16138 U.S. PTO
022107

U.S. PTO
11/709477
02/21/2007

PTO/SB/05 (02-07)
Approved for use through 02/28/2007. OMB 0651-0032
U.S. Patent and Trademark Office. U.S. DEPARTMENT OF COMMERCE
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# UTILITY PATENT APPLICATION TRANSMITTAL

*(Only for new nonprovisional applications under 37 CFR 1.53(b))*

| | |
|---|---|
| *Attorney Docket No.* | PNTA-P006.CIP.A |
| *First Inventor* | KULKARNI, et al. |
| *Title* | ROOT IMAGE CACHING AND INDEXING |
| *Express Mail Label No.* | EV943281767US |

## APPLICATION ELEMENTS

*See MPEP chapter 600 concerning utility patent application contents.*

1. ☑ **Fee Transmittal Form** (e.g., PTO/SB/17)
   *(Submit an original and a duplicate for fee processing)*
2. ☐ **Applicant claims small entity status.**
   See 37 CFR 1.27.
3. ☑ **Specification** [*Total Pages* 25 ]
   Both the claims and abstract must start on a new page
   *(For information on the preferred arrangement, see MPEP 608.01(a))*
4. ☑ **Drawing(s)** (*35 U.S.C. 113*) [*Total Sheets* 6 ]
5. **Oath or Declaration** [*Total Sheets* 3 ]
   a. ☑ Newly executed (original or copy)
   b. ☐ A copy from a prior application (37 CFR 1.63(d))
   *(for continuation/divisional with Box 18 completed)*
   i. ☐ DELETION OF INVENTOR(S)
   Signed statement attached deleting inventor(s) name in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. ☐ **Application Data Sheet.** See 37 CFR 1.76
7. ☐ **CD-ROM or CD-R** in duplicate, large table or Computer Program *(Appendix)*
   ☐ Landscape Table on CD
8. **Nucleotide and/or Amino Acid Sequence Submission**
   *(if applicable, items a. – c. are required)*
   a. ☐ Computer Readable Form (CRF)
   b. Specification Sequence Listing on:
      i. ☐ CD-ROM or CD-R (2 copies); or
      ii. ☐ Paper
   c. ☐ Statements verifying identity of above copies

*ADDRESS TO:*
**Commissioner for Patents**
**P.O. Box 1450**
**Alexandria VA 22313-1450**

## ACCOMPANYING APPLICATION PARTS

9. ☑ **Assignment Papers** (cover sheet & document(s))
   Name of Assignee Panta Systems, Inc.
10. ☐ **37 CFR 3.73(b) Statement** *(when there is an assignee)* ☐ **Power of Attorney**
11. ☐ **English Translation Document** *(if applicable)*
12. ☐ **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    ☐ Copies of citations attached
13. ☐ **Preliminary Amendment**
14. ☑ **Return Receipt Postcard** (MPEP 503)
    *(Should be specifically itemized)*
15. ☐ **Certified Copy of Priority Document(s)**
    *(if foreign priority is claimed)*
16. ☑ **Nonpublication Request** under 35 U.S.C. 122(b)(2)(B)(i).
    Applicant must attach form PTO/SB/35 or equivalent.
17. ☐ Other:

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:*

☐ Continuation ☐ Divisional ☑ Continuation-in-part (CIP) of prior application No.: 11/395,816

*Prior application information:* *Examiner* TBD *Art Unit:* 2628

## 19. CORRESPONDENCE ADDRESS

☑ The address associated with Customer Number: 41066 ***OR*** ☐ Correspondence address below

| | | | | | |
|---|---|---|---|---|---|
| Name | | | | | |
| Address | | | | | |
| City | | State | | Zip Code | |
| Country | | Telephone | | Email | |

| | | | |
|---|---|---|---|
| Signature | | Date | 02/21/2007 |
| Name (Print/Type) | Eric J. Maiers | Registration No. (Attorney/Agent) | 59,614 |

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# FEE TRANSMITTAL
## For FY 2007

☐ Applicant claims small entity status. See 37 CFR 1.27

**TOTAL AMOUNT OF PAYMENT** ($) 1,750.00

| Complete if Known | |
|---|---|
| Application Number | |
| Filing Date | 02/21/07 |
| First Named Inventor | KULKARNI, et al. |
| Examiner Name | |
| Art Unit | |
| Attorney Docket No. | PNTA-P006.CIP.A |

**METHOD OF PAYMENT** (check all that apply)

☑ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☑ Deposit Account Deposit Account Number: 23-0085 Deposit Account Name: _____

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, **except for the filing fee**

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**FEE CALCULATION**

**1. BASIC FILING, SEARCH, AND EXAMINATION FEES**

| Application Type | FILING FEES Fee ($) | FILING FEES Small Entity Fee ($) | SEARCH FEES Fee ($) | SEARCH FEES Small Entity Fee ($) | EXAMINATION FEES Fee ($) | EXAMINATION FEES Small Entity Fee ($) | Fees Paid ($) |
|---|---|---|---|---|---|---|---|
| Utility | 300 | 150 | 500 | 250 | 200 | 100 | 1000.00 |
| 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 | Fee ($) | Small Entity Fee ($) |
|---|---|---|
| Each claim over 20 (including Reissues) | 50 | 25 |
| Each independent claim over 3 (including Reissues) | 200 | 100 |
| Multiple dependent claims | 360 | 180 |

| Total Claims | Extra Claims | Fee ($) | Fee Paid ($) |
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| Multiple Dependent Claims Fee ($) | Multiple Dependent Claims Fee Paid ($) |
|---|---|
| | |

**3. APPLICATION SIZE FEE**

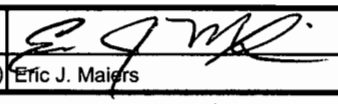
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**4. OTHER FEE(S)**

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|---|---|
| Non-English Specification, $130 fee (no small entity discount) | |
| Other (e.g., late filing surcharge): _____ | |

**SUBMITTED BY**

| | | | |
|---|---|---|---|
| Signature |  | Registration No. (Attorney/Agent) 59,614 | Telephone 408-938-9060 |
| Name (Print/Type) | Eric J. Maiers | | Date 02/21/2007 |

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11. [ ] **English Translation Document** *(if applicable)*
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    [ ] Copies of citations attached
13. [ ] **Preliminary Amendment**
14. [✓] **Return Receipt Postcard** (MPEP 503)
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[ ] Continuation [ ] Divisional [✓] Continuation-in-part (CIP) of prior application No.: 11/395,816

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| City | | State | | Zip Code | |
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| | | | |
|---|---|---|---|
| Signature | | Date | 02/21/2007 |
| Name (Print/Type) | Eric J. Maiers | Registration No. (Attorney/Agent) | 59,614 |

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| Art Unit | |
| Attorney Docket No. | PNTA-P006.CIP.A |

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☑ Deposit Account Deposit Account Number: 23-0085 Deposit Account Name: _____

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| Multiple Dependent Claims Fee ($) | Fee Paid ($) |
|---|---|
| | |

**3. APPLICATION SIZE FEE**

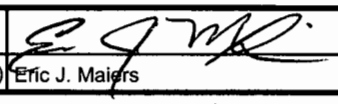
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| | Fees Paid ($) |
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| Non-English Specification, $130 fee (no small entity discount) | |
| Other (e.g., late filing surcharge): _____ | |

**SUBMITTED BY**

| | | | |
|---|---|---|---|
| Signature |  | Registration No. (Attorney/Agent) 59,614 | Telephone 408-938-9060 |
| Name (Print/Type) | Eric J. Maiers | | Date 02/21/2007 |

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UNITED STATES PATENT APPLICATION FOR

# ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT

Inventors:
Pradip Kulkarni
Mukul Kumar
Adhir Potar
Richard Au
Tung Nguyen

PREPARED BY:

WAGNER, MURABITO & HAO, LLP

TWO NORTH MARKET STREET

THIRD FLOOR

SAN JOSE, CA 95113

(408) 938-9060

# ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT

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

[0001] The present Application for Patent is a continuation-in-part of Patent Serial No. 11/395,816 entitled "BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT MANGEMENT" filed March 30, 2006, pending, and assigned to the assignee hereof and hereby expressly incorporated by reference herein.

## Reference to Co-Pending Applications for Patent

[0002] The present Application for Patent is related to the following co-pending U.S. Patent Application:

"VIRUS SCANNING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT" by Kulkarni et al, having Attorney Docket No. PNTA-P006.CON.B, filed concurrently herewith, assigned to the assignee hereof, and expressly incorporated by reference herein.

## BACKGROUND

### Field of the Invention

[0003] 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

[0004] 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



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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.

**[0005]** 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."

**[0006]** 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.

**[0007]** 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.

**[0008]** 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.

**[0009]** Additionally, once some compute nodes have booted, they will often engage in redundant activities with respect to each other. For example, assume that a cluster involves 20 compute nodes each running the same operating system and using substantially similar hardware. The 20 compute nodes will generally need to access



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much of the same data (e.g., drivers, library files, etc.). Moreover, when each of the 20 compute nodes index their file systems, the index results will only vary slightly to the extent that each compute node has developed its own "personality." Thus, to the extent that there is redundancy in the operations of the compute nodes, CPU resources, disk space, and data bus bandwidth are wasted.

**[0010]** 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 created for each unique operating system because data is stored at the file system level (i.e., on a "per file basis"). 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.



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## SUMMARY

[0011] Described herein is technology for, among other things root image caching and indexing for block-level distributed application management. The technology involves storing blocks of a root image on a first storage unit and storing blocks of leaf images on respective second storage units. The leaf images include additional data blocks not previously contained in the root image and changes made by respective compute nodes to the blocks of the root image. The technology includes caching blocks of the root image that have been accessed by at least one compute node. The technology also includes receiving indexing results pertaining to the root image from one compute node and providing the results for other compute nodes.

[0012] 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. Bring up time, and access time in general, can be further improved by caching commonly accessed the portions of the root image. Moreover, updating the boot image for the entire cluster simply involves updating the root image. Additionally, because of the commonality of the root image and the fact that its contents are not directly changed, certain operations performed on the root image (e.g., indexing) only need to be performed once by one compute node. Thereafter, the results of that operation can be shared with the other compute nodes in the cluster, thus saving the other compute nodes valuable time and resources.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0013]** FIG. 1 is a diagram of a suitable system on which embodiments may be implemented.

**[0014]** FIG. 2 is a diagram of a system for root image caching and indexing in a block-level distributed application environment, in accordance with various embodiments of the present invention.

**[0015]** FIGS. 3A-3B are flowcharts illustrating a process for root image caching and indexing in a block-level distributed application environment, in accordance with various embodiments of the present invention.

**[0016]** FIG. 4 illustrates a flowchart for a process for updating the cache based on a read request, in accordance with an embodiment of the present invention.

**[0017]** FIG. 5 illustrates a flowchart for a process for indexing a root image, in accordance with various embodiments of the present invention.

## DETAILED DESCRIPTION

**[0018]** 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.

**[0019]** 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.

[0020] 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.

[0021] Briefly stated, described herein is technology for, among other things root image caching and indexing for block-level distributed application management. The technology involves storing blocks of a root image on a first storage unit and storing blocks of leaf images on respective second storage units. The leaf images include additional data blocks not previously contained in the root image and changes made by respective compute nodes to the blocks of the root image. The technology includes caching blocks of the root image that have been accessed by at least one compute node. The technology also includes receiving indexing results pertaining to the root image from one compute node and providing the results for other compute nodes.

Example Compute Node Operating Environment

[0022] With reference to FIG. 1, an example system for implementing embodiments includes a general purpose computing system environment, such as compute node 100. In its most basic configuration, compute node 100 typically includes at least one processing unit 102 and memory 104. Depending on the exact configuration and type of compute node, memory 104 may be volatile (such as RAM), non-volatile (such as ROM,

flash memory, etc.) or some combination of the two. This most basic configuration is illustrated in Figure 1 by dashed line 105. Additionally, compute node 100 may also have additional features/functionality. For example, compute node 100 may also include additional storage (removable and/or non-removable) including, but not limited to, magnetic or optical disks or tape. Such additional storage is illustrated in FIG. 1 by removable storage 108 and non-removable storage 110. Computer storage media includes volatile and nonvolatile, removable and non-removable media implemented in any method or technology for storage of information such as computer readable instructions, data structures, program modules or other data. Memory 104, removable storage 108 and nonremovable storage 110 are all examples of computer storage media. Computer storage media includes, but is not limited to, RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by compute node 100. Any such computer storage media may be part of compute node 100.

**[0023]** Compute node 100 may also contain communications connection(s) 112 that allow it to communicate with other devices. Communications connection(s) 112 is an example of communication media. Communication media typically embodies computer readable instructions, data structures, program modules or other data in a modulated data signal such as a carrier wave or other transport mechanism and includes any information delivery media. The term "modulated data signal" means a signal that has one or more of its characteristics set or changed in such a manner as to encode information in the signal. By way of example, and not limitation, communication media includes wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, RF, infrared and other wireless media. The term computer readable media as used herein includes both storage media and communication media. Compute node 100 may also have input device(s) 114 such as a keyboard, mouse, pen, voice input device, touch input device, etc. Output device(s) 116 such as a display, speakers, printer, etc. may also be

included. All these devices are well known in the art and need not be discussed at length here.

Example Systems

[0024] FIG. 2 is a diagram of a system 200 for root image caching and indexing in a block-level distributed application environment, in accordance with various embodiments of the present invention. In one embodiment, system 200 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 200 has a number of compute nodes 220a-n coupled to first storage unit 240 and a corresponding second storage unit 250a-n though a corresponding union block device (UBD) 230a-n. To the compute nodes 220a-n, it appears that they have access to their own version of a distributed application environment. However, a separate and complete boot image is not created and stored for each compute node 220a-n.

