An Approach to Improve Security on Clone of Mobile Device during Augmented Execution

Yash Dave, Gordhan Jethava

Abstract: ***The goal of cloud computing is usage of cloud resource form anywhere i.e. mobility. Mobile cloud computing, new technology in the field of cloud computing enables cloud users to access cloud from their mobile devices (e.g. Laptops, PDA, Smartphone's). Computation power and battery life is one of the major issues of these mobile devices. Now a day's resource starved applications like online HD graphics games, multimedia, etc. needs more bandwidth and computation power that mobile device might not have. So to overcome this problem clones of mobile devices are created on cloud servers. This clone uses resources of the cloud servers. Using augmented execution all complex applications run in this clone and response is sent back to mobile device. This can save battery life for low configured mobile devices. This paper shows how to improve the synchronization between mobile device and clone to communicate more reliably in terms of improving security.***

Index Terms: Augmented execution, clone, cloud computing, mobile cloud computing.

I. INTRODUCTION

Cloud computing provides models that provides resources like computing power, memory, bandwidth, etc. as a service to cloud subscribers. There are lot many cloud providers in the market e.g. Google, Amazon, SalesForce.com etc. This model enables cloud users to subscribe their required business applications which are available for all time existed on cloud. It is easy to handle such these applications and it needs very little care to maintain providing advantage that your computer and mobile device are sync all the time [1]. Cloud users can have all personal data on their hand at any point of time. Cloud also enables user to deal their data in any form without worrying about the data loss. Also now a day people are opting for pervasive computing because mobile applications are growing very quickly as they can do all the stuff they wanted to be on hand. Up till now the technology has remodeled many times. Also mobile device has high speed connectivity with high configured machines like laptops and personal computers to commercial cloud. Applications are deployed on the server and response is sent back to the server. Also there are lot many mobile browsers available thanks to Opera, Google and Apple that motivates cloud users to use the cloud space from their mobile devices such as laptops, palmtops and smart phones [2]. Also this motivates mobile developers to develop their application that can be hosted on cloud. This is why now mobile apps are being developed that will be connected to cloud all the time.

Revised Manuscript Received on March, 2013.

Asst. Prof Yash Dave, Information Technology Department, Parul Institute of Engg. & Tech.

Prof. G.B.Jethava, HOD Information Technology Department, Parul Institute of Engg. Tech.

Unlike the cloud computing which offers the freedom to use applications which are hosted on cloud through wired connection, mobile cloud targets at the services available through mobile network providers (MNP like Vodaphone, AirTel) [3]. Think about those apps we can run our smart phones like online bill payment, online recharge your mobile balance, railway inquiry, GPS systems, gaming etc. This attracts mobile users to switch on to subscribe mobile cloud.

II. SOLUTION CATEGORIES OF MOBILE CLOUD COMPUTING

A. General purpose mobile cloud computing (GPMCC)

Using GPMCC concepts [4], cloud infrastructure helps to improve the performance of mobile device. Mobile device should have label to access the cloud applications or specific resource in an on-demand fashion [3]. Many individual applications can be used to do this, but why not to use these resources in more general purpose fashion so that limited computational power of mobile devices is alleviated. Thus the tasks which were locally being computed are now computed on cloud infrastructure and response is sent back to mobile devices. By these way computer resources of the remote computers is leveraged and no need to develop specific applications for that purpose.

B. Application specific mobile cloud computing (ASMCC)

In ASMCC [4] specific applications are developed for mobile devices which employ cloud computing [3]. Applications like sky drives or online file converting apps need ASMCC because internet is used as the communication resource and not only for storage or additional computational power. ASMCC has the ability to make mobile devices a more powerful computing device and provide use of many applications.

III. AUGMENTED EXECUTION FOR SMART PHONES

A clone is a hardware or software system that performs the same task as the system of which clone is created. Clone Cloud brings the power of cloud computing to your smart phones flawlessly.

Chun, Ihm, Maniatis and Ashwin [5] introduce the idea of improving the performance of hardware limited smart phones by using their proposed clone cloud architecture. Using augmented execution through cloning in which virtual clones of smart phone are created in neared computers or cloud servers and heavy computation are deployed on clone and response is sent back to mobile device.

