Tegra 250 / Tango Hardware Setup and Android Froyo Install Guide

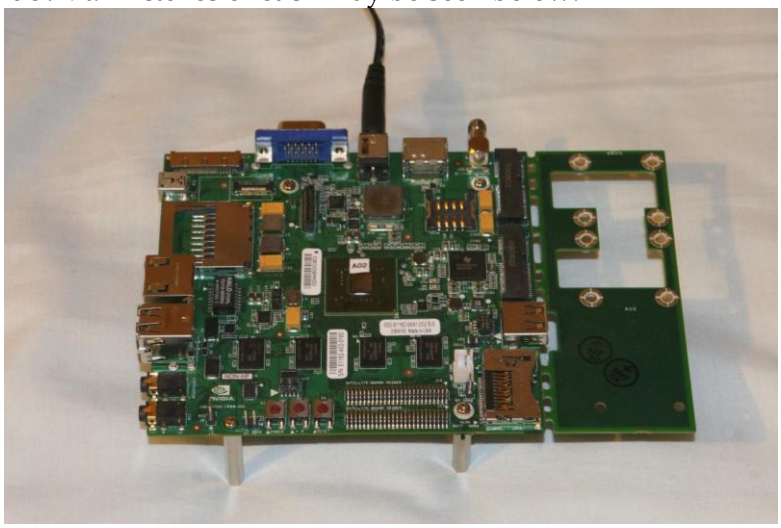
Version 20110207

Contents

Welcome to Tegra

This document describes how to setup a Tegra devkit and flash (install) the Android OS to it. Tegra devkits can be flashed from either Windows or Linux host PCs. Both are described in this document. This document is written for the Tegra 250 / Tango Tegra development hardware and the Android Froyo OS image

These instructions cover the setup of either a "Bare board" Tegra 250 devkit, or the "Tango" touchscreen Tegra devkit. Pictures of each may be seen below:



"Bare Board" Devkit

"Tango" Devkit

STEP 1: Gather Additional Hardware

Gather the following:

- Windows or Linux (Ubuntu 10.04 LTS recommended) based PC with 1 USB port free; ideally with a 2GHz CPU and 1GB RAM
    - You will need to have super-user access to the host PC if it is Linux-based
- USB cable – Type-A to Mini-B
- SD card or USB "thumb" drive is recommended for additional storage (not needed for this guide)

In addition, for the "Bare board" development kit, you will need

- External display supporting VGA (15-pin D-Sub), HDMI, or DVI (via HDMI-to-DVI adapter)
- Cable to connect the external display and the devkit
- USB mouse
- USB keyboard

STEP 2: Unboxing your Devkit

Unpack the components

Bare Board Devkit

- Devkit main board (contains the NVIDIA Tegra chip and several connectors)
- 15V power adapter (USA 120V mains power connection)
- Threaded WiFi antenna
- Expansion board (contains serial port, LEDs, and 3 buttons)

Tango Devkit

- Devkit unit
- 15V power adapter (USA 120V mains power connection)
- Threaded WiFi antenna (may already be attached)

STEP 3: Setup the Connections

Make the basic connections:

Bare Board Devkit

- **Expansion board** – Connect the two ribbon cables of the expansion board to the matching pair of headers on the devkit main board's front edge. Take care to ensure that all of the pins align.

- **Display connection** – Connect your VGA, HDMI, or DVI-D (via an HDMI-to-DVI adapter) display to the appropriate port on the devkit main board's back edge. Connect only one display.

- **WiFi Antenna** – The threaded end of the WiFi antenna should be firmly screwed onto the WiFi antenna connector on the rear edge of the devkit main board.

- **Keyboard and mouse** – Connect the USB keyboard and mouse to the two stacked USB jacks. If the mouse and keyboard are power hungry devices a powered hub is recommended.

