper` directory (you can `cd /android/system/device/asus/grouper` if necessary). And, as indicated in the wiki instructions, run the `extract-files.sh` script:

   ```
   ./extract-files.sh
   ```

   You should see the proprietary files (aka "blobs") get pulled from the device and moved to the right place in the `vendor` directory. If you see errors about `adb` being unable to pull the files, adb may not be in the path of execution.

   Note: It's important that these files are properly extracted and moved to the `vendor` directory. Without them, CyanogenMod will build without error, but you'll be missing important functionality, such as the ability to see anything!

6. A change from the regular CM7 instructions-- You'll need to `cd vendor/cm`, then enter "`./get-prebuilts`" in `vendor/cm` instead of "`./get-rommanager`".

7. If you want to speed up subsequent builds after this one, type:

   ```
   export USE_CCACHE=1
   ```

   Helpful Tip! Instead of typing `cd ~/android/system` every time you want to return back to the root of the source code, here's a short command that will do it for you: `croot`. To use this command, as with `brunch`, you must first do "`. build/envsetup.sh`" from `~/android/system`. Notice there is a period and space (". ") in that command.

8. Time to start building! So now type:

   ```
   croot
   brunch grouper
   ```

The build should begin.

Helpful Tip! If you get a **command not found** error for `croot` or `brunch` or `lunch`, be sure you've done the "`. build/envsetup.sh`" command as described in the regular instructions.

IF THE BUILD BREAKS...

- If you experience this not-enough-memory-related error...

```
ERROR: signapk.jar failed: return code 1

make: *** [out/target/product/grouper/cm_grouper-ota-eng.root.zip] Error 1
```

...you may want to make the following change to:

`system/build/tools/releasetools/common.py`

Change: `java -Xmx2048m` to `java -Xmx1024m` or `java -Xmx512m`

Then start the build again (with `brunch`).

- If you see a message about things suddenly being "killed" for no reason, your virtual machine may have run out of memory or storage space. Assign it more resources and try again.

HOW TO INSTALL THIS STUFF

Assuming the build completed without error (it will be obvious when it finishes), type :

```
cd $OUT
```

in the same terminal window that you did the build. Here you'll find all the files that were created. The stuff that will go in `/system` is in a folder called `system`. The stuff that will become your ramdisk is in a folder called `root`. And your kernel is called... `kernel`.

But that's all just background info. The two files we are interested in are (1) `recovery.img`, which contains ClockworkMod recovery, and (2) `cm-[something].zip`, which contains CyanogenMod.

Installing ClockworkMod Recovery

This is where **fastboot** comes back into play. You'll use it to install the fresh, new ClockworkMod recovery you just built. Then, in turn, you'll use ClockworkMod recovery to install the

`cm-[something].zip` file which contains CyanogenMod.

To install ClockworkMod (replacing whatever was in your recovery partition previously):

1. Connect the Nexus 7 to the computer with the MicroUSB.

2. On your computer, `cd $OUT` in the same terminal you just built to make sure you're in the directory with `recovery.img`

3. On the device, reboot into fastboot mode with the same `adb` command you used previously:

   ```
   adb reboot bootloader
   ```

4. When the system boots into the bootloader, type the following command:

   ```
   fastboot flash recovery recovery.img
   ```

   Assuming your Nexus 7's bootloader is unlocked and that the `fastboot` command is in your path of execution, ClockworkMod recovery should be copied to your device.

5. Use the volume keys on your device to select the "**Recovery mode**" option, and then press the power to boot into recovery.

6. Hopefully you will now be in ClockworkMod recovery!

Installing CyanogenMod

Back to the $OUT directory on your computer-- you should see a file that looks something like:

`cm-10-20120718-UNOFFICIAL-grouper.zip`

1. So connect your Nexus 7 to the computer, start up ClockworkMod recovery and ensure that the /sdcard partition is mounted. Then push the `update.zip` file to your Nexus 7 as follows:

   ```
   adb push cm-10-20120718-UNOFFICIAL-grouper.zip /sdcard/
   ```

2. On the Nexus 7, boot into clockworkmod recovery and **do a full backup of your current installation**.

3. Now you can flash the `cm...zip` file above as usual via clockworkmod's menu.

HOW TO UPDATE TO THE LATEST SOURCE CODE

To pull recent changes and bring your repository up-to-date, just use the `repo sync` command from `~/android/system`.

HOW TO GET HELP

Seek assistance here:

- http://forum.xda-developers.com/showpost.php?p=30547026
  The build it yourself thread on xda-developers' forum

- http://webchat.freenode.net?channels=nexus7
  A helpful, real-time chat room (or "channel") on IRC- the Internet Relay Chat.

For more tips, you might also want to check the build walkthroughs for:

- ***CM9 for HP Touchpad http://kan.gd/1esb***
- ***CM9 for Nook Color http://kan.gd/1of8***
- ***CM9 for Nook Tablet http://kan.gd/1qdx***
- ***CM10 for Nook Color http://kan.gd/1qdw***

Some of the comments may be relevant.

THAT'S IT! CONGRATS AND GOOD LUCK...