So they off load execution from smart phone to a computational infrastructure hosting a cloud of smart phone clone. Advantage of this concept is if the smart phone is lost or damaged the clone can be used as a backup. Another advantage is that hardware limitation of smart phone is overcome – task is transferred to high computation devices in the cloud. It also makes the developer job easy as there are no or few modifications needed to their applications.

A. Types of augmented execution

There is very broad range of the scope of augmented execution. In this section, authors have dictated the categories [4] of types of augmentation in Figure (a). We discuss how to achieve such augmentation in the next sections.

I. Primary functionality outsourcing

Computation-hungry applications such as speech processing, video indexing, and super-resolution are automatically split through dynamically partitioning of application fundamentals[6], so that the user-interface and other low-octane processing is retained at the smart phone, while the high-power, expensive computation is off-loaded to the infrastructure, synchronously. This is similar to designing the application as a client-server service, where infrastructure provides the service (e.g., the translation of speech to text), or as a thin-client environment.

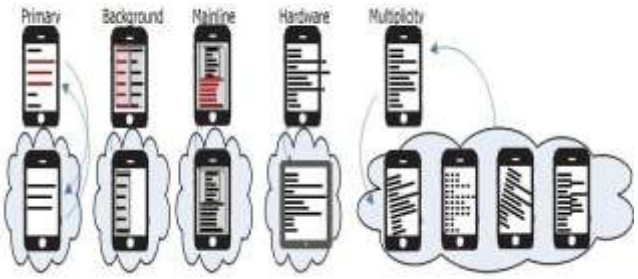

Figure (a): Types of augmented execution

II. Background augmentation

Differing from primary functionality outsourcing, this category deals with functionality that does not need to interact with users. Functionality that typically happens in the background, such as analyzing photos for common faces, scanning the file system for viruses, indexing files for faster search , crawling news web pages, etc. In this case, entire processes can be marked (by the user or by the programmer) or automatically inferred as "background" processes, and migrated to the infrastructure wholesale. Furthermore, off-loaded functionality can take on the role of a "virtual client." Even when the smart phone is turned off, the virtual client can continue to run background tasks. Later when the smart phone returns online, it can synchronize its state with the infrastructure.

III. Mainline augmentation

It can be categorized between primary functionality outsourcing and background augmentation [6]. User may choose to run a particular application in a wrapped fashion. Here the method of its execution is altered but its semantics remains unchanged. Examples like private-data leak detection (e.g., to taint-check an application or application set), fault-tolerance (e.g., to employ multi-variant execution analysis to protect the application from transparent bugs), or debugging (e.g., keep track dynamically of allocated memory in the heap to catch memory leaks).

IV. Hardware augmentation

This category is unique because it rectifies for fundamental weaknesses of the smart phone platform, such as low memory or other constraints, and hardware abnormality.

V. Augmentation through multiplicity

This category we consider is interesting in that it uses multiple copies of the system image executed in different ways. This can help running data parallel applications (e.g., doing indexing for disjoint sets of images).

IV. PROPOSED ARCHITECTURE

Work asks about two modules to be implemented. One is android application, second dalvik virtual machine. Figure (b) shows proposed architecture of work.

Virtual machine of mobile device is created on server or any other highly configured computer. This virtual machine is also known as clone of mobile device. Simple definition of clone is mirror image of original device, which will work similar as the original device.

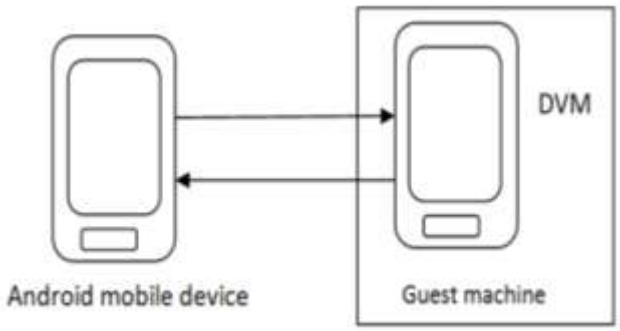

Figure (b): Proposed architecture

This clone of mobile device will use the resources of the computer on which it is created that is heavy configured computer. The clone will execute the process which requires heavy resources to execute. Now clone of mobile device evaluates the output of that process through executing it and response it back to mobile device.