- **External storage** – If you have a SD card, insert it into the SD card slot on the left edge of the devkit main board. If you have a USB "thumb" drive, insert it into the USB port on the right side of the devkit main board.

- **Power** – Place the "ACOK" switch, on the front right edge of the board, to "BATT". Connect the supplied 15V power supply to the power jack on the rear edge of the devkit main board.

Tango Devkit

- **WiFi Antenna** – The threaded end of the WiFi antenna should be firmly screwed onto the WiFi antenna connector on the top side of the devkit, if not already attached as supplied

- **External storage** – If you have a SD card, insert it into the SD card slot on the left edge of the devkit main board. If you have a USB "thumb" drive, insert it into the USB port on the right side of the devkit main board.

- **Power** – Connect the supplied 15V power supply to the power jack on the rear edge of the devkit main board.

STEP 4: Install the Android Support Pack

Installing from Windows

Run the Installer MSI:

1) Double-click the .msi file
2) [Click "Next"]
3) Accept the EULA
4) [Select "Complete"] – to install the entire support pack.
5) [Click "Install"]
6) [Click "Finish"]

Installing from Linux

Run the Installer RUN:

1) Open a shell to the location of the installer .run file
2) Execute the .run file
   `sh tegra_froyo_<version>.run`
3) You must read the license using "more" style interaction, quitting when done with "q"
4) You must then accept the license by typing
   `yes<enter>`

The flash pack will be installed to a subdirectory of the CWD named:

```
tegra_froyo_<version>
```

STEP 5: Flash the Devkit with the Android OS

Place the DevKit into Recovery Mode:

Bare Board Devkit

1) Press and hold “ForceRecovery” button on the attached expansion board.
2) Press the “ONKEY*” button until the power LEDs (near the center of the main board) light up.
3) Release the “ForceRecovery” button after 1-2 seconds.

Tango Devkit

1) Press and hold “Recovery” button on the short side of the devkit, next to the VGA connector
2) Press the nearby “ONKEY*” button until the power LEDs (near the center of the main board) light up.
3) Release the “Recovery” button after 1-2 seconds.

Flashing from Windows:

Install the Recovery Mode driver:

1) Connect the USB cable from the free USB port (Type-A) on your host PC to the flashing USB port (Mini or Micro USB, not full-sized) on the left-rear corner of the devkit. Referred to as "Development Cable" or "ADB/USB cable".

2) Install the Recovery Mode driver if asked. Use the "install from a specific location" option in the "New Device Wizard" dialog box. It is located here in the directory referred to by:

   Start Menu: All Programs: NVIDIA Corporation: Tegra 250 Android Froyo: Version <XXXXXXXX>: Platform Directory

   In the `usbpcdriver` subdirectory of this platform directory.

   This driver has not been submitted for Windows Logo testing, you may have to click "Continue Anyway" to install the driver. Note that the driver can take up to 5 minutes to install.

Note: Windows 7 may not indicate the new device's presence at times. If it does not:

1) [Press and hold the Windows Key]
2) [Press the Break key]
3) [Release the Windows Key]
4) [Select "Device Manager"] – on the left hand pane of the "System Information" dialog
5) Unrecognized devices will be shown as opened groupings when the "Device Manager" window initially opens. One of these devices should be the devkit. Select it and install the USB driver listed above.

If you receive an error message while installing the driver, see the appendix at the end of this document on ***Troubleshooting the Recovery Mode Driver***.

Flash your OS:

1) Open an Explorer window to the Android OS support pack you installed previously. It has the OS image in it. It should be found here:

   Start Menu: All Programs: NVIDIA Corporation: Tegra 250 Android Froyo: Version <XXXXXXXX>: Platform Directory

2) Select one of three batch files, depending on your display device. See the chart below.

