Grids of Android Mobile Devices

Mir Muhammad Juno, Ali Raza Bhangwar
Department of Computer System Engineering, QUEST
Nawabshah, 67480, Pakistan
Email:{mir.juno,arbaloch}@quest.edu.pk

Asif Ali Laghari
Department of Information Technology, QUEST
Nawabshah, 67480, Pakistan
Email: asifalilaghari@gmail.com

***Abstract*—In this paper we have proposed grid of android mobile devices to utilize free resources when students in class and employers are busy in work. When CPU usage is peak for processing Android mobiles consumes more battery power and battery power ends within few hours. We proposed basic algorithm to overcome battery power problem and make android mobiles devices useful for grid computing. These grids provide facility to researcher in universities and in industries to use resources for completion of those tasks which requires high computational power.**

I. Introduction

Due to depth research in new technologies and analysis of large amount of data, researchers need high computational resources for processing their tasks. Previously, individual or group of researchers cant afford high cost for high performance computing devices to complete their tasks. While cluster computing was introduced to achieve high performance computing using low end computers but wasnt much efficient due to lake of network management techniques and difficulty of managing all machines at same location [4]. Grid computing discovers resources from remote nodes having different Operating Systems and network topologies and combines their computational power by managing those resources at single central machine [2]. In grid computing, Globus toolkit software is responsible for managing resources of nodes on central server and client version is responsible to control remote nodes [3]. There are different types of grids used for high performance computing which may varies according to size, location, topology and organization type. Free grids provide free usage of resources shared by clients to be used for high performance tasks while commercial grids provide access on payment. The problem is that in public sector such as Universities of Pakistan, are having limited resources which results difficultly in managing grids.
Mobiles devices with new operating system of Android (open source) are very popular in developers and end users [7]. Android is Linux based operating system launched by Google in 2007[13]. Android operating system has advance features and application support compare to other mobile operating systems. Due to free source code of Android it gains high strength in industry and provide free architectural support for new hardware. Android operating system architectures depends on different layers show in fig 1, each layer of architecture provide different services for application processing [8]. Linux kernel is basic layer of android operating system architecture which provides abstraction between hardware and software. Linux kernel version 2.6 few changes made by Google, provide drivers of hardware like Wi-Fi, Bluetooth and other devices. The next layer is

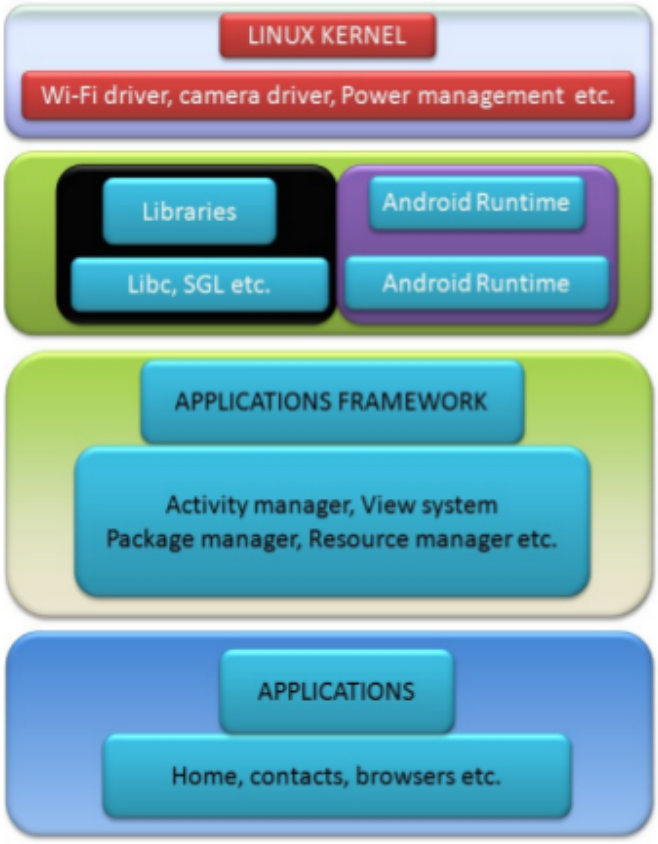

Fig. 1. Android architecture model

libraries of Android operating system hold different data types which are written in C, C++, these libraries also provides support different formats in runtime [9]. End user applications directly interact with application framework layer, this layer manages basic operations like voice call management, and resource management etc. Application framework layer is basic building block for application developers [8, 9]. The final layer is applications which contain application for end users like, multimedia players, web browsers and SMS client applications. End users directly interacts this layer to operate devices for particular purpose.

Nowadays mobiles with android operating system having high computational power for application processing contain open source operating system. The open source facility of operating system provides advantage to researcher utilize

978-969-9825-9/13/$30

Fig. 2. System Overview [1]

computational power of android devices and a developer has opportunity to develop applications for devices. The paper organized as: section II based on literature review, section contains III and IV contains proposed methodology and proposed algorithm respectively and finally section IV concludes this paper.

II. RELATED WORK

Researcher [1] have connected six mobile devices (fig 2) and developed a cluster using MPI (Message Passing Interface) in lab test. All mobile devices were on charging during the experiment because if power fails then that device will be disconnected from cluster and information part that was being processed will be lost.

