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(54) Title: A METHOD AND SYSTEM OF EXTENDING COMPUTING GRID RESOURCES

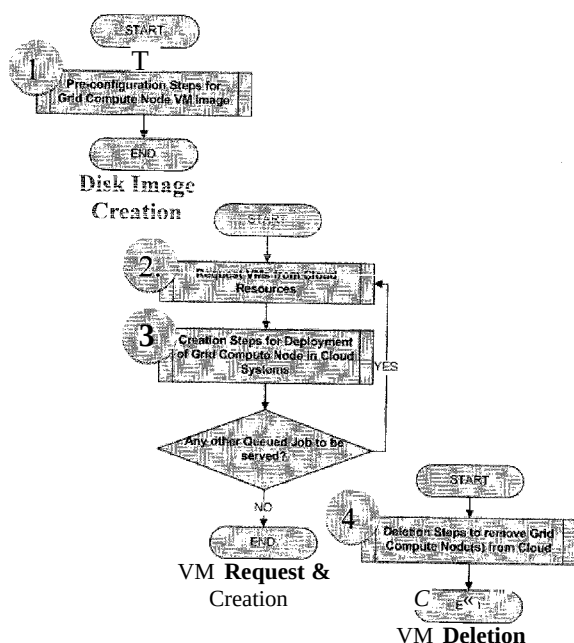


Figure 3

(57) **Abstract:** A method of extending computing grid resources by deploying virtual machines (VM) is provided, the method includes the steps of configuring at least one grid computing image in a cloud system, requesting at least one virtual machine from the cloud system, deploying a plurality of grid computing nodes in a cloud environment and removing the plurality of grid computing nodes from the cloud environment.

(84) **Designated States** (unless otherwise indicated, for every *Mnd of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.1 7(H))*

Published:

— *with international search report (Art. 21(3))*

A METHOD AND SYSTEM OF EXTENDING COMPUTING GRID RESOURCES

FIELD OF INVENTION

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The present invention relates to a method and a system of extending computing grid resources by deploying virtual machines (VM).

BACKGROUND OF INVENTION

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Long wait times for queued jobs when physical server nodes are fully utilised are an issue. When grid resources are fully utilised, new jobs are queued until resources become available. Jobs criteria include batch, sequential, workflow and parallel jobs. However, this entails delays in processing said jobs.

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US 7577722 B1 describes monitoring a status of a set of hosts platforms by obtaining a new identifier different from a model virtual machine identifier that identifies the staged VM. However, this solution relies on a threshold value before re-evaluating usage of resources which may inadvertently still result in delays.

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US 20080059556 A1 describes a virtual machine hypervisor logic executable on nodes with computer processor and physical memory. However, there is no emphasis on interoperability of systems in this prior art.

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Therefore, there is a need for a solution that resolves the waiting issue of queued jobs due to hardware capacity restriction while taking into account interoperability issues.

SUMMARY OF INVENTION

Accordingly, there is provided a method of extending computing grid resources by
5 deploying virtual machines (VM), the method includes the steps of configuring at least
one grid computing image in a cloud system, requesting at least one virtual machine from
the cloud system, deploying a plurality of grid computing nodes in a cloud environment
and removing the plurality of grid computing nodes from the cloud environment.

10 Further, there is provided a system of extending computing grid resources by deploying
virtual machines (VM), the system includes at least one Resource Manager, at least one
VM Manager network connectible to the Resource Manager and at least one Cloud
Controller in communication with the Resource Manager wherein the system is used for
cloud applications through life cycle.

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The present invention consists of several novel features and a combination of parts
hereinafter fully described and illustrated in the accompanying description and drawings,
it being understood that various changes in the details may be made without departing
from the scope of the invention or sacrificing any of the advantages of the present
20 invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be fully understood from the detailed description given herein below and the accompanying drawings which are given by way of illustration only, and
5 thus are not limitative of the present invention, wherein:

Figure 1 shows a block diagram of interactions between hardware/network layer in Grid and the IaaS layer in Cloud in the present invention;

Figure 2 shows a conceptual diagram of communications and interactions between Grid and Cloud;

10 Figure 3 shows a flowchart that illustrates a method of extending computing grid resources by deploying virtual machines (VM) in the preferred embodiment of the invention;

Figure 4 shows a block diagram of a system comparison between Prior Art and the present invention;

15 Figure 5 shows a flowchart of configuration steps for Grid Compute Node VM image(s) in the preferred embodiment of the invention;

Figure 6 shows a flowchart of Request Virtual Machine(s) from Cloud Resources in the preferred embodiment of the invention;

Figure 7 shows a flowchart of Creation Steps for Deployment of Grid Compute Node in
20 the preferred embodiment of the invention; and

Figure 8 shows a flowchart of Deletion Steps to remove Grid Compute Node(s) from Cloud in the preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention relates to a method and a system of extending computing grid
5 resources by deploying virtual machines (VM). Hereinafter, this specification will describe
the present invention according to the preferred embodiment of the present invention.
However, it is to be understood that limiting the description to the preferred embodiment
of the invention is merely to facilitate discussion of the present invention and it is
envisioned that those skilled in the art may devise various modifications and equivalents
10 without departing from the scope of the appended claims.