[0025] System 200 has a first storage unit 240 for storing blocks of a root image of an application environment. The root image contains data initially common to the compute nodes 220a-n. The root image is not changed by compute nodes 220a-n. For example, in one embodiment, compute nodes 220a-n have read-only access to the first storage unit 240.

[0026] Moreover, each compute node 220a-n has a corresponding second storage unit 250a-n for storing a leaf image. The first storage unit 240 and second storage units 250a-n may each be contained on separate physical storage devices, on separate logical spaces on the same storage device, or any combination thereof. Regardless, the first storage unit 240 and the second storage units 250a-n may be contained within a single storage appliance. 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 220a-n to its instance of the application environment. Thus, when a compute node (e.g., node 220a) 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 250a). 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 220a) 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 250a) plus some small overhead.

**[0027]** A compute node 220a-n mounts its instantiation of the application environment via its respective UBD 230a-n. In one embodiment, UBDs 230a-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 220a-n. The file system may reside on the server side of the system 200. The file system may also reside on each of the compute nodes 220a-n. Because UBDs 230a-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 200 is completely file system, and thus operating system, independent.

**[0028]** UBDs 230a-n determine what leaf image (from the appropriate second storage unit 250) is needed for portions of the application environment that their respective compute nodes 220a-n have changed. UBDs 230a-n also locate the portions of the application environment that are not changed by their respective compute nodes 220a-n. These portions may reside in the root image. There may also be intermediate images (not depicted in FIG. 2) comprising versions of the root image from which a compute node's instance of the application environment is derived. Further, UBDs 230a-n create a new leaf image on a respective second storage unit 250a-n when their respective compute nodes 220a-n make changes to their instantiations of the application environment. In one

embodiment, the UBDs 230a-n obtain the information necessary to create the application environment from a block modification log located in its respective leaf image.

[0029] UBDs 230a-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 230a-n will create an appropriate persistent mapping for sector X and then write sector X onto their respective second storage units 250a-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.

[0030] 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 240 may be refreshed with a new operating system patch, thereby automatically refreshing the image for all dependent compute nodes.

Caching

[0031] An embodiment of the present invention provides for caching of portions of the root image. Because several compute nodes in a cluster may often access the same data (e.g., same drivers, same library files, etc.) on the root image, tremendous speed improvements can be realized by caching such data in cache 260. For example, by current standards, it is common for a storage disk to achieve a data transfer rate around 76 MB/s, whereas cache memory can achieve speeds up to and greater than 800 MB/s. In one embodiment, the cache may be contained within a single storage appliance, along with the first storage unit 240 and the second storage units 250a-n.

[0032] The value of such caching becomes even more apparent in the context of initial boot sequences. For example, a cluster of 20 compute nodes may be booted for the first

time. Since it is a first boot, the cache is empty. The first compute node to boot (e.g., compute node 220a) will therefore load its data directly from the pertinent disks (e.g., first storage unit 240 and second storage unit 250a). While the first compute node is loading its data, its reads are intercepted and cached on a per-block basis in cache 260. Thereafter, when a second compute node (e.g., compute node 220b) goes to boot, any data required by the second compute node that was previously accessed by the first compute node can be served out of the cache 260 rather than the first storage unit. It is appreciated that to the extent that the configurations of the first and second compute nodes are substantially the same, the relationship between the data requested by the second compute node and the data stored in the cache 260 approaches a 1:1 ratio (i.e., a greater than ten-fold improvement in root image access time is realized). It is further appreciated that the entire contents of the root image may not necessarily be accessed to achieve a boot (e.g., unused drives and the like). Therefore, the data capacity of cache 260 can be much less than that of the first storage unit 240.

**[0033]** As new data is accessed on the root image that is not currently stored in the cache 260, the cache 260 may thereafter be updated with the new data. Moreover, as the amount of data in the cache 260 approaches or exceeds a threshold value, certain data will need to be removed from the cache 260 to make way for the new data. The data to be removed, deleted, overwritten, etc., may be selected the basis of, for example, how recently the data was accessed, how frequently the data has been accessed, or a combination of both. It should be appreciated that other cache arbitration algorithms known in the art may similarly be used.

Indexing

**[0034]** An embodiment of the present invention provides for indexing the root image. From the standpoint of seek time, it is beneficial for each compute node to have access to an index of its file system. In a traditional clustered computing situation, each compute node would independently index its file system. To the extent that each compute node in

a cluster has similar operating environments to the others, indexing performed on common data is therefore redundant.

[0035] As an added benefit of the architecture 200 depicted in FIG. 2, because the data stored in the root image is by definition common to all the compute nodes 220a-n, one compute node (e.g., compute node 220a) can index the contents of the root image and then provide the indexing results to the other compute nodes (e.g., compute nodes 220b-n). Thereafter, the compute nodes 220a-n need only be concerned with indexing their respective leaf image, which are relatively small compared to the root image. Moreover, in embodiments where the first storage unit 240 is read-only, the root image will not have to be re-indexed because the contents of the root image do not change. It is appreciated that the indexing results can be provided to the other compute nodes in a number of ways. For example, the results may be stored on a shared storage unit (such as, but not limited to, cache 260), the results may provided directly to the other compute nodes, etc. Moreover, the initial indexing of the root image does not have to be performed by a compute node. For example, the indexing may be performed by a dedicated indexing host.

Example Methods

[0036] FIGS. 3A-3B are flowcharts illustrating a process 300 for root image caching and indexing in a block-level distributed application environment, in accordance with various embodiments of the present invention. Although specific operations are disclosed in process 300, such operations are exemplary. Process 300 may not include all of the operations illustrated by FIGS. 3A-3B. Also, process 300 may include various other operations and/or variations of the operations shown by FIGS. 3A-3B. Likewise, the sequence of the operations of process 300 can be modified. Steps of process 300 may be stored as instructions on a computer readable medium and executed on a computer processor.

[0037] Step 310 involves 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.

[0038] Step 320 involves 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.

[0039] Step 322 involves caching blocks of the root image that have been accessed by a compute node. In doing so, embodiments improve the access time for subsequent compute nodes requesting to access the same blocks of data.

[0040] Step 324 involves receiving a read request from a compute node. At step 326, a determination is made as to whether the data requested by the compute node is currently stored in the cache. If a portion of the data is currently stored in the cache, that portion is then served from the cache (step 328), thus improving the access time with respect to that portion of data as compared to otherwise retrieving it from a storage unit such as a hard disk.

[0041] Step 330 involves merging the blocks of the root image, the blocks of the leaf image, and the relevant blocks of the cache, if any, to create the application environment. In other words, the merging occurs at an operational level between the file system of a compute node and the first storage unit, the corresponding second storage unit, and the cache. 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 environment. However, a separate and complete boot image is not actually stored for the compute node.

[0042] Step 340 involves 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.

[0043] Step 345 involves updating the cache based on the read request. For instance, to the extent that a compute node has accessed root image data not currently stored in the cache, the cache should be updated to include that cache. In some cases, the amount of data in the cache may approach a capacity limit, either due to the physical capacity of the cache itself or due to threshold limit set in software.

[0044] FIG. 4 illustrates a flowchart for a process 345 for updating the cache based on a read request, in accordance with an embodiment of the present invention. Is should be appreciated that the steps illustrated in FIG. 4 are exemplary and the updating performed in block 345 of process 300 may be achieved in many other ways as well. Process 345 may not include all of the operations illustrated by FIG. 4. Also, process 345 may include various other operations and/or variations of the operations shown by FIG. 4. Likewise, the sequence of the operations of process 345 can be modified. Steps of process 345 may be stored as instructions on a computer readable medium and executed on a computer processor.

[0045] At step 410, a determination is made as to whether the amount of data currently in the cache plus new data to be added exceeds a threshold value (physical or software-imposed). If the threshold value will be exceeded, the least recently accessed data is removed from the cache (step 420). This sequence repeats until there is adequate headroom in the cache to accommodate the new data. Once it is determined that the amount of data currently in the cache plus the new data to be added will not exceed the threshold value, FIG. 4 proceeds to step 430. Step 430 involves caching the portion of the requested data that is not currently stored in the cache (i.e., the "new data").

**[0046]** With reference again to FIG. 3B, step 350 involves 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.

**[0047]** Step 352 involves receiving indexing results pertaining to the root image from a compute node. Step 356 involves providing the indexing results to other compute nodes. It is appreciated that this may be done in a number of ways. For example, the indexing results may be provided directly to the compute nodes. Alternatively, the indexing results may be stored on a shared storage unit (step 354) and then provided to the compute nodes via the shared storage unit. By receiving the indexing result of the root image from one compute node and providing it to the rest of the compute nodes, valuable time, resources, and bandwidth are saved for the other compute nodes. Since the root image is common to all the compute nodes, any re-indexing of the root image would be redundant and a waste of resources.

**[0048]** Step 360 involves 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.

**[0049]** FIG. 5 illustrates a flowchart for a process 500 for indexing a root image, in accordance with various embodiments of the present invention. Although specific operations are disclosed in process 500, such operations are exemplary. Process 500 may not include all of the operations illustrated by FIG. 5. Also, process 500 may include various other operations and/or variations of the operations shown by FIG. 5. Likewise,

the sequence of the operations of process 500 can be modified. Steps of process 500 may be stored as instructions on a computer readable medium and executed on a computer processor.

[0050] Step 510 involves receiving data blocks of a file system at a compute node. The data blocks include a root image portion in the leaf image portion. As described above, the leaf image portion includes additional data blocks not previously contained in the root image portion and also changes made by the compute node to the blocks of the root image. Thus, the file system actually seen by the compute node is a product of urging the root image portion in the leaf image portion together at the block level.

[0051] Step 520 involves the compute node indexing the root image portion of its file system. In such a case, the compute node is to some extent agonizing to the fact that its file system is divided between a root image portion and a leaf image portion. At step 540, the compute node provides the indexing results of the root image portion to another compute node. It is appreciated that this may be achieved a number of ways. For example, the first compute node may simply provide the indexing results to the second compute node directly. Alternatively, the first compute node may store the indexing results on a shared storage unit that is accessible by the second compute node (step 530).

[0052] Thereafter, the compute node may complete its indexing of its file system by indexing the leaf image portion of the file system (step 550). Further down the road, the benefits of indexing the root image separately from the leaf image are realized when the compute node requires that its file system be re-indexed. At step 560, the compute node re-indexes its file system by re-indexing its corresponding leaf image portion with the previous indexing results of the root portion.

In

[0053] Thus, by operating at the block level, embodiments of the present invention provide file system and operating system independent systems and methods 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. Bring up time, and access time in general, can be further improved by caching commonly accessed the portions of the root image. Moreover, updating the boot image for the entire cluster simply involves updating the root image.

**[0054]** 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. For example, and with reference to FIG. 2, cache 261, first storage unit 241, and second storage units 251a-n provide failover/redundancy security for system 200. 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).

**[0055]** Moreover, because of the commonality of the root image and the fact that its contents are not directly changed, certain operations performed on the root image (e.g., indexing) only need to be performed once by one compute node. Thereafter, the results of that operation can be shared with the other compute nodes in the cluster, thus saving the other compute nodes valuable time and resources.

**[0056]** 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 providing data to a plurality of compute nodes comprising:

a first storage unit for storing blocks of a root image of said compute nodes;

a plurality of second storage units for storing leaf images of respective compute nodes, said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image; and

a cache for caching blocks of said root image previously accessed by at least one of said compute nodes.

2. The system as recited in Claim 1 wherein said cache is configurable to store the X most recently accessed blocks of said root image, and wherein further X represents a cache threshold value.

3. The system as recited in Claim 1 wherein said first storage unit, said second storage units, and said cache are contained within a single storage appliance.

4. The system as recited in Claim 1 further comprising:

a plurality of union block devices for interfacing between respective compute nodes and said first storage unit, respective second storage units, and said cache to distribute application environments to the compute nodes, wherein said union block devices create said application environments by merging the blocks of said root image with the blocks of respective leaf images.

5. The system as recited in Claim 4 wherein said union block devices comprise low-level drivers for interfacing between the file systems of respective compute nodes and said first storage unit, respective second storage units, and said cache.



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6. The system as recited in Claim 1 wherein said first storage unit is read-only.

7. A method for providing data to a plurality of compute nodes, comprising:

storing blocks of a root image of said compute nodes on a first storage unit;

storing leaf images for respective compute nodes on respective second storage units, said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of the root image; and

caching blocks of said root image that have been accessed by at least one of said compute nodes in a cache memory.

8. The method as recited in Claim 7 further comprising:

receiving a read request from at least one of said compute nodes, wherein a first portion of the data requested is currently stored in said cache memory; and

providing said first portion of said data to said at least one of said compute nodes from said cache memory.

9. The method as recited in Claim 8 further comprising:

updating said cache memory based on said read request.

10. The method as recited in Claim 9 wherein a second portion of the data requested is not currently stored in said cache memory and said updating comprises:

caching said second portion in said cache memory; and

removing the least recently accessed data from said cache memory if the amount of data is said cache memory is above a threshold value.

11. The method as recited in Claim 7 further comprising:

merging the blocks of said root image with the blocks of respective leaf images to create cohesive respective application environments.

12. The method as recited in Claim 11 wherein said merging occurs at an operational level between the respective file systems of the compute nodes and said first storage unit, respective second storage units, and said cache memory.

