033006 17224 U.S. PTO

Attorney Docket No.: PNTA-P006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Patent Application

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Express Mail Label No.:	EV757243264US	Name of Person Making the Deposit:	Anthony Chou
Date of Deposit:	03/30/2006	Signature of the Person Making the Deposit:	Anthony Chou

113374 U.S.PTO 11/395816 033006

Inventor(s): Mukul KUMAR, Adhir POTDAR, Pradip KULKARNI, Richard AU

Group Art Unit:

Filed: 03/30/2006

Examiner:

Title: BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Sir:

Transmittal of a Continuation-in-Part Patent Application

Transmitted herewith is the above identified patent application, including:

- X Specification, claims and abstract, totaling 19 pages.
- ____ Formal drawings, totaling ____ pages.
- X Informal drawings, totaling 3 pages.
- X Copy of Petition for Extension of Time to provide copendency in the parent application.
- X Copy of Notification in Parent of Filing to provide copendency in the parent application.
- ____ Information Disclosure statement
- X Assignment(s)
- X Assignment Recordation Form (duplicate)
- X Declaration / Power of Attorney
- ____ A certified copy of priority application:
- X Other: Request and Certification under 35 U.S.C. 122(b)(2)(B)(i)

PRIORITY CLAIM

A. 35 U.S.C 119

The prior U.S. application(s), including any prior International Application designating the U.S., identified above, in turn itself claim(s) foreign priority(ies) as follows:

country	application no.	filed on

The certified copy(ies) has (have)

☐ been filed on ____ in prior application ____
which was filed on ____

☐ is are attached

☐ Amend the specification by inserting, before the first line, the following sentence:

B. 35 U.S.C. 119(e)

"This application claims the benefit of U.S. Provisional Application(s) No(s).:
APPLICATION NO(S).: FILING DATE

rev. 12/04 kgr

C. 35 U.S.C. 120, 121 and 365(c)

"This application is a continuation-in-part of and claims the benefit of copending application(s)

[X] application number 11/026,622 filed on 12/30/2006
[ ] International Application filed on

and which designated the U.S."

INVENTORSHIP STATEMENT

[X] This application discloses and claims additional disclosure by amendment and a new declaration /oath is being filed. With respect to the prior application, the inventor(s) in this application are

[ ] the same.
[X] the following additional inventor(s) have been added
Mukul KUMAR, Adhir POTDAR, Pradip KULKARNI
[X] the following additional inventor(s) have been deleted
Tung M. NGUYEN, Eric POUYOUL

FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
		Small Entity		Small Entity		Small Entity	
Application Type	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fees Paid ($)
Utility	300	150	500	250	200	100	$1,000.00
Design $	200	100	100	50	130	65	
Plant $	200	100	300	150	160	80	
Reissue $	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Small Entity Fee ($)	Small Entity Fee ($)
Each claim over 20 or, for Reissues, each claim over 20 and more than in the original patent	50	25
Each independent claim over 3 or, for reissues, each independent claim more than in the original patent	200	100
Multiple dependent claims	360	180

Total Claims	Extra Claims	Fee ($)	Fee Paid ($)	Multiple Dependent Claims	
33 -20 or HP=	**13**	x 50.00	$ **650.00**	Fee ($)	Fee Paid ($)
HP= highest number of total claims paid for, if greater than 20					

Indep. Claims	Extra Claims	Fee ($)	Fee Paid ($)
2 -3 or HP=	**0**	x 200	$ **$0.00**
HP= highest number of independent claims paid for, if greater than 3			

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper, the application size fee due is &250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets

Total Sheets		Extra Sheets		Number of each additional 50 or fraction thereof	Fee $		Fee Paid $
23	- 100	0	/50	0	0	=	$0.00

4. OTHER FEE(S)

Total Fees Due ($)

Non-English specification, $130 fee (no small entity discount)

☑ Other: Assignment Recordation Fee of $40.00

$1,690.00

5. PAYMENT OF FEES

The full fee due in connection with this communication is provided as follows:

a. Not enclosed

[ ] No filing fee is to be paid at this time.

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[X] Filing fee

[X] Recording Assignment

[X] The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No.: 23-0085. A duplicate copy of this authorization is enclosed.

[X] A check in the amount of $1,690.00

This application is filed pursuant to 37 C.F.R. § 1.53 in the name of the above-identified Inventor(s).

[X] Customer No: 41066

Please direct all correspondence concerning the above-identified application to the following address:

WAGNER, MURABITO & HAO LLP
Two North Market Street, Third Floor
San Jose, California 95113
(408) 938-9060

[X] This transmittal ends with this page.

Respectfully submitted,

Date: March 30, 2006

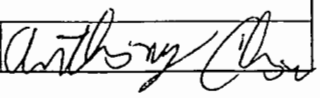
By: _____
James P. Hao
Reg. No. 36,398

rev. 12/04 kgr

Attorney Docket No.: PNTA-P006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

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Date of Deposit:	03/30/06	Name of Person Making the Deposit:	Anthony Chou	Signature of the Person Making the Deposit:	

In re Application

Inventor(s): NGUYEN, et al.

Application No.: 11/026,622

Filed: 12/30/2004

Title: NARROW WIDE SPACER

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

NOTIFICATION OF FILING OF CONTINUATION-IN-PART PATENT APPLICATION

[X] Notification is hereby being made of the filing of a continuation-in-part application for this case

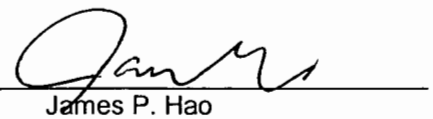
[X] concurrently herewith.
[ ] on .....

Please direct all correspondence concerning the above-identified application to the following address:

WAGNER, MURABITO & HAO LLP
Two North Market Street, Third Floor
San Jose, California 95113
(408) 938-9060
Customer No: 000041066

Respectfully submitted,

Date: March 30, 2006

By: 
James P. Hao
Reg. No. 36,398

rev. 12/97 dbp

CANCELLED
PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

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In re Application of:

Inventor(s): NGUYEN, et al.

Application No.: 11/026,622

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Title: NARROW WIDE SPACER

Commissioner for Patents
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Alexandria, VA 22313-1450

CONDITIONAL PETITION FOR EXTENSION OF TIME

This conditional petition is being filed concurrently with the filing of a CONTINUATION-IN-PART PATENT APPLICATION

and provides for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

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Status

This application is on behalf of

- [X] other than a small entity
- [ ] a small entity
  - A verified statement:
    - [ ] is attached
    - [ ] is already filed

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San Jose, California 95113
(408) 938-9060
Customer No: 000041066

Respectfully submitted,

Date: March 30, 2006

By: _____
James P. Hao
Reg. No. 36,398

Notification to Parent of CIP Application Filing

Applicant: **NGUYEN, et al.** FILED: **12/30/2004**

Docket No.: **PNTA-P002** S/N.:**11/026,622**

Title: **NARROW WIDE SPACER**

Sir:

Please acknowledge receipt of the following:

☑ Certificate of Mailing
☑ Conditional Petition for an Extension of Time
☑ Notification of Filing of CIP

SUBMITTED 03/30/2006

rev. 12/97 dbp

17224 U.S. PTO
033006

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113374 U.S.PTO
11/395816
033006

Inventor(s): Mukul KUMAR, Adhir POTDAR, Pradip KULKARNI, Richard AU

Group Art Unit:

Filed: 03/30/2006

Examiner:

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which was filed on ____

☐ is are attached

☐ Amend the specification by inserting, before the first line, the following sentence:

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APPLICATION NO(S).: FILING DATE

rev. 12/04 kgr

C. 35 U.S.C. 120, 121 and 365(c)

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[ ] International Application filed on

and which designated the U.S."

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[X] This application discloses and claims additional disclosure by amendment and a new declaration /oath is being filed. With respect to the prior application, the inventor(s) in this application are

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Mukul KUMAR, Adhir POTDAR, Pradip KULKARNI
[X] the following additional inventor(s) have been deleted
Tung M. NGUYEN, Eric POUYOUL

FEE CALCULATION

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Total Sheets

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4. OTHER FEE(S) **Total Fees Due ($)**

Non-English specification, $130 fee (no small entity discount) $1,690.00

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[X] Customer No: 41066

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San Jose, California 95113
(408) 938-9060

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Respectfully submitted,

Date: March 30, 2006

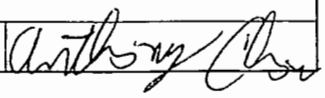
By: _____
James P. Hao
Reg. No. 36,398

rev. 12/04 kgr

Attorney Docket No.: PNTA-P006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

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Date of Deposit:	03/30/06	Name of Person Making the Deposit:	Anthony Chou	Signature of the Person Making the Deposit:	

In re Application

Inventor(s): NGUYEN, et al.

Application No.: 11/026,622

Filed: 12/30/2004

Title: NARROW WIDE SPACER

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

NOTIFICATION OF FILING OF CONTINUATION-IN-PART PATENT APPLICATION

[X] Notification is hereby being made of the filing of a continuation-in-part application for this case

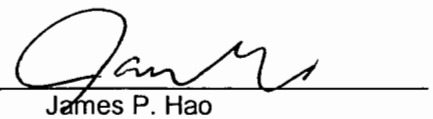
[X] concurrently herewith.
[ ] on .....

Please direct all correspondence concerning the above-identified application to the following address:

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Two North Market Street, Third Floor
San Jose, California 95113
(408) 938-9060
Customer No: 000041066

Respectfully submitted,

Date: March 30, 2006

By: 
James P. Hao
Reg. No. 36,398

rev. 12/97 dbp

CANCELLED
PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

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Date of Deposit:	03/30/06	Name of Person Making the Deposit:	Anthony Chou	Signature of the Person Making the Deposit:	Anthony Chou

In re Application of:

Inventor(s): NGUYEN, et al.

Application No.: 11/026,622

Filed: 12/30/2004

Title: NARROW WIDE SPACER

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

CONDITIONAL PETITION FOR EXTENSION OF TIME

This conditional petition is being filed concurrently with the filing of a CONTINUATION-IN-PART PATENT APPLICATION

and provides for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

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Status

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- [X] other than a small entity
- [ ] a small entity
  - A verified statement:
    - [ ] is attached
    - [ ] is already filed

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rev. 12/97 dbp

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Two North Market Street, Third Floor
San Jose, California 95113
(408) 938-9060
Customer No: 000041066

Respectfully submitted,

Date: March 30, 2006

By: _____
James P. Hao
Reg. No. 36,398

Notification to Parent of CIP Application Filing

Applicant: **NGUYEN, et al.** FILED: **12/30/2004**

Docket No.: **PNTA-P002** S/N.:**11/026,622**

Title: **NARROW WIDE SPACER**

Sir:

Please acknowledge receipt of the following:

☑ Certificate of Mailing
☑ Conditional Petition for an Extension of Time
☑ Notification of Filing of CIP

SUBMITTED 03/30/2006

rev. 12/97 dbp

UNITED STATES PATENT APPLICATION FOR

BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT

Inventors:
Mukul Kumar
Adhir Potdar
Pradip Kulkarni
Richard Au

PREPARED BY:

WAGNER, MURABITO & HAO, LLP

TWO NORTH MARKET STREET

THIRD FLOOR

SAN JOSE, CA 95113

(408) 938-9060

BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT

Claim of Priority under 35 U.S.C. §120

[0001] The present Application for Patent is a Continuation-in-Part of Patent Application No. 11/026,622 entitled "BRANCING STORE FILE SYSTEM" filed December 30, 2004, pending, and assigned to the assignee hereof and hereby expressly incorporated by reference herein.

BACKGROUND

Field of the Invention

[0002] Embodiments of the present invention relate to the field of networked computing. Specifically, embodiments of the present invention relate to distributed application environment deployment in a multi-computer system.

Background

[0003] Over the years, as the internet has expanded and computers have multiplied, the need for clustered computing such as High Performance Computing (HPC) has increased. Clustered computing involves multiple compute nodes, usually a server grid, that work together to achieve a common task. For example, several (typically hundreds of) compute nodes may be clustered together to share the load of serving a high-traffic website. In large-scale systems such as this, a trend in software deployment is to centralize data management on a globally accessible file system with stateless computing nodes. A common example of this is Operating System (OS) software image management, where the compute nodes are activated with the distributed application environment by either diskless booting protocols or remote software installation to local storage. Under this architecture, a boot image is required for each compute node in the cluster. The boot image necessarily contains the kernel; it may additionally contain the application software that is intended to be run on the compute node.

[0004] The primary concern in clustered computing is low cluster bring-up time. The software that provides the boot images for the cluster typically stores a master boot image. It may then either pre-create clones of this master image for each such server, or it may create them "on the fly."

[0005] Creating a boot image on the fly involves copying the entire contents of the master image, which are typically in the range of 5-15 GB. Even with a significant amount of bandwidth by today's standards, this method will result in a large bring-up time.

[0006] Pre-creating a boot image for each server is advantageous from the point of view of cluster bring-up time. However, since one often does not know in advance how many servers will ever be booted, this scheme may result in wasted disk space.

[0007] Regardless of which of the preceding methods is used, both suffer from the same major problem – updating the boot image(s) for the cluster is cumbersome, as it means updating a number of copies of the boot image.

[0008] A Branching Store File System, as described in Patent Application No. 11/026,622 entitled "BRANCING STORE FILE SYSTEM" filed December 30, 2004, pending, and assigned to the assignee hereof, was developed as a solution to the above problem. In a branching store file system, a read-only base image (or "root" image) of the application environment is created. The root image is accessible by all compute nodes in the cluster. Changes made by a compute node to the root image are stored in a "leaf" image unique to that compute node. A filter operates between the compute nodes and the file system(s), which merges the changes recorded on the leaf images with the root image and delivers the result to the appropriate compute node. From the point of view of the compute node, it is running its own unique and cohesive instance of the application environment. While this system allows for creation of boot images on the fly without severely diminishing bring-up time, a separate version of the system must be

IPR2025-00202 / 844 Patent Page 17 of 128 EX1010

created for each unique operating system. Thus, migrating a computing cluster from one operating system to another is much more complicated than simply installing a new root image containing the new OS.

IPR2025-00202 / 844 Patent Page 18 of 128 EX1010

SUMMARY

[0009] An embodiment of the present invention is directed to a system for distributing an application environment to a compute node. The system includes a first storage unit for storing blocks of a root image of the compute node and a second storage unit for storing a leaf image comprising new data blocks and changes to the blocks of the root image. The system further includes a union block device for interfacing between the compute node and the first and second storage units to distribute the application environment to the compute node. The union block device creates the application environment by merging the blocks of the root image stored on the first storage unit with the leaf image stored on the second storage unit.

[0010] Thus, embodiments of the present invention provide an operating system-independent system and method for distributing an application environment to a compute node. By utilizing a root-leaf system of application environment storage, embodiments of the present invention allow creation of boot images on the fly without significantly diminishing bring-up time. This is due to the fact that creating a new boot image does not require copying the contents of the root image. Rather it involves registering a new UBD with the system, which occurs very quickly. Moreover, updating the boot image for the entire cluster simply involves updating the root image.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIGURE 1 is a diagram of a system for distributing an application environment, in accordance with an embodiment of the present invention.