The following detailed description of the preferred embodiment will now be described in
accordance with the attached drawings, either individually or in combination.

15 Figure 4 illustrates a diagram of interactions between a system and other components
with which the system is designed to interface which shows a difference of the present
invention and prior art.

The VM Manager is the core component of the present invention which consists of two
20 modules namely, the VM Request & Creation, and the VM Removal. The Resource
Manager selects and sends queued job information to the VM Manager. Based on the
queued job information, the VM Request & Creation requests the additional number of
virtual machines from the Cloud system. The Cloud system corresponds by returning the
virtual machines' IP address and hostname to the VM Manager. Subsequently, the virtual
25 machines are configured as Grid Compute Nodes and the VM Manager sends the newly
configured Grid Compute Nodes information to the Resource Manager. The Resource
Manager schedules the job with the newly configured Grid Compute Nodes. When the job

has completed, the Resource Manager notifies the VM manager. The VM Removal sends a request for the removal of virtual machines from the Cloud.

A method of extending computing grid resources by deploying virtual machines (VM) is described herein as seen in Figure 3. The method includes the steps of configuring at least one grid computing image in a cloud system, requesting at least one virtual machine from the cloud system, deploying a plurality of grid computing nodes in a cloud environment and removing the plurality of grid computing nodes from the cloud environment.

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The step of configuring further includes the steps of creating a new disk image, installing a resource manager and operating system, mapping a plurality of user accounts to a client, configuring security and network settings, registering kernel and RAM disk image to a controlling means and uploading the disk image to the controlling means. Figure 5 illustrates the configuration steps for Grid Compute Node VM image(s). First, a new disk image is created for grid compute node. The Operating System is then installed on the new Disk Image. Subsequently, the Resource Manager client is also installed. Thereafter, user accounts from the Resource Manager Server are mapped to the Resource Manager Client. Next, Security settings and network communications between Resource Manager server and Resource Manager client are configured. The kernel and RAM disk is extracted from the disk image. Once extracted, the kernel and RAM disk is uploaded to the Cloud storage to be registered. Finally, the disk image is uploaded to the Cloud storage controller.

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The step of requesting at least one virtual machine further includes the steps of determining a queued job, extracting numbers of nodes, processors, memory capacity and storage of job, requesting number of virtual machines (VM) based on extracted information, reserving jobs when there are sufficient number of VM instances, recording

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job information and reserved VM status, running VM from cloud, obtaining reserved VM hostname and IP address and configuring VM. Figure 6 illustrates these steps for requesting virtual machine(s) from Cloud. First, the waiting or queued job is obtained from the Resource Manager. Initially, the waiting or queue job to be served is retrieved from the Resource Manager. Once the job to be served is identified, the number of requested nodes, CPUs, memory capacity, and storage are extracted from the job requirement. Based on the extracted job requirement, the number of available virtual machines is determined. If there are enough virtual machines to meet job requirement, the job is reserved to virtual machines. The Job information and the Virtual machines' status are then marked as reserved.

Figure 7 illustrates the creation steps for the deployment of Grid Compute Node. According to the figure, the VM hostname and IP address which was reserved earlier from Cloud is obtained. Subsequently, the VM hostname and IP address information are added to the Resource Manager to enable virtual machine as Grid compute node. The virtual machine is then configured to support parallel jobs. Next, the virtual machine is further configured to recognize and to communicate with the Resource Manager. The steps are repeated until there is no other virtual machine to configure. Finally, the reserved job is scheduled to run the newly configured and deployed Grid Compute nodes.

The step of removing the plurality of grid computing nodes further includes the steps of retrieving a list of queued jobs, determining if a job matches that of those in the list of retrieved queued jobs, removing a corresponding node allocated to a job not found on the list of queued jobs and terminating corresponding VM instance allocated to the job not found on the list of queued jobs. Figure 8 illustrates steps for the removal of Grid Compute Nodes from Cloud. The Accounting initially records a list of mapping between job and virtual machines which have been reserved. The job queue is checked regularly and periodically from the Resource Manager for any completed jobs. Each job record

from Accounting is checked against the job record from the Resource Manager. If the job record does not exist in the Resource Manager, all reserved virtual machines for that specific job record are marked. Further, all marked virtual machines are destroyed. Subsequently, the specific job record is removed from the Accounting. These same steps
5 are repeated for all other job record in the Accounting.

The invention leverages cloud system to accommodate the demand of applications. Scientific batch, workflow and parallel applications are compute intensive, and usually require the co-located use of large amounts of resources for a shorter period of time.
10 Jobs will tend to present tighter coupling, and parallel applications fall into this category. Virtual machines offered by cloud systems have the ability to be flexible in the amount of nodes requested and are not limited by hardware constraints in terms of amount of computer resources available.