13. The method as recited in Claim 7 wherein said first storage unit is read-only.

14. A system for indexing file systems for a plurality of compute nodes, comprising:

a first storage unit for storing blocks of a root image of said compute nodes;

a plurality of second storage units for storing leaf images of respective compute nodes, said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image; and

a plurality of union block devices corresponding to said compute nodes, said union block devices for interfacing between said compute nodes and said first and second storage units to distribute said file systems to said compute nodes, wherein said union block devices create said file systems by merging the blocks of said root image stored on the first storage unit with the blocks of respective leaf images stored on respective second storage units, and wherein further at least one of said compute nodes is configurable to index said root image and provide the indexing results to another of said compute nodes.

15. The system as recited in Claim 14 wherein said first storage unit and said second storage units are contained within a single storage appliance.

16. The system as recited in Claim 14 further comprising:

a plurality of union block devices for interfacing between respective compute nodes and said first storage unit and respective second storage units, said

union block devices operable to distribute application environments to the compute nodes, wherein said union block devices create said application environments by merging the blocks of said root image with the blocks of respective leaf images.

17. The system as recited in Claim 16 wherein said union block devices comprise low-level drivers for interfacing between the file systems of respective compute nodes and said first storage unit, respective second storage units, and said cache.

18. The system as recited in Claim 14 wherein said first storage unit is read-only.

19. A method for indexing file systems for a plurality of compute nodes, comprising:

storing blocks of a root image of said compute nodes on a first storage unit;

storing leaf images for respective compute nodes on respective second storage units, said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of the root image;

merging the blocks of said root image with the blocks of respective leaf images stored on respective second storage units to create respective file systems for respective compute nodes;

receiving indexing results pertaining to said root image from one of said compute nodes; and

providing said indexing results to the others of said compute nodes.

20. The method as recited in Claim 19 further comprising:

storing said indexing results on a shared storage unit.

21. The method as recited in Claim 19 wherein said merging occurs at an operational level between the respective file systems of the compute nodes and said first storage unit and respective second storage units.

22. The method as recited in Claim 19 wherein said first storage unit is read-only.

23. Logic encoded in one or more tangible media for execution by a first compute node, and when executed said logic operable to:

receive data blocks of a file system, said data blocks comprising a root image portion and leaf image portion, said leaf image portion comprising additional data blocks not previously contained in said root image portion and changes made by said first compute node to the blocks of said root image, wherein said file system is the result of merging said root image portion and said leaf image portion together at the block-level;

index said root image portion; and

provide the results of said indexing to a second compute node.

24. The logic as recited in Claim 23 wherein said providing further comprises:

storing said results of said indexing on a shared storage unit accessible by said second compute node.

25. The logic as recited in Claim 23 wherein said logic is further operable to:

index said leaf image portion.

26. The logic as recited in Claim 25 wherein said logic is further operable to:

re-index said file system by re-indexing said leaf image portion and merging the results of said re-indexing of said leaf image portion with said results of said indexing of said root image portion.

27. The logic as recited in Claim 23 wherein said root image portion is read-only.



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# ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT

## ABSTRACT

Described herein is technology for, among other things root image caching and indexing for block-level distributed application management. The technology involves storing blocks of a root image on a first storage unit and storing blocks of leaf images on respective second storage units. The leaf images include additional data blocks not previously contained in the root image and changes made by respective compute nodes to the blocks of the root image. The technology includes caching blocks of the root image that have been accessed by at least one compute node. The technology also includes receiving indexing results pertaining to the root image from one compute node and providing the results for other compute nodes.



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Attorney Docket No.: PNTA-P006.CIP.A

# 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:

ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION 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) |
|---|---|---|
| 11/395,816 | 03/30/2006 | Pending |
| _____ | _____ | _____ |

Attorney Docket No.: PNTA-P006.CIP.A

## 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 29 Jan 2007

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 29 Jan 2007

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 29 JAN 2007

Residence Maharahstra India Citizenship India
(City State)

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

Attorney Docket No.: PNTA-P006.CIP.A

Full Name of Joint/Fourth Inventor: Richard AU

Inventor's Signature _____ Date 1/30/2007

Residence Woodside, California (City State) Citizenship USA

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

Full Name of Joint/Fifth Inventor: Tung NGUYEN

Inventor's Signature _____ Date 2/5/2007

Residence Cupertino, California (City State) Citizenship USA

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

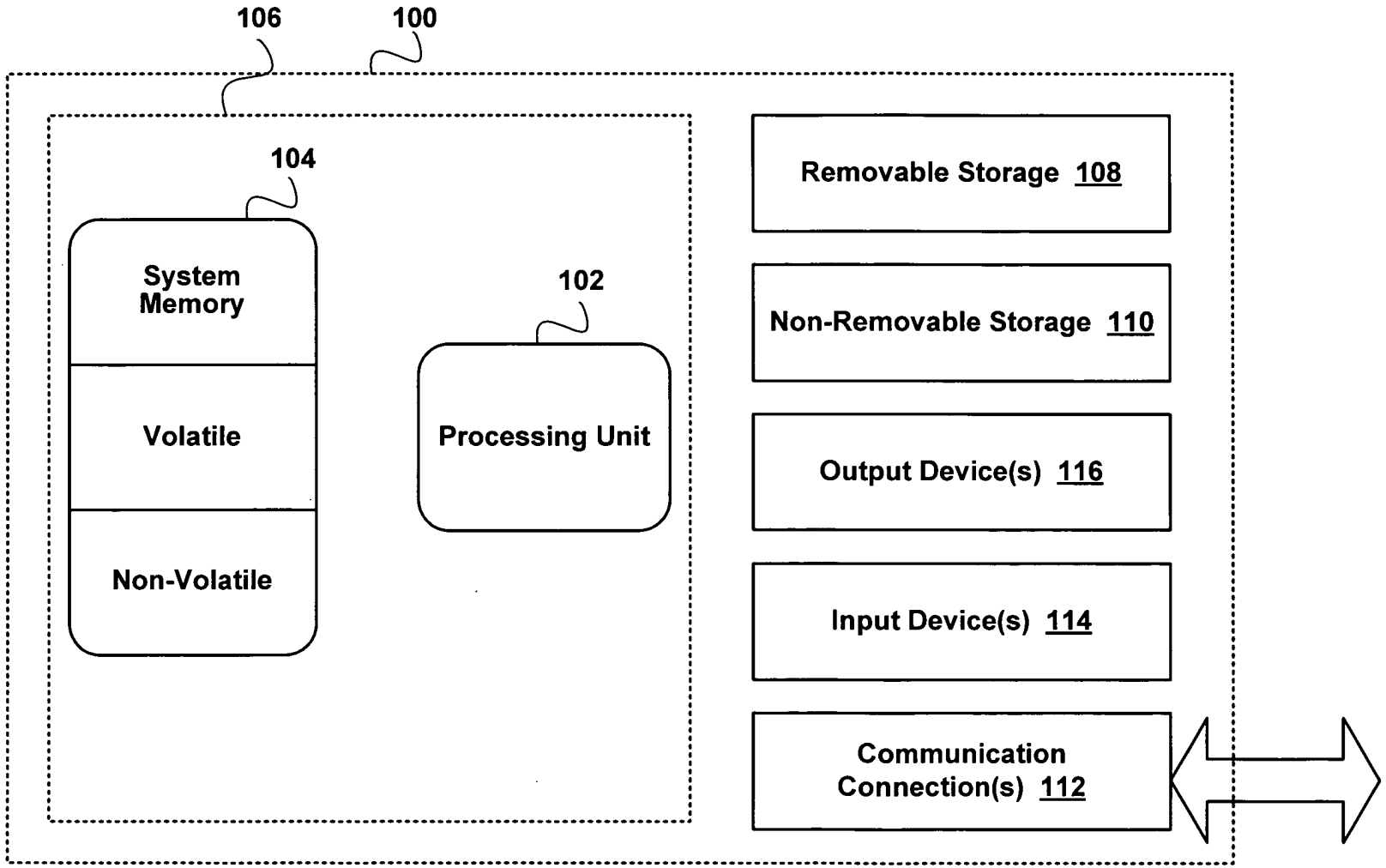

106
100
104
System Memory
Volatile
Non-Volatile
102
Processing Unit
Removable Storage 108
Non-Removable Storage 110
Output Device(s) 116
Input Device(s) 114
Communication Connection(s) 112

FIG. 1

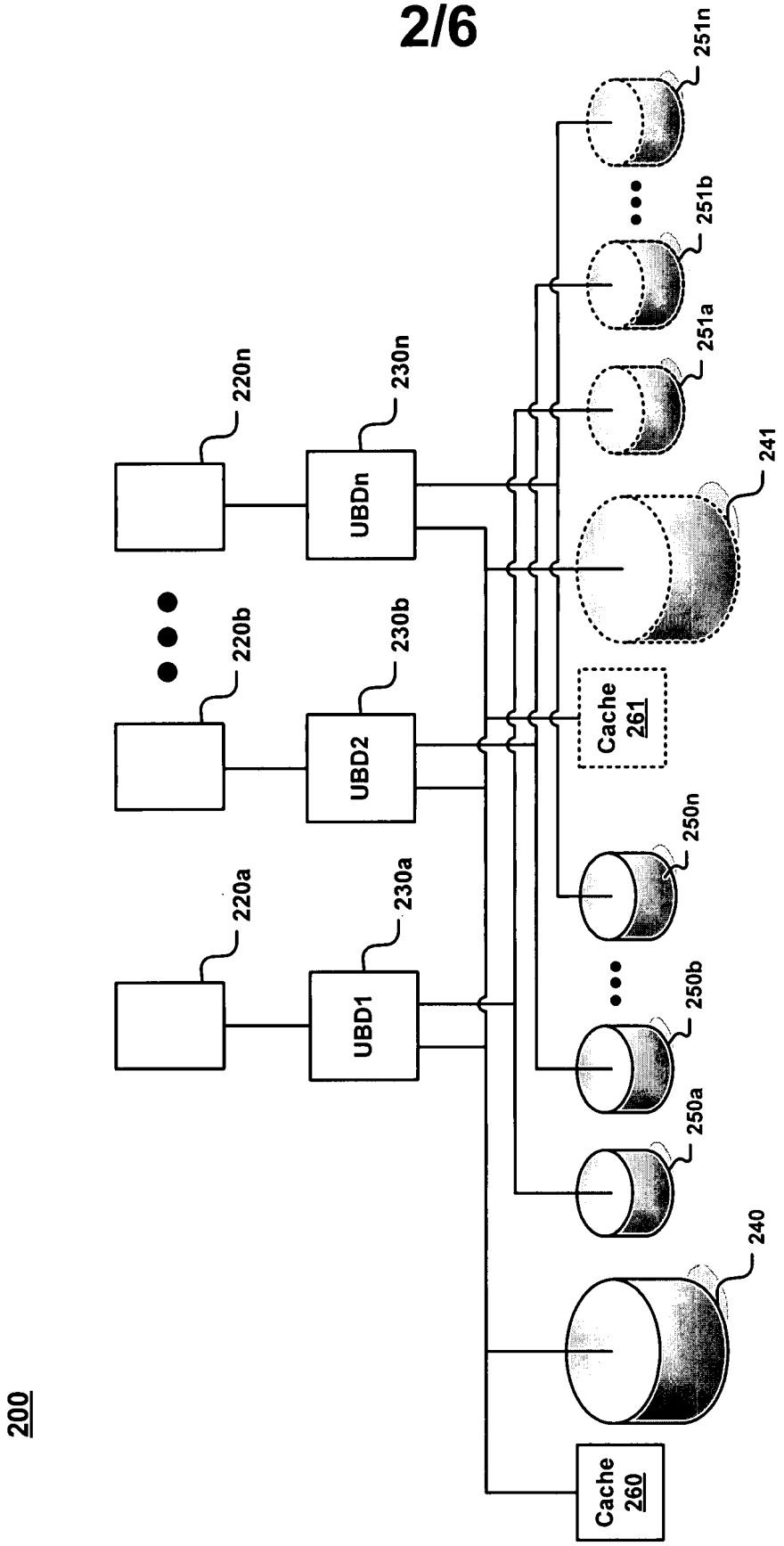

200
220n
230n
UBDn
220b
230b
UBD2
220a
230a
UBD1
251n
251b
251a
241
Cache
261
250n
250b
250a
240
Cache
260