[0012] FIGURE 2 is a tree structure that illustrates a branching system, in accordance with an embodiment of the present invention.

[0013] FIGURE 3 is a flowchart illustrating a process 300 for distributing an application environment to a compute node, in accordance with an embodiment of the present invention.

IPR2025-00202 / 844 Patent Page 20 of 128 EX1010

DETAILED DESCRIPTION

[0014] Reference will now be made in detail to the preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. While the invention will be described in conjunction with the preferred embodiments, it will be understood that they are not intended to limit the invention to these embodiments.. On the contrary, the invention is intended to cover alternatives, modifications and equivalents, which may be included within the spirit and scope of the invention as defined by the claims. Furthermore, in the detailed description of the present invention, numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be obvious to one of ordinary skill in the art that the present invention may be practiced without these specific details. In other instances, well known methods, procedures, components, and circuits have not been described in detail as not to unnecessarily obscure aspects of the present invention.

[0015] Some portions of the detailed descriptions that follow are presented in terms of procedures, logic blocks, processing, and other symbolic representations of operations on data bits within a computer or digital system memory. These descriptions and representations are the means used by those skilled in the data processing arts to most effectively convey the substance of their work to others skilled in the art. A procedure, logic block, process, etc., is herein, and generally, conceived to be a self-consistent sequence of steps or instructions leading to a desired result. The steps are those requiring physical manipulations of physical quantities. Usually, though not necessarily, these physical manipulations take the form of electrical or magnetic signals capable of being stored, transferred, combined, compared, and otherwise manipulated in a computer system or similar electronic computing device. For reasons of convenience, and with reference to common usage, these signals are referred to as bits, values, elements, symbols, characters, terms, numbers, or the like with reference to the present invention.

IPR2025-00202 / 844 Patent Page 21 of 128 EX1010

[0016] It should be borne in mind, however, that all of these terms are to be interpreted as referencing physical manipulations and quantities and are merely convenient labels and are to be interpreted further in view of terms commonly used in the art. Unless specifically stated otherwise as apparent from the discussion herein, it is understood that throughout discussions of the present embodiment, discussions utilizing terms such as "determining" or "outputting" or "transmitting" or "recording" or "locating" or "storing" or "displaying" or "receiving" or "recognizing" or "utilizing" or "generating" or "providing" or "accessing" or "checking" or "notifying" or "delivering" or the like, refer to the action and processes of a computer system, or similar electronic computing device, that manipulates and transforms data. The data is represented as physical (electronic) quantities within the computer system's registers and memories and is transformed into other data similarly represented as physical quantities within the computer system memories or registers or other such information storage, transmission, or display devices.

[0017] Embodiments of the present invention provide methods and systems for distributing an application environment to one or more compute nodes. Figure 1 is a diagram of a system 100 for distributing an application environment. In a preferred embodiment, system 100 is implemented in a multi-computer system, such as an HPC cluster. In one embodiment, the application environment includes an operating system. In other embodiments, the application environment may contain other applications. System 100 has a number of compute nodes 120a-n coupled to first storage unit and a corresponding second storage unit 150a-n though a corresponding union block device (UBD) 130a-n. To compute nodes 120a-n, it appears that they have access to their own version of a distributed application. However, a separate and complete boot image is not created and stored for each compute node 120a-n.

[0018] System 100 has a first storage unit 140 for storing blocks of a root image of an application environment. The root image contains data initially common to the compute nodes 120a-n. The root image is not changed by compute nodes 120a-n. For example, in one embodiment, compute nodes 120a-n have read-only access to the first storage unit.

[0019] Moreover, each compute node 120a-n has a corresponding second storage unit 150a-n for storing a leaf image. The first storage unit 140 and second storage units 150a-n may each be contained on separate physical storage devices, on separate logical spaces on the same storage device, or any combination thereof. The leaf image may contain blocks of new data, blocks of changed data, or other blocks of data unique to the individual compute node. The leaf image may also contain a block modification log. In other words, a leaf image will describe the changes made by the respective compute node 120a-n to its instance of the application environment. Thus, when a compute node (e.g., node 120a) makes changes involving the root image, modifications are made to that compute node's leaf image (e.g., leaf image stored on second storage device 150a). With respect to changes to the root image, only the specific blocks that are changed are stored in the leaf image. For example, a particular file on the root image may comprise twenty blocks of data (e.g., blocks 1-20). One compute node (e.g., compute node 120a) desires to make a change to this file which involves a modification of only a few specific blocks of the file (e.g., blocks 4-9). In this example, only the modified blocks (e.g., blocks 4-9) will be stored in the compute node's leaf image (e.g., leaf image stored on second storage device 150a) plus some small overhead.

[0020] A compute node 120a-n mounts its instantiation of the application environment via its respective UBD 130a-n. The UBDs 130a-n are effectively low-level drivers that operate as an interface between the first and second storage devices and the file system of each compute node 120a-n. The file system may reside on the server side of the system 100. The file system may also reside on each of the compute nodes 120a-n. Because UBDs 130a-n operate below the file system, they are concerned merely with the blocks of data themselves, rather than files they form. As a result, system 100 is completely file system, and thus operating system, independent.

[0021] UBDs 130a-n determine what leaf image (from the appropriate second storage unit 150) is needed for portions of the application environment that their respective

compute nodes 120a-n have changed. UBDs 130a-n also locate the portions of the application environment that are not changed by their respective their respective compute nods 120a-n. These portions may reside in the root image. There may also be intermediate images (not depicted in Fig. 1) comprising versions of the root image from which a compute node's instance of the application environment is derived. Further, UBDs 130a-n create a new leaf image on a respective second storage unit 150a-n when their respective compute nodes 120a-n make changes to their instantiations of the application environment. In one embodiment, the UBSs 130a-n obtain the information necessary to create the application from a block modification log located in its respective leaf image.

[0022] UBDs 130a-n may also modify the leaf image in response to their respective compute node's access to its instance of the application environment. For example, upon receiving a write request from their respective compute nodes for a sector X, the UBDs 130a-n will create an appropriate persistent mapping for sector X and then write sector X onto their respective second storage units 150a-n, where sector X can then be modified. It will be appreciated that the data block being modified may already exist in the leaf image, in which case it does not need to be mapped and copied from the root image before modification.

[0023] By providing an application environment to multiple compute nodes via a branching store system, embodiments allow for a more streamlined update/patch procedure. In one embodiment, first storage device 140 may be refreshed with a new operating system patch, thereby automatically refreshing the image for all dependent compute nodes.

Application Groups

[0024] An embodiment of the present invention provides for application groups (AG). An AG is a way to provide a group of compute nodes their own instantiation of an

IPR2025-00202 / 844 Patent Page 24 of 128 EX1010

application environment, while allowing versions of the application environment to be frozen from time to time. Thus, an archive of the application environment is created.

[0025] At creation time, an AG comprises the original root image. A number of leaf images are created to match the desired capacity demand of the AG. The leaf images can be created very quickly and require very little storage because the leaf images reflect only the changes to the root instance.

[0026] Figure 2 is a tree structure 200 that illustrates a branching system, in accordance with an embodiment of the present invention. Some nodes are read-only, others are read-write-modify. A node may change from read-write-modify to read-only. For example, creating a new edition of the AG may be accomplished by freezing a current leaf image structure and creating a new set of leaf images therefrom. Referring now to Figure 2, the root node 140 (also referred to herein as the root image) is the base application environment. As previously discussed, the root node 140 is not modified by compute nodes for which the application environment is distributed.

[0027] The first level of the exemplary tree structure 200 comprises first branch node 210 and second branch node 220. Branch node 210 has three leaf nodes 150a-c. The leaf nodes 150 may be for blocks from configuration files, for example. The compute nodes 150 can boot from the configuration files. The leaf nodes are also referred to herein as leaf images. In another embodiment, the leaf nodes 150 comprise block modification logs.

[0028] The branch node 220 also has three leaf nodes 150d-f, which are analogous to the leaf nodes 150a-c. However, branch node 220 also has a service group 221, which reflects a change to the application environment. The service group 221 has leaf nodes 150g-i.

IPR2025-00202 / 844 Patent Page 25 of 128 EX1010

[0029] Embodiments provide for additional advanced features. In one embodiment for example, a particular branch, rather than the entire tree structure back to the root, is refreshed with an update to the application environment contained thereon, thereby automatically refreshing its dependent compute nodes. In another embodiment, a leaf node or a branch node may be completely detached from the original structure to make a new and completely independent branch.

[0030] Figure 3 is a flowchart illustrating a process 300 for distributing an application environment to a compute node, in accordance with an embodiment of the present invention. Steps of process 300 may be stored as instructions on a computer readable medium and executed on a computer processor. Step 310 is storing blocks of a root image of the compute node on a first storage unit. By storing data at the block level, embodiments are able to operate beneath the file system and thus are designed to be file system and operating system independent.

[0031] Step 320 is storing a leaf image on a second storage unit. The leaf image includes, but is not limited to, new data blocks for the compute node and blocks of the root image that the compute node has changed. The leaf image includes a block modification log in one embodiment.

[0032] Step 330 is merging the blocks of the root image with the blocks of the leaf image to create the application environment. Once the application environment has been created, it will appear to the compute node as one cohesive image rather than a base image plus its additions, deletions, and modifications. To the compute node, it appears that it has access to its own unique version of an application. However, a separate and complete boot image is not actually stored for the compute node.

[0033] Step 340 is delivering the application environment to the compute node. Step 340 may comprise a low-level driver determining which data blocks are needed for the

compute node's instance of the application environment and delivering the application environment to the compute via the compute node's file system.

[0034] Step 350 is modifying the leaf image in response to the compute node's access to its instance of the application environment. The modifying of the leaf image may include copying one or more data blocks from the root image to the leaf image, and modifying the data block in the leaf image. It will be appreciated that the data block being modified may already exist in the leaf image, in which case it does not need to be copied from the root image before modification.

[0035] Step 360 is reconciling the root image and the leaf image to form a new root image. This may be desirable if, for example, the leaf image has grown to exceed a particular disk quota. Furthermore, if there are multiple compute nodes that access the root image, each having their own respective leaf image, and there is substantial commonality between the leaf images, it may also be beneficial to reconcile the leaf images with the root image.

[0036] Thus, by operating at the block level, embodiments of the present invention provide a file system and operating system independent system and method for distributing an application environment to a compute node. By utilizing a branching store system of application environment distribution, embodiments of the present invention allow creation of boot images on the fly without significantly diminishing bring-up time. This is due to the fact that creating a new boot image does not require copying the contents of the root image, but rather it involves registering a new UBD with the system, which occurs very quickly. Moreover, updating the boot image for the entire cluster simply involves updating the root image.

[0037] Embodiments of the present invention also allow for scalability and redundancy. For example, a server containing the root image may only have the resources to supply the root image to 100 compute nodes. Thus, in order to implement a 200-compute node

system, two servers, each containing a copy of the root image, are used. This scalability provided by embodiments also lends itself to dynamic scaling. In other words, the number of root images required for a specific configuration can change based on the I/O workload, and new root images can be created on the fly accordingly. Moreover, additional servers containing the root image may be added into the system to provide redundancy and increase reliability. As an added security measure, some of the root nodes may be located remotely from each other (e.g., half located in a main office and half in a satellite office). In addition, it is possible to copy the contents of one or more leaf nodes into a non-UBD (regular block device) copy (e.g., for use as an isolated backup).

[0038] The previous description of the disclosed embodiments is provided to enable any person skilled in the art to make or use the present invention. Various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments without departing from the spirit or scope of the invention. Thus, the present invention is not intended to be limited to the embodiments shown herein but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.

CLAIMS

WHAT IS CLAIMED IS:

1. A system for distributing an application environment to a compute node comprising:

a first storage unit for storing blocks of a root image of the compute node;

a second storage unit for storing a leaf image, the leaf image comprising new data blocks and changes to the blocks of the root image; and

a union block device for interfacing between the compute node and the first and second storage units to distribute the application environment to the compute node, wherein the union block device creates the application environment by merging the blocks of the root image stored on the first storage unit with the blocks of the leaf image stored on the second storage unit.

2. The system as recited in Claim 1 wherein the compute node comprises a server.

3. The system as recited in Claim 1 wherein the compute node comprises a thin-client workstation.

4. The system as recited in Claim 1 wherein the root image comprises an operating system.

5. The system as recited in Claim 1 wherein the root image is concurrently accessible to a plurality of compute nodes.

6. The system as recited in Claim 1 wherein the first storage unit is remotely located from the compute node.

7. The system as recited in Claim 1 wherein the second storage unit is remotely located from the compute node.

IPR2025-00202 / 844 Patent Page 29 of 128 EX1010

8. The system as recited in Claim 1 wherein the second storage unit contains a block modification log for the compute node.

9. The system as recited in Claim 1 wherein the first storage unit in contained within a first partition on a hard disk and the second storage unit is contained within a second partition on the hard disk.

10. The system as recited in Claim 1 wherein the union block device comprises a low-level driver for interfacing between the first and second storage units and the file system of the compute node.

11. The system as recited in Claim 1 wherein the union block device, upon receiving a write request from the compute node for a sector X, creates an appropriate persistent mapping for sector X.

12. The system as recited in Claim 11 wherein the union block device writes sector X on the second storage unit.

13. The system as recited in Claim 1 wherein the system operates in a high performance computing cluster.

14. The system as recited in Claim 1 wherein the system operates in a grid computing cluster.

15. The system as recited in Claim 1 wherein the first storage unit is read only.

16. The system as recited in Claim 1 further comprising an intermediate image between the root image and the leaf image, wherein the intermediate image comprises an application environment service group.

17. A method for distributing an application environment to a compute node comprising:

storing blocks of a root image of the compute node on a first storage unit;

storing a leaf image comprising new data blocks and changes to the blocks of the root image on a second storage unit;

merging the blocks of the root image stored on the first storage unit with the blocks of the leaf image stored on the second storage unit to create the application environment; and

delivering the application environment to the compute node.

18. The method as recited in Claim 17 further comprising:

modifying the leaf image in response to the compute node's access to the application environment.

19. The method as recited in Claim 18 wherein the modifying comprises:

upon receiving a write request from the compute node for a sector X, creating an appropriate persistent mapping for sector X; and

writing sector X on the second storage unit.

20. The method as recited in Claim 17 further comprising:

reconciling the root image and the leaf image to form a new root image.

21. The method as recited in Claim 17 wherein the compute node comprises a server.

IPR2025-00202 / 844 Patent Page 31 of 128 EX1010

22. The method as recited in Claim 17 wherein the compute node comprises a thin-client workstation.

23. The method as recited in Claim 17 wherein the root image comprises an operating system.

24. The method as recited in Claim 17 wherein the root image is concurrently accessible to a plurality of compute nodes.

25. The method as recited in Claim 17 wherein the first storage unit is remotely located from the compute node.

26. The method as recited in Claim 17 wherein the second storage unit is remotely located from the compute node.

27. The method as recited in Claim 17 wherein the second storage unit contains a block modification log for the compute node.