15 The positioning of hierarchy (respective layers) in a computer constituting Grid computing and Cloud computing is shown in Figure 1. Above a bottom layer for Grid computing comprises a hardware layer which includes motherboard or an input output (I/O) association such as a processor (Hardware) or network equipment (Network). Above this layer is a platform layer (Platform) which includes operating system (OS) and the like. For
20 example, operating systems such as Windows, Linux, and Unix are equivalent to this layer. There is a layer that is called middleware above the layer. Software for controlling security or computer resource management in Grid computing such as, but not limited to, gLite, Globus, and Unicore etc. resides at the middleware layer. Finally, a normal application or portal layer (Application or Portal) exists in a top layer.

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Figure 1 also illustrates hierarchical layers of Cloud Computing. Cloud computing is a facility of services, software, or infrastructure, delivered via the Internet in a pay-per-use and self-service way. The lower level of Cloud computing is infrastructure-as-a-service

(IaaS) which describes platforms that provide computer and server infrastructure typically provided as a virtualization environment. The platform would provide the ability for consumers to scale their infrastructure up or down by demand and pay for the resources consumed. This is where pre-configured hardware is provided via a virtualised interface or hypervisor. There is no high level infrastructure software provided such as an operating system at this layer, and this must be provided by the users embedded with their own virtual applications.

Above the IaaS layer, the Platform as a Service (PaaS) provides the ability for building and deploying custom applications on Cloud resources. On the other hand, the Software as a service (SaaS) layer resides on top of the PaaS layer. With SaaS, fully functional applications are provided. SaaS offers fully functional applications on-demand to provide specific services such as email management, CRM, ERP, web conferencing and an increasingly wide range of other commercial applications.

From Figure 1, we can also see that there is a communication link between the hardware/network layer in Grid and the IaaS layer in Cloud. The present invention aims to use IaaS Cloud infrastructure to expand/extend grid resources for processing a wide range of queued jobs which include serial, workflow and parallel jobs. The queued jobs originally derive from the Application / Portal layer which are subsequently handled at the Middleware, Platform and Hardware/Network layer.

Figure 2 illustrates the flow of job execution based on Grid Broker of a prior art. The Grid Broker serves as a middleware responsible for the distribution and management of jobs across Grid resources, The Resource Manager serves as a scheduler of that schedules jobs across the computational resources (Grid compute nodes).

In the prior art, the system starts by receiving job submission directly from the user from which the Grid Broker distributes the receiving jobs to the Resource Manager for execution. If job requirements can be met, the job is scheduled immediately when there are sufficient nodes. However, if job requirements cannot be met by any of physical resource nodes available, the job is queued. Furthermore, if the physical server nodes are not fully utilized, the prior art employs modern virtualisation to configure and deploy virtual machines as Grid Compute Nodes to accommodate and satisfy the requirements of queued jobs.

Nevertheless, there is a limit on the number of virtual machines that can be deployed: virtual machines cannot be deployed when all physical server nodes are fully utilized. Therefore, the present invention resolves the limitation issue by enabling the system to deploy additional virtual machines using cloud resources.

The preferred embodiment of the invention includes the following main steps as shown in Figure 3:

1. **Pre-configuration Steps for Grid Compute Node VM image(s).** These include steps on how to register a Grid Compute Image to support automatic deployment of Grid Compute Nodes in Cloud System. This step is only performed once.

2. **Request Virtual Machines from Cloud Resources.** These include steps on how the Resource Manager requests Virtual Machines from the Cloud System.

3. **Creation Steps for Deployment of Grid Compute Node(s) in Cloud Systems.**

These include steps on how new grid compute node(s) are deployed in Cloud environment.

4. Deletion Steps to remove Grid Compute Node(s) from Cloud Systems. These include steps on how deployed Grid Compute Node(s) are removed from the Cloud environment.

This invention is adapted for resolving the waiting issue of queued jobs by using cloud resources to expand grid resources for processing queued batch, serial, workflow and parallel queued jobs, when the resource requirements of the job cannot be accommodated due to hardware capacity restriction, the queued jobs can still be served by deploying additional Grid Compute Nodes on Cloud The disclosed invention is suitable, but not restricted to, for use in cloud computing systems.

