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RESOURCE ALLOCATION USING ENTROPY BASED FIFO METHOD IN MOBILE CLOUD COMPUTING

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ABSTRACT

The cloud computing provides services to the users through the internet. The mobile cloud is internet based data, applications and related services accessed through smartphones, laptops and other portable devices. The combination of cloud computing, wireless communication, portable computing devices is called mobile cloud computing which allows users an online access. But the mobile cloud computing have some issues like power consumption, resource poverty and security. In this paper we propose an entropy based FIFO method to allocate resources to the mobile devices.

Keywords: Resources, Entropy, FIFO, Threshold, time period

1. INTRODUCTION:

Cloud computing is a type of computing that relies on *sharing computing resources* rather than having local servers or personal devices to handle applications. In cloud computing, the word cloud (also phrased as "the cloud") is used as a metaphor for "*the Internet*," so the phrase *cloud computing* means "a type of Internet-based computing," where different services -- such as servers, storage and applications -- are delivered to an organization's computers and devices through the Internet. The mobile cloud is Internet-based data, applications and related services accessed through smartphones, laptop computers, tablets and other portable devices. Mobile cloud computing is differentiated from mobile computing in general because the devices run cloud-based Web apps rather than native apps. Users subscribe to cloud services and access remotely stored applications and their associated data over the Internet.

1.1 Importance of Mobile Cloud Computing:

1.1.1 Mobile cloud computing is big in size: At the end of 2009, mobile phones were four billion. By 2013, that number is projected to grow to 6 billion. That is many times the number of personal computers. And when we start including in the mobile world other Internet capable devices, like eBook readers, photo frames printers, photo and video cameras, personal navigators, the numbers go way up. Small portable devices that can access information are already part of everyday life for hundreds of millions of people in the developed world. Also, many hints point to the fact that developing countries will be using the mobile cloud before they get to the 'regular' one. Just as Free/Libre Open Source Software played a major role in the growth of the Internet and cloud computing, sparking issues about openness and freedom, the Free Software movement has the potential to provide a similar yet different impact on mobile cloud computing.

1.1.2. Mobile cloud computing is a need – form factor and other needs: By definition, mobile devices that access the Internet are performing mobile cloud computing: handsets need to borrow storage and computing power from the cloud because of their limited resources or because it makes more sense. For example, consider modern wireless car navigators, like the Dash: these devices not only can store locally the maps and calculate routes, but they rely on the cloud to get real time information about traffic conditions and plan the routes accordingly. Accessing data in the cloud from mobile devices is becoming a basic need.

1.1.3. Mobile cloud needs interoperability: Mobile cloud services are largely dominated by vendor specific walled gardens, and debate is not as intense as one would expect given the numbers of cell phone users. Probably this is due to the fact that not only Free Software powered mobile phones are still a minority, but also installing new software on phones was not an option for the mass market until recently. After iPhone and Android, with more and more 'application stores' emerging, the issue of mobile users' freedom is showing up. Users of one handset, for example, may want to get their email from a provider but sync pictures with another. Or if they buy music from a digital store from the desktop computer, they want to sync their playlists with any phone. A minimum requirement is interoperable services implementing open standards, because users' data must be preserved at all costs. Proprietary walled gardens create small monopolies that sometimes grow big and take away personal data from the users. Consider these recent cases that demonstrate that users of mobile cloud services are exposed to serious problems. Palm Pre owners cannot access the music that they bought and stored in Apple's iTunes: Apple still wants to own the music it sold its users and keep their data hostage. Similar risks are run by owners of Amazon Kindle, who had their purchased books deleted too easily by Amazon from the devices. The recent fiasco with Microsoft losing people's data is the opening act of how we've all learned that data is not necessarily safe in a proprietary cloud. If one of the world's premier software companies cannot be trusted to keep people's data safe, who can be trusted? Furthermore, do people really want Microsoft, Google et