FIG. 2

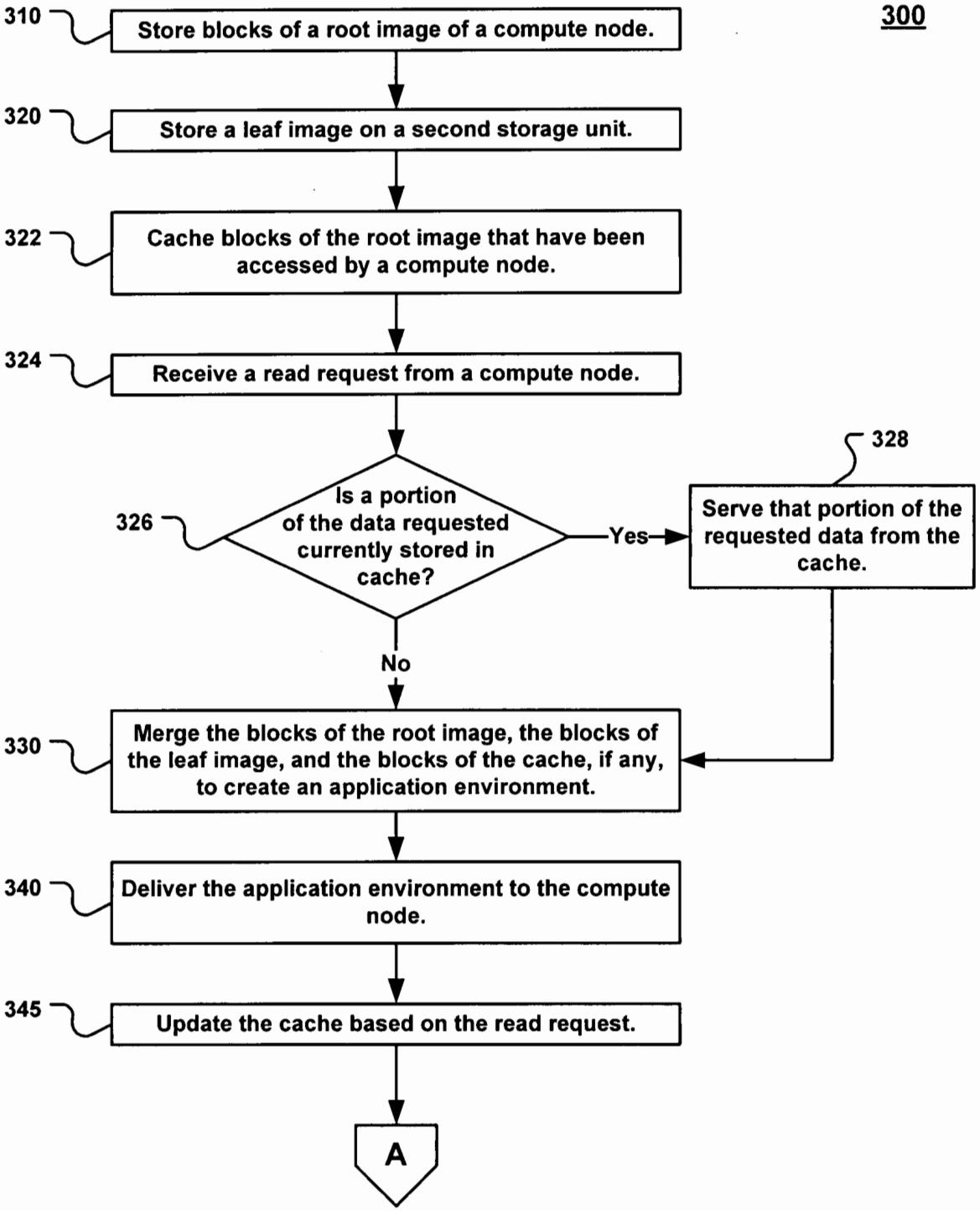

300
310
Store blocks of a root image of a compute node.
320
Store a leaf image on a second storage unit.
322
Cache blocks of the root image that have been accessed by a compute node.
324
Receive a read request from a compute node.
326
Is a portion of the data requested currently stored in cache?
Yes
328
Serve that portion of the requested data from the cache.
No
330
Merge the blocks of the root image, the blocks of the leaf image, and the blocks of the cache, if any, to create an application environment.
340
Deliver the application environment to the compute node.
345
Update the cache based on the read request.
A

FIG. 3A

300

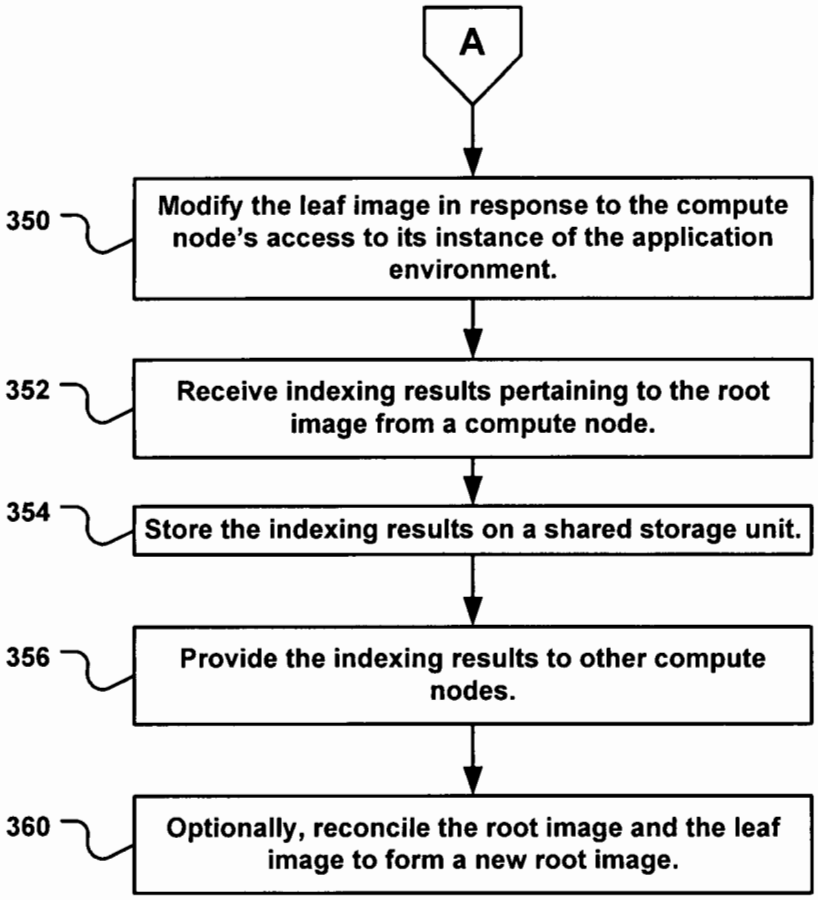

A
350
Modify the leaf image in response to the compute node's access to its instance of the application environment.
352
Receive indexing results pertaining to the root image from a compute node.
354
Store the indexing results on a shared storage unit.
356
Provide the indexing results to other compute nodes.
360
Optionally, reconcile the root image and the leaf image to form a new root image.

FIG. 3B

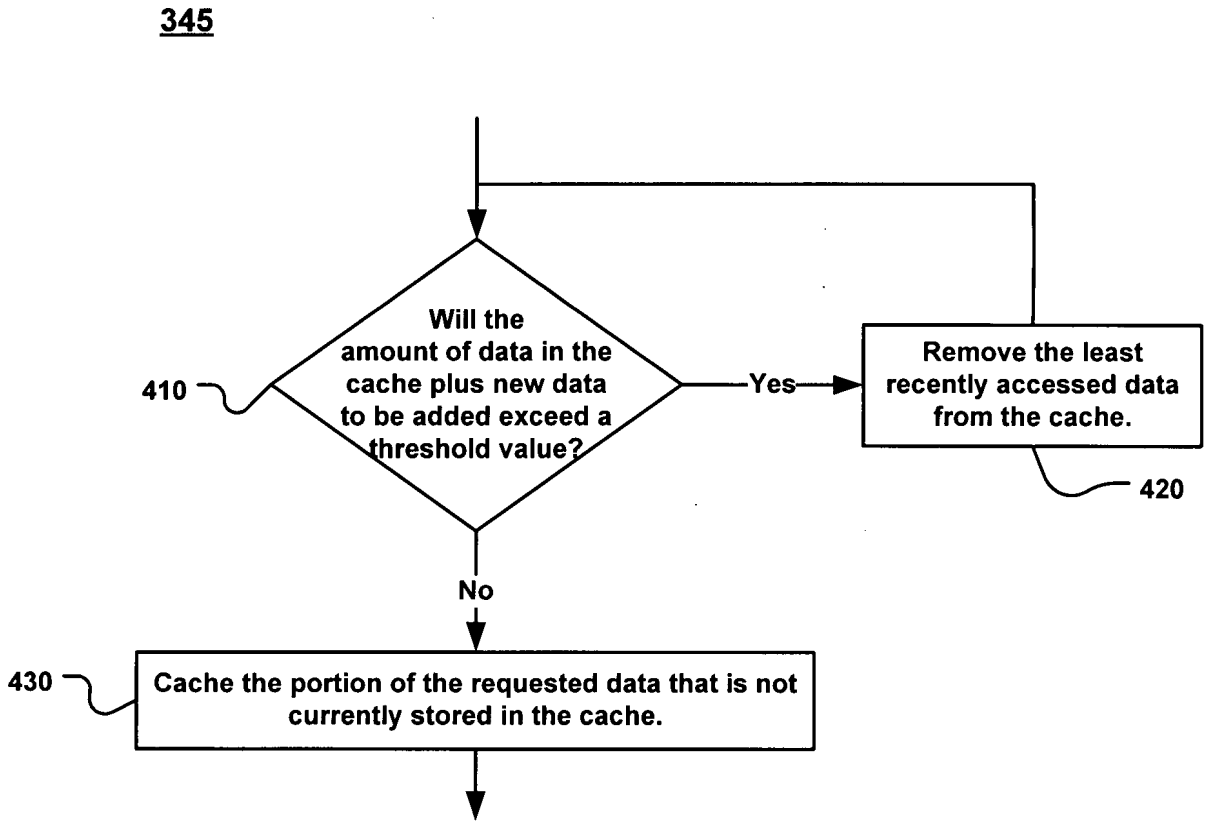

345
Will the amount of data in the cache plus new data to be added exceed a threshold value?
410
Yes
Remove the least recently accessed data from the cache.
420
No
430
Cache the portion of the requested data that is not currently stored in the cache.

FIG. 4

500

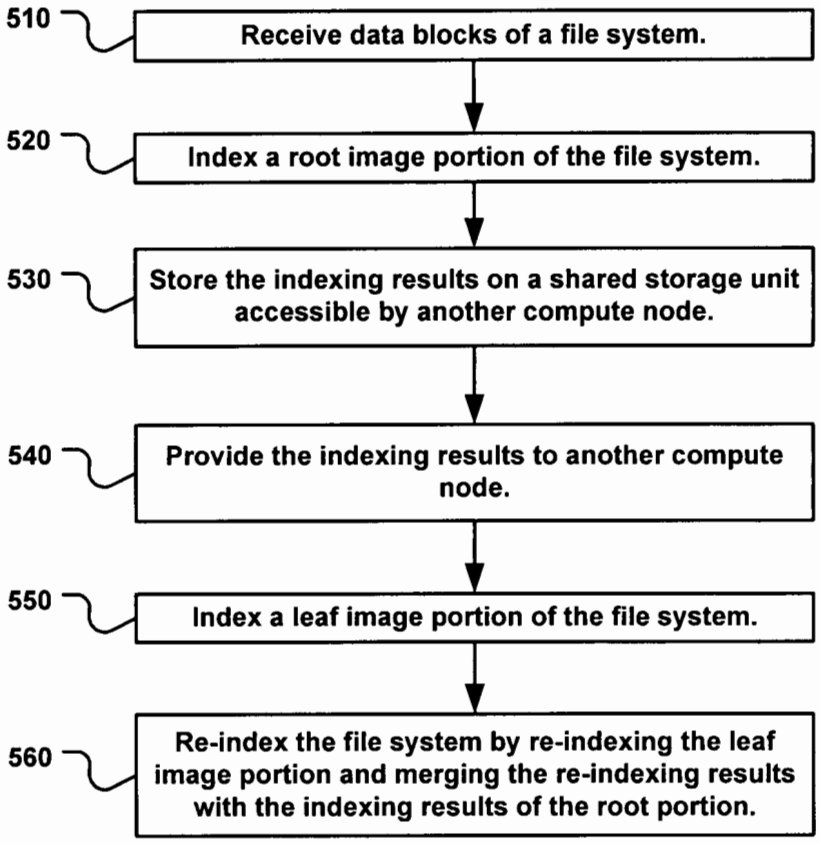

510
Receive data blocks of a file system.
520
Index a root image portion of the file system.
530
Store the indexing results on a shared storage unit accessible by another compute node.
540
Provide the indexing results to another compute node.
550
Index a leaf image portion of the file system.
560
Re-index the file system by re-indexing the leaf image portion and merging the re-indexing results with the indexing results of the root portion.

FIG. 5

PATENT APPLICATION SERIAL NO. _____

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

02/26/2007 EAYALEW1 00000065 11709477

| | | |
|---|---|---|
| 01 FC:1011 | 300.00 | OP |
| 02 FC:1111 | 500.00 | OP |
| 03 FC:1311 | 200.00 | OP |
| 04 FC:1201 | 400.00 | OP |
| 05 FC:1202 | 350.00 | OP |

PTO-1556
(5/87)

*U.S. Government Printing Office: 2002 — 469-267/60033

PTO/SB/06 (12-04)
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U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
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# PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875 Effective December 8, 2004

Application or Docket Number: 11,709,477

## 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 | $200 |
| TOTAL CLAIMS (37 CFR 1.16(i)) | 27 minus 20 = | 7 | X$ 25 = | | OR | X$50 = | 350 |
| INDEPENDENT CLAIMS (37 CFR 1.16(h)) | 5 minus 3 = | 2 | X100 = | | | X200 = | 400 |
| 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 | 1750 |

1 7 23

## APPLICATION AS AMENDED – PART II

14 19

| | | (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 ($) | OTHER THAN SMALL ENTITY ADDITIONAL FEE ($) |
|---|---|---|---|---|---|---|---|---|---|---|
| AMENDMENT A | 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 | |

| | | (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 ($) | OTHER THAN SMALL ENTITY ADDITIONAL FEE ($) |
|---|---|---|---|---|---|---|---|---|---|---|
| AMENDMENT B | 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.