CLAIMS

1. A method of extending computing grid resources by deploying virtual machines (VM), the method includes the steps of:
 - 5 i. configuring at least one grid computing image in a cloud system;
 - ii. requesting at least one virtual machine from the cloud system;
 - iii. deploying a plurality of grid computing nodes in a cloud environment; and
 - iv. removing the plurality of grid computing nodes from the cloud environment.
- 10 2. The method as claimed in claim 1, wherein the step of configuring further includes the steps of creating a new disk image, installing a resource manager and operating system, mapping a plurality of user accounts to a client, configuring security and network settings, registering kernel and RAM disk image to a controlling means and uploading the disk image to the controlling means.
- 15 3. The method as claimed in claim 1, wherein the step of requesting at least one virtual machine further includes the steps of :
 - i. determining a queued job;
 - ii. extracting numbers of nodes, processors, memory capacity and storage of job;
 - 20 iii. requesting number of virtual machines (VM) based on extracted information;
 - iv. reserving jobs when there are sufficient number of VM instances;
 - v. recording job information and reserved VM status;
 - vi. running VM from cloud;
 - vii. obtaining reserved VM hostname and IP address; and
 - 25 viii. configuring VM.
4. The method as claimed in claim 1, wherein the step of removing the plurality of grid computing nodes further includes the steps of:

- i. retrieving a list of queued jobs;
- ii. determining if a job matches that of those in the list of retrieved queued jobs;
- iii. removing a corresponding node allocated to a job not found on the list of queued jobs; and
- 5 iv. terminating corresponding VM instance allocated to the job not found on the list of queued jobs.

5. A system of extending computing grid resources by deploying virtual machines (VM), the system includes:

10 at least one Resource Manager;

at least one VM Manager network connectible to the Resource Manager; and

at least one Cloud Controller in communication with the Resource Manager wherein the system is used for cloud applications through life cycle.

15 6. The system as claimed in claim 5, wherein the Resource Manager selects and sends queued job information to the VM Manager.

7. The system as claimed in claim 5, wherein the VM Manager further includes the VM Request & Creation and the VM Removal.