28. The method as recited in Claim 17 wherein the first storage unit is contained within a first partition on a hard disk and the second storage unit is contained within a second partition on the hard disk.

29. The method as recited in Claim 17 wherein merging occurs at an operational level between the first and second storage units and file system of the compute node.

30. The method as recited in Claim 17 wherein the method operates in a high performance computing cluster.

31. The method as recited in Claim 17 wherein the system operates in a grid computing cluster.

32. The method as recited in Claim 17 wherein the first storage unit is read only.

33. The method as recited in Claim 17 further comprising:

creating an intermediate image on a third storage unit between the root image and the leaf image, wherein the intermediate image comprises an application environment service group.

BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT

ABSTRACT

An embodiment of the present invention is directed to a system for distributing an application environment to a compute node. The system includes a first storage unit for storing blocks of a root image of the compute node and a second storage unit for storing a leaf image comprising new data blocks and changes to the blocks of the root image. The system further includes a union block device for interfacing between the compute node and the first and second storage units to distribute the application environment to the compute node. The union block device creates the application environment by merging the blocks of the root image stored on the first storage unit with the leaf image stored on the second storage unit.

IPR2025-00202 / 844 Patent Page 34 of 128 EX1010

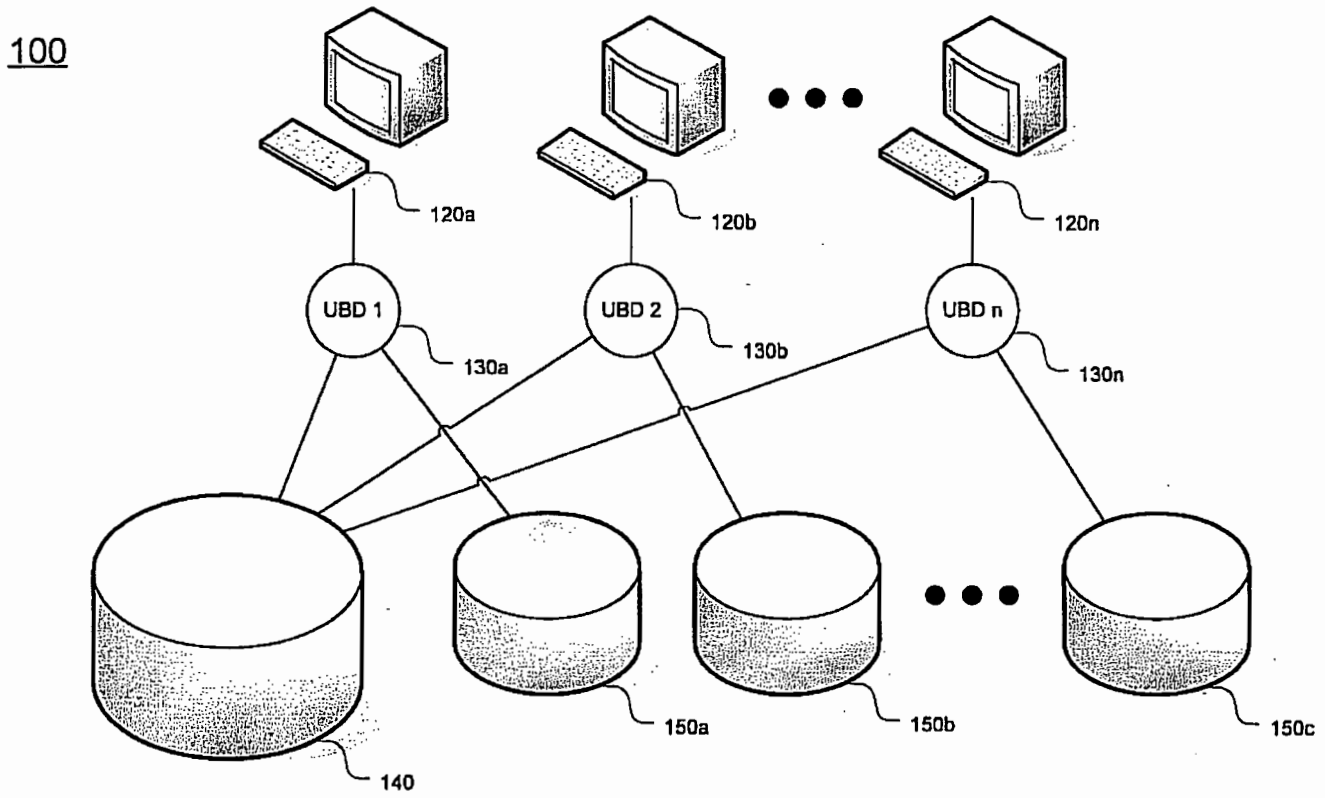

100
120a
120b
120n
UBD 1
UBD 2
UBD n
130a
130b
130n
140
150a
150b
150c

Figure 1

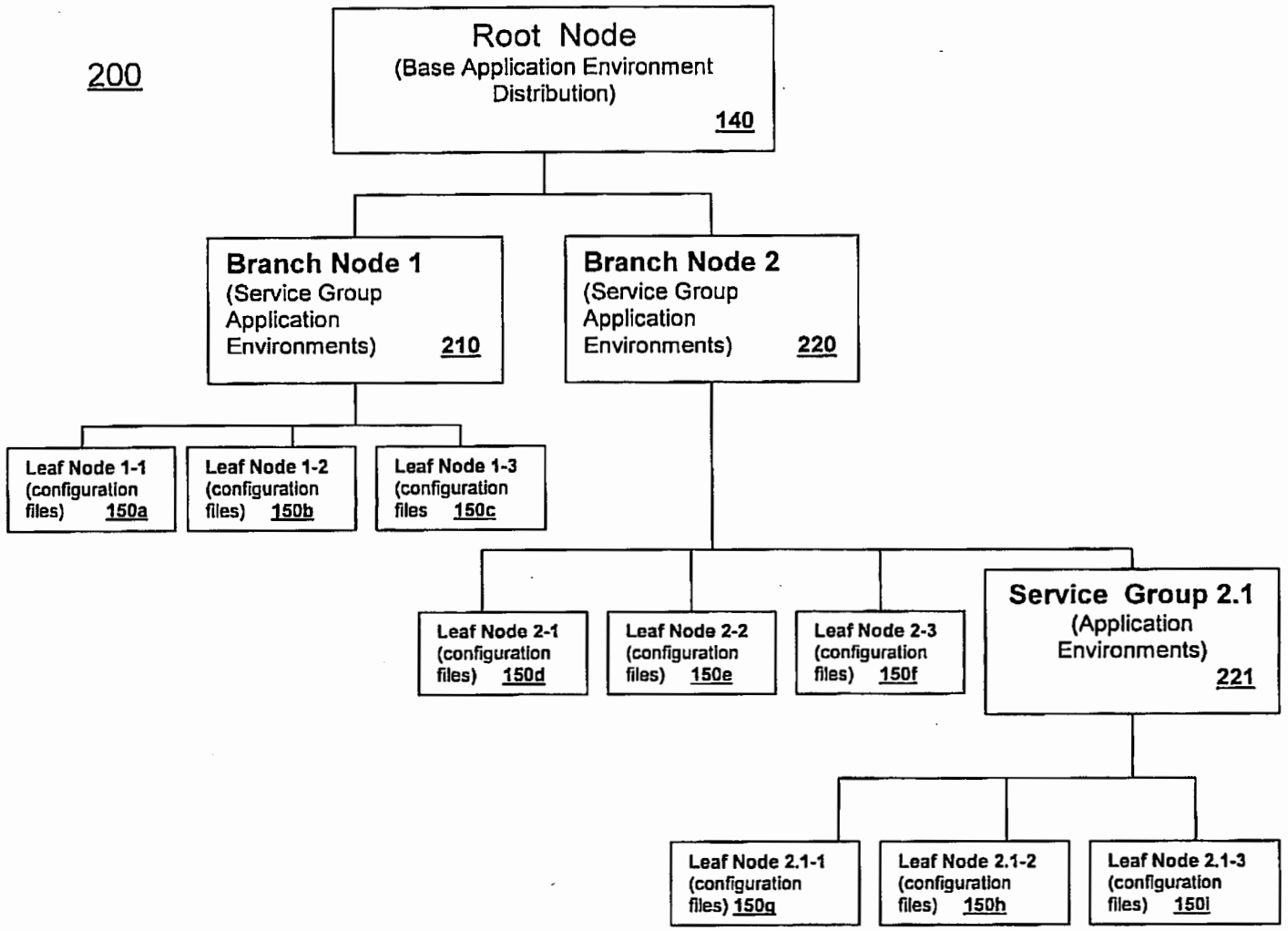

200
Root Node
(Base Application Environment Distribution)
140
Branch Node 1
(Service Group Application Environments) 210
Branch Node 2
(Service Group Application Environments) 220
Leaf Node 1-1 (configuration files) 150a
Leaf Node 1-2 (configuration files) 150b
Leaf Node 1-3 (configuration files 150c
Leaf Node 2-1 (configuration files) 150d
Leaf Node 2-2 (configuration files) 150e
Leaf Node 2-3 (configuration files) 150f
Service Group 2.1 (Application Environments) 221
Leaf Node 2.1-1 (configuration files) 150g
Leaf Node 2.1-2 (configuration files) 150h
Leaf Node 2.1-3 (configuration files) 150i

Figure 2

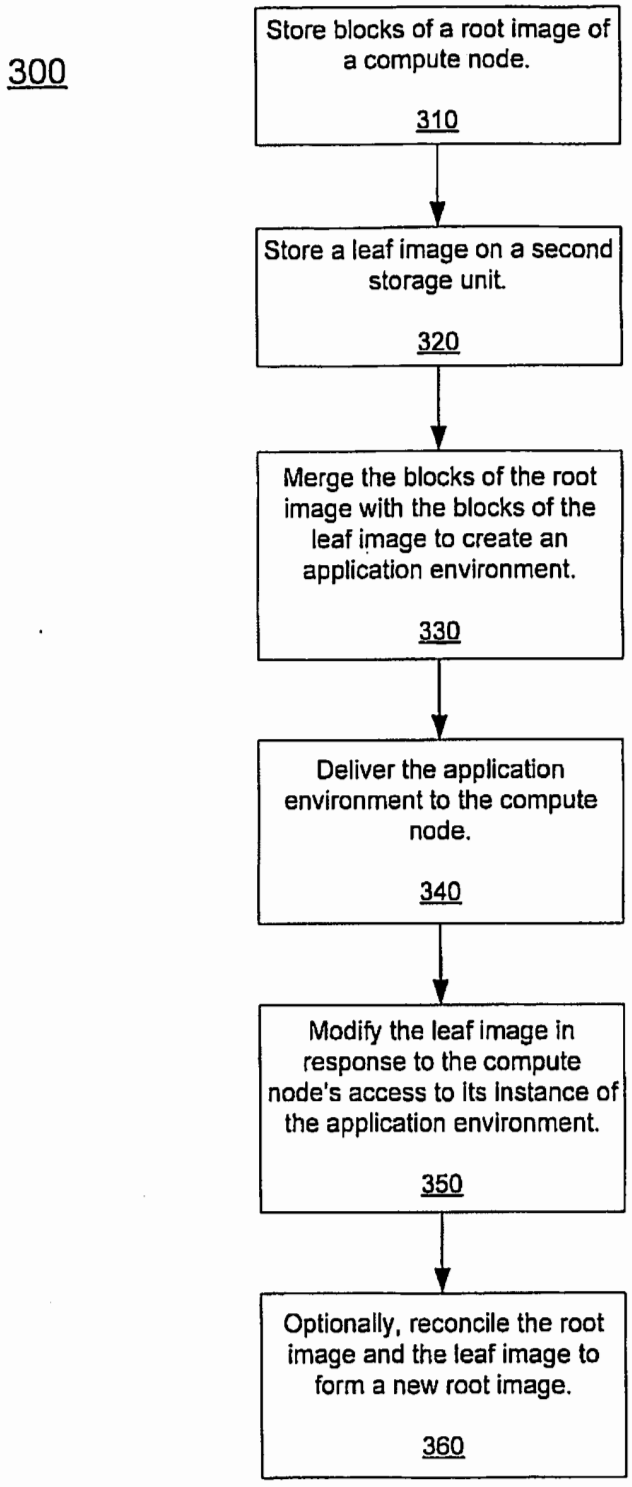

300
Store blocks of a root image of a compute node.
310
Store a leaf image on a second storage unit.
320
Merge the blocks of the root image with the blocks of the leaf image to create an application environment.
330
Deliver the application environment to the compute node.
340
Modify the leaf image in response to the compute node's access to its instance of the application environment.
350
Optionally, reconcile the root image and the leaf image to form a new root image.
360

Figure 3

Declaration and Power of Attorney for a Patent Application

Declaration

As below named inventor, I hereby declare that my residence post office address, and citizenship are as stated below my name. Further, I hereby declare that I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT

the specification of which:

X is attached hereto, or
____ was filed on ____ as application serial no. ____ : and
____ was amended on ____

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above; and

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56.

Foreign Priority Claim

I hereby claim foreign priority benefits under Title 35, United States Code Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Number	Country	Date Filed	Priority Claimed	
			____ yes	____ no
			____ yes	____ no

U.S. Priority Claim

I hereby claim the benefit under Title 35, United States Code, Section 120 and 119(e) of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Serial Number	Filing Date	Status (patented/pending/abandoned)
11/026,622	12/30/2004	Pending

rev 2/02 kgr

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Power of Attorney

As a named inventor, I hereby appoint practitioners associated with this Customer Number:

41066

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

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Third Floor
San Jose, California 95113
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Signatures

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Power of Attorney

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41066

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

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Third Floor
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Signatures

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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IPR2025-00202 / 8,444,487 Patent Page 41 of 128 EX1010

Attorney Docket No.: PNTA-P006

Inventor(s): Mukul KUMAR, Adhir POTDAR, Pradip KULKARNI, Richard AU

Title: BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT

REQUEST AND CERTIFICATION UNDER 35 U.S.C. 122(b)(2)(B)(i)

I hereby certify that the invention disclosed in the attached application **has not and will not be** the subject of an application filed in another country, or under a multilateral agreement, that requires publication at eighteen months after filing. I hereby request that the attached application not be published under 35 U.S.C. 122(b).

Date: March 30, 2006

By: _____
James P. Hao
Reg. No. 36,398

This request must be signed in compliance with 37 CFR 1.33(b) and submitted with the application **upon filing**.

Applicant may rescind this nonpublication request at any time. If applicant rescinds a request that an application not be published under U.S.C. 122(b), the application will be scheduled for publication at eighteen months from the earliest claimed filing date for which a benefit is claimed.

