

Cells: A Virtual Mobile Smartphone Architecture

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ABSTRACT

Smartphones are increasingly ubiquitous, and many users carry multiple phones to accommodate work, personal, and geographic mobility needs. We present *Cells*, a virtualization architecture for enabling multiple virtual smartphones to run simultaneously on the same physical cellphone in an isolated, secure manner. *Cells* introduces a usage model of having one foreground virtual phone and multiple background virtual phones. This model enables a new device namespace mechanism and novel device proxies that integrate with lightweight operating system virtualization to multiplex phone hardware across multiple virtual phones while providing native hardware device performance. *Cells* virtual phone features include fully accelerated 3D graphics, complete power management features, and full telephony functionality with separately assignable telephone numbers and caller ID support. We have implemented a prototype of *Cells* that supports multiple Android virtual phones on the same phone. Our performance results demonstrate that *Cells* imposes only modest runtime and memory overhead, works seamlessly across multiple hardware devices including Google Nexus 1 and Nexus S phones, and transparently runs Android applications at native speed without any modifications.

Keywords

Android, Smartphones, Virtualization

Categories and Subject Descriptors

C.0 [Computer Systems Organization]: General-System architectures; D.4.6 [Operating Systems]: Security and Protection; D.4.7 [Operating Systems]: Organization and Design; D.4.8 [Operating Systems]: Performance; H.5.2 [Information Interfaces and Presentation]: User Interfaces-User-centered design; I.3.4 [Computer Graphics]: Graphics Utilities-Virtual device interfaces

General Terms

Design, Experimentation, Measurement, Performance, Security