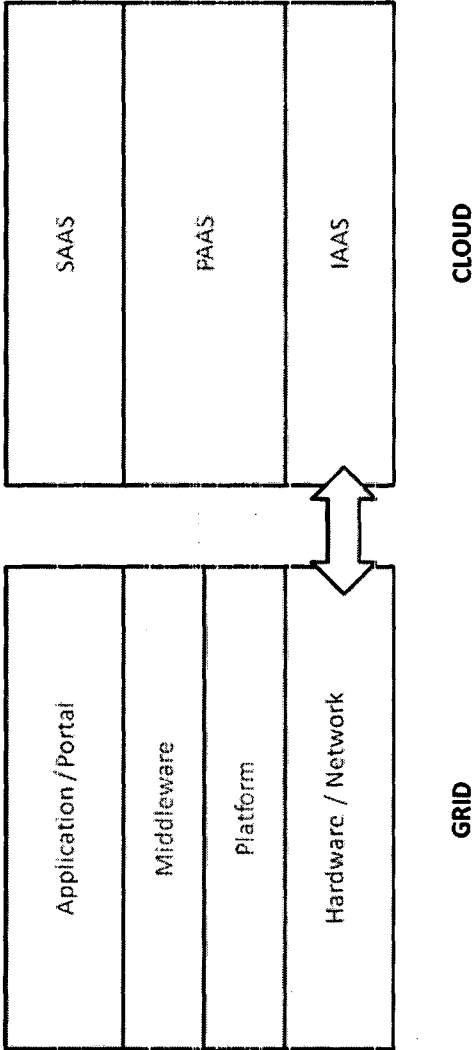


Figure 1

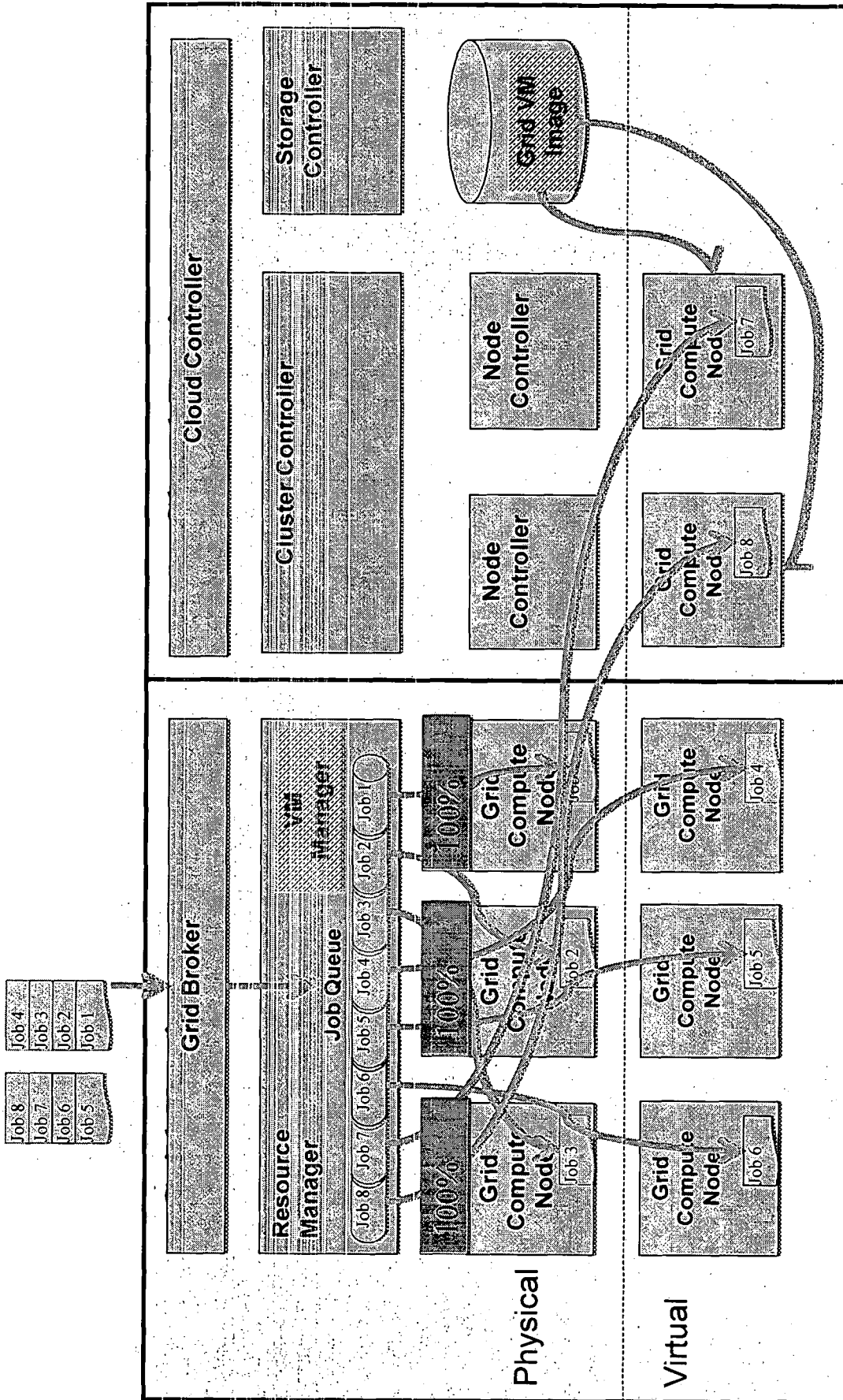


Figure 2

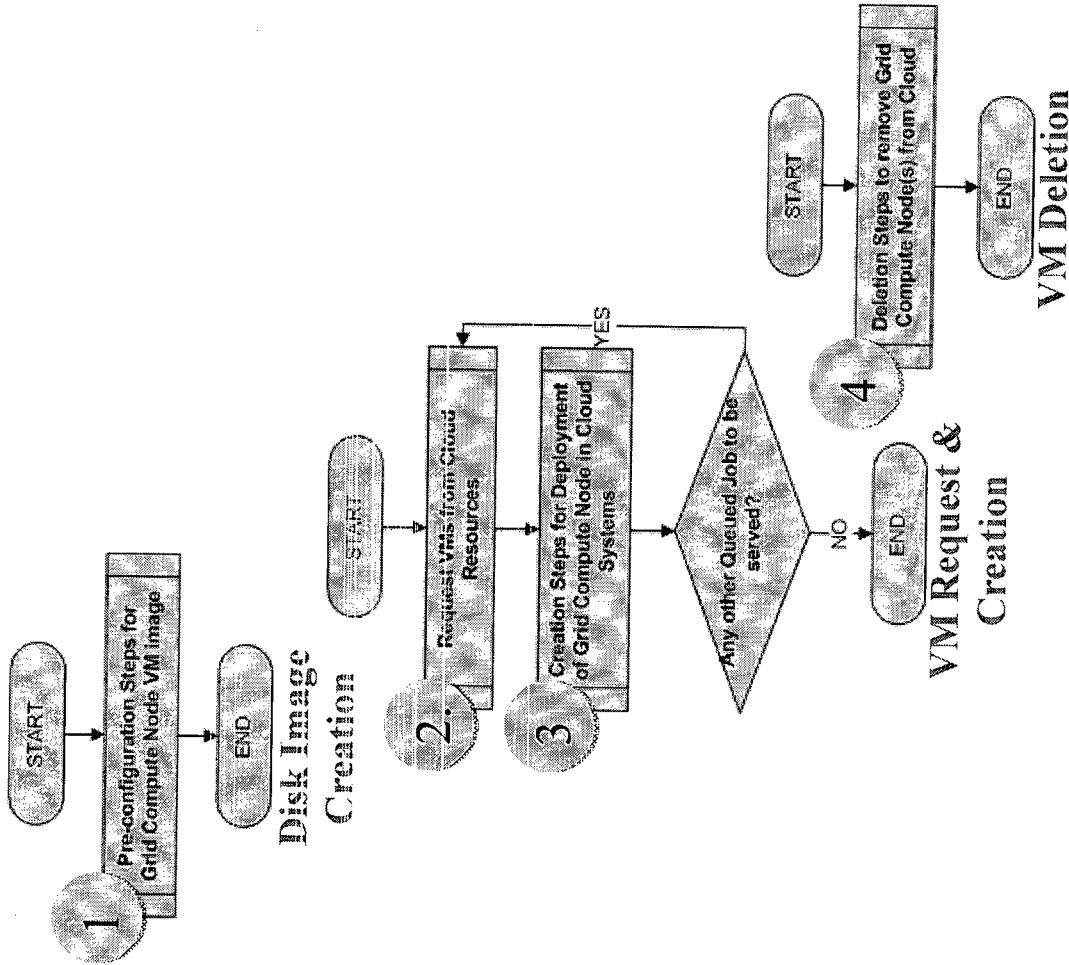