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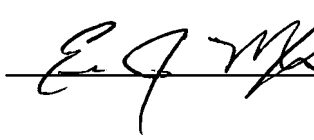
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U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
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# NONPUBLICATION REQUEST UNDER 35 U.S.C. 122(b)(2)(B)(i)

| | |
|---|---|
| First Named Inventor | KULKARNI, et al. |
| Title | Root Image Caching and Indexing for Block-Level Distributed... |
| Attorney Docket Number | PNTA-P006.CIP.A |

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 international 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).



Signature

February 21, 2007
Date

Eric J. Maiers
Typed or printed name

59,614
Registration Number, if applicable

(408) 936-9060
Telephone Number

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 35 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)).**

This collection of information is required by 37 CFR 1.213(a). 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 1.11 and 1.14. This collection is estimated to take 6 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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Application Number: **11709477** Document Date: **02/21/2007**

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Form Revision Date: December 8, 2006

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| APPLICATION NUMBER | FILING or 371(c) DATE | GRP ART UNIT | FIL FEE REC'D | ATTY.DOCKET.NO | TOT CLAIMS | IND CLAIMS |
|---|---|---|---|---|---|---|
| 11/709,477 | 02/21/2007 | 2628 | 1750 | PNTA-P006.CIP.A | 27 | 5 |

**CONFIRMATION NO. 4127**

41066
MURABITO, HAO & BARNES, LLP
TWO NORTH MARKET STREET, THIRD FLOOR
SAN JOSE, CA95113

**FILING RECEIPT**

Date Mailed: 04/02/2007

Receipt is acknowledged of this regular Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please mail to the Commissioner for Patents P.O. Box 1450 Alexandria Va 22313-1450. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).**

**Applicant(s)**

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

**Assignment For Published Patent Application**

Panta Systems, Inc.

**Power of Attorney:** The patent practitioners associated with Customer Number 41066

**Domestic Priority data as claimed by applicant**

This application is a CIP of 11/395,816 03/30/2006

**Foreign Applications**

**If Required, Foreign Filing License Granted:** 04/02/2007

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US11/709,477**

**Projected Publication Date:** Request for Non-Publication Acknowledged

**Non-Publication Request:** Yes

**Early Publication Request:** No

**Title**

Root image caching and indexing for block-level distributed application management

**Preliminary Class**

345

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Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

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Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

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| 11/709,477 | | 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:**
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3rd Floor
San Jose,CA 95113

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 11/709,477 | 02/21/2007 | Pradip Kulkarni | PNTA-P006.CIP.A | 4127 |

70848 7590 01/05/2010

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

| EXAMINER | |
|---|---|
| MARTELLO, EDWARD | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2628 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 01/05/2010 | 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) | |
|---|---|---|---|
| | 11/709,477 | KULKARNI ET AL. | |
| | Examiner | Art Unit | |
| | Edward Martello | 2628 | |

*-- 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 *21 February 2007*.

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) *1-27* 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) *1-27* 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 *21 February 2007* 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*

1. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: Claims 4, 5, 14, 16 and 17 all incorporate features called "union block devices." There is insufficient basis within the claims to define the character of these devices. Union block devices are only described in paragraph [0024] of the instant application which has this single sentence: "System 200 has a number of compute nodes 220a-n coupled to first storage unit 240 and a corresponding second storage unit 250a-n though a corresponding union block device (UBD) 230a-n." This description is insufficient to define this device. The union block devices are also shown in figure 2 as functional blocks without any further details. There is insufficient information provided as to the functionality of this joining device and as such the specification provides insufficient antecedent basis for the claimed subject matter.

2. Claims 5 and 7 proclaim that the union device consists of low-level drivers which are generally known in the art as computer processor instructions, usually running at the OS kernel level, that provide low-level hardware device interfacing to higher level software applications. Based on these claims, the union device must contain a processor or some dedicated hardware that can process driver instructions, adding to the vagueness of these devices.

### *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.

3. Claims 4, 5, 14, 16 and 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 4, 5, 14, 16 and 17 all incorporate features called "union block devices" with insufficient basis within the claims to define their character. Union block devices are only described in paragraph [0024] of the instant application which has this single sentence: "System 200 has a number of compute nodes 220a-n coupled to first storage unit 240 and a corresponding second storage unit 250a-n though a corresponding union block device (UBD) 230a-n." This description is insufficient to define this device. The union block devices are also shown in figure 2 as functional blocks without any further details. There is insufficient information provided in the claims and the specification as to the functionality of this joining device and as such, the claimed subject matter does not meet the requirements of UCS 112 second paragraph.

***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.

4. Claims 23-27 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Each of the claims recites the feature or limitation of logic which is encoded in one or more tangible media. Abstract ideas or methods are examples of non-functional descriptive material which do not encompass any of the four statutory categories of invention. Rephrasing these claims to call out tangible media with or comprising computer

executable instructions that perform the logic of the methods described could result in statutory claims if done properly.

5. Claims 23-27 are rejected under 35 U.S.C. § 101 because the claimed invention is directed to non-statutory subject matter. In addition to the above described problem, the Applicants describe in paragraph [0023] of the specification that the computer readable or tangible media may be any medium capable or carrying instructions and includes modulated data signals. Thus, in light of the specification, claims 23-27 recite a signal per se. Claims that recite nothing but the physical characteristics of a form of energy, such as a frequency, voltage, or the strength of a magnetic field, define energy or magnetism, per se, and as such are nonstatutory natural phenomena. O'Reilly, 56 U .S. (15 How.) at 112-14.

6. Moreover, it does not appear that a claim reciting a signal encoded with "computer readable codes" falls within any of the categories of patentable subject matter set forth in 35 U.S.C. §101. The codes must be in a form that will cause a computer or CPU or processor to execute a method as presented in the respective claims.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 14-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Chang (U. S. Patent Application Publication 2003/0126242 A1, hereafter '242).

8. In regard to claim 14, Chang teaches a system for indexing file systems for a plurality of compute nodes (‘242; fig. 1), comprising: a first storage unit for storing blocks of a root image of said compute nodes (‘242; fig. 1, element 72); a plurality of second storage units for storing leaf images of respective compute nodes (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)), said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)); and a plurality of union block devices corresponding to said compute nodes (‘242; ¶ 0020, iSCSI drivers and protocol in element 60 of fig. 1), said union block devices for interfacing between said compute nodes and said first and second storage units to distribute said file systems to said compute nodes, wherein said union block devices create said file systems by merging the blocks of said root image stored on the first storage unit with the blocks of respective leaf images stored on respective second storage unit (‘242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients), and does not explicitly teach wherein further at least one of said compute nodes is configurable to index said root image and provide the indexing results to another of said compute nodes. a plurality of union block devices corresponding to said compute nodes (‘576; ¶ 0020, iSCSI drivers and protocol in element 60 of fig. 1), said union

block devices for interfacing between said compute nodes and said first and second storage units to distribute said file systems to said compute nodes (‘576; ¶ 0020, iSCSI drivers and protocol in element 60 of fig. 1), wherein said union block devices create said file systems by merging the blocks of said root image stored on the first storage unit with the blocks of respective leaf images stored on respective second storage units (‘576; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients), wherein further at least one of said compute nodes is configurable to index (‘242; ¶ 0022-0026, snapshot methods) said root image and provide the indexing results to another of said compute nodes (‘242; ¶ 0022-0026, snapshot methods).

9. Regarding claim 15, Chang further teaches wherein said first storage unit and said second storage units are contained within a single storage appliance (‘242; fig. 1, element 60; ¶ 0017, storage controller or server).

10. In regard to claim 16, Chang teaches the system as recited in Claim 14 and further teaches the system as further comprising: a plurality of union block devices for interfacing between respective compute nodes (‘242; ¶ 0020, iSCSI drivers and protocol in element 60 of fig. 1) and said first storage unit and respective second storage units (‘242; fig. 1, element 60; ¶ 0017, storage controller or server), said union block devices operable to distribute application environments to the compute nodes, wherein said union block devices create said application environments by merging the blocks of said root image with the blocks of respective leaf images (‘242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients).

11. Regarding claim 17, Chang further teaches wherein said union block devices comprise low-level drivers for interfacing between the file systems of respective compute nodes and said first storage unit, respective second storage units, and said cache (‘242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients).

12. In regard to claim 18 Chang teaches the system as recited in Claim 14 and further teaches wherein said first storage unit is read-only (‘242; ¶ 0012, writes do not touch common OS and application image blocks).

13. Regarding claim 19, Chang teaches a method for indexing file systems for a plurality of compute nodes (‘242; fig. 1), comprising: storing blocks of a root image of said compute nodes on a first storage unit (‘242; fig. 1, element 72); storing leaf images for respective compute nodes on respective second storage units (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)), said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of the root image (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)); merging the blocks of said root image with the blocks of respective leaf images stored on respective second storage units to create respective file systems for respective compute nodes (‘242 ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client

images in element 70 of fig. 1 to be distributed to clients); receiving indexing results pertaining to said root image from one of said compute nodes (‘242; ¶ 0022-0026, snapshot methods); and providing said indexing results to the others of said compute nodes (‘242; ¶ 0022-0026, snapshot methods).

14. In regard to claim 20, Chang teaches the method as recited in Claim 19 and further teaches the method as further comprising: storing said indexing results on a shared storage unit (‘242; fig. 1, element 60; ¶ 0017, storage controller or server).

15. Regarding claim 21, Chang teaches the method as recited in Claim 19 and further teaches wherein said merging occurs at an operational level between the respective file systems of the compute nodes and said first storage unit and respective second storage units (‘242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients).

16. In regard to claim 22, Chang teaches the method as recited in Claim 19 and further teaches wherein said first storage unit is read-only (‘242; ¶ 0012, writes do not touch common OS and application image blocks).

17. Regarding claim 23 Chang teaches logic (methods) encoded in one or more tangible media for execution by a first compute node, and when executed said logic operable to (‘242; fig. 1): receive data blocks of a file system, said data blocks comprising a root image portion (‘242; fig. 1, element 72) and leaf image portion, said leaf image portion comprising additional data blocks not previously contained in said root image portion and changes made by said first compute node to the blocks of said root image (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands

or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)), wherein said file system is the result of merging said root image portion and said leaf image portion together at the block-level (‘242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients); index said root image portion (‘242; ¶ 0022-0026, snapshot methods); and provide the results of said indexing to a second compute node (‘242; ¶ 0022-0026, snapshot methods).

18. In regard to claim 24, Chang further teaches wherein said providing further comprises: storing said results of said indexing on a shared storage unit accessible by said second compute node (‘242; ¶ 0022-0026, snapshot methods).

19. Regarding claim 25 Chang teaches the logic (methods) as recited in Claim 23 and further teaches wherein said logic is further operable to: index said leaf image portion (‘242; ¶ 0022-0026, snapshot methods).

20. In regard to claim 26, Chang further teaches wherein said logic is further operable to: re-index said file system by re-indexing said leaf image portion and merging the results of said re-indexing of said leaf image portion with said results of said indexing of said root image portion (‘242; ¶ 0022-0026, snapshot methods capture updates to client specific images).

21. Regarding claim 27, Chang teaches the logic as recited in Claim 23 and further teaches wherein said root image portion is read-only (‘242; ¶ 0012, writes do not touch common OS and application image blocks).

***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.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

22. Claims 1-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang (U. S. Patent Application Publication 2003/0126242 A1, hereafter '242) as applied to claims 14-27 above and in view of Kobayashi et al. (U. S. Patent 6,101,576, hereafter '576).

23. Regarding claim 1, Chang teaches a system for providing data to a plurality of compute nodes ('242; fig. 1) comprising: a first storage unit for storing blocks of a root image of said compute nodes ('242; fig. 1, element 72); a plurality of second storage units for storing leaf images of respective compute nodes ('242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)), said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of

said root image nodes (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)); and does not explicitly teach a physical cache for caching blocks of said root image previously accessed by at least one of said compute nodes. Chang does teach caching blocks of said root image previously accessed by at least one of said compute nodes (‘242; ¶ 0010; caching of original blocks is provided in the original volume) and Kobayashi, solving the same problem of caching frequently accessed data sets, however, explicitly teaches physical caches (‘576; fig. 12, memory caches as elements 11a, 11b and a disk cache as element 14b; col. 5, ln. 47-51) for the benefit of increasing the speed of data transfers from the host to client in data streaming or transfer operations as frequently accessed data is kept in high speed memory and not constantly retrieved from slower disk sources. It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the detailed image/data cache teachings of Kobayashi with the server/client image assess and remotely stored boot/OS system teachings of Chang for the benefit of increasing the speed of data transfers from the host to client in data streaming or transfer operations as frequently accessed data is kept in high speed memory and not constantly retrieved from slower disk sources.

24. In regard to claim 2, Kobayashi further teaches wherein said cache is configurable to store the X most recently accessed blocks of said root image, and wherein further X represents a cache threshold value (‘576; col. 2, ln. 37 through col. 3, ln. 9).

25. Regarding claim 3, Chang and Kobayashi teach the system as recited in Claim 1 Chang further teaches wherein said first storage unit, said second storage units, and said cache are

contained within a single storage appliance (‘242; fig. 1, element 60; ¶ 0017, storage controller or server).

26. In regard to claim 4, Chang and Kobayashi teach the system as recited in Claim 1 and Chang further comprising: a plurality of union block devices for interfacing between respective compute nodes and said first storage unit, respective second storage units, and said cache (‘242; ¶ 0020, iSCSI drivers and protocol in element 60 of fig. 1) to distribute application environments to the compute nodes, wherein said union block devices create said application environments by merging the blocks of said root image with the blocks of respective leaf images (‘242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients).

27. Regarding claim 5, Chang further teaches wherein said union block devices comprise low-level drivers for interfacing between the file systems of respective compute nodes and said first storage unit, respective second storage units, and said cache (‘242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients).

