

Towards Clouds M-Commerce with Priority Based Resources Allocation (CMPRA) Algorithm

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Abstract:

Cloud computing is one of the popular topics on information technology like E-commerce; which is affected by the use of cloud computing as a communication network tool. Cloud resources should be available for rent by its users; this could be achieved by resource allocation strategies. This work presented the integration between our previous e-business multilayer structure and clouds with resources allocation priority algorithm; in Cloud M-commerce Priority Resource Allocation (CMPRA) algorithm.

Keywords: Cloud Computing, E-commerce, Resource Allocation, Priority, CMPRA.

الملخص

الحوسبة السحابية من المواضيع الحديثة في تكنولوجيا المعلومات، ويمكن استخدامها كوسيلة اتصال في بيئة الاعمال الالكترونية. بشكل عام توفر الحوسبة السحابية امكانية استئجار مصادر من قبل مستخدميها. ولذلك يجب ان توفر صفة الاتاحة لهذه المصادر وبمرونة عالية. ولتحقيق ذلك يجب استخدام خوارزميات تتيح امكانية تخصيص المصادر وبشكل كفوء لارضاء كافة مستخدمي الشبكة. هذا العمل يقدم تطوير لفكرة بيئة اعمال الكترونية تم اقتراحها مسبقا من خلال ربطها مع الحوسبة السحابية مع امكانية تخصيص المصادر التي يتم طلبها او استئجارها من قبل مستخدمي الشبكة و ذلك من خلال خوارزمية CMPRA.

Introduction

E-business is a popular web application that serves multiple types of users for different kinds of services. It's the exchange of products and services by internet [1]. From business point of view, cloud computing help in reducing the cost of infrastructure and maintenance [2].

Many business companies do not have enough resources nor infrastructure to use e-commerce solutions, hence many e-commerce systems are developed as distributed applications [3].

Cloud Computing

The services cloud computing can save the cost of IT infrastructure in organization [2].

Cloud's benefits, are:

1. No cost for hardware upgrades.
2. On demand dynamic flexibility.
3. Availability of data and services with a level of protection.
4. Less hardware requirements for cloud clients.
5. Get internet and be part of cloud.
6. No need for crash-recovery.
7. Centralized data storage with monitoring ability [3].

Cloud's drawbacks, are:

1. Cloud performance affected with internet speed.
2. High cost of data center subscription
3. Low data security.

The application mode of cloud computing is divided into three parts:

1. Infrastructure as a Service (IaaS).
2. Platform as a Service (PaaS).
3. Software as a Service (SaaS).

Those are the types of services for the cloud application.

IaaS's responsibilities are: manage computing resources, responsible of building on demand ad hoc system for costumers, and resource allocation ability.

PaaS responsibility is providing platform to run customer's system.

SaaS responsibility is to run applications globally by users of the cloud; like on line word processor.

According to the previous three types of services for the cloud, hence we can have three types of clouds; those are: Infrastructure cloud, platform cloud, and application cloud [4].

There are multiple models for cloud computing environment, those are:

1. Public cloud; it's the traditional type of cloud computing where all resources are available for allocation over the internet.
2. Private cloud; its related to a single organization, without sharing ability of its resources. Its managed either internally or by third-party and protected by firewall.
3. Hybrid cloud; also called virtual cloud, it's a combination of two or more different types of clouds; this type gets benefits of the compound models [5].

Cloud computing is not a new computing mode; it's the development of traditional distributed computing [1] and [15].

E-Commerce and Cloud Computing

In past, e-commerce workers had to buy all the hardware and software that they need to do e-commerce business successfully. With cloud help the e-commerce workers can rent the IT products and services; in on demand way. The most famous technical architecture is the (charging mode); pay-as-service for its flexibility, because it helps e-commerce company for its resource whenever they are needed [1].

Cloud computing improved e-commerce architecture from technical side; because all IT resources such as: hardware, software, data, and network application's, are all stored on the cloud platform in the form of services. But as cloud suffers from security issues then

e-commerce data will not be save from attackers, hence customer's privacy will not be save also [1].

There are several factors that lead to the combination between e-commerce and cloud computing, like: Demand, Efficiency, Policy, and Quality [1].

Resource Allocation and Scheduling (RAS)

Resource Allocation (RA) related to IaaS part of cloud computing, it's one of the major issues for clouds. RA simply means allocating resource to the cloud's user, who requested that resource [1]. There are various factors to be considered when choosing the suitable RA algorithm. Those are:

1. Performance: the application should provide a good service to the cloud's user.
2. Response Time: the application must respond in short time.
3. Reliability: Unreliable systems cause users changing it to another one.
4. Availability: whenever there is a request for resource allocation then it should be done in short time.
5. Security: on line transaction application need to be secured more than other applications.
6. Throughput: maximize the number of applications that run per unit of time. [6]

When a request is made for the cloud's resource, it should be approved directly in the same way of providing electricity for rent. [6]

The next section describe the most related previous work for the environment of cloud computing and m-commerce with resource allocation strategies. The later section present the proposed idea of this work then its implementation and conclusion then ended with references.