Figure 3

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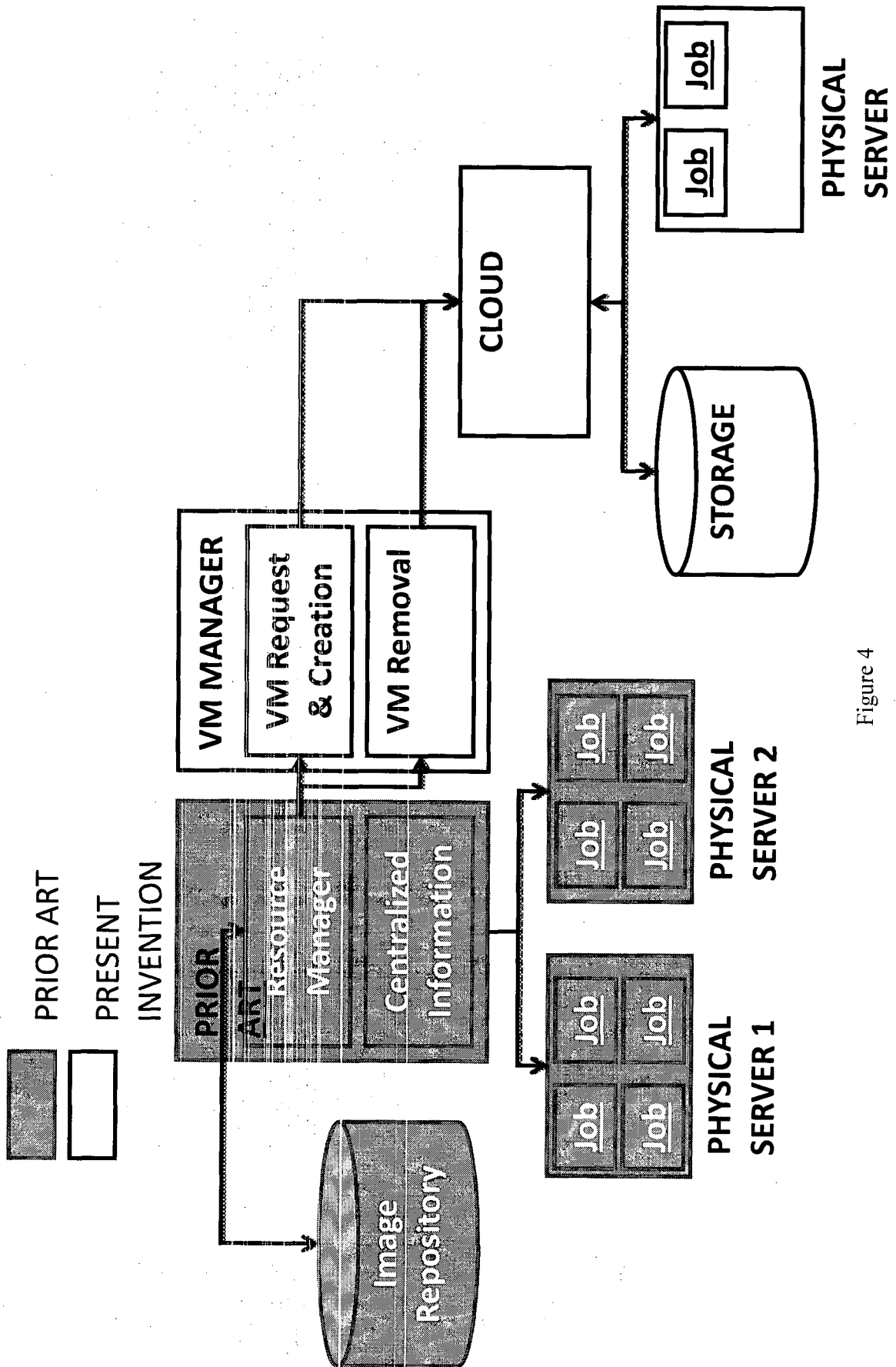