28. In regard to claim 6, Chang and Kobayashi teach the system as recited in Claim 1 wherein said first storage unit is read-only (‘242; ¶ 0012, writes do not touch common OS and application image blocks).

29. Regarding claim 7, Chang teaches a method for providing data to a plurality of compute nodes(‘242; fig. 1), comprising: storing blocks of a root image of said compute nodes on a first storage unit (‘242; fig. 1, element 72); storing leaf images for respective compute nodes on respective second storage units (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific

blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)), said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of the root image (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)); and does not explicitly teach caching blocks of said root image that have been accessed by at least one of said compute nodes in a cache memory. Chang does teach caching blocks of said root image previously accessed by at least one of said compute nodes (‘242; ¶ 0010; caching of original blocks is provided in the original volume) and Kobayashi, solving the same problem of caching frequently accessed data sets, however, teaches explicit physical caches (‘576; fig. 12, memory caches as elements 11a, 11b and a disk cache as element 14b; col. 5, ln. 47-51) for the benefit of increasing the speed of data transfers from the host to client in data streaming or transfer operations as frequently accessed data is kept in high speed memory and not constantly retrieved from slower disk sources. It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the detailed image/data cache teachings of Kobayashi with the server/client image assess and remotely stored boot/OS system teachings of Chang for the benefit of increasing the speed of data transfers from the host to client in data streaming or transfer operations as frequently accessed data is kept in high speed memory and not constantly retrieved from slower disk sources.

30. In regard to claim 8, Chang further teaches the method as further comprising: receiving a read request from at least one of said compute nodes, wherein a first portion of the data requested is currently stored in said cache memory; and providing said first portion of said data to said at least one of said compute nodes from said cache memory (‘242; ¶ 0020-0022).

31. Regarding claim 9, Chang further teaches the method as further comprising: updating said cache memory based on said read request (‘242; ¶ 0020-0022).

32. In regard to claim 10, Kobayashi further teaches wherein a second portion of the data requested is not currently stored in said cache memory and said updating comprises: caching said second portion in said cache memory; and removing the least recently accessed data from said cache memory if the amount of data is said cache memory is above a threshold value (‘576; col. 12, ln. 59-65, LRU algorithm).

33. Regarding claim 11, Chang and Kobayashi teach the method as recited in Claim 7 and Chang further teaches the method as further comprising: merging the blocks of said root image with the blocks of respective leaf images to create cohesive respective application environments (‘242 ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients).

34. In regard to claim 12, Chang further teaches wherein said merging occurs at an operational level between the respective file systems of the compute nodes and said first storage unit, respective second storage units, and said cache memory (‘242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients).

35. Regarding claim 13, Chang and Kobayashi teach the method as recited in Claim 7 and Chang further teaches wherein said first storage unit is read-only ('242; ¶ 0012, writes do not touch common OS and application image blocks).

## *Conclusion*

The following prior art, made of record, was not relied upon but is considered pertinent to applicant's disclosure:

| | |
|---|---|
| US 6751658 B1 | Providing a reliable operating system for clients of a net-booted environment |
| US 6421777 B1 | Method and apparatus for managing boot images in a distributed data processing system – Teaches read-only boot data and client specific images in a networked boot environment. |

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edward Martello whose telephone number is (571) 270-1883. The examiner can normally be reached on M-F 7:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Xiao Wu can be reached on (571) 272-7761. 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.

/EM/

Examiner, Art Unit 2628

/XIAO M. WU/
Supervisory Patent Examiner, Art Unit 2628

| Notice of References Cited | Application/Control No. 11/709,477 | Applicant(s)/Patent Under Reexamination KULKARNI ET AL. | |
|---|---|---|---|
| | Examiner Edward Martello | Art Unit 2628 | Page 1 of 1 |

**U.S. PATENT DOCUMENTS**

| * | | Document Number Country Code-Number-Kind Code | Date MM-YYYY | Name | Classification |
|---|---|---|---|---|---|
| * | A | US-6,101,576 A | 08-2000 | Kobayashi et al. | 711/122 |
| * | B | US-6,421,777 B1 | 07-2002 | Pierre-Louis et al. | 713/2 |
| * | C | US-2003/0126242 A1 | 07-2003 | Chang, Albert H. | 709/222 |
| * | D | US-6,751,658 B1 | 06-2004 | Haun et al. | 709/222 |
| | E | US- | | | |
| | F | US- | | | |
| | G | US- | | | |
| | H | US- | | | |
| | I | US- | | | |
| | J | US- | | | |
| | K | US- | | | |
| | 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 | |
| | V | |
| | W | |
| | X | |

*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.

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 11709477 | KULKARNI ET AL. |
| | **Examiner** | **Art Unit** |
| | Edward Martello | 2628 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

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

| CLAIM | | DATE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Final | Original | 12/23/2009 | | | | | | | | |
| | 1 | ✓ | | | | | | | | |
| | 2 | ✓ | | | | | | | | |
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| | 27 | ✓ | | | | | | | | |

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 11709477 | KULKARNI ET AL. |
| | Examiner | Art Unit |
| | Edward Martello | 2628 |

## SEARCHED

| Class | Subclass | Date | Examiner |
|---|---|---|---|
| 345 | 557 | 10/26/2009 | /EM/ |

## SEARCH NOTES

| Search Notes | Date | Examiner |
|---|---|---|
| eDAN Inventor Name Search | 10/26/2009 | /EM/ |
| See attached EAST Search History | 12/16/2009 | /EM/ |
| See attached EAST Search History | 12/23/2009 | /EM/ |

## INTERFERENCE SEARCH

| Class | Subclass | Date | Examiner |
|---|---|---|---|
| | | | |

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# BIB DATA SHEET

**CONFIRMATION NO. 4127**

| SERIAL NUMBER | FILING or 371(c) DATE<br>RULE | CLASS | GROUP ART UNIT | ATTORNEY DOCKET NO. |
|---|---|---|---|---|
| 11/709,477 | 02/21/2007 | 345 | 2628 | PNTA-P006.CIP.A |

**APPLICANTS**

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

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

This application is a CIP of 11/395,816 03/30/2006

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

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

04/02/2007

| Foreign Priority claimed ☐ Yes ☑ No<br>35 USC 119(a-d) conditions met ☐ Yes ☐ No<br>Verified and Acknowledged /EDWARD MARTELLO/ Examiner's Signature | ☐ Met after Allowance<br>Initials | STATE OR COUNTRY | SHEETS DRAWINGS | TOTAL CLAIMS | INDEPENDENT CLAIMS |
|---|---|---|---|---|---|
| | | INDIA | 6 | 27 | 5 |

**ADDRESS**

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

**TITLE**

Root image caching and indexing for block-level distributed application management

| FILING FEE RECEIVED | | |
|---|---|---|
| 1750 | FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following: | ☐ All Fees<br>☐ 1.16 Fees (Filing)<br>☐ 1.17 Fees (Processing Ext. of time)<br>☐ 1.18 Fees (Issue)<br>☐ Other _____<br>☐ Credit |

BIB (Rev. 05/07).

## EAST Search History

### EAST Search History (Prior Art)

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
|---|---|---|---|---|---|---|
| S3 | 1 | root WITH image SAME caching | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/16 08:50 |
| S4 | 60 | root WITH image SAME cach$3 | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/16 08:52 |
| S5 | 12 | ("5113523" \| "5127104" \| "5999734" \| "6018747" \| "6502238" \| "7200715" \| "7246351" \| "7263551" \| "7331047" \| "7467293" \| "7475274" \| "7496739").PN. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/16 08:55 |
| S6 | 3 | ("6421777" \| "6751658" \| "20030126242").PN. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 12:30 |
| S7 | 21 | ((base or kernel) WITH code) WITH image SAME cach$3 | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 15:43 |
| S8 | 2 | ("6502238" \| "7475274").PN. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 16:11 |
| S9 | 10 | (US-20030126242-$ or US-20060179308-$ or US-20070061787-$ or US-20070198772-$).did. or (US-6751658-$ or US-6421777-$ or US-6101576-$ or US-6651245-$ or US-7475274-$ or US-6502238-$).did. | US-PGPUB; USPAT | ADJ | ON | 2009/12/23 16:39 |



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| | | | | | | |
|---|---|---|---|---|---|---|
| S10 | 8 | S9 AND cache | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 16:39 |

**12/24/2009 10:57:46 AM**
**C:\Documents and Settings\emartello\My Documents\EAST\Workspaces\11709477_Root_Image_Caching.wsp**


IPR2025-00202/844 Patent Page 71 of 322 EX1002

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | | | |
|---|---|---|---|
| Applicant | : Kulkarni, et al. | Confirmation | : 4127 |
| Serial No. | : 11/709,477 | Examiner | : Martello, Edward |
| Filing Date | : 02/21/2007 | Art Unit | : 2628 |

Attorney Docket No. : PNTA-P006.CIP.A

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For: ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION 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 January 5, 2010, please consider the following amendments and remarks in the above captioned patent application.

I hereby certify that this correspondence is being electronically transmitted to the USPTO via EFS on the date shown below:
**April 5, 2010**
/Shannon Warren/
Shannon Warren

Amendments to the Claims:

1. (Currently amended) A system for providing data to a plurality of compute nodes comprising:

a first storage unit for storing blocks of a root image of said compute nodes;

a plurality of second storage units for storing leaf images of respective compute nodes, said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; and

a cache for caching blocks of said root image previously accessed by at least one of said compute nodes.

2. (Original) The system as recited in Claim 1 wherein said cache is configurable to store the X most recently accessed blocks of said root image, and wherein further X represents a cache threshold value.

3. (Original) The system as recited in Claim 1 wherein said first storage unit, said second storage units, and said cache are contained within a single storage appliance.

4. (Original) The system as recited in Claim 1 further comprising:

a plurality of union block devices for interfacing between respective compute nodes and said first storage unit, respective second storage units, and said cache to distribute application environments to the compute nodes, wherein said union block devices create said application environments by merging the blocks of said root image with the blocks of respective leaf images.

5. (Original) The system as recited in Claim 0 wherein said union block devices comprise low-level drivers for interfacing between the file systems of respective compute nodes and said first storage unit, respective second storage units, and said cache.

6. (Original) The system as recited in Claim 1 wherein said first storage unit is read-only.

7. (Currently amended) A method for providing data to a plurality of compute nodes, comprising:

storing blocks of a root image of said compute nodes on a first storage unit;

storing leaf images for respective compute nodes on respective second storage units, said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of the root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; and

caching blocks of said root image that have been accessed by at least one of said compute nodes in a cache memory.

8. (Original) The method as recited in Claim 0 further comprising:

receiving a read request from at least one of said compute nodes, wherein a first portion of the data requested is currently stored in said cache memory; and

providing said first portion of said data to said at least one of said compute nodes from said cache memory.

9. (Original) The method as recited in Claim 0 further comprising:

updating said cache memory based on said read request.

10. (Original) The method as recited in Claim 0 wherein a second portion of the data requested is not currently stored in said cache memory and said updating comprises:

caching said second portion in said cache memory; and

removing the least recently accessed data from said cache memory if the amount of data is said cache memory is above a threshold value.

11. (Original) The method as recited in Claim 0 further comprising:

merging the blocks of said root image with the blocks of respective leaf images to create cohesive respective application environments.

12. (Original) The method as recited in Claim 0 wherein said merging occurs at an operational level between the respective file systems of the compute nodes and said first storage unit, respective second storage units, and said cache memory.

13. (Original) The method as recited in Claim 0 wherein said first storage unit is read-only.

14. (Currently amended) A system for indexing file systems for a plurality of compute nodes, comprising:

a first storage unit for storing blocks of a root image of said compute nodes;

a plurality of second storage units for storing leaf images of respective compute nodes, said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; and

a plurality of union block devices corresponding to said compute nodes, said union block devices for interfacing between said compute nodes and said first and second storage units to distribute said file systems to said compute nodes, wherein said union block devices create said file systems by merging the blocks of said root image stored on the first storage unit with the blocks of respective leaf images stored on respective second storage units, and wherein further at least one of said compute nodes is configurable to index said root image and provide the indexing results to another of said compute nodes.

15. (Original) The system as recited in Claim 0 wherein said first storage unit and said second storage units are contained within a single storage appliance.

16. (Original) The system as recited in Claim 0 further comprising:

a plurality of union block devices for interfacing between respective compute nodes and said first storage unit and respective second storage units, said union block devices operable to distribute application environments to the compute nodes, wherein said union block devices create said application environments by merging the blocks of said root image with the blocks of respective leaf images.

17. (Original) The system as recited in Claim 0 wherein said union block devices comprise low-level drivers for interfacing between the file systems of respective compute nodes and said first storage unit, respective second storage units, and said cache.

18. (Original) The system as recited in Claim 0 wherein said first storage unit is read-only.

19. (Currently amended) A method for indexing file systems for a plurality of compute nodes, comprising:

storing blocks of a root image of said compute nodes on a first storage unit;

storing leaf images for respective compute nodes on respective second storage units, said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of the root image, wherein said leaf images for respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes;

merging the blocks of said root image with the blocks of respective leaf images stored on respective second storage units to create respective file systems for respective compute nodes;

receiving indexing results pertaining to said root image from one of said compute nodes; and

providing said indexing results to the others of said compute nodes.

20. (Original) The method as recited in Claim 0 further comprising:

storing said indexing results on a shared storage unit.

21. (Original) The method as recited in Claim 0 wherein said merging occurs at an operational level between the respective file systems of the compute nodes and said first storage unit and respective second storage units.