V. IMPLIMENTATION AND RESULTS

Proposed work uses android mobile device as a mobile device user that will augment an application which user has marked for augmented execution. The choice of application augmentation is depend on user or it can be programmed previously.

This work uses Dalvik virtual machine (DVM) that will be instantiated on either on webserver machine or on nearer highly configured computer for which they have to connect in network. DVM will perform all the executive tasks that need to perform as a clone of mobile device. Android mobile device will send all data that need to be executed on VM. This will avoid execution on mobile device and improves battery life and optimize task execution as it will be executed on highly configured pc or on server.

Then DVM sends response back to android mobile device. There are many applications which can be performed by these methodologies e.g. face recognition, taint checking, scanning for viruses etc. If we persist DVM on webservice we can use it as mobile device's backup. Because all the data of mobile device is be on in VM.

Android Debugger Bridge (adb) is used to execute tasks through Dalvik virtual machine. To execute tasks automatically on guest machine combination of java programming and socket programming is used to send – receive data. Work improves security by authenticating VM created on guest machine. This will save our mobile device from VM to VM attack. Any adversary cannot enter in environment.

The work improves ability of execution of a mobile phone as it will be executed in highly configured environment. Also we provide authentication to clone at response time so no other can pretend to our clone can enter in mobile phone environment.

VI. CONCLUSION AND FUTURE WORK

Future of mobile cloud is very bright. Lot many developing still need to be done on security of mobile cloud computing. By using augmented execution concept we can provide mobile devices high configured device power and also we can save low battery life of mobile device. In this paper I have improve the security of synced mobile device and clone of mobile device in terms of authentication. In future we can provide access control to the clone to limit their access in mobile devices.

Augmented execution of mobile device through cloning is very good concept to improve computing power of mobile devices. The care needs to be taken that this clone must be authenticated and authorized to deploy mobile devices' data not being intruder that can gain can access of mobile device and harm mobile device system and its user.

As I set communication between mobile device and clone of mobile device, in future further enchantement will be interms of improving communication channel between them. This imporvement will be either in terms of security cocerns or interms of imporving data transfer between mobile device and mobile clone.

REFERENCES

1. "Mobile Cloud Computing: The Future of Cloud" by Pragya Gupta1, Sudha Gupta in International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 1, Issue 3, September 2012
2. "Mobile cloud computing as future for mobile application implementation, methods and challenges issues" by Shahryar Shafique Qureshi, Toufeeq Ahmad, Khalid Rafique, Shuja-ul-islam in Proceedings of IEEE CCIS2011
3. Challenges in Securing the Interface between the Cloud and Pervasive Systems" by Brent Lagesse in Oak Ridge National Laboratory.
4. "Augmented Smartphone Applications Through Clone Cloud Execution" by Byung-Gon Chun and Petros Maniatis in Intel Research Berkeley
5. "CloneCloud: Elastic Execution between Mobile Device and Cloud" by Byung-Gon Chun, Sunghwan Ihm, Petros Maniatis, Mayur Naik and Ashwin Patti in EuroSys'11, April 10–13, 2011, Salzburg, Austria
6. "ThinkAir: Dynamic resource allocation and parallel execution in cloud for mobile code offloading" by Sokol Kosta, Andrius Aucinas, Andrius Aucinas, Richard Mortier and Xinw.
7. "SnowFlock: Rapid Virtual Machine Cloning for Cloud Computing" by H. Andrés Lagar- Cavilla, Joseph A. Whitney, Adin Scannell, Philip Patchin, Stephen M. Rumble, Eyal de Lara, Michael Brudno, M. Satyanarayanan in University of Toronto and Carnegie Mellon University en Zhang in Google's 2011 Q2 earnings call.
8. Technical Report- "Analysis of Dalvik Virtual Machine and Class Path Library".
9. http://code.google.com/p/android-dalvik-vm-on-java/wiki/Tutorial1