

This will be a cool title

Will Dietz, Kevin Larson, Shivaram Venkataraman
University of Illinois at Urbana Champaign

1 Introduction

In recent years, virtual machines have become prevalent in cluster computing environments [1] as they lower power costs and help in conserving data center space. Hardware improvements have meant that smart phone configurations found today resemble desktop machines from few years ago and many of them run commodity operating systems. There is a growing interest in academia [11] and industry [5] about the virtualization on these devices. We believe that virtualization can provide better security guarantees in mobile devices and enable useful applications like environment migration.

Mobile devices today run many third party applications to perform complex tasks like web browsing, banking and gaming. Recent studies have found that smartphones are the target of an increasing number of malware attacks [9], [3], [4] and their security is important as personal data such as contacts, credit card numbers and passwords are often stored on the device. While some security models [2] provide a stronger process level isolation among applications, operating system bugs [6] can still allow malicious applications to take over the device. We believe that virtualization can be useful for secure isolation of third party code from confidential data and provide a greater defence-in-depth against attacks on the system.

Environment migration has been studied earlier, in the context of servers in a cluster [10] and enables administrators of clusters to perform maintenance tasks without interruption. Migrating an OS to a mobile device can be useful as it can take advantage of network or computation facilities that are closer to the user's location and provide the user with a consistent experience irrespective of the network connectivity.

1.1 Existing Work

Currently, there are many solutions available for virtualization on desktop environments. VMware is a popular closed source solution which implements a variety of virtualization techniques and is used in both industry and academia. KVM [12], QEMU [8], and XEN [7] are all open source solutions, implementing their own assortments of virtualization techniques. Unfortunately, none of these solutions (without massive modification) is appropriate for a mobile

environment.

There are various mobile solutions; however, most of these projects don't value portability very highly. As a result, one of the main advantages of a mobile platform is lost. The Columbia Android paper prioritizes performance and security at the cost of usability and portability. They disable the Android's runtime stack, sacrificing a large portion of the usability of the phone. Another solution, MobiVMM [13], focuses on power efficiency and security. Similarly to the Columbia Android project, the usability is sacrificed in order to further other goals.

1.2 Our solution

We intend to improve upon the existing mobile virtualization solutions through superior usability. By integrating with the host OS and building upon the existing user experience and bring added value to existing devices. A primary goal of ours is compatibility with existing x86 and x11 applications such that upon our project completion we can immediately take advantage of the vast quantity of applications that already use these. We also provide emulation which appears to the user to be at the application level, making it simpler conceptually to work with. Our biggest contribution is the way we bring live migration into this. This is the most novel part of our program.

2 Timeline

3 Evaluation plan

4 Anticipated results

References

- [1] 16 percent of workloads are running Virtual Machines. <http://www.gartner.com/it/page.jsp?id=1211813>.
- [2] Android Security and Permissions. <http://developer.android.com/guide/topics/security/security.html>.

- [3] Cyber-criminals target mobile banking. <http://www.v3.co.uk/vnunet/news/2173161/cyber-criminals-target-mobile>.
- [4] iPhone privacy. http://seriot.ch/resources/talks_papers/iPhonePrivacy.pdf.
- [5] Mobile Phones, The Next Frontier. <http://blogs.vmware.com/console/2009/08/mobile-phones-the-next-frontier.html>.
- [6] Vulnerability Summary for CVE-2009-2692. <http://web.nvd.nist.gov/view/vuln/detail?vulnId=CVE-2009-2692>.
- [7] P. Barham, B. Dragovic, K. Fraser, S. Hand, T. Harris, A. Ho, R. Neugebauer, I. Pratt, and A. Warfield. Xen and the art of virtualization, 2003.
- [8] F. Bellard. QEMU, a fast and portable dynamic translator. In *ATEC '05: Proceedings of the annual conference on USENIX Annual Technical Conference*, pages 41–41, Berkeley, CA, USA, 2005. USENIX Association.
- [9] A. Bose and K. Shin. On Mobile Viruses Exploiting Messaging and Bluetooth Services. *Securecomm and Workshops, 2006*, pages 1–10, 2006.
- [10] C. Clark, K. Fraser, S. Hand, J. Hansen, E. Jul, C. Limpach, I. Pratt, and A. Warfield. Live migration of virtual machines. In *Proceedings of the 2nd conference on Symposium on Networked Systems Design & Implementation-Volume 2*, page 286. USENIX Association, 2005.
- [11] L. Cox and P. Chen. Pocket Hypervisors: Opportunities and Challenges. In *Eighth IEEE Workshop on Mobile Computing Systems and Applications, 2007. HotMobile 2007*, pages 46–50, 2007.
- [12] Qumranet. Kernel-Based Virtual Machine. [Online], 2009. Available: <http://linux-kvm.org>.
- [13] S. Yoo, Y. Liu, C.-H. Hong, C. Yoo, and Y. Zhang. Mobivmm: a virtual machine monitor for mobile phones. In *MobiVirt '08: Proceedings of the First Workshop on Virtualization in Mobile Computing*, pages 1–5, New York, NY, USA, 2008. ACM.