22. (Original) The method as recited in Claim 0 wherein said first storage unit is read-only.

23. (Currently amended) Logic encoded in one or more tangible media for execution by a first compute node, and when executed said logic operable to:

receive data blocks of a file system, said data blocks comprising a root image portion and leaf image portion, said leaf image portion comprising additional data blocks not previously contained in said root image portion and changes made by said first compute node to the blocks of said root image, wherein said leaf image portion does not include blocks of said root image that are unchanged by said first compute node, wherein said file system is the result of merging said root image portion and said leaf image portion together at the block-level;

index said root image portion; and

provide the results of said indexing to a second compute node, wherein said logic encoded in the one or more tangible media comprise computer executable instructions executed by the first compute node.

24. (Original) The logic as recited in Claim 0 wherein said providing further comprises:

storing said results of said indexing on a shared storage unit accessible by said second compute node.

25. (Original) The logic as recited in Claim 0 wherein said logic is further operable to:

index said leaf image portion.

26. (Original) The logic as recited in Claim 0 wherein said logic is further operable to:

re-index said file system by re-indexing said leaf image portion and merging the results of said re-indexing of said leaf image portion with said results of said indexing of said root image portion.

27. (Original) The logic as recited in Claim 0 wherein said root image portion is read-only.

## REMARKS

Claims 1-27 are pending. Claims 1, 7, 14, 19, and 23 are amended. No new matter has been added as a result of these amendments.

### Objection to the Specification

The Specification is objected to for allegedly failing to provide proper antecedent basis for the claimed subject matter. The rejection contends that Claims 4, 5, 14, 16, and 17 claim "union block devices" but have insufficient basis within the claims to define the character of these devices. Applicants respectfully disagree.

Applicants respectfully assert that the union block devices, as claimed in Claims 4, 5, 14, 16, and 17 are defined in at least Paragraphs 0024 and 0027-0029 of Applicants' Specification and illustrated in Figure 2. In particular, the union block devices (UBDs) are defined as coupling compute nodes to the first storage unit and corresponding second storage units (paragraph 0024; and Figure 2). Applicants respectfully assert that one skilled in the art would understand that the compute nodes mount instantiations of the application environment via their respective UBDs, which are described in one embodiment as low-level drivers that operate as an interface between the first and second storage devices and the file system of each compute node (Paragraph 0027). Because the UBDs operate below the file system, they are concerned merely with the blocks of data themselves, rather than the files they form (Paragraph 0027). Applicants respectfully assert that the UBDs implemented as low-level drivers (software) are illustrated in Figure 2 as coupling the compute nodes with the first storage unit and corresponding second

storage units. In other words, Applicants respectfully assert that one skilled in the art would understand that the UBDs may be implemented as low level drivers serving to couple the hardware together (compute nodes, first storage unit and corresponding second storage units) (Paragraph 0024 and 0027).

Claim Rejections – 35 U.S.C. §112

Claims 4, 5, 14, 16, and 17 are rejected under 35 U.S.C. 112, second paragraph, as being allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. In particular, the rejection contends that Claims 4, 5, 14, 16, and 17 incorporate features called "union block devices" with insufficient basis within the claims to define their character. Applicants respectfully disagree. For the same or similar reasons as stated above, Applicants respectfully assert that the "union block devices" as claimed in Claims 4, 5, 14, 16, and 17 are defined in at least Paragraphs 0024 and 0027-0029 of Applicants' Specification and illustrated in Figure 2.

As stated above, Applicants respectfully assert that the union block devices, as claimed in Claims 4, 5, 14, 16, and 17 are defined in the Specification as coupling compute nodes to the first storage unit and corresponding second storage units, wherein the compute nodes mount instantiations of the application environment via their respective UBDs, which are described in one embodiment as low-level drivers that operate as an interface between the first and second storage devices and the file system of each compute node (Paragraphs 0024 and 0027). Applicants respectfully assert that one

skilled in the art would understand the low-level drivers to be implemented through software (Paragraph 0024). Further, because the UBDs operate below the file system, they are concerned merely with the blocks of data themselves, rather than the files they form (Paragraphs 0024 and 0027; and Figure 2).

For the above reasons, Applicants request reconsideration and withdrawal of the rejections under 35 U.S.C. §112.

Claim Rejections – 35 U.S.C. §101

Claims 23-27 are rejected under 35 U.S.C. 101 because the claimed invention is allegedly directed to non-statutory subject matter. The rejection contends that each of the claims recites the feature or limitation of logic which is encoded in one or more tangible media. The rejection advises that rephrasing Claims 23-27 to call out tangible media with or comprising computer executable instructions that perform the logic of the methods would result in statutory claims. Applicants have amended the claims as appropriate. Applicants have amended Claim 23 to further claim "said logic encoded in the one or more tangible media comprise computer executable instructions executed by the first compute node."

Claim Rejections – 35 U.S.C. §102

Claims 14-27 are rejected under 35 U.S.C. 102(b) as being allegedly anticipated by Chang (US 2003/0126242), hereinafter "Chang."

As is well established, anticipation requires the presence of a single prior art reference to disclose each and every element of the claimed invention, arranged as in the claim. There must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention. Scripps Clinic & Research Found. v. Genentech Inc., 18 USPQ 2d 1001, 1010 (Fed. Cir. 1991).

Applicants contend that Chang fails to teach all of the claimed elements of Independent Claims 14, 19, and 23.

Claim 14:

Amended Claim 1 recites in part:

> a plurality of second storage units for storing leaf images of respective compute nodes, said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes (emphasis added)

Applicants respectfully assert Chang does not teach or suggest "leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of

respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes," as claimed in Claim 14.

As understood by Applicants, Chang discloses a client image copy that is created using a snapshot of a base boot image with a virtual copy or reverse snapshot of the base image stored for each client device, wherein each client image copy includes the base boot image and information specific to the client (Abstract). In particular, Chang teaches that each client image copy includes physically common operating system (OS) and application blocks for storing the base boot image and client-specific blocks for storing information specific to the particular client device (Paragraph 0012; and Figure 1). Chang discloses in Figure 2 that each client image copy includes common OS and application blocks 80 containing the reverse snapshot of the base image as well as client specific blocks 82 for storing client specific files (Paragraphs 0030-0034).

To the extent that Chang discloses leaf images that contain client specific blocks 82 as part of a client image copy, Applicants respectfully assert that Chang does not teach or suggest "leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes," as claimed in Claim 14. Applicants respectfully assert that Chang discloses a client image copy comprising both a base boot image and information specific to the particular client device, while Applicants' claim a leaf image comprising additional data blocks not previously contained in a root

image and changes made by a respective compute node to the blocks of the root image, wherein the leaf image does not include blocks of the root image that are unchanged by the compute node, as claimed in Claim 14. Applicants respectfully assert the client image copy of Chang is not a leaf image, as claimed in Claim 14, because the client image copy of Chang includes blocks of the root image that are unchanged by a compute node (the snapshot or reverse snapshot of the boot image for each client image copy).

Therefore, Applicants respectfully assert that embodiments as recited by Claim 14 are not rendered anticipated by Chang. Accordingly, Applicants respectfully assert that dependent Claims 15-18 are patentable by virtue of their dependency on an allowable base claim, as well as for their additional recited patentable features.

Claim 19:

Independent Claim 19 recites features similar to that of independent Claim 14 and is therefore patentable for at least the same or similar reasons as recited above. Accordingly, Applicants respectfully assert that dependent Claims 20-22 are patentable by virtue of their dependency on an allowable base claim, as well as for their additional recited patentable features.

Claim 23:

Independent Claim 23 recites features similar to that of independent Claim 14 and is therefore patentable for at least the same or similar reasons as recited above. Accordingly, Applicants respectfully assert that dependent Claims 24-27 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. §102.

Claim Rejections – 35 U.S.C. §103

Claims 1-13 are rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Chang, in view of Kobayashi et al. (US 6,101,576), hereinafter "Kobayashi." Applicants respectfully assert that Claims 1-13 are patentable over the cited combination in view of the following.

Applicants respectfully point out that the Examiner has the burden of establishing a prima facie 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 respectfully assert the combination of Chang and Kobayashi fails to teach or suggest all the claimed elements of Claims 1-13 in view of the following rationale.

Claim 1:

Amended Claim 1 recites in part:

> a plurality of second storage units for storing leaf images of respective compute nodes, said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes (emphasis added)

Applicants respectfully assert the combination of Chang and Kobayashi does not teach or suggest "leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes," as claimed in Claim 1.

For at least the same or similar reasons as recited above with regards to Claim 14, Applicants respectfully assert that Chang does not teach or suggest leaf images comprising changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes, as claimed in Claim 1. Applicants respectfully assert the deficiencies of Chang are not remedied by Kobayashi.

Therefore, Applicants respectfully assert that Claim 1 is not rendered obvious by the combination of Chang and Kobayashi. Accordingly, Applicants respectfully assert that dependent Claims 2-6 are patentable by virtue of their dependency on an allowable base claim, as well as for their additional recited patentable features.

Claim 7:

Independent Claim 7 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 8-13 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 1-27 overcome the rejections of record and, therefore, allowance of Claims 1-27 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: April 5, 2010

/Jeffrey A. Lehman/
Jeffrey A. Lehman
Registration No. 65,494

MURABITO, HAO & BARNES LLP
Two North Market Street
Third Floor
San Jose, California 95113

(408) 938-9060 Voice
(408) 938-9069 Facsimile

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 7348967 |
| **Application Number:** | 11709477 |
| **International Application Number:** | |
| **Confirmation Number:** | 4127 |
| **Title of Invention:** | Root image caching and indexing for block-level distributed application management |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Customer Number:** | 70848 |
| **Filer:** | Jeffrey A. Lehman/Shannon Warren |
| **Filer Authorized By:** | Jeffrey A. Lehman |
| **Attorney Docket Number:** | PNTA-P006.CIP.A |
| **Receipt Date:** | 05-APR-2010 |
| **Filing Date:** | 21-FEB-2007 |
| **Time Stamp:** | 13:21:46 |
| **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-P006CIPA-Response.pdf | 123873<br>8275bbc9086ccc41c84fe0a8ec203d83bf8dadff | yes | 18 |

| | Multipart Description/PDF files in .zip description | | |
|---|---|---|---|
| | **Document Description** | **Start** | **End** |
| | Amendment/Req. Reconsideration-After Non-Final Reject | 1 | 1 |
| | Claims | 2 | 7 |
| | Applicant Arguments/Remarks Made in an Amendment | 8 | 18 |
| **Warnings:** | | | |
| **Information:** | | | |
| | **Total Files Size (in bytes):** | 123873 | |

**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.**

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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# PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

| Application or Docket Number | Filing Date | ☐ To be Mailed |
|---|---|---|
| 11/709,477 | 02/21/2007 | |

## 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 04/22/2010 | (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)) | * 27 | Minus | ** 27 | = 0 | X $ = | | OR | X $52= | 0 |
| Independent (37 CFR 1.16(h)) | * 5 | Minus | ***5 | = 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:
/JAMES w. TUNSTALL/

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.*

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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.

# PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

| Application or Docket Number | Filing Date | ☐ To be Mailed |
|---|---|---|
| 11/709,477 | 02/21/2007 | |

## 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 04/22/2010 | (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)) | * 27 | Minus | ** 27 | = 0 | X $ = | | OR | X $52= | 0 |
| Independent (37 CFR 1.16(h)) | * 5 | Minus | ***5 | = 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:
/JAMES w. TUNSTALL/

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.*

PTO/SB/08a (01-10)
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# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 11709477 |
| Filing Date | 2007-02-21 |
| First Named Inventor | Kulkarni |
| Art Unit | 2628 |
| Examiner Name | |
| Attorney Docket Number | PNTA-P006.CIPA |

**U.S.PATENTS** Remove

| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1 | 7269664 | | 2007-09-11 | Hutsch, et al. | |
| | 2 | 5175852 | | 1992-12-29 | Johnson, et al. | |
| | 3 | 6502238 | | 2002-12-31 | Pavan, et al. | |
| | 4 | 7475274 | | 2009-01-09 | Davidson | |

If you wish to add additional U.S. Patent citation information please click the Add button. Add

**U.S.PATENT APPLICATION PUBLICATIONS** Remove

| Examiner Initial* | Cite No | Publication Number | Kind Code[1] | Publication Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1 | 20050131962 | A1 | 2005-06-16 | Deshpande | |
| | 2 | 20020083120 | A1 | 2002-06-27 | Soltis | |

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

**FOREIGN PATENT DOCUMENTS** Remove

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 11709477 |
| | Filing Date | 2007-02-21 |
| | First Named Inventor | Kulkarni |
| | Art Unit | 2628 |
| | Examiner Name | |
| | Attorney Docket Number | PNTA-P006.CIPA |

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] ¡ | Kind Code[4] | Publication Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear | T[5] |
|---|---|---|---|---|---|---|---|---|
| | 1 | | | | | | | ☐ |

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**NON-PATENT LITERATURE DOCUMENTS** Remove

| Examiner Initials* | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T[5] |
|---|---|---|---|
| | 1 | | ☐ |

If you wish to add additional non-patent literature document citation information please click the Add button Add

**EXAMINER SIGNATURE**

| Examiner Signature | | Date Considered | |
|---|---|---|---|

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 11709477 |
| | Filing Date | 2007-02-21 |
| | First Named Inventor | Kulkarni |
| | Art Unit | 2628 |
| | Examiner Name | |
| | Attorney Docket Number | PNTA-P006.CIPA |