Related Work

[7] and [14]

Produced a review paper for resource allocation in cloud computing, this review contained multiple allocation algorithms like: Ant Colony, Bee Colony, Priority, and Bin-Packing; with the main features and drawbacks for each algorithm; But no comparison between them and without proposing any optimization or enhancement.

[8]

Also contained a review for various methods; with constraint on two main strategies; Ant colony optimization algorithm, a dynamic resource method called CDA (Continuous Double Action), TARA (Topology Aware Resource Allocation), and Dynamic Resource Allocation for Parallel Data Processing with general lines about the advantages and limitation of resource allocation in cloud.

[9]

Proposed a new strategy called Collaborative Autonomic Resource Management System (CARMS) that integrated with their previous work "Planet Cloud". Their

CARMS with the information-base for getting the necessary information about the requested cloud; their work contained experiment results for calculation the average execution time of application versus different number of nodes.

[10]

The paper presented a modified bees algorithm; known as Bees Life Algorithm BLA; for job scheduling in hybrid clouds. The work depends on using two types of queues; i.e.: non-primitive priority queue model, and global queue model. The work contained experiment results for comparing two other algorithms (FA as Firefly Algorithm, and GA as Genetic Algorithm) to show that BLA need less makespan.

[11]

Produced an optimized Max-Min task scheduling algorithm in cloud computing with theoretical analysis and gantt chart for the proposed algorithm.

[4]

Produced the idea of combine e-commerce with cloud computing, but without any suggestions for new integration ideas.

[12] and [1]

Produced the idea of m-commerce with mobile cloud environment, with proposing a cloud based m-commerce architecture for using mobile cell phones to get the application as icon. This cloud could be used to analysis the market behave to make new decisions based on data analysis.

[3] and [2]

Proposed new framework for e-commerce cloud computing with multiple application but it was just a general talk and did not discuss the resource allocation problem and it could be solved after this kind of integration.

[16] and [17]

We had proposed new e-business architecture built from six layers; from top: E-Business layer (L1), E-Commerce layer (L2), E-market layer (L3), Secured Software layer (L4), Transport layer (L5), and Data Management layer (L6). And in the same work we proposed how to construct a new secured communication channel called STAM related to layer four.

Later we developed our work by proposing a new approach for secured information retrieval called SDM related to layer six.

However, the proposed multilayer approach is still under construction and needed much work to fix all its parts.

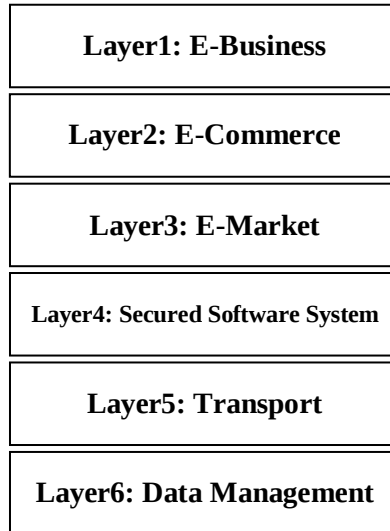


Figure (1): Enhanced E-Business Layered Architecture [10]

Proposed Idea

In this work we proposed a new algorithm called Cloud M-commerce Priority Resource Allocation (CMPRA) that deals with layers: two, three, and five in [16] and [17]. CMPRA contains four layers [3], as follows:

Layer one: Interface Layer

This layer deals with Virtual Machines (VM); this strategy is used in resource allocation work for cloud computing. There will be a virtual network of virtual machines that are flexible to work with different infrastructures. This virtual environment is flexible in relocation itself with its resources, with some limitation in scheduling process [13]. The idea of VM appended to solve the problem of resource allocation, where number of requests is more than available resources, so there will be on demand virtual resources created for each request with virtual machines, and then every VM will be mapped to its Physical Machine (PM) [6].

Layer two: Middleware Layer

Contains two parts: software resource part and resource management part; the first part deals with e-commerce application embedded in the cloud; while the other part deals with resource allocation and scheduling (RAS) algorithms.