Figure 4

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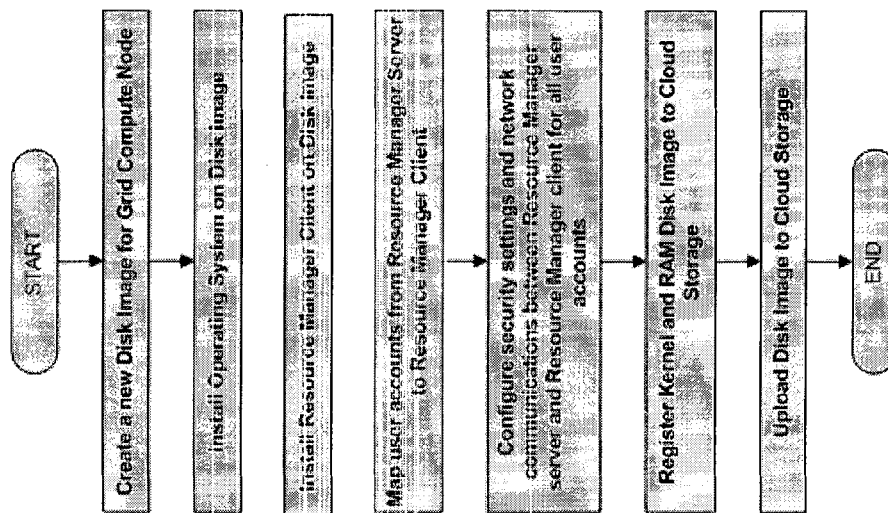


Figure 5

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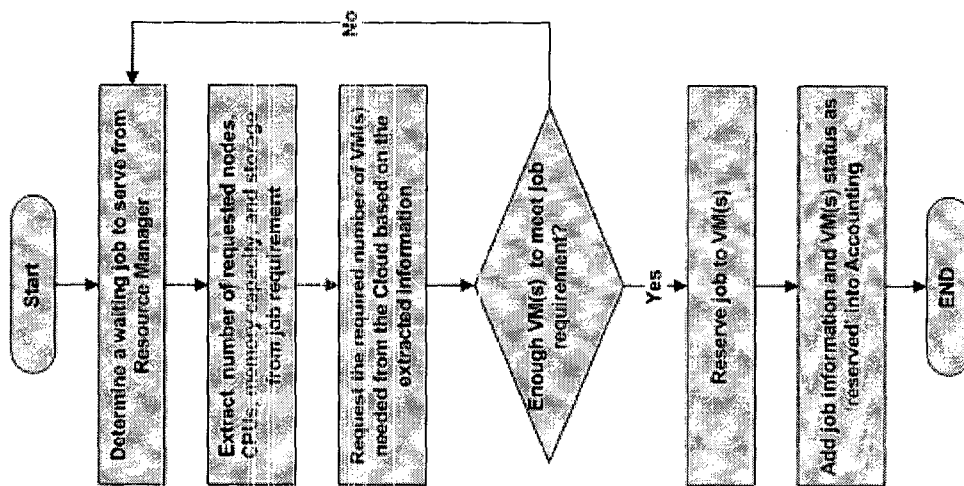


Figure 6

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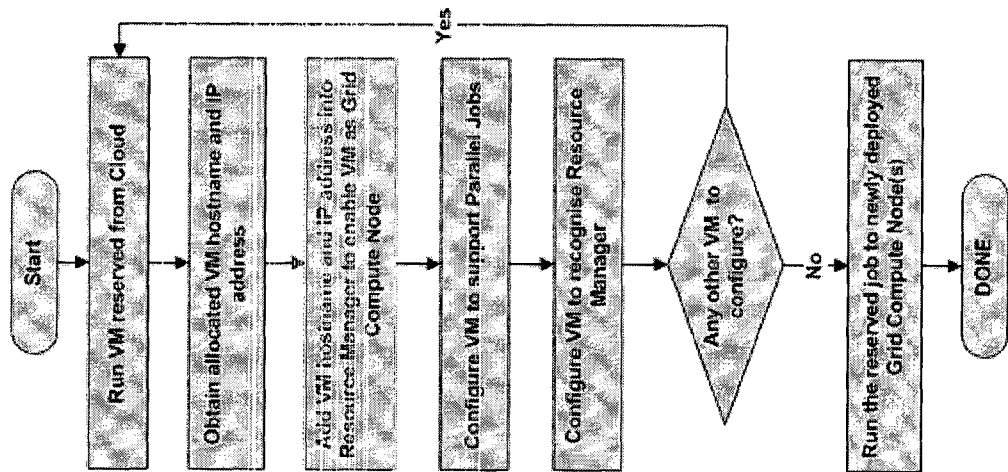


