Android-based boot system

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1 About you

What is your name?
Vlad Victor Ungureanu

What is your email address?
ungureanuvladvictor@gmail.com

What is your eLinux.org wiki username?
ungureanuvladvictor

What is your IRC nickname
vvu, vvu|Mobile

What is the name of your School and in what country?
Jacobs University Bremen Germany, pursuing a BSc in Computer Science

What is your primary language?
Romanian

Where are you located, and what hours do you tend to york?
During the project I will be back in Romania (GMT +2). My working hours are mainly after 10:00 PM but depending on the mentor who is assigned to the project I can be available during the day very easily.

Have you ever participated in an open-source project before?
I participated in Google Code-IN 2011 especially working for FFmpeg, finding bugs and submitting reports. All my work is under the name oanastratulat. List of bugs and patches can be find here. I want to work again close with an open source organization because I am using embedded platform on a daily basis(Raspberry PI and RoBoard for robotics) and I feel that I need to give something in exchange to the community. The status of a user does not satisfy me anymore therefore I would like to contribute within this community so that people can actually make use of my work.

2 About your project

What is the name of your project?
Android-based boot system

Describe your project in 10-20 sentences.What are you making? For whom are you making it, and why do they need it? What technologies will you be using?
The goal of the project is to semi-boot a BeagleBoard from an Android phone/tablet, then use it as an external touchscreen/monitor. The Android device provides the kernel and the root filesystem for the boot and will communicate with the board using ADK. At startup the board will read from from the MMC the MLO, U-Boot and a Linux Kernel. After that the binary, which is the main communication line between the board and the Android device is ran and this tool requests the real final kernel, fs and will kexec the old kernel with

the new one which will result in a fully functionally BeagleBoard but with no display output. To tackle this problem my idea was to capture the framebuffer and send its output over ADK that uses the Android device as a touchscreen/monitor device. On the Android device an app will take care of the ADK input and will render the video on the screen. In the same app the touches will be captured and sent over to the BeagleBoard and emulate the clicks.

This project will be just a kickstart to show the power of the ADK e.g. : sharing internet connection via USB, update the BeagleBoard sw. through USB. The project will be useful for the people that do not have a DVI capable monitor or a DVI-Cape for their boards and want to use an external display. Another case where this system would be useful is for those who have boards running in remote places that log(locally, no internet connection) data and they want to check the state of the device and on the fly send the logs to some server using the internet connection from the Android Device.

During this project I will use a wide range of technologies: for the 1st part of the project I will recompile the kernel and contribute with some modifications, so that the final behavior will be as expected. For the ADK communication path between the board and the Android device I will use C programming to rewrite the ADK-libusb actual implementation to suit my needs. A Java app that will download the required kernel + fs will be done and will work on the Android device to provide them ready when they are sent to the board. Regarding the video output on the BeagleBoard all coding will be done in C and on the Android device there will be a stand-alone Java app that will receive all the frames, render them then capture the touches and send them to the BeagleBoard.

What is the timeline for development of your project? The Summer of Code work perios is about 11 weeks long; tell us what you will be working on each week.

Time Frame	Milestone
12th May - 27th May	A part of my free time I will use to talk to my mentor and read on the technologies/tool I will have to use so I can hit the ground running from the first week of GSoC.
28th May - 4th Jun.	Getting familiarized with the BeagleBoard system, codebase and exploring possibilities how the goal of the project can be achieved.
5th Jun. -11th Jun.	Rewrite ADK-libusb to suit my needs.
12th Jun. - 18th Jun.	Test the code.
19th Jun. - 25th Jun.	Implement ADK downloader + MMC Kernel.
25th Jun. - 3rd Jul.	Test the code.
4th Jul. - 11th Jul.	Implement Android app to provide download service for kernel, fs and send them over ADK.
12th Jul. - 19th Jul.	Test the code and put together the booting procedure from Android device.
20th Jul. - 27th Jul.	Extensively test the system and be ready for midterm evaluation.
28th Jul. - 4th Aug.	Reroute the framebuffer output over ADK to the Android device.
5th Aug. - 12th Aug.	Develop Java app to render the frames received over ADK.
13th Aug. - 20th Aug.	Test the code.
21st Aug. - 28th Aug	Capture touches and send them to BeagleBoard and implement on BeagleBoard a daemon to simulate the clicks.
29th Aug. - 5th Sep.	Test the full code on multiple Android devices(Nexus 7 tablet, Samsung Galaxy Nexus phone, Samsung Galaxy Fit phone, Samsung Galaxy Chat phone, Samsung Galaxy S, S II phones). Maybe more members of the community will test the bundle.
6th Sep. - 13th Sep.	Make code compatible with all the upper devices if bugs will arise.
14th Sep. - 23rd Sep.	Final testing, documentation, packaging and submitting the full work for final evaluation

Convince us, in 5-15 sentences, that you will be able to successfully complete your project in the timeline you have described.

I have made contact with the embedded scene 3 years ago, when I bought my first RoBoard. Since then I have developed several projects that make use of such devices. I find myself fascinated of the power of such tiny boards and how they can influence our lives. I consider myself as an experienced Linux user and C/C++ developer because I am using it actively for the last 5 years. Regarding Java I have build several apps for some school projects but the most important one is an app that interacts with a MySql server and retrieves/stores

data and presenting them in a nice UI. Because I have a strong affiliation to robotics. Together with my father we built a rover which was supposed to be a test device for Google Lunar-X program but ended in a strong personal project. The core of the rover is RB-110, a robotics embedded computer and 3 Arduinos that ensure the communication with the sensors and motors. I have build this robot to be controlled from simple devices that have a web browser with JavaScript support. I consider that this challenge can be seen as a win-win situation both for the organization as well for me. I am sure that during the time of this project I will be able to further refine my programming skills while contributing to the organization's growth. More projects of mine can be seen on my portfolio page VDev.ro.

Progress:
I intent to keep a git repo with all the code I will produce and the according documentation about the project.
I intend to publish the progress on my own website, so other people can see how the project is going and how it gets to a final form.

Deliverables:
A fully boot system from a Android device which later will be used for video output and touch input.

Do you have other obligations from late May to early Aug. ?
I have my final exams starting from 17 May until 2nd of Jun. when I arrive back home and can start working for the project. But apart from that I have no other obligations and would be available from my GSoC work.

3 You and the community

If your project is successfully completed, what will its impact be on the BeagleBoard.org community. Consider who will use it and how it will save them effort.
•The project will be very helpful for those who want to use Android devices as monitors if they do not have boards with DVI output or a DVI-Cape to supply connection with a monitor. Another usage case is updating the software on the Beagle from the phone using its internet connection over ADK. It can be also used to load a debug image on the Beagle and test the board.

What will you do if you get stuck on your project and your mentor isn't around?
I am a very versatile programmer and during development of my various projects I stumbled upon issues that did not have answers directly on the community forums and this taught me how to be creative and overcome the specific problems. Another sources to find some useful answers are IRC/ML where questions are answered by experienced users of the community. In the end Google is another source for information that will help me overcome the difficulties of the project.