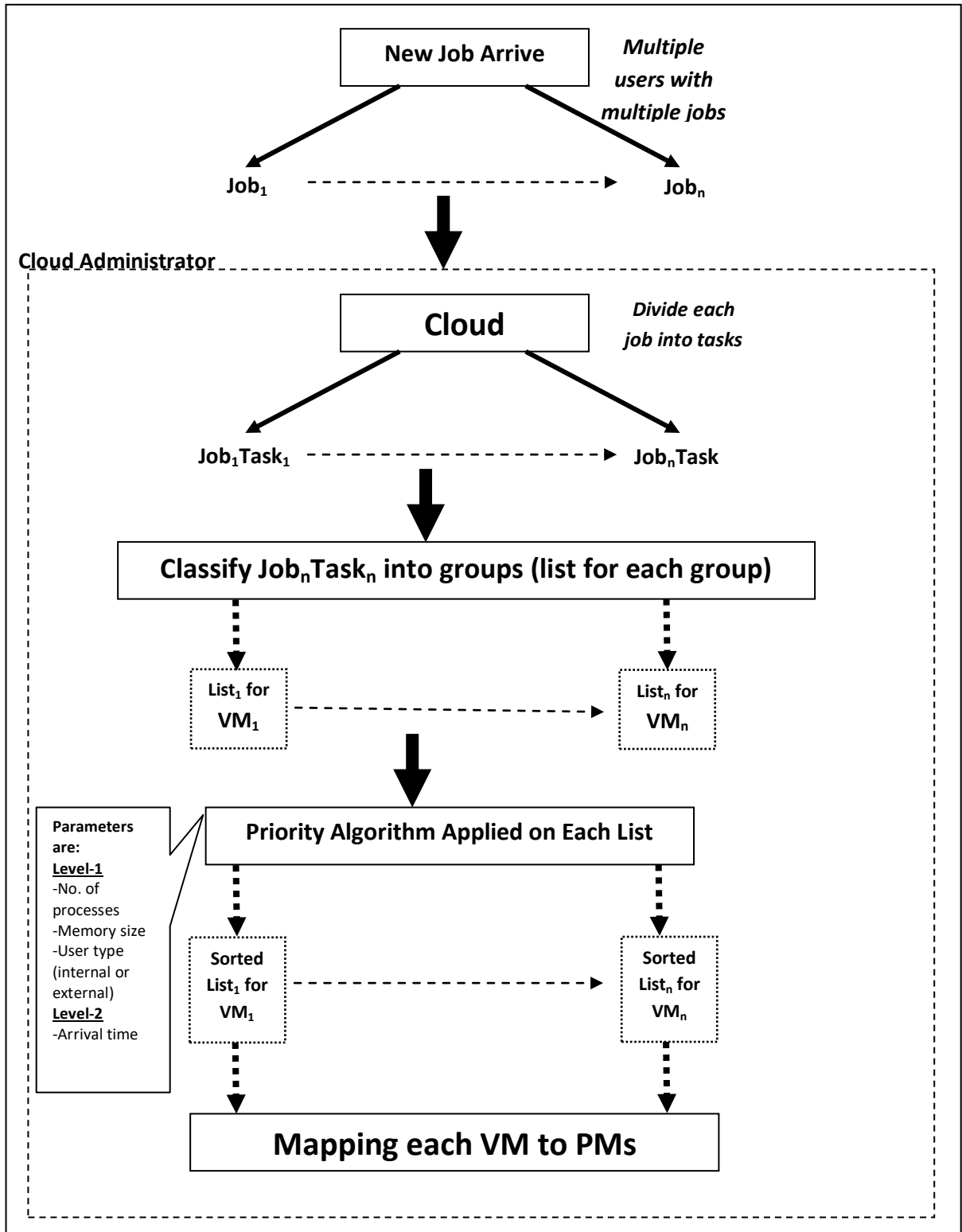


Figure (3): Cloud M-commerce Priority Resource Allocation (CMPRA) algorithm

Implementation and Results

The proposed scheduling algorithm; CMPRA; had been implemented using Visual Basic as a programming language, the results saved by text files for future use. From the following figure we can see that there are two levels; i.e. user level and admin level. In the first level the user decides how many jobs are needed to be executed, and for each job the number for its tasks, later the details for each task should be entered and saved after choosing the button “submit task”. Hence the admin level will list the results for sorting each group that contains multiple tasks for same job or different jobs.

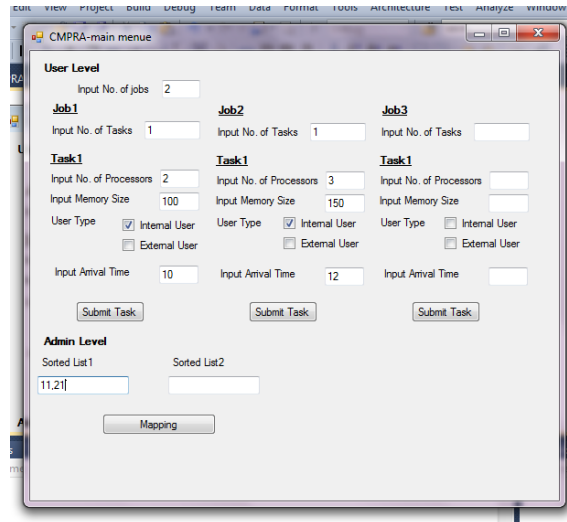


Figure (4) : CMPRA

Suppose that we had two jobs with multiple tasks for each job (Job1:Task1, Task2, Job2:Task1, Task2, and Task3) with the following details for each job;