Another author proposed taxonomy of Grid workflows management [10]. The taxonomy characterized in four sections of workflow design, workflow scheduling, fault management and data movement. GLOA algorithm presented an author named Zohra Pooranian [12], GLOA algorithm schedule the jobs/tasks on the grid computing. Comparison of simulation results of GLOA algorithm takes least makespan and it waste less time for computation than other algorithms [11]. Resource co-allocation model proposed by author [12], the virtual agent is used for resource allocation to provide maximum benefit to resource provider. This provides QoS in terms of budget, deadline maximization of resources [12].

Android mobile devices that have high processing power but having limited battery time for operating. In this paper we have proposed grid of android mobiles using wireless network to facilitate high performance computing which also provide a solution for battery time in basic algorithm.

III. PROPOSED METHODOLOGY

In Universities, during the lectures students dont use their android mobile devices similarly in industries and stores; mostly employees are busy doing their job so their mobile phones are in idle state which results low utilization of resources at that time which can be used to create a grid to comply the need of high performance computing.
Proposed grid can be implemented in two ways, one way is using short area using Wireless LAN [6] in university campus area or in an organization and second way is using WiMAX internet resources in wide area [5]. In WiMAX owner have to pay more charges for the service but that device will be connected most of the time with grid but in WLAN, owner have to pay small or no charges for the service but have short range which may result disconnection if owner is travelling.
While, Android mobiles consumes more battery when their CPU processing is increased so user have to sacrifice battery timing to its resource. Due to battery charge ends during the running of grid migrated process then it will very expensive for high performance computing because a part of work may be lost which can result deadlock condition. The proposed algorithm provides a solution of battery timing of nodes those are part of grid and in future this algorithm may be part of Globus toolkit.

IV. PROPOSED ALGORITHM

- Step 1. Check battery status and resources of all devices available in grid.
- Step 2. Acknowledge central management system about battery status and resources of nodes connect to grid.
- Step 3. If battery of a node is charged less than 50% then dont use that node for computation.
- Step 4. If battery of a node is charged above then 70% then shift process(es) to devices for processing.
- Step 5. If the battery of device is now at 20% of charge which is still running process(es) then send alert to grid central management system.
- Step 6. Shift process(es) to another nearby idle node.

V. CONCLUSION

This paper contains novel solution for utilization free resources of android mobiles in form of grid. This type of grids may help to facilitate high performance computing by utilizing resources of idle devices using wireless connectivity (wifi, WiMAX, 3G and 4G) in Universities and industries. The battery utilization algorithm will be useful for the grid developer to obtain resources shared voluntarily from Android devices owners.

REFERENCES

[1] F. Busching, S. Schildt, and L. Wolf, "DroidCluster: Towards Smartphone Cluster Computing–The Streets are Paved with Potential Computer Clusters." In Distributed Computing Systems Workshops (ICDCSW), 2012 32nd International Conference on, pp. 114-117. IEEE, 2012.

[2] D. Lee, "IP-Paging base Resource Management and Task Migration in Mobile Grid Environments." International Journal of Grid and Distributed Computing 3, no. 3 (2010): 29-40.

[3] T. Yun, P.J. Rhodes "A Fast Location Service for Partial Spatial Replicas", Grid Computing (GRID), 2011 12th IEEE/ACM International Conference on, On page(s): 190 - 197.

[4] L.A. Laranjeira, "NCAPS: Application high availability in UNIX computer clusters." In Fault-Tolerant Computing, 1998. Digest of Papers. Twenty-Eighth Annual International Symposium on, pp. 441- 450. IEEE, 1998. Laranjeira, Luiz A. "NCAPS: Application high availability in UNIX computer clusters." In Fault-Tolerant Computing, 1998. Digest of Papers. Twenty-Eighth Annual International Symposium on, pp. 441-450. IEEE, 1998.

[5] Dziyauddin, A. Rudzidatul, K. Dritan, and D. Angela, "Channel-and delay-aware scheduling and packet dropping for real time traffic over WiMAX networks." In Vehicular Technology Conference (VTC Fall), 2012 IEEE, pp. 1-5. IEEE, 2012.

[6] H. Maniza, A. Damodaram, "Resource discovery in wireless, mobile and ad hoc grids Issues and challenges," Advanced Communication Technology (ICACT), 2011 13th International Conference on , vol., no., pp.502,505, 13-16 Feb. 2011.

[7] http://www.openhandsetalliance.com/android_overview.html

[8] http://www.edureka.in/blog/beginners-guide-android-architecture/

[9] http://www.android-app-market.com/android-architecture.html

[10] Y. Jia, and B. Rajkumar, "A taxonomy of scientific workflow systems for grid computing." Sigmod Record 34, no. 3 (2005): 44-49.

[11] Z. Poornian, M. Shojafar, J. H. Abawajy, and M. Singhal. "Gloa: a new job scheduling algorithm for grid computing." IJIMAI 2, no. 1 (2013): 59-64.

[12] P. Xiao, D. Liu, and X. Qu. "Three-side Gaming Model for Resource Co- allocation in Grid Computing." Journal of Software 7, no. 9 (2012)

[13] Gandhewar, Nisarg, and Rahila Sheikh. "Google Android: An emerging software platform for mobile devices." International Journal on Computer Science and Engineering 1.1 (2010): 12-17.