If applicant subsequently files an application directed to the invention disclosed in the attached application in another country, or under a multilateral international agreement, that requires publication of applications eighteen months after filing, the applicant must notify the United States Patent and Trademark Office of such filing within forty-five (45) days after the date of the filing of such foreign or international application. **Failure to do so will result in abandonment of this application (35 U.S.C. 122(b)(2)(B)(iii)).**

PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

04/05/2006 MWOLDGE1 00000031 11395816

01 FC:1011	300.00	OP
02 FC:1111	500.00	OP
03 FC:1311	200.00	OP
04 FC:1202	650.00	OP

PTO-1556
(5/87)

*U.S. Government Printing Office: 2002 — 489-267/69033

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PTO/SB/06 (12-04)
Approved for use through 7/31/2006. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875 Effective December 8, 2004

Application or Docket Number: 11395816

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	150.00		N/A	300.00
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	$250		N/A	$500
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	$100		N/A	$200
TOTAL CLAIMS (37 CFR 1.16(i))	33 minus 20 =	* 13	X$ 25 =		OR	X$50 =	650
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*	X100 =			X200 =	
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			+180=			+360=	
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1650

APPLICATION AS AMENDED – PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X$ 25 =		OR	X$50 =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X100 =		OR	X200 =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					+180=		OR	+360=	
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X$ 25 =		OR	X$50 =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X100 =		OR	X200 =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					+180=		OR	+360=	
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

BEST AVAILABLE COPY

OIPE IAP98 OCT 31 2006 PATENT & TRADEMARK OFFICE

Attorney Docket No.: PNTA-P006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

I hereby certify that this transmittal of the below described document is being deposited with the United States Postal Service in an envelope bearing First Class Postage and addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on the below date of deposit.					
Date of Deposit:	10/24/06	Name of Person Making the Deposit:	Shannon Carmo	Signature of the Person Making the Deposit:	Shannon Carmo

In re Application of: Kumar, et al

Application Serial No. : 11/395,816 Group Art Unit: 2628

Filed : 3/30/2006 Examiner:

For : BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION MANAGEMENT

Commissioner for Patents
P.O Box 1450
Alexandria, VA 22313-1450

AMENDMENT AND REQUEST FOR CORRECTION OF INVENTORSHIP UNDER 37 C.F.R. 1.48 (a)

AMENDMENT, REQUEST AND PROCESSING FEE TO ADD INVENTOR TO ORIGINAL INVENTORSHIP IN NONPROVISIONAL APPLICATION
(37 C.F.R. 1.48(a))

1. This amendment and request is to correct the incorrect original naming of inventor(s) in the declaration filed on 3/30/06 pursuant to 37 C.F.R. 1.48(a).

2. Request to correct the inventorship as follows:

[X] Add the following previously unnamed person(s) as inventor(s) of this nonprovisional application:

James M. Mott & Tung M. Nguyen

[ ] Delete the following previously incorrectly named inventor(s)

_____

_____

10/31/2006 SSESHE1 00000004 11395816 130.00 OP
01 FC:1464

3. Attachments

Attached is

(a) A statement from: (check items below that apply)

[X] each person being added as an inventor that the error in inventorship occurred without deceptive intention on his or her part. 37 C.F.R. 1.48(a)(2).

[ ] each person being deleted as an inventor that the error in inventorship occurred without deceptive intention on his or her part. 37 C.F.R. 1.48(a)(2).

(b) a declaration by each of the actual inventor(s) as required by 37 C.F.R. 1.63. 37 C.F.R. 1.48(a)(3).

(c) written assent of the assignee. 37 C.F.R. 1.48 (a)(5).

(e) statement under 3.73(b) and copy of assignments

4. Fee Payment (37 C.F.R. 1.17(i)-$130.00)

The processing fee required is paid as follows:

[x] The Commissioner is hereby authorized to charge any fees associated with this communication or credit any overpayment to Deposit Account No.: 23-0085.
A duplicate copy of this authorization is enclosed.

[x] A check in the amount of $130.00

Please direct all correspondence concerning the above-identified application to the following address:

WAGNER, MURABITO & HAO LLP
Two North Market Street, Third Floor
San Jose, California 95113
(408) 938-9060
Customer Number 41066

Respectfully submitted,

Date: **October 24, 2006**

By: _____
James P. Hao
Reg. No. 36,398

OIPE
OCT 31 2006
PATENT & TRADEMARK OFFICE
IAP98

Attorney Docket No.: PNTA-P006

Declaration and Power of Attorney for a Patent Application

Declaration

As below named inventor, I hereby declare that my residence post office address, and citizenship are as stated below my name. Further, I hereby declare that I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT

the specification of which:

_____ is attached hereto, or
X was filed on 03/30/2006 as application serial no. 11/395,816 : and
_____ was amended on _____

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above; and

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56.

Foreign Priority Claim

I hereby claim foreign priority benefits under Title 35, United States Code Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Number	Country	Date Filed	Priority Claimed	
_____	_____	_____	_____ yes	_____ no
_____	_____	_____	_____ yes	_____ no

U.S. Priority Claim

I hereby claim the benefit under Title 35, United States Code, Section 120 and 119(e) of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Serial Number	Filing Date	Status (patented/pending/abandoned)
11/026,622	12/30/2004	Pending
_____	_____	_____

rev 2/02 kgr

OIPE IAP98 OCT 31 2006 PATENT & TRADEMARK OFFICE

Attorney Docket No.: PNTA-P006

Power of Attorney

As a named inventor, I hereby appoint practitioners associated with this Customer Number:

41066

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Send Correspondence to:

WAGNER, MURABITO & HAO LLP
Two North Market Street
Third Floor
San Jose, California 95113
(408) 938-9060

Signatures

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of Sole/First Inventor: Pradip KULKARNI

Inventor's Signature _____ Date 16th Oct, 2006

Residence Pune India Citizenship INDIA
(City State)

P.O. Address 3B/11, Visava Park D P Road, Aundh Pune 411007 India

Full Name of Joint/Second Inventor: Mukul KUMAR

Inventor's Signature _____ Date 16th Oct, 2006

Residence Pune India Citizenship INDIA
(City State)

P.O. Address Flat No. 7, Nont Vert Solitaire, S. No. 260/1, Aundh, Pune 411007, India

Full Name of Joint/Third Inventor: Adhir POTDAR

Inventor's Signature _____ Date 16th Oct, 2006

Residence Maharahstra India Citizenship India
(City State)

P.O. Address A1-21, Royal Orchard, Wireless Colony, D.P. Road, Aundh Pune-Maharahstra 411007 India

rev 2/02 kgr

OIPE IAP98 OCT 31 2006 PATENT & TRADEMARK OFFICE

Attorney Docket No.: PNTA-P006

Full Name of Joint/Fourth Inventor: Richard AU

Inventor's Signature _____ Date 9/19/2006

Residence Woodside, California Citizenship USA
(City State)

P.O. Address 389 Moore Road, Woodside, CA 94062

Full Name of Joint/Fifth Inventor: James M. MOTT

Inventor's Signature _____ Date _____

Residence Austin, Texas Citizenship USA
(City State)

P.O. Address 3301 Windy Harbor Drive, Austin, TX 78734

Full Name of Joint/Sixth Inventor: Tung M. NGUYEN

Inventor's Signature _____ Date 9/18/2006

Residence Cupertino, CA Citizenship USA
(City State)

P.O. Address 22346 Mc. Clellan Road, Cupertino, CA 95014

OIPE IAP98 OCT 31 2006 PATENT & TRADEMARK OFFICE

Attorney Docket No.: PNTA-P006

Full Name of Joint/Fourth Inventor: Richard AU

Inventor's Signature _____ Date _____

Residence Woodside, California (City State) Citizenship USA

P.O. Address 389 Moore Road, Woodside, CA 94062

Full Name of Joint/Fifth Inventor: James M. MOTT

Inventor's Signature _____ Date 9/18/2006

Residence Austin, Texas (City State) Citizenship USA

P.O. Address 3301 Windy Harbor Drive, Austin, TX 78734

OIPE IAP98 OCT 31 2006 PATENT & TRADEMARK OFFICE

Attorney Docket No.: PNTA-P006

Full Name of Joint/Fourth Inventor: Richard AU

Inventor's Signature _____ Date 9/19/2006

Residence Woodside, California Citizenship USA
(City State)

P.O. Address 389 Moore Road, Woodside, CA 94062

Full Name of Joint/Fifth Inventor: James M. MOTT

Inventor's Signature _____ Date _____

Residence Austin, Texas Citizenship USA
(City State)

P.O. Address 3301 Windy Harbor Drive, Austin, TX 78734

Full Name of Joint/Sixth Inventor: Tung M. NGUYEN

Inventor's Signature _____ Date 9/18/2006

Residence Cupertino, CA Citizenship USA
(City State)

P.O. Address 22346 Mc. Clellan Road, Cupertino, CA 95014

OIPE IAP98 OCT 31 2006 PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Kumar, et al

Application Serial No. : 11/395,816 Group Art Unit: 2628

Filed : 3/30/2006 Examiner:

For : BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION MANAGEMENT

Commissioner for Patents
P.O Box 1450
Alexandria, VA 22313-1450

STATEMENT OF NON-DECEPTIVE INTENT BY PERSON BEING ADDED BY AMENDMENT AND REQUEST TO CORRECT INVENTORSHIP IN A PATENT APPLICATION (37 C.F.R. SECTION 1.48(a))

I, James M. Mott, who is the person being added as an inventor by the amendment and request being submitted to correct the inventorship of the patent application identified above, do hereby declare that the inventorship error in failing to include my name as an inventor on the patent application identified above occurred without any deceptive intent on my part.

Dated: 10/23/07

James M. Mott

OIPE IAP98 OCT 31 2006 PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Kumar, et al

Application Serial No. : 11/395,816 Group Art Unit: 2628

Filed : 3/30/2006 Examiner:

For : BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION MANAGEMENT

Commissioner for Patents
P.O Box 1450
Alexandria, VA 22313-1450

STATEMENT OF NON-DECEPTIVE INTENT BY PERSON BEING ADDED BY AMENDMENT AND REQUEST TO CORRECT INVENTORSHIP IN A PATENT APPLICATION (37 C.F.R. SECTION 1.48(a))

I, Tung M. Nguyen, who is the person being added as an inventor by the amendment and request being submitted to correct the inventorship of the patent application identified above, do hereby declare that the inventorship error in failing to include my name as an inventor on the patent application identified above occurred without any deceptive intent on my part.

Dated: 9/18/2006

Tung M. Nguyen

OIPE IAP98
OCT 31 2006
PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Kumar, et al

Application Serial No. : 11/395,816 Group Art Unit: 2628

Filed : 3/30/2006 Examiner:

For : BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION MANAGEMENT

Commissioner for Patents
P.O Box 1450
Alexandria, VA 22313-1450

ASSENT OF ASSIGNEE TO CORRECTION OF INVENTORSHIP IN A PATENT APPLICATION (37 C.F.R. SECTION 1.48(a))

1. Name of ASSIGNEE: PANTA Systems, Inc.
10400 Ridgeview Court
Suite 200
Cupertino, CA 95014

2. Assignee, PANTA Systems, Inc., certifies that it is the assignee of the entire right, title, and interest in the patent application identified above by virtue of an assignment from the inventors. A Statement under 37 C.F.R. Section 3.73(b) is also attached.

3. Assignee hereby assents to the correction of inventorship filed herewith. The undersigned is authorized to act on behalf of the Assignee.

4. Date: 9/18/2006

Signature of person signing for assignee

Tung Nguyen
Printed name of person signing for assignee

CTO & Chairman
Title of person signing for assignee

Respectfully submitted,

WAGNER, MURABITO & HAO, LLP

Date: 10/24/06

James P. Hao
Registration No. 36,398

Two North Market Street, Third Floor
San Jose, CA 95113
(408) 938-9060

Attorney Docket No.: PNTA-P006

Assignment to PANTA Systems, Inc.

In consideration of good and valuable consideration, receipt of which is hereby acknowledged, I/we James M. MOTT do hereby sell, assign, and transfer unto PANTA Systems, Inc. (hereinafter called PANTA), a Delaware Corporation having its principal place of business at 20450 Stevens Creek Blvd., Suite 400, Cupertino, California 95014, and its successors and assigns, the entire right, title, and interest for the United States and all foreign countries, in and to any and all improvements, including the right of priority in, to, and under, the application for the United States patent entitled:

BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT

____ filed herewith and the inventions set forth and described therein, and any and all Letters Patent of the United States and of countries foreign thereto which may be granted thereon or therefor; or

_X_ Serial No.: 11/398,816 filed on 03/30/2006 and the inventions set forth and described therein, and any and all Letters Patent of the United States and of countries foreign thereto which may be granted thereon or therefor;

And for the above consideration, I/we agree promptly upon request of PANTA, its successors or assigns, to execute and deliver without further compensation any power of attorney, assignment, application, whether original, continuation, divisional or reissue, or other papers which may be necessary or desirable fully to secure to PANTA, its successors and assigns, the inventions described in said application and all patent rights therein, in the United States and in any country foreign thereto, and to cooperate and assist in the prosecution of interference proceedings involving said inventions and in the adjudication or reexamination of said Letters Patent provided the expenses which may be incurred by me/us in lending such cooperation and assistance are paid by PANTA.

I/we further covenant with PANTA, its successors, assigns, and legal representatives that no assignment, grant, mortgage, license, or other agreement affecting the rights and property herein conveyed has been made to others by the undersigned, and that full right to convey the same as herein expressed is possessed by the undersigned;

In witness whereof, I/we hereunto set my/our hand(s) and seal:

Inventor's Signature: _____ Date: 10/23/07
James M. MOTT

State of _____

County of _____

Before me this _____ day of _____ personally appeared _____ who is _____ personally known or _____ proved to me on the basis of satisfactory evidence to be the person who acknowledged the foregoing instrument of assignment to be _____ his or _____ her free act and deed.

Notary Stamp/Seal

Notary Public _____

rev. 10/15/2004.dc

Attorney Docket No.: PNTA-P006

Assignment to PANTA Systems, Inc.

In consideration of good and valuable consideration, receipt of which is hereby acknowledged, I/we
Tung M. NGUYEN
do hereby sell, assign, and transfer unto PANTA Systems, Inc. (hereinafter called PANTA), a Delaware Corporation having its principal place of business at 20450 Stevens Creek Blvd., Suite 400, Cupertino, California 95014, and its successors and assigns, the entire right, title, and interest for the United States and all foreign countries, in and to any and all improvements, including the right of priority in, to, and under, the application for the United States patent entitled:

BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT

____ filed herewith and the inventions set forth and described therein, and any and all Letters Patent of the United States and of countries foreign thereto which may be granted thereon or therefor; or

X Serial No.: 11/398,816 filed on 03/30/2006 and the inventions set forth and described therein, and any and all Letters Patent of the United States and of countries foreign thereto which may be granted thereon or therefor;

And for the above consideration, I/we agree promptly upon request of PANTA, its successors or assigns, to execute and deliver without further compensation any power of attorney, assignment, application, whether original, continuation, divisional or reissue, or other papers which may be necessary or desirable fully to secure to PANTA, its successors and assigns, the inventions described in said application and all patent rights therein, in the United States and in any country foreign thereto, and to cooperate and assist in the prosecution of interference proceedings involving said inventions and in the adjudication or reexamination of said Letters Patent provided the expenses which may be incurred by me/us in lending such cooperation and assistance are paid by PANTA.