al to access all their data? With the cloud in general and in particular, the mobile cloud (because you want your mobile data backed up), it is more important than ever that people have the full ability to access and preserve their data, which means the open mobile cloud. These are just visible signals of proprietary services battling to own user data. If iTunes and Microsoft used interoperable and open standards, which could be safely implemented in free/libre open source software, their users would not face these problems.
1.1.4. Mobile cloud largely depends on locked-down devices: Network operators don't want users to be too free, so most of them prevent users to run applications that are not digitally signed. RIM, Apple and to some extent, Symbian devices are locked down, which renders users' freedom in the mobile cloud a balancing act: on one hand a developer needs to obey the rules dictated by network operators and device manufacturers; on the other hand the same developer needs to find ways to deliver freedom to users. In Funambol's case, for example, the official iPhone client can only sync contacts because the official Apple SDK only allows that. Nonetheless, the Funambol client for iPhone can also sync calendars by accessing directly the SQLite database, but this version cannot run on the device unless it is unlocked (breaking Apple's warranty).
1.1.5. Mobile cloud is an opportunity for free software providers: With so many new mobile devices hitting the market, billions of new users have the issue of freedom for the software on the device and freedom in the mobile cloud. The Free Software community has the opportunity to participate in the mobile cloud debate and shape this new environment. Ignoring the issues posed by the mobile cloud risks excluding a large number of digital citizens from the benefits that free software has brought to other computer users. The mobile cloud is an open territory where many vendors are already fighting to lock-in users. Resting on the cloud and network services, free and open source software should rely on licenses that prevent abuse. Fortunately, the Free Software Foundation has contributed a very good tool to bring freedom to the cloud. By extending its reach to interaction over a network, the Affero GPL v3 (AGPLv3) is very effective at bringing copy left to the services offered by cloud computing. Some people have had the chance to use open source software to offer services to the public, without returning anything to the community. That's taking open source software as free beer. It is just not being honest with the community, to the people who sweat to write the code to see someone running away with it and not contributing anything. Using the AGPLv3 for all software that can be used over a network is a smart way to start building a mobile cloud that respects user's freedom.

2 .RELATED WORK:

In [1] "An Auction Mechanism for Resource Allocation in Mobile Cloud Computing Systems" by Yang Zhang, Dusit Niyato, Ping Wang , first model the resource allocation process of a mobile cloud computing system as an auction mechanism with premium and discount factors. The premium and discount factors indicate complementary and substitutable relations among cloud resources provided by the service provider. Then, we analyze the individual rationality and incentive compatibility (truthfulness) properties of the users in the proposed auction mechanism. The optimal solutions of the resource allocation and cost charging schemes in the auction mechanism are discussed afterwards.
In [2] "Entropy-Based Grouping Techniques for Resource Management in Mobile Cloud Computing" by Ji Su Park, Eun young Lee, groups are classified according to the availability and mobility to manage reliable resource. The mobile devices has been grouped by measuring the behavior of mobile devices and calculating the entropy in order to avoid faults in the mobile cloud computing. In [3] "Energy Saving in Mobile Cloud Computing" by Rahman first presents the research scope and classified issues in energy saving in mobile clouds. Then, it reviews the existing research results and techniques, and examines their strengths and weaknesses. Finally, the paper offers observations, and identifies the open issues and needs for future research.
In [4] "A QoS-Constrained Resource Allocation Game in Federated Cloud" by Xu, Xin ; Yu, Huiqun ; Cong, Xinyu propose a cooperative game algorithm that helps the resource allocation decision-making process with a flexible resource amount of the total federation. This algorithm also takes the QoS constraints into account and provides two different approaches for cost-sensitive or time-sensitive customers. Simulation results show that the proposed algorithm improves various QoS requirements and increases the satisfaction level of customer's requests.
In [5] " A resource scheduling model for cloud computing data centres" by Abu Sharkh, M. propose a new model to tackle the resource allocation problem for a group of cloud user requests. This includes provisioning for both data center computational resources and network resources. The model is implemented with the objective of minimizing the average tardiness of connection requests. Four combined scheduling algorithms are introduced and used to schedule virtual machines on data center servers and then schedule connection requests on the network paths available. Of the four methods, the method combining Resource Based Distribution technique and Duration Priority technique have shown the best performance getting the minimum tardiness while complying with the problem constraints.
In[10][9] The utilization of computational resources is managed through accessing various services from Virtual Machine (VM) resources. A single service accessed from VMs running inside such a cloud platform may not

cater the application demands of all surveillance users. Services require to be modeled as a value added composite service. In order to provide such a composite service to the customer, VM resources need to be utilized optimally so that QoS requirements are fulfilled. In order to optimize the VM resource allocation, we have used linear programming approach as well as heuristics. The simulation results show that our approach outperforms the existing VM allocation schemes in a cloud-based video surveillance environment, in terms of cost and response time.

