mPaaS: Delivering Mobile Platforms as a Cloud Service

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With the increasing ubiquity of smart-devices, demand for isolated userspaces for business, personal, development, or mobility has grown significantly. The need for such isolation, without the troubles of carrying separate devices, has motivated recent solutions such as Cells [2] and VMWare [3], which allow users to run multiple isolated virtualized phones on a single device. The user may switch between virtual phones (VPs) with the flick of a button, but one must note that these VPs still share the same device resources. Furthermore, maintaining isolation of user space, ensuring security, and enabling hardware (HW) sharing between VPs on the same device requires either substantial kernel changes (Cells [2]) or bears a significant performance overhead (MVP [3]).

We propose to combine two simple ideas to overcome these limitations: (1) cloud augmentation and streaming capabilities of modern day online gaming services, for example Gaikai [1], which demonstrate quick responses to user input; (2) virtualization of phone operating systems based on ARMv7 infrastructure, which can enable one to multiplex the same phone hardware across different virtual phones. We abstract mobile architecture into three layers: **Platform layer**, to run the mobile OS virtually on the cloud by simulating device hardware; **Hardware layer**, which refers to the mobile client device and runs a VM app to interface with the cloud phone; and **Interface layer**, to segregate the functionality of client devices from virtual phone OS. The interface layer consists of the following: (1) the set of user/kernel level processes running over both cloud platforms and mobile client; (2) the *Cloud Bridge*, which exists on the cloud, to interface between virtual phones running on the cloud and the client device; and (3) the underlying network infrastructure.

Our approach, termed mPaaS, offers several advantages over traditional mobile architecture, as well as recent in-device virtualization solutions.

Flexibility: User has the option of using multiple mobile platforms concurrently, as well as using disparate OS for different scenarios (business/personal/development). Like any other service, a mobile user can also try beta versions of newly launched platforms over his own device before purchase. All mobile platforms based on ARMv7 instruction sets could be supported (includes Android, iOS, Windows, Ubuntu) [3].

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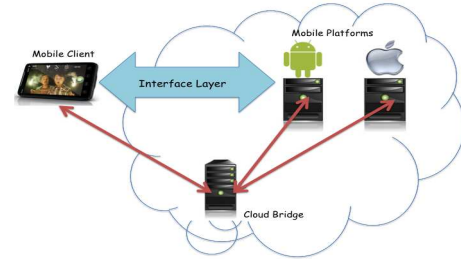†sgrover3@gatech.edu, Georgia Tech

Figure 1: Delivery of mobile platform as a cloud service. User interacts with mobile client which communicates with cloud platforms via a cloud bridge.

Scalability: User is provided limitless computational prowess over the cloud, and there is no limit to the number of mobile platforms he/she wants to interface with. This also ensures similar or better performance of applications when running over the virtual OS.

Elasticity: User is provisioned computational resources elastically ensuring availability of additional resources when required.

Security: User is ensured protection of one mobile platform's resources against malicious programs running over another compromised platform, but not at the cost of user flexibility.

Simplicity: Enables the use of unmodified mobile platform images over the same VM without any changes in the OS. Modifications at the client end are limited to installing a new application that communicates with the cloud bridge present on the cloud, and streams the virtual phone to the device.

Manageability: Features for admins to remotely manage device access policies, provision resources, software updates, and file management. The model encourages a a natural service-based pricing model.

Both the authors are students and the presentation will be accompanied by a short demo. We plan to demonstrate basic functionalities of the cloud bridge enabling virtualization of mobile sensors.

References

[1] Gaikai: www.gaikai.com.

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[3] K. Barr, P. Bungale, S. Deasy, V. Gyuris, P. Hung, C. Newell, H. Tuch, and B. Zoppis. The vmware mobile virtualization platform: Is that a hypervisor in your pocket? *SIGOPS Oper. Syst. Rev.*