Phase 2: True Random Generation on the APQ8060 Dragonboard

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***Abstract*—The abstract goes here.**

I. Introduction

[1]

A. Background

B. Problem Statement

C. Related Work

In the Linux kernel, including the Android kernel, there is an entropy pool. Access to this pool is done through the random device located in /dev/random. If the pool is drained to below 128 bits, then the application reading from the pool will spin until more entropy is added to the pool. There also exists a urandom device which provides “unlimited” entropy. This device uses the same approach as the random device until the 128 bit barrier. At which point the urandom device does not block, but forgoes true randomness and is therefore vulnerable to cryptographic attacks.

In the Google Play Store there exists and application entitled Seeder. The developers of seeder are trying to speed up the Android experience by removing the need to spin on the random device. Their solution is when the random device’s 128 bit limit is reached to pipe the false entropy from the urandom device back into the entropy pool. The developers of Seeder claim this brings the user noticeable speedups in day to day use of the Android Operating System. As this application has been downloaded over ten thousand times in the past 30 days, it is clear that this is an area of interest to the Android user community.

The task of finding true randomness on mobile platforms has been targeted before. In [1], the two main sources analyzed in this paper were the camera and microphone. The authors of this paper were unable to generate definite numbers for random number generation but were able to verify the validity. There were several advantages and disadvantages presented in this paper in regards to the camera as a random number generator. The advantages included the ability to produce considerable entropy even at 5C and with the camera guard closed. However there were also some vulnerabilities, an attacker could use a halogen light bulb to over saturate the CCD to produce only 255 values for R,G, and B. This would highly influence the randomness given by the phone. The microphone’s noise as a source of randomness as

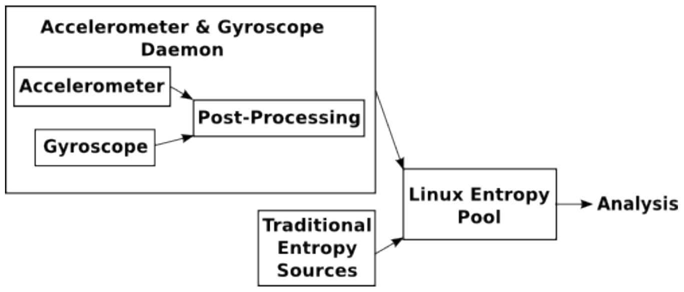

Fig. 1. Block diagram of the proposed solution. Our daemon will poll from the accelerometer and gyroscope (when requested), perform post-processing and feed random bits into the Linux entropy pool via system calls.

II. Proposed Solution

Mobile phones have become diverse systems-on-a-chip, incorporating many types of devices onto one platform. Devices such as touchscreens, cameras, microphones, battery levels, etc. have been investigated as additional sources of entropy on these systems, as they have become ubiquitous. However, a serious drawback of many of these devices is the potential for strong bias; for example, a microphone can be biased by a loud tone that overwhelms the sensor and causes it to generate the same saturated values for subsequent samplings. Being able to strongly influence these devices is a serious cryptographic concern - as such, it is important to find a device or devices that can produce high-quality random numbers at fast bitrate.

As discussed in [**?**], accelerometers are a good candidate for this role. Because of the highly sensitive nature of accelerometers, they are resistant to a variety of potential sources of bias. J. Voris et. al. provide a detailed discussion of this resistance, showing that most attempts to produce bias actually increase the randomness of the device. They show that even at its lowest entropic level (when the accelerometer is at rest on industrial dampening material), it still produces high-quality randomness. Additionally, gyroscopes are another potential source of entropy as they are designed to achieve the same level of sensitivity. Thus, both of these devices are attractice ways to add high quality randomness into the entropy pool.

We propose implementation and analysis of a daemon that, when awoken, reads from the accelerometer and the gyroscope, performs post-processing to increase the quality of the data and adds the data to the entropy pool. We will analyze the daemon in regards to power consumption, quality of the random numbers generated, and speedup of random number generation. Figure 1 shows the overall architecture for our daemon. It will perform device polling and post-processing to produce data, then will use system calls to add entropy into the Linux entropy pool. Finally, various synthetic and real-world benchmarks will be used to analyze the speed of random number generation, quality of generated numbers, and power draw from using the daemon.

A. *Figure*

B. *Motivation*

C. *Expectations*

III. Plan for Development

IV. Conclusion

The conclusion goes here.

Acknowledgment

The authors would like to thank...

References

[1] Jan Krhovjak and Petr Svenda. The sources of randomness in mobile devices. 2007.