I/we further covenant with PANTA, its successors, assigns, and legal representatives that no assignment, grant, mortgage, license, or other agreement affecting the rights and property herein conveyed has been made to others by the undersigned, and that full right to convey the same as herein expressed is possessed by the undersigned;

In witness whereof, I/we hereunto set my/our hand(s) and seal.

Inventor's Signature: _____ Date: 9/18/2006
Tung M. NGUYEN

State of _____

County of _____

Before me this ____ day of _____ personally appeared _____
who is ____ personally known or ____ proved to me on the basis of satisfactory evidence to be the person who acknowledged the foregoing instrument of assignment to be ____ his or ____ her free act and deed.

Notary Stamp/Seal

Notary Public

STATEMENT UNDER 37 CFR 3.73(b)

Applicant: Kumar, et al

Application No.: 11/395,816 Filed: 3/30/06

For: BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT

PANTA Systems, Inc., a corporation
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

certifies that it is the assignee of the entire right, title and interest in the patent application identified above by virtue of either:

A. [X] An assignment from the inventor(s) of the patent application identified above. The assignment was recorded in the Patent and Trademark office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. [ ] A chain of title from the inventor(s) of the patent application identified above, to the current assignee as shown below:

1. From: _____ To: _____
The document was recorded in the Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____
The document was recorded in the Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

[X] Copies of assignments or other documents in the chain of title are attached.

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further, that these statements are made with the knowledge that willful false statements, and the like so made, are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Name: Tung Nguyen Title: CTO & Chairman

Signature: _____ Date: 9/18/2006

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	FILE WRAPPER LOCATION
11/395,816		2628	

Correspondence Address / Fee Address Change

The following fields have been set to Customer Number 70848 on 06/04/2007

- Correspondence Address
- Maintenance Fee Address

The address of record for Customer Number 70848 is:
Panta c/o Murabito, Hao & Barnes LLP
Two Market Street
3rd Floor
San Jose,CA 95113

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/395,816	03/30/2006	Pradip Kulkarni	PNTNA-P006	2625

70848 7590 07/08/2009

PANTA c/o MURABITO HAO & BARNES LLP
Two Market Street
3rd Floor
San Jose, CA 95113

EXAMINER	
KHATRI, ANIL	

ART UNIT	PAPER NUMBER
2191	

MAIL DATE	DELIVERY MODE
07/08/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/395,816	KULKARNI ET AL.	
	Examiner	Art Unit	
	Anil Khatri	2191	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 March 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *3/30/06* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

The disclosure is objected to because of the following informalities: Summary of the invention is identical and verbatim as an abstract.

Content of Specification

(a) Title of the Invention: See 37 CFR 1.72(a) and MPEP § 606. The title of the invention should be placed at the top of the first page of the specification unless the title is provided in an application data sheet. The title of the invention should be brief but technically accurate and descriptive, preferably from two to seven words may not contain more than 500 characters.

(b) Cross-References to Related Applications: See 37 CFR 1.78 and MPEP § 201.11.

(c) Statement Regarding Federally Sponsored Research and Development: See MPEP § 310.

(d) The Names Of The Parties To A Joint Research Agreement: See 37 CFR 1.71(g).

(e) Incorporation-By-Reference Of Material Submitted On a Compact Disc: The specification is required to include an incorporation-by-reference of electronic documents that are to become part of the permanent United States Patent and Trademark Office records in the file of a patent application. See 37 CFR 1.52(e) and MPEP § 608.05. Computer program listings (37 CFR 1.96(c)), "Sequence Listings" (37 CFR 1.821(c)), and tables having more than 50 pages of text were permitted as electronic documents on compact discs beginning on September 8, 2000.

(f) Background of the Invention: See MPEP § 608.01(c). The specification should set forth the Background of the Invention in two parts:

(1) Field of the Invention: A statement of the field of art to which the invention pertains. This statement may include a paraphrasing of the applicable U.S. patent classification definitions of the subject matter of the claimed invention. This item may also be titled "Technical Field."

(2) Description of the Related Art including information disclosed under 37 CFR 1.97 and 37 CFR 1.98: A description of the related art known to the applicant and including, if applicable, references to specific related art and problems involved in the prior art which are solved by the applicant's invention. This item may also be titled "Background Art."

(g) Brief Summary of the Invention: See MPEP § 608.01(d). A brief summary or general statement of the invention as set forth in 37 CFR 1.73. The summary is separate and distinct from the abstract and is directed toward the invention rather than the disclosure as a whole. The summary may point out the advantages of the invention or how it solves problems previously existent in the prior art (and preferably indicated in the Background of the Invention). In chemical cases it should point out in general terms the utility of the invention. If possible, the nature and gist of the invention or the inventive concept should be set forth. Objects of the invention should be treated briefly and only to the extent that they contribute to an understanding of the invention.

(h) Brief Description of the Several Views of the Drawing(s): See MPEP § 608.01(f). A reference to and brief description of the drawing(s) as set forth in 37 CFR 1.74.

(i) Detailed Description of the Invention: See MPEP § 608.01(g). A description of the preferred embodiment(s) of the invention as required in 37 CFR 1.71. The description should be as short and specific as is necessary to describe the invention adequately and accurately. Where elements or groups of elements, compounds, and processes, which are conventional and generally widely known in the field of the invention described and their exact nature or type is not necessary for an understanding and use of the invention by a person skilled in the art, they should not be described in detail. However, where particularly complicated subject matter is involved or where the elements, compounds, or processes may not be commonly or widely known in the field, the specification should refer to another patent or readily available publication which adequately describes the subject matter.

(j) Claim or Claims: See 37 CFR 1.75 and MPEP § 608.01(m). The claim or claims must commence on separate sheet or electronic page (37 CFR 1.52(b)(3)). Where a claim sets forth a plurality of elements or steps, each element or step of the claim should be separated by a line indentation. There may be plural indentations to further segregate subcombinations or related steps. See 37 CFR 1.75 and MPEP § 608.01(i)-(p).

(k) Abstract of the Disclosure: See MPEP § 608.01(f). A brief narrative of the disclosure as a whole in a single paragraph of 150 words or less commencing on a separate sheet following the claims. In an international application which has entered the national stage (37 CFR 1.491(b)), the applicant need not submit an abstract commencing on a separate sheet if an abstract was published with the international application under PCT Article 21. The abstract that appears on the cover page of the pamphlet published by the International Bureau (IB) of the World Intellectual Property Organization (WIPO) is the abstract that will be used by the USPTO. See MPEP § 1893.03(e).

(l) Sequence Listing, See 37 CFR 1.821-1.825 and MPEP §§ 2421-2431. The requirement for a sequence listing applies to all sequences disclosed in a given application, whether the sequences are claimed or not. See MPEP § 2421.02.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-33 are rejected under 35 USC 101 because they disclose a claimed invention that is an abstract idea as defined in the case *In re Warmerdam*, 33, F 3d 1354, 31 USPQ 2d 1754 (Fed. Cir. 1994).

Analysis: Claims 1-33 disclosed by the applicant as being a "system for distributing…". Since the claims are each a series of steps to be performed on a computer the processes must be analyzed to determine whether they are statutory under 35 USC 101.

Examiner interprets that the claims 1-33 are non-statutory because they do not disclose that how a system will be able to process and carry out its intended results incorporating a processor, memory and medium. Claims 1-33 recites storage unit, node and block device without showing how and where is been done? Therefore, claims 1-33 are an abstract idea and merely a storage unit for some data without representing intermediate steps so its functionality cannot be realized and does not produce any useful results. Thus claims 1-33 are non-statutory and rejected under 35 USC 101.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-16 recites the limitation "union block device". There is insufficient antecedent basis for this limitation in the claim. Further is unclear and vague what applicant means by union block device?

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pavan et al USPN 6,502,238 in view of Davidson USPN 7,475,274.

Regarding claims 1 and 17

Pavan et al teaches

a first storage unit for storing blocks of a root image of the compute node (column 2, line 29, according to another aspect of the invention, a user program specifying connections between a plurality of program blocks distributed across a plurality of processing nodes is received. At least one program block located on a root processing node is identified. The root node is the processing node controlling execution of the program. The input and output connections from each one of the program blocks located on the root node are traced. Connection between one of the program blocks located on the root processing node and one of the program blocks located on a remote processing node are identified. A first system-level block is inserted on the root processing node. A second system-level block is inserted on the remote node. The first and second system-level blocks provide network services. A program fragment is created for the processing nodes. The program fragment for each processing node comprises the program blocks and the system-level blocks located on the processing node);

a second storage unit for storing a leaf image, the leaf image comprising new data blocks and changes to the blocks of the root image (column 10, line 12, the connections out of and into the block are examined to identify a next child of the root block (box 604). A connection between two program blocks is also referred to herein as an "edge." A "child" is a program block that is connected to the current block that is

being processed by the "GROW-FRAGMENT" step. The child may be located on the same processing node as the block or the child may be located on a different processing node. If the next child of the root node exists (box 606), then the child is examined to determine if the child is already a part of a program fragment (box 610). If the child is already in a program fragment, then this connection is a backedge and indicates a cycle. In one embodiment, a variable (e.g. backedge) is set to indicate if the connection is a backedge or not. After determining if the child is already in a program fragment, the location of the child is compared to the location of the block to determine if the child and the block are located on the same processing node (box 610). If the child is on a different processing node, then the flowchart continues to FIG. 6B as indicated by the label "C". If the child is on the same processing node as the block, then the connection between the child and the block is checked to see if the connection is a backedge (box 612). If the connection is not a backedge, then the flowchart continues at "F" (box 660) of FIG. 6C. If the connection is a backedge, then the flowchart continues at "H" (box 680) of FIG. 6E). Pavan et al does not teach explicitly a union block device for interfacing between the compute node and the first and second storage units to distribute the application environment to the compute node, wherein the union block device creates the application environment by merging the blocks of the root image stored on the first storage unit with the blocks of the leaf image stored on the second storage unit. However, Davidson teaches (see summary of the invention, column 4, line 30, management node 105 comprises at least one blade substantially dedicated to managing or assisting an administrator. For example,

management node 105 may comprise two blades, with one of the two blades being redundant (such as an active/passive configuration). In one embodiment, management node 105 may be the same type of blade or computing device as HPC nodes 115. But, management node 105 may be any node, including any Number of circuits and configured in any suitable fashion, so long as it remains operable to at least partially manage grid 110. Often, management node 105 is physically or logically separated from the plurality of HPC nodes 115, jointly represented in grid 110. In the illustrated embodiment, management node 105 may be communicably coupled to grid 110 via link 108. Reference to a "link" encompasses any appropriate communication conduit implementing any appropriate communications protocol. As an example and not by way of limitation, a link may include one or more wires in one or more circuit boards, one or more internal or external buses, one or more local area networks (LANs), one or more metropolitan area networks (MANs), one or more wide area networks (WANs), one or more portions of the Internet, or a combination of two or more such links, where appropriate. In one embodiment, link 108 provides Gigabit or 10 Gigabit Ethernet communications between management node 105 and grid 110). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention was made to incorporate union block in between computing nodes. The modification would have been obvious because one of ordinary skill in the art would have been motivated to combine teaching into distributing computing environment to achieve processing efficiency and reduces compilation time.

Regarding claims 2 and 21

Pavan et al teaches

the compute node comprises a server (column 9, line 28, four types of communications blocks exist: an input client block, an output client block, an input server block and an output server block. Communications blocks are inserted into the system-level program in client-server pairs to facilitate communication between program blocks distributed across the network. In the example system-level program 402 shown in FIG. 4, a pair of communications blocks 410, 412 is inserted in the system-level program between the MIMO program block 112 and the display program block 110. One of the communications blocks is a client block and the other is a server block. In an example scenario where the MIMO program block 112 is located on a root node and the display program block 110 is located on a remote node, the communications block 410 adjacent the MIMO program block 112 is an output client block and the communications block 412 adjacent the display block 110 is an input server block).

Regarding claims 3 and 22

Pavan et al teaches

compute node comprises a thin-client workstation (column 9, line 28, four types of communications blocks exist: an input client block, an output client block, an input server block and an output server block.

Communications blocks are inserted into the system-level program in client-server pairs to facilitate communication between program blocks distributed across the network. In the example system-level program 402 shown in FIG. 4, a pair of communications blocks 410, 412 is inserted in the system-level program between the MIMO program block 112 and the display program block 110. One of the communications blocks is a client block and the other is a server block. In an example scenario where the MIMO program block 112 is located on a root node and the display program block 110 is located on a remote node, the communications block 410 adjacent the MIMO program block 112 is an output client block and the communications block 412 adjacent the display block 110 is an input server block).

Regarding claims 4 and 23

Pavan et al teaches

the root image comprises an operating system (column 7, line 26, in one embodiment, the method of constructing and distributing block-based program fragments is incorporated into software executing on a computer. As described below, the software program constructs the desired application by resolving connection conflicts between distributed program blocks specified in the user program and inserting the necessary system-level blocks in the system-level program. In one embodiment, the software executes under an operating system such as Solaris 2.5 or the like and executes on an industry-standard workstation such as a Sun SPARCstation 20 or the like. The software program is developed using any high level language having programming

constructs to support blocks. In an example embodiment, the software is developed using the C++ programming language. A user interface for allowing the user to create user programs by selecting program blocks from a block library is implemented with any common graphical user interface such as Xviews or the like).

Regarding claims 5 and 24

Davidson teaches

the root image is concurrently accessible to a plurality of compute nodes (column 4, line 55, grid 110 is a group of nodes 115 interconnected for increased processing power. Typically, grid 110 is a 3D Torus, but it may be a mesh, a hypercube, or any other shape or configuration without departing from the scope of this disclosure. Reference to a "torus" may encompass all or a portion of grid 110, where appropriate, and vice versa, where appropriate. The links between nodes 115 in grid 110 may be serial or parallel analog links, digital links, or any other type of link that can convey electrical or electromagnetic signals such as, for example, fiber or copper. Each node 115 is configured with an integrated switch. This allows node 115 to more easily be the basic construct for the 3D Torus and helps minimize XYZ distances between other nodes 115. Further, this may make copper wiring work in larger systems at up to Gigabit rates with, in some embodiments, the longest cable being less than 5 meters. In short, node 115 is generally optimized for nearest-neighbor communications

and increased I/O bandwidth).