Figure 7

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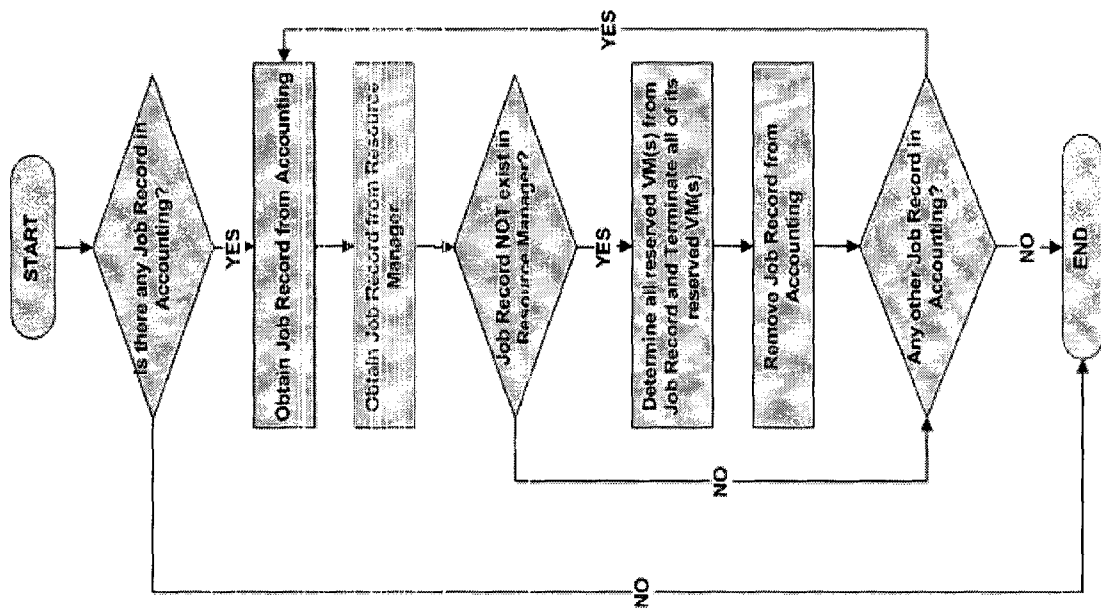


Figure 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/MY2012/000152

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F9/455
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/300057 AI (FRIEDMAN NATHANIEL [DE]) 3 December 2009 (2009--12-03) abstract paragraph [0003] - paragraph [0004] paragraph [0006] - paragraph [0028] paragraph [0031] paragraph [0028] - paragraph [0047] paragraph [0063] - paragraph [0077] paragraph [0079] - paragraph [0082] paragraph [0089] - paragraph [0095] paragraph [0103] - paragraph [0111] paragraph [0114] - paragraph [0118] paragraph [0123] - paragraph [0125] claims 1-28; figures 1-5 ----- -/-	1, 2, 5



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

23 November 2012

Date of mailing of the international search report

21/02/2013

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
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Authorized officer

Eftimescu, Ni col ae

INTERNATIONAL SEARCH REPORT

International application No.
PCT/MY2012/000152

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos. :

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos. :

1, 2, 5

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No

PCT/MY2012/000152

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7 577 722 B1 (KHANDEKAR DILIP [US] ET AL) 18 August 2009 (2009-08-18) abstract column 1, line 12 - column 3, line 9 column 3, line 30 - column 5, line 20 column 5, line 25 - column 9, line 32 column 9, line 46 - column 13, line 16 column 13, line 65 - column 23, line 51 claims 1-10; figures 1-7 -----	1, 2, 5
A	US 2011/191767 A1 (PINSKY HOWARD [US] ET AL) 4 August 2011 (2011-08-04) abstract paragraph [0023] - paragraph [0041] paragraph [0054] - paragraph [0085] paragraph [0108] - paragraph [0112] claims 1-15; figures 1-5 -----	2
A	US 2008/092134 A1 (ZHANG WEIJIA [US] ET AL) 17 April 2008 (2008-04-17) abstract paragraph [0005] - paragraph [0010] paragraph [0016] - paragraph [0029] claims 1-20; figures 1-4b -----	2

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/MY2012/000152

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009300057 AI	03-12 -2009	US 2009300057 AI	03-12-2009
		US 2009300076 AI	03-12-2009
		US 2009300151 AI	03-12-2009
		US 2009300604 AI	03-12-2009
		US 2009300641 AI	03-12-2009

US 7577722 BI	18-08 -2009	US 7577722 BI	18-08-2009
		US 2009282404 AI	12-11-2009

US 2011191767 AI	04-08 -2011	NONE	

US 2008092134 AI	17-04 -2008	BR PI0703951 A	03-06-2008
		CN 101165654 A	23-04-2008
		DE 102007048920 AI	30-04-2008
		FR 2907929 AI	02-05-2008
		GB 2443071 A	23-04-2008
		IE 20070733 AI	11-06-2008
		SG 142247 AI	28-05-2008
		TW 200828118 A	01-07-2008
		US 2008092134 AI	17-04-2008

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1, 2, 5

regarding method and systems of extending grid computing resources and configuring a system image

2. claims: 3, 4, 6, 7

regarding methods of requesting, selecting, deploying and removing (deallocating) virtual machines (VM)