Display Type	Flash Batch Script
CRT, VGA	`nvflash_1gb_crt.bat`
HDMI, DVI (via adapter)	`nvflash_1gb_hdmi.bat`
Tango devkit or bare board devkit if built-in LCD is supplied	`nvflash_1gb_lcd.bat`

3) Double click to run the appropriate .bat file. The flashing process will begin immediately. At the end of a successful flash, remove the USB cable connection to the PC. If you do not, Windows will ask for another driver, please cancel out of the "New Device Wizard". We will install this driver later. The last few lines of a successful flash will look something like this:

```
sending file: bootloader.bin
\ 903580/903580 bytes sent
bootloader.bin sent successfully
sending file: boot.img
| 2529280/2529280 bytes sent
boot.img sent successfully
sending file: system.img
| 79590720/79590720 bytes sent
system.img sent successfully
Press enter to continue:
```

4) The device should have rebooted to the desired video out mode with the Android desktop. If it did not, stop here and see the appendix at the end of this document on ***Troubleshooting the Recovery Mode Driver***.

Flashing from Linux:

Flash your OS:

1) Connect the USB cable from the free USB port (Type-A) on your host PC to the flashing USB port (Mini or Micro USB, not full-sized) on the left-rear corner of the devkit. Referred to as "Development Cable" or "ADB/USB cable".
2) Open a shell to the directory containing the installed flashpack (`tegra_froyo_<version>`)
3) Select and run from the command line one of three shell script files, depending on your display device. See the chart below.

Display Type	Flash Batch Script
CRT, VGA	`nvflash_crt.sh`
HDMI, DVI (via adapter)	`nvflash_hdmi.sh`
Tango devkit or bare board devkit if built-in LCD is supplied	`nvflash_lcd.sh`

4) You will likely be asked to provide your super-user password if you have not already attained "`su`"
5) The output of the flashing script should be extremely similar to the windows output shown in the previous section.

Additional Features of the OS Image

NVIDIA PerfHUD ES Support

The supplied OS images support the latest version of NVIDIA's PerfHUD ES, available from the developer website. However, by default, this support is disabled. To enable it (and later disable it if desired), do the following:

Enable/Disable on Windows Host

1) Open an explorer window to Start Menu: All Programs: NVIDIA Corporation: Tegra 250 Android Froyo: Version <XXXXXXXX>: Platform Directory
2) Navigate to the sub-directory: `perfhud_switch`
3) Ensure that your devkit is connected to the Host PC via ADB
4) Run the `enable_perfhud.bat` batch file, which will enable PerfHUD ES support and reboot your devkit. This support will stay enabled across reboots until manually disabled or the board is re-flashed.

To manually disable PerfHUD ES support, follow these instructions using the `disable_perfhud.bat` script

Enable/Disable on Linux Host

1) Open a shell to the `perfhud_switch` subdirectory of the OS installer pack
2) Ensure that your devkit is connected to the Host PC via ADB
3) Run the `enable_perfhud.sh` script, which will enable PerfHUD ES support and reboot your devkit. This support will stay enabled across reboots until manually disabled or the board is re-flashed.

To manually disable PerfHUD ES support, follow these instructions using the `disable_perfhud.sh` script

OProfile Support

This OS image also supports profiling via the OProfile tool. See the Tegra Developers website (http://tegradeveloper.nvidia.com/tegra/downloads) for details of how to use this profiling tool

Perf Support

The "perf"tool is not supported by this OS image.

Known Issues

The following items are known not to work with this OS image:

- Accelerometer is not supported
- OV5630 camera modules are not supported. Only OV5650 camera modules are supported

Summing Up

Having followed the instructions in this document, you should now be in possession of a devkit that boots to the desired version of Android. If you wish to continue setting up your Host PC to develop Android applications, please follow the Tegra Android Setup Guide, which may be found at http://tegradeveloper.nvidia.com/tegra/downloads, and may indeed be the document that you are currently following at the higher level to set up your system.