Regarding claims 6, 7, 25 and 26

Pavan et al teaches

first storage unit is remotely located from the compute node (column 8, line 51, FIG. 5A is a high-level flowchart of one embodiment of a method of translating a user program to a system-level program. The initial step "Read in the block program" 502 reads the user program file as input. The next step "Is the block program distributed?" 504 determines if the program blocks specified in the user program are located on a single processing node or are distributed across a network of processing nodes. If the program blocks are located on a single node then the step "Execute Program" 506 executes the user program. If the program blocks are distributed across a network, then the step "GROW_FRAGMENT" 508 detects program blocks located on different processing nodes and inserts one or more system-level blocks in the system-level program. The step "GROW_FRAGMENT" 508 constructs a program fragment (referred to herein as a fragment) for each node on which one or more program blocks reside. The fragment comprises the program blocks and the system-level blocks running on the node. After a fragment is constructed for a node, the fragment is written to the node in the step "WRITE_FRAGMENTS" 510. The processing node from which the user program is controlled is referred to as the control node. In one embodiment, the control node is the node on which the user program is submitted

for execution. In addition to the fragment that is written to each remote node, a fragment (referred to herein as a root fragment) is written to the control node).

Regarding claim 8, 18 and 27

Pavan et al teaches

the second storage unit contains a block modification log for the compute node (column 4, line 48, each one of the program blocks is logically characterized as a source block, a sink block or an intermediate block. A source block produces data. In an application for a control system, example source blocks represent cameras, infrared cameras, microphones, temperature sensors, pressure sensors, color sensors, laser sensors, optical sensors, disk drives, tape drives, memory, network monitoring devices such as an Ethernet sniffer and the like. A sink block consumes data. Example sink blocks represent displays, speakers, control valves, plotters, printers, disk drives, memory, tape drives, locking devices, brakes, throttles and the like. Between source and sink blocks are intermediate blocks that represent physical devices or software that perform various processing functions. Image recognition, thresholding, synchronization and flow control are examples of functions associated with intermediate blocks. Additional intermediate blocks comprise any device or software that processes or transforms data. As will be readily apparent to one of skill in the art, these categories are not mutually exclusive. For example, a disk storage system is capable of being represented as either a source block when data is read from the disk or as a sink block when data is written to the disk. In the

example application shown in FIG. 1, camera A 102 and camera B 104 are represented by source blocks; display 110 is represented by a sink block; and synchronizer 106 and image processor 108 are represented as intermediate blocks).

Regarding claims 9 and 28

Davidson teaches

first storage unit in contained within a first partition on a hard disk and the second storage unit is contained within a second partition on the hard disk (see figure 5).

Regarding claims 10 and 29

Davidson teaches

the union block device comprises a low-level driver for interfacing between the first and second storage units and the file system of the compute node (column 4, line 18, at a high level, HPC server 102 includes a management node 105, a grid 110 comprising a plurality of nodes 115, and cluster management engine 130. More specifically, server 102 may be a standard 19" rack including a plurality of blades (nodes 115) with some or all of the following components: i) dual-processors; ii) large, high bandwidth memory; iii) dual host channel adapters (HCAs); iv) integrated fabric switching; v) FPGA support; and vi) redundant power inputs or N+1 power supplies. These various components allow for failures to be confined to the node level. But it will be understood

that HPC server 102 and nodes 115 may not include all of these components. Management node 105 comprises at least one blade substantially dedicated to managing or assisting an administrator. For example, management node 105 may comprise two blades, with one of the two blades being redundant (such as an active/passive configuration). In one embodiment, management node 105 may be the same type of blade or computing device as HPC nodes 115. But, management node 105 may be any node, including any Number of circuits and configured in any suitable fashion, so long as it remains operable to at least partially manage grid 110. Often, management node 105 is physically or logically separated from the plurality of HPC nodes 115, jointly represented in grid 110. In the illustrated embodiment, management node 105 may be communicably coupled to grid 110 via link 108. Reference to a "link" encompasses any appropriate communication conduit implementing any appropriate communications protocol. As an example and not by way of limitation, a link may include one or more wires in one or more circuit boards, one or more internal or external buses, one or more local area networks (LANs), one or more metropolitan area networks (MANs), one or more wide area networks (WANs), one or more portions of the Internet, or a combination of two or more such links, where appropriate. In one embodiment, link 108 provides Gigabit or 10 Gigabit Ethernet communications between management node 105 and grid 110).

Regarding claims 11, 12 and 19

Pavan et al teaches

the union block device, upon receiving a write request from the compute node for a sector X, creates an appropriate persistent mapping for sector X (column 7, line 53, FIG. 4 is a functional block diagram of the mapping of a user program 400 for the control system application shown in FIG. 1 to a corresponding system-level program 402 having program fragments. In the example shown in FIG. 4, the user program 400 describes the interconnection between the camera A program block 102, the camera B program block 104, the MIMO program block 112 and the display program block 110. Each one of the program blocks 102, 104, 110, 112 is located on different a computing node distributed across a network as shown in FIG. 3).

Regarding claims 13, 14, 30 and 31

Davidson teaches

the system operates in a high performance computing cluster (column 2, line 1, in one embodiment, a method for fault tolerance and recovery in a high-performance computing (HPC) system includes monitoring a currently running node in an HPC system including multiple nodes. A fabric coupling the multiple nodes to each other and coupling the multiple nodes to storage accessible to each of the multiple nodes and capable of storing multiple hosts that are each executable at any of the multiple nodes. The method includes, if a fault occurs at the currently running node,

discontinuing operation of the currently running node and booting the host at a free node in the HPC system from the storage. Particular embodiments of the present invention may provide one or more technical advantages. As an example, particular embodiments provide fault tolerance and recovery in a cluster of commodity computer systems. Particular embodiments provide viable fault tolerance and recovery in a cluster of commodity computer systems for scientific and data-center computing applications. Particular embodiments provide cost-effective fault tolerance and recovery in a cluster of commodity computer systems for scientific and data-center computing applications. Particular embodiments of the present invention provide all, some, or none of the above technical advantages. Particular embodiments may provide one or more other technical advantages, one or more of which may be readily apparent to a person skilled in the art from the figures, description, and claims herein).

Regarding claims 15 and 32

Pavan et al teaches

the first storage unit is read only (column 4, line 48, each one of the program blocks is logically characterized as a source block, a sink block or an intermediate block. A source block produces data. In an application for a control system, example source blocks represent cameras, infrared cameras, microphones, temperature sensors, pressure sensors, color sensors, laser sensors, optical sensors, disk drives, tape drives, memory, network monitoring devices such as an Ethernet sniffer and the like. A sink block consumes data. Example sink blocks represent displays, speakers,

control valves, plotters, printers, disk drives, memory, tape drives, locking devices, brakes, throttles and the like. Between source and sink blocks are intermediate blocks that represent physical devices or software that perform various processing functions. Image recognition, thresholding, synchronization and flow control are examples of functions associated with intermediate blocks. Additional intermediate blocks comprise any device or software that processes or transforms data. As will be readily apparent to one of skill in the art, these categories are not mutually exclusive. For example, a disk storage system is capable of being represented as either a source block when data is read from the disk or as a sink block when data is written to the disk. In the example application shown in FIG. 1, camera A 102 and camera B 104 are represented by source blocks; display 110 is represented by a sink block; and synchronizer 106 and image processor 108 are represented as intermediate blocks).

Regarding claims 16 and 33

Pavan et al teaches

an intermediate image between the root image and the leaf image, wherein the intermediate image comprises an application environment service group (column 12, line 1, FIG. 7A is a functional block diagram of the program fragments for the application shown in FIG. 1. In the example scenario, the user program shown in FIG. 2 is submitted for execution on processing node C 300 of FIG. 7A. After the software identifies that the program blocks specified in the user

program are distributed across computing nodes in the network, the software begins to build a program fragment for each one of the computing nodes having at least one program block specified in the user program. In this example embodiment, the software begins with the program blocks located on node C 300 because node C is the node where the user program was submitted for execution. The software identifies input synchronizer program block 106 which has two output ports. The output ports of program block 106 are connected to input ports of image processor program block 108. Because the image processor program block 108 and the input synchronizer program block 106 reside on the same node C 300, no communications blocks are required for information to pass between the program blocks 106, 108. Image processor program block 108 has two output ports. One output port is connected to display program block 110 on node D 302. Because display program block 110 is located on a different computing node than image processor program block 108, the software must break the connection between image processor program block 108 and display program block 110 and insert communications blocks 700, 702. As described earlier, communications blocks are inserted into the system-level program in client-server pairs. First, the software adds an input server block 702 to the program fragment for node D 302. The input server block 702 is coupled to the display program block 110. Then the software adds an output client block 700 to the program fragment on node C 300. The output client block 700 is coupled to the image processor program block 108. Next, the software

connects an output port of the output client block 700 on node C 300 to an input port of the input server block 702 on node D 302).

Regarding claim 20

Pavan et al teaches

reconciling the root image and the leaf image to form a new root image(column 13, line 3, the software identifies the connection between camera A program block 102, input synchronizer block 106, image processor program block 108 and returning to camera A program block 102 as a feed back loop. Rather than continuing to follow the connections between these applications infinitely, the software identifies the connection between image processor program block 108 and camera A program block 102 (and the associated communications blocks 706, 704) as a back edge and does not continue to follow the loop. A back edge is identified when, in processing a new edge, the new edge leads to a node that has already been fragmented/processed. Rather, the software looks for other connections to image processor program block 108. After the software establishes the connections for all of the input and output ports of image processor program block 108, the software returns to input synchronizer program block 106. Input synchronizer program block 106 has two input ports. One of the input ports is coupled to input client block 710 as described above. The other input port of the Input synchronizer program block 106 is connected to an output port of camera B program block 104 on node B 306. Because camera B program block 104 is located on a different computing node than input synchronizer program block 106, the software

must break the connection between input synchronizer program block 106 and camera B program block 104 and insert communications blocks 712, 714. First, the software adds an output server block 712 to the program fragment for node B 306. The output server block 712 is coupled to the camera B program block 104. Then the software adds an input client block 714 to the program fragment on node C 300. The input client block 714 is coupled to the input synchronizer program block 106. Next, the software connects the input port of input client block 714 on node C 300 to an output port of the output server block 712 on node B 306).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anil Khatri whose telephone number is 571-272-3725. The examiner can normally be reached on M-F 8:30-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wei Zhen can be reached on 571-272-3708. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

***

/Anil Khatri/

Primary Examiner, Art Unit 2191

Notice of References Cited	Application/Control No. 11/395,816	Applicant(s)/Patent Under Reexamination KULKARNI ET AL.	
	Examiner Anil Khatri	Art Unit 2191	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-7,467,293	12-2008	Zhang et al.	713/1
*	B	US-7,263,551	08-2007	Belfiore et al.	709/219
*	C	US-6,502,238	12-2002	Pavan et al.	717/149
*	D	US-7,475,274	01-2009	Davidson, Shannon V.	714/4
*	E	US-5,113,523	05-1992	Colley et al.	712/12
*	F	US-7,200,715	04-2007	Kleiman et al.	711/114
*	G	US-6,018,747	01-2000	Burns et al.	707/203
*	H	US-7,496,739	02-2009	Raghavan et al.	713/1
*	I	US-7,331,047	02-2008	Chu et al.	717/178
*	J	US-7,246,351	07-2007	Bloch et al.	717/175
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	N					
	O					
	P					
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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**** CONTINUING DATA ***************************

This application is a CIP of 11/026,622 12/30/2004

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

04/21/2006

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ Yes ☑ No	☐ Yes ☑ No	/ANIL KHATRI/ Examiner's Signature	☐ Initials	INDIA	3	33	2

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TITLE

Block-level I/O subsystem for distributed application environment management

FILING FEE RECEIVED		
1650	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

BIB (Rev. 05/07).

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L4	1	("7143259").PN.	USPAT; USOCR	OR	OFF	2009/06/30 14:48
L5	1	("7162575").PN.	USPAT; USOCR	OR	OFF	2009/06/30 14:49
L6	1	("7159093").PN.	USPAT; USOCR	OR	OFF	2009/06/30 14:50
L7	1	("7143260").PN.	USPAT; USOCR	OR	OFF	2009/06/30 14:51
L8	1	("7383410").PN.	USPAT; USOCR	OR	OFF	2009/06/30 14:51
L9	1	("6397682").PN.	USPAT; USOCR	OR	OFF	2009/06/30 14:52
L10	1	("7437506").PN.	USPAT; USOCR	OR	OFF	2009/06/30 14:52
L11	1	("7370156").PN.	USPAT; USOCR	OR	OFF	2009/06/30 14:52
L12	205	(717/172).CCLS.	USPAT; USOCR	OR	OFF	2009/06/30 14:53
L13	340	(717/173).CCLS.	USPAT; USOCR	OR	OFF	2009/06/30 14:53
L14	460	(717/174).CCLS.	USPAT; USOCR	OR	OFF	2009/06/30 14:53
L15	253	(717/175).CCLS.	USPAT; USOCR	OR	OFF	2009/06/30 14:53
L16	259	(717/176).CCLS.	USPAT; USOCR	OR	OFF	2009/06/30 14:53
L17	266	(717/177).CCLS.	USPAT; USOCR	OR	OFF	2009/06/30 14:53

6/30/2009 2:54:17 PM
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IPR2025-00202 / 844 Patent Page 85 of 128 EX1010

Search Notes	Application/Control No.	Applicant(s)/Patent under Reexamination	
	11/395,816	KULKARNI ET AL.	
	Examiner	Art Unit	
	Anil Khatri	2191	

SEARCHED			
Class	Subclass	Date	Examiner
717	172-177	6/30/2009	AK
717	149	6/30/2009	AK

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
East	6/30/2009	AK
inventor/DP search USPN 7143259, 7162575,7159093,7143260, 7383410,6397682,7437506,7386647, 7370156	6/30/2009	AK

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Kulkarni, et al.	Confirmation	: 2625
Serial No.	: 11/395,816	Examiner	: Khatri, Anil
Filing Date	: 03/30/2006	Art Unit	: 2191

Attorney Docket No. : PNTA-P006

For: BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT

AMENDMENT AND RESPONSE TO OFFICE ACTION

Commissioner for Patents & Trademarks
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action mailed July 8, 2009, please consider the following amendments and remarks in the above captioned patent application.

Amendments to the Specification begin on Page 2 of this paper.

Amendments to the Claims are reflected in the listing of Claims which begins on page 4 of this paper, followed by Applicants' remarks.

Amendments to the Specification

Please replace Paragraph 0009 with the following:

[0009] An embodiment of the present invention is directed to a system for distributing an application environment to a compute node (e.g., a server or a thin-client workstation). The system includes a first storage unit for storing blocks of a root image (e.g., an operating system) of the compute node and a second storage unit for storing a leaf image comprising new data blocks and changes to the blocks of the root image. The system further includes a union block device for interfacing between the compute node and the first and second storage units to distribute the application environment to the compute node. The union block device creates the application environment by merging the blocks of the root image stored on the first storage unit with the leaf image stored on the second storage unit.