Job-no.	Task-no.	Processor-no.	Execution Time	Memory size as total for all Tasks	User type	Arrival time	Job's Priority (as processor no.)	Job's Priority (as memory size)
Job1	Task1	1,2	10,15	60 from 100	Internal	0	2	2
Job1	Task2	2	14	40 from 100	Internal	1	1	1
Job2	Task1	1,2,3	10,7,9	50 from 150	Internal	2	5	4
Job2	Task2	1,3	8,4	60 from 150	Internal	3	3	5
Job2	Task3	3,2	10,16	40 from 150	Internal	4	4	3

Table (1) : Priority algorithm for CMPRA – all details

Processor1	Processor2	Processor3	Priority1	Priority2
$J_1T_1=10$	$J_1T_1=15$		2	2
	$J_1T_2=14$		1	1
$J_2T_1=10$	$J_2T_1=7$	$J_2T_1=9$	4	5
$J_2T_2=8$		$J_2T_2=4$	5	3
	$J_2T_3=10$	$J_2T_3=16$	3	4

Table (2): Priority algorithm for CMPRA – concluded

Hence, we will calculate the average waiting for each task as we consider it as a process when its executed by the CPU. The following are the details for the calculation:

Classification according to Processor-Numbers

Gantt Chart (Processor1)	$J_1T_1=10$	$J_2T_1=10$	$J_2T_2=8$		Average Time=10	Waiting
Gantt Chart (Processor2)	$J_1T_2=14$	$J_1T_1=15$	$J_2T_3=10$	$J_2T_1=7$	Average Time=20.5	Waiting
Gantt Chart (Processor3)	$J_2T_3=16$	$J_2T_1=9$	$J_2T_2=4$		Average Time=13.6	Waiting

Classification according to Memory-Size

Gantt Chart (Processor1)	$J_1T_1=10$	$J_2T_2=8$	$J_2T_1=10$		Average Time=9.3	Waiting
Gantt Chart (Processor2)	$J_1T_2=14$	$J_1T_1=15$	$J_2T_3=16$	$J_2T_1=7$	Average Time=22	Waiting
Gantt Chart (Processor3)	$J_2T_2=4$	$J_2T_3=16$	$J_2T_1=9$		Average Time=8	Waiting

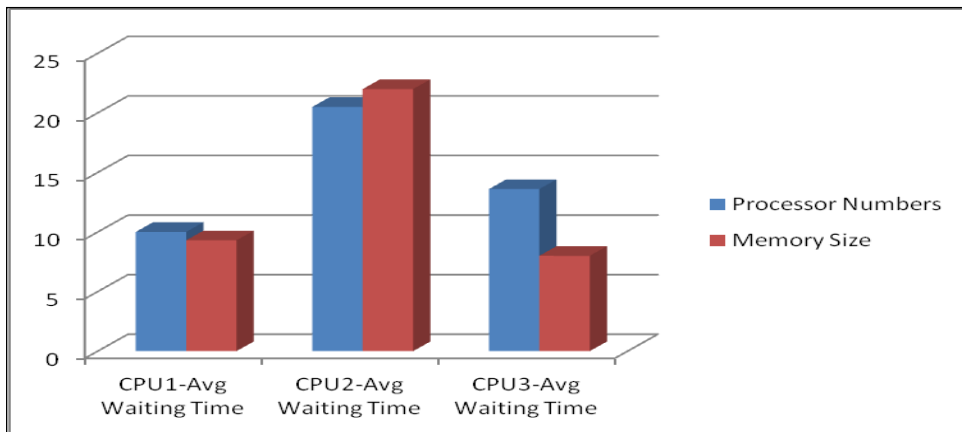


Figure (5): CMPRA's Priority average waiting time

Figure5 shows the results for the average waiting time for two types of priority classification; according to number of processors needed for each job, and according to the needed memory size.

Conclusion

Cloud computing is a new technology that optimize e-business work; it allows sharing resources over any communication network. In cloud computing environment different resources are needed. Hence, enhanced resource allocation strategy will always be needed to get the work done in a ways that satisfy all cloud's users. This work presented the integration between our previous work that introduced a malty layer e-business structure and cloud computing as a network connection with the use of priority based algorithm for resource allocation strategy.

Mainly, we found that scheduling according to needed memory size would result less waiting time for executed processes. For future work, we can use other scheduling algorithms and compare the results.

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