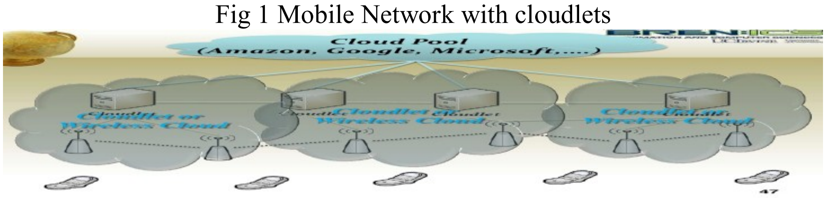
In [7] Mobile Community Cloud Platform (MCCP) as a cloud computing system that can leverage the full potential of mobile community growth has been proposed. An analysis of the core requirements of common mobile communities is provided that supports building and evolving of mobile communities. In [8] A concrete framework and categorization of the various ways of supporting mobile client-server computing for information access has been proposed. The characteristics of mobility that distinguish mobile client-server computing from its traditional counterpart have been distinguished. A comprehensive analysis of new paradigms and enabler concepts for mobile client-server computing, including mobile-aware adaptation, extended client-server model, and mobile data access has been provided.

In [6] An optimal cloud resource provisioning (OCRP) algorithm is proposed by formulating a stochastic programming model. The OCRP algorithm can provision computing resources for being used in multiple provisioning stages as well as a long-term plan, e.g., four stages in a quarter plan and twelve stages in a yearly plan. The demand and price uncertainty is considered in OCRP. In this paper, different approaches to obtain the solution of the OCRP algorithm are considered including deterministic equivalent formulation, sample-average approximation, and Benders decomposition. Numerical studies are extensively performed in which the results clearly show that with the OCRP algorithm, cloud consumer can successfully minimize total cost of resource provisioning in cloud computing environments.

3. PROPOSED METHOD:

Recently, research on utilizing mobile devices as resources in mobile cloud environments has been gaining attention because of the enhanced computing power of mobile devices, with the advent of quad-core chips. Such research is also motivated by the advance of communication networks as well as the growing population of users of smart phones, tablet PCs, and other mobile devices. This trend has led researchers to investigate the utilization of mobile devices in cloud computing. However, mobile devices have several problems such as characteristics of the mobility, low memory, low battery, and low communication bandwidth. Especially, the mobility of mobile device causes system faults more frequently, and system faults prevent application using mobile devices from being processed reliably. In this method the resources has been allocated to the mobiles based upon the entropy and FIFO. The entropy has been calculated based upon the formula $E(M_i)= -(t/M)\log_2(t/M)$ Where t is the time at which the mobile has sent a request to the cloudlet and M is the total number of mobile devices in a cloudlet. A threshold value will set. After calculating the entropy for each mobile the threshold value will be checked. If the mobile satisfies the threshold the requested application will be provided otherwise it will be kept in queue. If more than one mobile device satisfies the threshold then based upon the FIFO the application will be served.

Fig 1 Mobile Network with cloudlets



Consider M1,M2…..M10 be ten mobile devices in a cloudlet trying to access three applications A1,A2,A3 from the cloudlet. If too many mobile devices request the same application then there will be resource poverty. To avoid that we calculate the entropy for each mobile device which is requesting the application.

Table 1 Mobile devices with Applications

M	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
A	A1	A2	A3	A2	A1	A2	A3	A3	A1	A2

Where M is the mobile devices and A is the applications. The mobile devices M1, M5, M9 are requesting the application A1 .M2, M4, M6, M10 requesting A2 and M3, M7, M8 requesting A3. Assume threshold value as 0.5. Consider the time periods for mobile devices as

Table 2 Mobile devices with Time period

M	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
t	3	2	5	4	6	7	6	9	8	9

Where M represents mobile devices and t represents time period. Now for application A1, A2, A3 calculate the entropy values .The values are shown in the table.

Table 3 Applications with Entropy Values and time periods

APPLICATIONS	MOBILE DEVICES	ENTROPY	TIME PERIOD
A1	M1	0.5	3
	M5	0.4	6
	M9	0.3	8
A2	M2	0.5	2
	M4	0.5	4
	M6	0.4	7
	M10	0.1	9
A3	M3	0.5	5
	M7	0.4	6
	M8	0.1	9

For A1,the mobile device M1 is satisfying the threshold value so the application will be allocated to M1 , other devices will be kept in a queue. Similarly for A3, M3 is satisfying the threshold value so A3 will be allocated to the device M3.But for A2, more than one mobile is satisfying the threshold so here we consider FIFO .The device M2 has requested the application first so it will served first and the remaining devices will be served later. So that we can reduce the resource poverty.

4. CONCLUSION:

In this paper we have proposed an entropy based FIFO method to allocate resources to the mobile devices to reduce the resource poverty .In future we can also extend this method for storage.

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