Please add the following paragraph between Paragraphs 0009 and 0010:

Another embodiment of the present invention is directed to a method for distributing an application environment to a compute node. The method includes storing blocks of a root image of the compute node on a first storage unit and storing a leaf image comprising new data blocks and changes to the blocks of the root image on a second storage unit. The method further includes merging the blocks of the root image stored on the first storage unit with the blocks of the leaf image stored on the second storage unit to create the application environment. The application environment is created by merging

the blocks of the root image stored on the first storage unit with the blocks fo the leaf image stored on the second storage unit. Lastly, the application environment is delivered to the computer node.

IPR2025-00202 / 844 Patent Page 89 of 128 EX1010

Amendments to the Claims

1. (Currently amended) A system for distributing an application environment ~~to a compute node~~ comprising:

a compute node comprising a computer system;

a first storage unit for storing blocks of a root image of the compute node, wherein the first storage unit comprises a first non-volatile memory, wherein the root image comprises a computer program, wherein the blocks comprise sections of data, and wherein a file of the root image comprises at least one block;

a second storage unit for storing a leaf image, the leaf image comprising new data blocks and changes to the blocks of the root image, wherein the second storage unit comprises a second non-volatile memory; and

a union block device for interfacing between the compute node and the first and second storage units to distribute the application environment to the compute node, wherein the union block device comprises a driver, wherein the union block device creates the application environment by merging the blocks of the root image stored on the first storage unit with the blocks of the leaf image stored on the second storage unit.

2. (Original) The system as recited in Claim 1 wherein the compute node comprises a server.

3. (Original) The system as recited in Claim 1 wherein the compute node comprises a thin-client workstation.

4. (Original) The system as recited in Claim 1 wherein the root image comprises an operating system.

5. (Original) The system as recited in Claim 1 wherein the root image is concurrently accessible to a plurality of compute nodes.

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6. (Original) The system as recited in Claim 1 wherein the first storage unit is remotely located from the compute node.

7. (Original) The system as recited in Claim 1 wherein the second storage unit is remotely located from the compute node.

8. (Original) The system as recited in Claim 1 wherein the second storage unit contains a block modification log for the compute node.

9. (Original) The system as recited in Claim 1 wherein the first storage unit in contained within a first partition on a hard disk and the second storage unit is contained within a second partition on the hard disk.

10. (Original) The system as recited in Claim 1 wherein the union block device comprises a low-level driver for interfacing between the first and second storage units and the file system of the compute node.

11. (Original) The system as recited in Claim 1 wherein the union block device, upon receiving a write request from the compute node for a sector X, creates an appropriate persistent mapping for sector X.

12. (Original) The system as recited in Claim 11 wherein the union block device writes sector X on the second storage unit.

13. (Original) The system as recited in Claim 1 wherein the system operates in a high performance computing cluster.

14. (Original) The system as recited in Claim 1 wherein the system operates in a grid computing cluster.

15. (Original) The system as recited in Claim 1 wherein the first storage unit is read only.

16. (Original) The system as recited in Claim 1 further comprising an intermediate image between the root image and the leaf image, wherein the intermediate image comprises an application environment service group.

17. (Currently amended) A method for distributing an application environment ~~to a compute node~~ comprising:

storing blocks of a root image of a[[the]] compute node on a first storage unit, wherein the compute node comprises a computer system, and wherein the first storage unit comprises a first non-volatile memory, wherein the root image comprises a computer program, wherein the blocks comprise sections of data, and wherein a file of the root image comprises at least one block;

storing a leaf image comprising new data blocks and changes to the blocks of the root image on a second storage unit, wherein the second storage unit comprises a second non-volatile memory;

merging the blocks of the root image stored on the first storage unit with the blocks of the leaf image stored on the second storage unit to create the application environment; and

delivering the application environment to the compute node.

18. (Original) The method as recited in Claim 17 further comprising:

modifying the leaf image in response to the compute node's access to the application environment.

19. (Original) The method as recited in Claim 18 wherein the modifying comprises:

upon receiving a write request from the compute node for a sector X, creating an appropriate persistent mapping for sector X; and

writing sector X on the second storage unit.

20. (Original) The method as recited in Claim 17 further comprising:

reconciling the root image and the leaf image to form a new root image.

21. (Original) The method as recited in Claim 17 wherein the compute node comprises a server.

22. (Original) The method as recited in Claim 17 wherein the compute node comprises a thin-client workstation.

23. (Original) The method as recited in Claim 17 wherein the root image comprises an operating system.

24. (Original) The method as recited in Claim 17 wherein the root image is concurrently accessible to a plurality of compute nodes.

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25. (Original) The method as recited in Claim 17 wherein the first storage unit is remotely located from the compute node.

26. (Original) The method as recited in Claim 17 wherein the second storage unit is remotely located from the compute node.

27. (Original) The method as recited in Claim 17 wherein the second storage unit contains a block modification log for the compute node.

28. (Original) The method as recited in Claim 17 wherein the first storage unit is contained within a first partition on a hard disk and the second storage unit is contained within a second partition on the hard disk.

29. (Original) The method as recited in Claim 17 wherein merging occurs at an operational level between the first and second storage units and file system of the compute node.

30. (Original) The method as recited in Claim 17 wherein the method operates in a high performance computing cluster.

31. (Original) The method as recited in Claim 17 wherein the system operates in a grid computing cluster.

32. (Original) The method as recited in Claim 17 wherein the first storage unit is read only.

33. (Original) The method as recited in Claim 17 further comprising:

creating an intermediate image on a third storage unit between the root image and the leaf image, wherein the intermediate image comprises an application environment service group.

REMARKS

Claims 1-33 are pending. Claims 1 and 17 are amended. No new matter has been added as a result of these amendments.

Specification Objections

The Summary of the invention is objected to because it is allegedly identical and verbatim to the abstract. Applicants have therefore amended paragraph 0009 and added a new paragraph between paragraph 0009 and 0010 that describes another embodiment of the invention. Further, Applicants respectfully point out that paragraph 0010 provides additional information related to the advantages of the invention over the prior art by explaining the nature of the invention (e.g., rather than copying the contents of the root image to create a new boot image, a new UBD is registered, which occurs very quickly).

Claim Rejections – 35 U.S.C. §101

Claims 1-33 are rejected under 35 U.S.C. 101 for allegedly disclosing a claimed invention that is an abstract idea. The rejection contends that Claims 1-33 are non-statutory because they do not disclose how a system will be able to process and carry out its intended results incorporating a processor, memory and medium. The rejection therefore, contends that Claims 1-33 recite "storage unit," "node," and "union block device" without showing how and where they are performed. Applicants have amended Claims 1 and 17 to further define the claim terms and their functionality.

Claim Rejections – 35 U.S.C. §112

Claims 1-16 are rejected under 35 U.S.C 112, second paragraph, for allegedly providing insufficient antecedent basis for the limitation "union block device." The rejection alleges this term is unclear and vague. Applicants have amended Claim 1 to further define the union block device as a "low level driver." Support for this amendment is found in Paragraph 0020 of Applicants' Specification. Paragraph 0020 also further describes the union block device and a sample embodiment (i.e., low level driver). As described in Applicants' Specification, and as known in the art, low-level drivers may be used in data acquisition, such as with the individual blocks making up files (data) within the root images and leaf images, as claimed in Claim 1.

Claim Rejections – 35 U.S.C. §103

Claims 1-33 are rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Paven (US 6,502,238), hereinafter "Paven," in view of Davidson (US 7,475,274), hereinafter "Davidson." Applicants respectfully assert that Claims 1-33 are patentable over the combination of Paven and Davidson in view of the following.

Applicants respectfully point out that the Examiner has the burden of establishing a prima case of obviousness. To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when

combined) must teach or suggest all the claim features. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP 2100-126. Specifically, "all words in a claim must be considered when judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d., 1382 (CCPA 1970).

Moreover, in response to the recent U.S. Supreme Court decision in *KSR Int'l Co. v. Teleflex, Inc*. (U.S. 2007), new guidelines were set forth for examining obviousness under 35 U.S.C. 103. The U.S. Supreme Court reaffirmed the *Graham* factors and, while not totally rejecting the "teachings, suggestion, or motivation" test, the Court appears to now require higher scrutiny on the part of the U.S. Patent & Trademark Office. In accordance with the recently submitted guidelines, it is "now necessary to identify the reason" why a person of ordinary skill in the art would have combined the elements of cited references, or at least describe the pertinence of the elements set forth in the cited disclosure, in the manner presently claimed.

Applicants contend that the combination of Paven and Davidson fail to teach or suggest all the claimed elements of Claims 1-33 in view of the following rationale.

Claim 1:

Amended Claim 1 recites in part:

> a compute node comprising a computer system;
> a first storage unit for storing blocks of a root image of the compute node, wherein the first storage unit comprises a first non-volatile memory;
> a second storage unit for storing a leaf image, the leaf image comprising new data blocks and changes to the blocks of the root image, wherein the second storage unit comprises a second non-volatile memory, wherein the root image comprises a computer program, and wherein the blocks comprise sections of data; and
> a union block device for interfacing between the compute node and the first and second storage units to distribute the application environment to the compute node, wherein the union block device comprises a driver, wherein the union block device creates the application environment by merging the blocks of the root image stored on the first storage unit with the blocks of the leaf image stored on the second storage unit (emphasis added).

Applicants respectfully assert that Pavan does not teach or suggest "a first storage unit for storing blocks of a root image…; a second storage unit for storing a leaf image… comprising new data blocks and changes to the blocks of the root image…; and a union block device for interfacing between the compute node and the first and second storage units to distribute the application environment to the compute node, …wherein the union block device creates the application environment by merging the blocks of the root image stored on the first storage unit with the blocks of the leaf image stored on the second storage unit," as claimed in Claim 1.

As understood by Applicants, Pavan is directed towards a distributed block-based programming model for control applications, wherein a user program specifies interconnections between a plurality of program blocks distributed across a plurality of

processing nodes (Abstract). Pavan discloses using multimedia information with Multiple-Input Multiple-Output (MIMO) control systems (Column 1, line 56 to Column 2, line 10). Paven discloses a method wherein a user program is received. This user program specifies interconnections between a plurality of program blocks distributed across a plurality of processing nodes, wherein the user program is translated into a system-level program having a program fragment for each of the processing nodes, wherein each program fragment comprises the program blocks located on the processing node and one or more system-level blocks for establishing connections between the processing node and a different processing node across a network (Column 2, lines 19-27; and Figure 4).

Applicants respectfully assert that to the extent Pavan discloses program blocks, root nodes, and the creation of program fragments with program blocks and children, Pavan does not teach or suggest a first storage unit for storing blocks of a root image, a second storage unit for storing a leaf image, nor a union block device which creates an application environment by merging the blocks of the root image stored on the first storage unit with the blocks of the leaf image stored on the second storage unit, as claimed in Claim 1.

Applicants respectfully assert that the blocks of a root image, as claimed in amended Claim 1 are not the program blocks as taught by Pavan. Applicants have amended Claim 1 to clarify that the blocks of a root image comprise sections of data, wherein a file of the root image comprises at least one block, as claimed in Claim 1.

Support for Applicants' amendment is found in Applicants' Specification, Paragraphs 0018-0020. As claimed in Amended Claim 1, these blocks make up a root image which comprises a computer program. Support for this amendment may be found in Paragraph 0017. This is completely different from the program blocks as taught by Pavan. As understood by Applicants, Pavan teaches that a program block is part of a block-based programming model, wherein a block is a high level program abstraction (Column 3, line 64 to Column 4, line 2). Further, these program blocks may be functions, objects implemented in an object-oriented programming language, or sensors, cameras and functions performed by physical devices (Column 3, line 64 to Column 4, line 18). The functional blocks of Pavan are not blocks comprising sections of data, as claimed in Claim 1.

Applicants respectfully assert that Pavan does not teach or suggest a root image or a leaf image, as claimed in Claim 1. A root image, as claimed in Claim 1, is not a root node, as taught by Pavan. The root block, node, or fragment, as taught by Pavan, controls the system operations and executes on the control node and controls the execution of the system-level program for a MIMO control system (Column 9, lines 64-67), as compared to a root image comprising a computer program, as claimed in amended Claim 1. Support for this amendment may be found in Applicants' Specification, Paragraph 0018.

Further, Applicants respectfully assert that a second storage unit for storing a leaf image, as claimed in Claim 1, is not the same thing as the process Pavan describes for the "Grow-Fragment" block 508. Pavan teaches methods for making program fragments for

each of the processing nodes that take into account all the components or program blocks that make up each processing node as well as all interconnecting lines between the processing nodes. Pavan describes a "child" as a program block that is connected to the current block that is being processing by the "Grow-Fragment" block. Where Pavan teaches a method for implementing a programming method for interconnecting program blocks or functions that may reside on several compute nodes, Applicants claim a second storage unit for storing a leaf image, the leaf image comprising new data blocks and changes to the blocks of the root image, as claimed in Claim 1. Applicants respectfully assert that Davidson does not remedy these deficiencies.

Lastly, the rejection appears to agree that Pavan does not teach or suggest "a union block device for interfacing between the compute node and the first and second storage units to distribute the application environment to the compute node, …wherein the union block device creates the application environment by merging the blocks of the root image stored on the first storage unit with the blocks of the leaf image stored on the second storage unit," as claimed in Claim 1. Applicants respectfully assert that Davidson does not remedy the this deficiency.

The rejection contends that Davidson describes a union block device. Applicants respectfully assert that the rejection is reading the management node 105 of Davidson, which manages or assists an administrator of an HPC system, on Applicants' claimed union block device that creates an application environment by merging the blocks of the

root image stored on the first storage unit with the blocks of the leaf image stored on the second storage unit, as claimed in Claim 1. Applicants respectfully disagree.

As understood by Applicants, Davidson discloses a method and apparatus for fault tolerance and recovery of high-performance computing (HPC) systems. Davidson teaches a method for monitoring currently running nodes in the HPC system, and when a fault occurs, shutting down the defaulting node and booting the host at a free node in the HPC system. Davidson further discloses the management node 105, referred to by the rejection, comprising at least one blade substantially dedicated to managing or assisting an administrator. Davidson further discusses the methods of linking the blades comprising the management node 105 with the rest of the HPC nodes through wires, buses, LANs, MANs, WANS, an Internet connection, or a combination of two or more such links. However, Applicants do not find any teaching by Davidson wherein the management node provides an application environment to a compute node by merging the blocks of the root image stored on the first storage unit with the blocks of the leaf image stored on the second storage unit, as claimed in Claim 1

Applicants respectfully assert that the combination of Pavan and Davidson does not teach or suggest a first storage unit for storing blocks of a root image of the compute node; and a second storage unit for storing a leaf image, the leaf image comprising new data blocks and changes to the blocks of the root image, nor a union block device for interfacing between the compute node and the first and second storage units to distribute the application environment to a compute node, wherein the union block device creates

the application environment by merging the blocks of the root image stored on the first stored unit with the blocks of the leaf image stored on the second storage unit, as claimed in Claim 1.