Appendix: Troubleshooting the Recovery Mode Driver

Flashing Produces Device Not Found

If running the flash bat file gives the output similar to:

```
C:\Program Files (x86)\NVIDIA Corporation\tegra_froyo_20110207>"nvflash.exe" --bct
flash.bct --setbct --bl bootloader.bin --configfile flash.cfg --odmdata 0x30000011
--create --go
Nvflash started
USB device not foundPress enter to continue:
```

Then try the following:

1) Ensure that the device is connected to the PC via USB
2) Ensure that the device is on and in recovery mode

Open the Device Manager and check under "Universal Serial Bus controllers". You should see:

"NVIDIA USB Boot-recovery driver for mobile devices"

If this device is missing or has an error marker next to it, install or reinstall the driver via the method listed in the following section ***Manually Install the Driver***.

Flashing Halts without Completing

If the flashing process produces the following output similar to:

```
C:\Program Files (x86)\NVIDIA Corporation\tegra_froyo_20110207>"nvflash.exe" --b
ct flash.bct --setbct --bl bootloader.bin --configfile flash.cfg --odmdata 0x300
00011 --create --go
Nvflash started
rcm version 0X20001
System Information:
   chip name: t20
   chip id: 0x20 major: 1 minor: 2
   chip sku: 0x8
   chip uid: 0x0808104842204617
   macrovision: disabled
   hdcp: enabled
   sbk burned: false
   dk burned: false
```

```
   boot device: emmc
   operating mode: 3
   device config strap: 0
   device config fuse: 0
   sdram config strap: 0

sending file: flash.bct
- 4080/4080 bytes sent
flash.bct sent successfully
odm data: 0x30000011
downloading bootloader -- load address: 0x108000 entry point: 0x108000
sending file: bootloader.bin
| 933404/933404 bytes sent
bootloader.bin sent successfully
waiting for bootloader to initialize
```

And then blocks for an extended period of time (more that ~20 seconds). First try rebooting the device ensuring you are in recovery mode and try the flashing procedure again. If this does not succeed, it is possible that you may have a development kit that is not supported by the OS image. Please visit the Tegra developer site and make sure you are downloading an OS image compatible with your development kit (http://developer.nvidia.com/tegra/devkit-start).

Driver Will Not Install

If the driver will not install or produces a "Code 10" error, try manually forcing a removal of the driver:

1) Locate and download the "usbdeview.exe" utility (note that there is a 64 bit version for Windows Vista 64 bit and Windows 7 64 bit) -- we generally recommend using http://download.cnet.com or other "safe" download sites.
2) Install and run usbdeview.exe (for Windows Vista and Windows 7 (32 and 64 bit) you need to right-click on usbdeview.exe and choose "Run as Administrator...").
3) From the list of devices, select all devices named "NVIDIA USB Boot-recovery driver for Mobile devices", and click the Uninstall button in the toolbar.
4) Unplug the USB cable from the Tegra development kit and plug it back in.
5) Place the device in recovery mode again.
6) Follow the Hardware Wizard and reinstall the USB driver (see next section).

Next, follow the ***Manually Install the Driver*** section that follows.

Manually Install the Driver

Connect the device and place it in recovery mode again. When the device wizard shows up:

1) "Can Windows connect to Windows Update..."
   a. Windows does not need to connect to Windows Update
   b. [Click “Next”]
2) "What do you want the wizard to do?"
   a. "Install from a list or specific location (Advanced)"
   b. [Click “Next”]
3) Select "Don't Search. I will choose the driver to install."
   a. [Click “Next”]
4) [Click "Have Disk..."]
5) Browse to where your modified .inf file is, and pick that .inf file specifically. For example, browse to:

   `C:\Program Files\NVIDIA Corporation\tegra_froyo_20110207\usbpcdriver`

   and select:

   `NvidiaUsb.inf`

Note: You must select the "Don't Search" and “Have Disk…” options otherwise Windows will likely select an older driver that is already installed even though it also sees the updated driver you are pointing it at.

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