Therefore, Applicants respectfully assert that embodiments as recited by Claim 1 are not rendered obvious by the combination of Pavan and Davidson. Accordingly, Applicants respectfully assert that dependent Claims 2-16 are patentable by virtue of their dependency on an allowable base claim, as well as for their additional recited patentable features.

Claim 17:

Independent Claim 17 recites features similar to that of independent Claim 1 and is therefore patentable for at least the same or similar reasons as recited above. Accordingly, Applicants respectfully assert that dependent Claims 18-33 are patentable by virtue of their dependency on an allowable base claim, as well as for their additional recited patentable features.

For the above reasons, Applicants request reconsideration and withdrawal of the rejections under 35 U.S.C. §103.

CONCLUSION

In light of the above listed remarks, reconsideration of rejected Claims is requested. Based on the arguments presented above, it is respectfully submitted that Claims 1-33 overcome the rejections of record and, therefore, allowance of Claims 1-33 is earnestly solicited.

Please charge any additional fees that may be required to maintain pendency of the present application, or apply any credits to our PTO deposit account number: 50-4160.

Respectfully submitted,

MURABITO, HAO & BARNES LLP

Dated: October 8, 2009

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I hereby certify that this correspondence is being electronically transmitted to the USPTO via EFS on the date shown below:
October 8, 2009
/Shannon Warren/
Shannon Warren

Electronic Acknowledgement Receipt

EFS ID:	6230365
Application Number:	11395816
International Application Number:	
Confirmation Number:	2625
Title of Invention:	Block-level I/O subsystem for distributed application environment management
First Named Inventor/Applicant Name:	Pradip Kulkarni
Customer Number:	70848
Filer:	James P. Hao/Shannon Warren
Filer Authorized By:	James P. Hao
Attorney Docket Number:	PNTNA-P006
Receipt Date:	08-OCT-2009
Filing Date:	30-MAR-2006
Time Stamp:	17:31:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		PNTA-P006-Response.pdf	143639 adc6ce9c8f8fcfb4f43666ac81fdbff7e7dde6b5	yes	18

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Specification	2	3
	Claims	4	8
	Applicant Arguments/Remarks Made in an Amendment	9	18
Warnings:			
Information:			
	Total Files Size (in bytes):	143639	

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
11/395,816	03/30/2006	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☐ RATE ($)	SMALL ENTITY ☐ FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 10/08/2009	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 33	Minus	** 33	= 0	X $ =		OR	X $52=	0
Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $ =		OR	X $220=	0
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/DORIS M. KING/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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NOTICE OF ALLOWANCE AND FEE(S) DUE

70848 7590 01/26/2010

PANTA c/o MURABITO HAO & BARNES LLP
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EXAMINER	
KHATRI, ANIL	
ART UNIT	PAPER NUMBER
2191	

DATE MAILED: 01/26/2010

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/395,816	03/30/2006	Pradip Kulkarni	PNTA-P006	2625

TITLE OF INVENTION: BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$0	$0	$1510	04/26/2010

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

70848 7590 01/26/2010

PANTA c/o MURABITO HAO & BARNES LLP
Two Market Street
3rd Floor
San Jose, CA 95113

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/395,816	03/30/2006	Pradip Kulkarni	PNTA-P006	2625

TITLE OF INVENTION: BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$0	$0	$1510	04/26/2010

EXAMINER	ART UNIT	CLASS-SUBCLASS
KHATRI, ANIL	2191	717-176000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1_____

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2_____ 3_____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

❑ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/395,816	03/30/2006	Pradip Kulkarni	PNTA-P006	2625

70848 7590 01/26/2010

PANTA c/o MURABITO HAO & BARNES LLP
Two Market Street
3rd Floor
San Jose, CA 95113

EXAMINER	
KHATRI, ANIL	
ART UNIT	PAPER NUMBER
2191	

DATE MAILED: 01/26/2010

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 770 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 770 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

Notice of Allowability	Application No.	Applicant(s)	
	11/395,816	KULKARNI ET AL.	
	Examiner	Art Unit	
	Anil Khatri	2191	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *10/8/2009*.

2. ☒ The allowed claim(s) is/are *1-9, 12-18 and 20-33*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Jeffery Lehman registration no. 65,494 on 1/11/10.

The application has been amended as follows:

In Claims

Cancel claim 10.

Cancel claim 11.

Cancel claim 19.

Claim 1

Last line, after unit delete - -. - -

Last line, after unit insert - - ; the union block device comprises a low-level driver for interfacing between the first and second storage units and the file system of the compute node; and the union block device, upon receiving a write request from the compute node for a sector X, creates an appropriate persistent mapping for sector X.

Claim 12

First line, after claim delete - - 11 - -

First line, after claim insert - - 1 - -

Claim 17

Last line, after node delete - - . - -

Last line, after node insert - - ; wherein the modifying comprises: upon receiving a write request from the compute node for a sector X, creating an appropriate persistent mapping for sector X; and writing sector X on the second storage unit.

Allowable Subject Matter

Claims 1-9, 12-18 and 20-33 (renumbered 1-30) are allowed.

The following is an examiner's statement of reasons for allowance:

The cited prior art taken alone or in combination does not fairly suggest the claimed invention of networked computing specifically related to distributed application environment deployment in a multi-computer system. The cited prior art teaches the user program specifies interconnections between a plurality of program blocks distributed across a plurality of processing nodes and translated into a system-level program having a program fragment for each one of the processing nodes and fault tolerance and recovery in a high-performance computing system includes monitoring a currently running node in an HPC system including multiple nodes but silent on the root image comprises a computer program, wherein the blocks comprise sections of data,

and wherein a file of the root image comprises at least one block, a union block device for interfacing between the compute node and the first and second storage units to distribute the application environment to the compute node, wherein the union block device comprises a driver, wherein the union block device creates the application environment by merging the blocks of the root image stored on the first storage unit with the blocks of the leaf image stored on the second storage unit. Therefore, it improves on cluster computing and improves load balancing where high traffic computation is required to optimize the process.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anil Khatri whose telephone number is 571-272-3725. The examiner can normally be reached on M-F 8:30-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wei Zhen can be reached on 571-272-3708. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

***

/Anil Khatri/

Primary Examiner, Art Unit 2191

Notice of References Cited	Application/Control No. 11/395,816	Applicant(s)/Patent Under Reexamination KULKARNI ET AL.	
	Examiner Anil Khatri	Art Unit 2191	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,606,744	08-2003	Mikurak, Michael G.	717/174
*	B	US-7,150,015	12-2006	Pace et al.	717/176
*	C	US-6,779,177	08-2004	Bahrs et al.	717/173
*	D	US-7,454,462	11-2008	Belfiore et al.	709/203
*	E	US-6,990,513	01-2006	Belfiore et al.	709/203
*	F	US-6,195,680	02-2001	Goldszmidt et al.	709/203
*	G	US-5,764,902	06-1998	Rothrock, Lewis V.	709/205
*	H	US-7,246,351	07-2007	Bloch et al.	717/175
*	I	US-7,127,712	10-2006	Noble et al.	717/173
*	J	US-7,155,714	12-2006	Makris et al.	717/176
*	K	US-6,292,941	09-2001	Jollands, Thomas Derrick	717/176
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Ohta et al, "Improving parallel write by node level request scheduling", IEEE, pp 196-203, 2009
	V	LI et al, "Design issue of a novel toolkit for parallel application performance monitoring and analysis in cluster and grid environments", IEEE ISPAN, pp 1-6, 2005
	W	Zhu et al, "Scheduling divisible loads in the dynamic heterogenous grid environment", ACM INFOSCALE, pp 1-10, 2006
	X	Chen et al, "Exploiting high level coherence information to optimize distributed shared state", ACM PPpPP, pp 131-142, 2003

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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BIB DATA SHEET

CONFIRMATION NO. 2625

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/395,816	03/30/2006	345	2191	PNTA-P006

APPLICANTS

Pradip Kulkarni, Pune, INDIA;
Mukul Kumar, Pune, INDIA;
Adhir Potdar, Maharahstra, INDIA;
Richard Au, Woodside, CA;

**** CONTINUING DATA **************************

This application is a CIP of 11/026,622 12/30/2004

**** FOREIGN APPLICATIONS **************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

04/21/2006

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ Yes ☑ No	☐ Yes ☑ No	/ANIL KHATRI/ Examiner's Signature	☐ Initials	INDIA	3	33	2

ADDRESS

PANTA c/o MURABITO HAO & BARNES LLP
Two Market Street
3rd Floor
San Jose, CA 95113
UNITED STATES

TITLE

Block-level I/O subsystem for distributed application environment management

FILING FEE RECEIVED		
1650	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

BIB (Rev. 05/07).

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	237	(717/172). CCLS.	USPAT; USOCR	OR	OFF	2010/01/12 10:03
L2	362	(717/173). CCLS.	USPAT; USOCR	OR	OFF	2010/01/12 10:03
L3	514	(717/174). CCLS.	USPAT; USOCR	OR	OFF	2010/01/12 10:03
L4	286	(717/175). CCLS.	USPAT; USOCR	OR	OFF	2010/01/12 10:03
L5	293	(717/176). CCLS.	USPAT; USOCR	OR	OFF	2010/01/12 10:03
L6	6370	(709/203). CCLS.	USPAT; USOCR	OR	OFF	2010/01/12 10:03
L7	1658	(709/204). CCLS.	USPAT; USOCR	OR	OFF	2010/01/12 10:03

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IPR2025-00202 / 8444 Patent Page 118 of 128 EX1010

Issue Classification	Application/Control No. 11/395,816	Applicant(s)/Patent under Reexamination KULKARNI ET AL.
	Examiner Anil Khatri	Art Unit 2191

ISSUE CLASSIFICATION

ORIGINAL		INTERNATIONAL CLASSIFICATION									
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED				
717	176	G	06	F	9	/445	G	06	F	9	/44
						/					/

CROSS REFERENCES											
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)										
717	175										
709	203										

(Assistant Examiner) (Date)	/Anil Khatri/ (Primary Examiner) (Date)	Total Claims Allowed: 30	
(Legal Instruments Examiner) (Date)		O.G. Print Claim(s) 1	O.G. Print Fig. 2

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	28	31		61		91		121		151		181
2	2	29	32		62		92		122		152		182
3	3	30	33		63		93		123		153		183
4	4		34		64		94		124		154		184
5	5		35		65		95		125		155		185
6	6		36		66		96		126		156		186
7	7		37		67		97		127		157		187
8	8		38		68		98		128		158		188
9	9		39		69		99		129		159		189
	10		40		70		100		130		160		190
	11		41		71		101		131		161		191
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11	13		43		73		103		133		163		193
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22	25		55		85		115		145		175		205
23	26		56		86		116		146		176		206
24	27		57		87		117		147		177		207
25	28		58		88		118		148		178		208
26	29		59		89		119		149		179		209
27	30		60		90		120		150		180		210

Search Notes	Application/Control No.	Applicant(s)/Patent under Reexamination	
	11/395,816	KULKARNI ET AL.	
	Examiner	Art Unit	
	Anil Khatri	2191	

SEARCHED			
Class	Subclass	Date	Examiner
717	172-176	1/12/2010	AK
709	203-204	1/12/2010	AK

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner
717	**175**	1/12/2010	**AK**
709	203	1/12/2010	AK

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
East	1/12/2010	AK
IEEE/ACM	1/12/2010	AK
inventor search	1/12/2010	AK

Index of Claims

Application/Control No.	Applicant(s)/Patent under Reexamination
11/395,816	KULKARNI ET AL.
Examiner	**Art Unit**
Anil Khatri	2191

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

Claim		Date								
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Bib Data Sheet

CONFIRMATION NO. 2625

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/395,816	03/30/2006 RULE	717	2191	PNTA-P006

APPLICANTS

Pradip Kulkarni, Pune, INDIA;
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Adhir Potdar, Maharahstra, INDIA;
Richard Au, Woodside, CA;
James M. Mott, Austin, TX;
Tung M. Nguyen, Cupertino, CA;

** 2/18/10

**** CONTINUING DATA ***************************

This application is a CIP of 11/026,622 12/30/2004

**** FOREIGN APPLICATIONS ********************

IF REQUIRED, FOREIGN FILING LICENSE GRANTED
** 04/21/2006

Foreign Priority claimed	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ yes ☒ no	INDIA	3	33	2

35 USC 119 (a-d) conditions met: ☐ yes ☒ no ☐ Met after Allowance

Verified and Acknowledged: _____ Examiner's Signature Initials

ADDRESS
70848

TITLE

BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
1650	No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

70848 7590 01/26/2010

PANTA c/o MURABITO HAO & BARNES LLP
Two Market Street
3rd Floor
San Jose, CA 95113

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

Shannon Warren (Depositor's name)
(Signature)
04/01/2010 (Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/395,816	03/30/2006	Pradip Kulkarni	PNTA-P006	2625

TITLE OF INVENTION: BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$0	$0	$1510	04/26/2010

EXAMINER	ART UNIT	CLASS-SUBCLASS
KHATRI, ANIL	2191	717-176000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Panta Systems, Inc. Santa Clara, CA

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☒ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies 0

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 50-4160 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date 04/01/2010

Typed or printed name James P. Hao Registration No. 36,398

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Electronic Patent Application Fee Transmittal

Application Number:	11395816
Filing Date:	30-Mar-2006
Title of Invention:	BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT
First Named Inventor/Applicant Name:	Pradip Kulkarni
Filer:	James P. Hao/Shannon Warren
Attorney Docket Number:	PNTA-P006

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl issue fee	1501	1	1510	1510
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**1510**

Electronic Acknowledgement Receipt

EFS ID:	7335115
Application Number:	11395816
International Application Number:	
Confirmation Number:	2625
Title of Invention:	BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANAGEMENT
First Named Inventor/Applicant Name:	Pradip Kulkarni
Customer Number:	70848
Filer:	James P. Hao/Shannon Warren
Filer Authorized By:	James P. Hao
Attorney Docket Number:	PNTA-P006
Receipt Date:	01-APR-2010
Filing Date:	30-MAR-2006
Time Stamp:	14:46:21
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Electronic Funds Transfer
Payment was successfully received in RAM	$1510
RAM confirmation Number	946
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Issue Fee Payment (PTO-85B)	PTNA-P006-IssueFeeTran.pdf	79909 55b7cdb59e354e050b6d1b52826e12a821d2c91f	no	1
Warnings:					
Information:					
2	Fee Worksheet (PTO-875)	fee-info.pdf	30467 8cc1b64fc9342154ddcb0b593a06c8e3c158a71b	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	110376	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/395,816	05/18/2010	7721282	PNTA-P006	2625

70848 7590 04/28/2010

PANTA c/o MURABITO HAO & BARNES LLP
Two Market Street
3rd Floor
San Jose, CA 95113

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 1084 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

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James M. Mott, Austin, TX;
Tung M. Nguyen, Cupertino, CA;