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ None

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

| Signature | /Jeffrey A. Lehman/ | Date (YYYY-MM-DD) | 2010-04-22 |
|---|---|---|---|
| Name/Print | Jeffrey A. Lehman | Registration Number | 65494 |

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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.**

## Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 11709477 |
| **Filing Date:** | 21-Feb-2007 |
| **Title of Invention:** | Root image caching and indexing for block-level distributed application management |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Filer:** | Jeffrey A. Lehman/Shannon Warren |
| **Attorney Docket Number:** | PNTA-P006.CIP.A |

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:** | | | | |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| Submission- Information Disclosure Stmt | 1806 | 1 | 180 | 180 |
| | | **Total in USD ($)** | | **180** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 7467188 |
| **Application Number:** | 11709477 |
| **International Application Number:** | |
| **Confirmation Number:** | 4127 |
| **Title of Invention:** | Root image caching and indexing for block-level distributed application management |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Customer Number:** | 70848 |
| **Filer:** | Jeffrey A. Lehman/Shannon Warren |
| **Filer Authorized By:** | Jeffrey A. Lehman |
| **Attorney Docket Number:** | PNTA-P006.CIP.A |
| **Receipt Date:** | 22-APR-2010 |
| **Filing Date:** | 21-FEB-2007 |
| **Time Stamp:** | 14:38:44 |
| **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 | $180 |
| RAM confirmation Number | 782 |
| Deposit Account | |
| Authorized User | |

## File Listing:

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

| | | | | | |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Filed (SB/08) | PNTA-P006CIPA-IDS.pdf | 806345<br>df744d72f85b0a00b9ea118918f6be36fa859d73 | no | 4 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Fee Worksheet (PTO-875) | fee-info.pdf | 30253<br>467ca78bf2b7a501c06c14a2670ea003edc2dfdd | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | | **Total Files Size (in bytes):** | 836598 | |

**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.**

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. |
|---|---|---|---|---|
| 11/709,477 | 02/21/2007 | Pradip Kulkarni | PNTA-P006.CIP.A | 4127 |

70848 7590 05/25/2010

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

| EXAMINER | |
|---|---|
| MARTELLO, EDWARD | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2628 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 05/25/2010 | 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) | |
|---|---|---|---|
| | 11/709,477 | KULKARNI ET AL. | |
| | Examiner | Art Unit | |
| | Edward Martello | 2628 | |

*-- 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 *05 April 2010*.

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) *1-27* 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) *1-27* is/are rejected.

7)☒ Claim(s) *5, 8-13, 15-18, 20-22 and 24-27* 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 _____ 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 *04/22/2010*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Amendment*

1. This Office Action is responsive to the amendment received 5 April 2010.

2. Claims 1, 7, 14, 19 and 23 are amended while claims 2-6, 8-13, 15-18, 20-22 and 24-27 are as originally presented.

### *Claim Objections*

3. Claims 5, 8-13, 15-18, 20-22 and 24-27 are objected to because of the following informalities: All of these dependent claims have been made dependent upon **claim 0**, which obviously is an editing error. Since no claims have been cancelled and these claims have not been otherwise amended, the Examiner will use the dependencies presented in the original submission and keep the status indication as original. Appropriate correction is required.

### *Specification*

4. The disclosure is objected to because of the following informalities: Paragraph [0022] of the specification calls out "the most basic configuration is illustrated in figure 1 by dashed line 105." and the dashed line shown in figure 1 is labeled 106. The Examiner assumes that it is easier to correct the specification rather than change the drawing. Appropriate correction is required.

5. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: Claims 4, 5, 14, 16 and 17 all incorporate features called "union block devices" with insufficient basis within the claims to define their character. Union block devices are described in paragraph [0024] and in paragraphs [0027]-[0028]. Pargaraph 27 states that they may be low level drivers and that the file system resides on the server side of system 200. But as they are shown in figure 2, they are standalone devices and not part of the compute nodes. The functionality described in paragraphs [0027]-[0028] requires a processor that is not part of the UBD device as shown in figure 2, thus they must be part of their respective compute nodes which they would be if they were a driver. If they are standalone devices as shown in figure 2, then some description of how they obtain their compute power is required. Additional confusion reins as paragraph [0028] claims that the UBD may create new leaf images on a second storage unit when their respective compute nodes make changes to their instantiation of the application environment. And they do this without knowledge of the file system as claimed in the last sentence in paragraph [0027]. The Examiner would like to know how a UBD can create files on a disk that are associated with files on another disk, the main disk 260 which is managed with a file system on the server or compute node side of the overall environment, and not have any knowledge of the file system. There is insufficient information provided in the claims and the specification as to the where/ how the functionality of this UBD joining device is accomplished in the broadly defined embodiments covered in the specification.

***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.

6. Claims 23-27 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Each of the claims recites the feature or limitation of logic which is encoded in one or more tangible media. Abstract ideas or methods are examples of non-functional descriptive material which do not encompass any of the four statutory categories of invention. Rephrasing these claims to call out "non-transitory computer readable media" with or comprising computer executable instructions that perform the logic of the methods described could result in statutory claims if done properly.

7. Claims 23-27 are rejected under 35 U.S.C. § 101 because the claimed invention is directed to non-statutory subject matter. In addition to the above described problem, the Applicants describe in paragraph [0023] of the specification that the computer readable or tangible media may be any medium capable or carrying instructions and includes modulated data signals. Thus, in light of the specification, claims 23-27 recite a signal per se. Claims that recite nothing but the physical characteristics of a form of energy, such as a frequency, voltage, or the strength of a magnetic field, define energy or magnetism, per se, and as such are nonstatutory natural phenomena. O'Reilly, 56 U .S. (15 How.) at 112-14.

8. Moreover, it does not appear that a claim reciting a signal encoded with "computer readable codes" falls within any of the categories of patentable subject matter set forth in 35 U.S.C. §101. The codes must be in a form that will cause a computer or CPU or processor to execute a method as presented in the respective claims.

***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.

9. Claims 4, 5, 14, 16 and 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 4, 5, 14, 16 and 17 all incorporate features called "union block devices" with insufficient basis within the claims to define their character. Union block devices are described in paragraph [0024] and in paragraphs [0027]-[0028]. Paragraph 27 states that they may be low level drivers and that the file system resides on the server side of system 200. But as they are shown in figure 2, they are standalone devices and not part of the compute nodes. The functionality described in paragraphs [0027]-[0028] requires a processor that is not part of the UBD device as shown in figure 2, thus they must be part of their respective compute nodes which they would be if they were a driver. If they are standalone devices as shown in figure 2, then some description of how they obtain their compute power is required. Additional confusion reins as paragraph [0028] claims that the UBD may create new leaf images on a second storage unit when their respective compute nodes make changes to their instantiation of the application environment. And they do this without knowledge of the file system as

claimed in the last sentence in paragraph [0027]. The Examiner would like to know how a UBD can create files on a disk that are associated with files on another disk, the main disk 260 which is managed with a file system on the server or compute node side of the overall environment, and not have any knowledge of the file system. There is insufficient information provided in the claims and the specification as to the where/ how the functionality of this UBD joining device is accomplished in the broadly defined embodiments covered in the specification and as such, the claimed subject matter does not meet the requirements of UCS 112 second paragraph.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 14-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Chang (U. S. Patent Application Publication 2003/0126242 A1, hereafter '242).

11. In regard to claim 14 (Currently Amended), Chang teaches a system for indexing file systems for a plurality of compute nodes ('242; fig. 1), comprising: a first storage unit for storing

blocks of a root image of said compute nodes (‘242; fig. 1, element 72); a plurality of second storage units for storing leaf images of respective compute nodes (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)), said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)), wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes (‘242; ¶ 0025-0026; client-specific blocks are "allocated-on-write" with reads from the unmodified blocks coming from the base image blocks and writes going to the client-specific blocks (client respective leaf images) only); and a plurality of union block devices corresponding to said compute nodes (‘242; ¶ 0020, iSCSI drivers and protocol in element 60 of fig. 1), said union block devices for interfacing between said compute nodes and said first and second storage units to distribute said file systems to said compute nodes, wherein said union block devices create said file systems by merging the blocks of said root image stored on the first storage unit with the blocks of respective leaf images stored on respective second storage unit (‘242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients), and does not explicitly teach wherein further at least one of said compute nodes is configurable to index said root image and provide the indexing results

to another of said compute nodes. a plurality of union block devices corresponding to said compute nodes (‘576; ¶ 0020, iSCSI drivers and protocol in element 60 of fig. 1), said union block devices for interfacing between said compute nodes and said first and second storage units to distribute said file systems to said compute nodes (‘576; ¶ 0020, iSCSI drivers and protocol in element 60 of fig. 1), wherein said union block devices create said file systems by merging the blocks of said root image stored on the first storage unit with the blocks of respective leaf images stored on respective second storage units (‘576; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients), wherein further at least one of said compute nodes is configurable to index (‘242; ¶ 0022-0026, snapshot methods) said root image and provide the indexing results to another of said compute nodes (‘242; ¶ 0022-0026, snapshot methods).

12. Regarding claim 15 (Original), Chang further teaches wherein said first storage unit and said second storage units are contained within a single storage appliance (‘242; fig. 1, element 60; ¶ 0017, storage controller or server).

13. In regard to claim 16 (Original), Chang teaches the system as recited in Claim 14 and further teaches the system as further comprising: a plurality of union block devices for interfacing between respective compute nodes (‘242; ¶ 0020, iSCSI drivers and protocol in element 60 of fig. 1) and said first storage unit and respective second storage units (‘242; fig. 1, element 60; ¶ 0017, storage controller or server), said union block devices operable to distribute application environments to the compute nodes, wherein said union block devices create said

application environments by merging the blocks of said root image with the blocks of respective leaf images (‘242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients).

14. Regarding claim 17 (Original), Chang further teaches wherein said union block devices comprise low-level drivers for interfacing between the file systems of respective compute nodes and said first storage unit, respective second storage units, and said cache (‘242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients).

15. In regard to claim 18 (Original), Chang teaches the system as recited in Claim 14 and further teaches wherein said first storage unit is read-only (‘242; ¶ 0012, writes do not touch common OS and application image blocks).

16. Regarding claim 19 (Currently Amended), Chang teaches a method for indexing file systems for a plurality of compute nodes (‘242; fig. 1), comprising: storing blocks of a root image of said compute nodes on a first storage unit (‘242; fig. 1, element 72); storing leaf images for respective compute nodes on respective second storage units (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)), said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute

nodes to the blocks of the root image (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)), wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes (‘242; ¶ 0025-0026; client-specific blocks are "allocated-on-write" with reads from the unmodified blocks coming from the base image blocks and writes going to the client-specific blocks (client respective leaf images) only); merging the blocks of said root image with the blocks of respective leaf images stored on respective second storage units to create respective file systems for respective compute nodes (‘242 ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients); receiving indexing results pertaining to said root image from one of said compute nodes (‘242; ¶ 0022-0026, snapshot methods); and providing said indexing results to the others of said compute nodes (‘242; ¶ 0022-0026, snapshot methods).

17. In regard to claim 20 (Original), Chang teaches the method as recited in Claim 19 and further teaches the method as further comprising: storing said indexing results on a shared storage unit (‘242; fig. 1, element 60; ¶ 0017, storage controller or server).

18. Regarding claim 21 (Original), Chang teaches the method as recited in Claim 19 and further teaches wherein said merging occurs at an operational level between the respective file systems of the compute nodes and said first storage unit and respective second storage units

('242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients).

19. In regard to claim 22 (Original), Chang teaches the method as recited in Claim 19 and further teaches wherein said first storage unit is read-only ('242; ¶ 0012, writes do not touch common OS and application image blocks).

20. Regarding claim 23 (Original), Chang teaches logic (methods) encoded in one or more tangible media for execution by a first compute node, and when executed said logic operable to ('242; fig. 1): receive data blocks of a file system, said data blocks comprising a root image portion ('242; fig. 1, element 72) and leaf image portion, said leaf image portion comprising additional data blocks not previously contained in said root image portion and changes made by said first compute node to the blocks of said root image ('242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received ('242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)), wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute node ('242; ¶ 0025-0026; client-specific blocks are "allocated-on-write" with reads from the unmodified blocks coming from the base image blocks and writes going to the client-specific blocks (client respective leaf images) only), wherein said file system is the result of merging said root image portion and said

leaf image portion together at the block-level (‘242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients); index said root image portion (‘242; ¶ 0022-0026, snapshot methods); and provide the results of said indexing to a second compute node(‘242; ¶ 0022-0026, snapshot methods), wherein said logic encoded in the one or more tangible media comprise computer executable instructions executed by the first compute node (‘242; fig. 1; ¶ 0017).

21. In regard to claim 24 (Original), Chang further teaches wherein said providing further comprises: storing said results of said indexing on a shared storage unit accessible by said second compute node (‘242; ¶ 0022-0026, snapshot methods).

22. Regarding claim 25 (Original), Chang teaches the logic (methods) as recited in Claim 23 and further teaches wherein said logic is further operable to: index said leaf image portion (‘242; ¶ 0022-0026, snapshot methods).

23. In regard to claim 26 (Original), Chang further teaches wherein said logic is further operable to: re-index said file system by re-indexing said leaf image portion and merging the results of said re-indexing of said leaf image portion with said results of said indexing of said root image portion (‘242; ¶ 0022-0026, snapshot methods capture updates to client specific images).

24. Regarding claim 27 (Original), Chang teaches the logic as recited in Claim 23 and further teaches wherein said root image portion is read-only ('242; ¶ 0012, writes do not touch common OS and application image blocks).

***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.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

25. Claims 1-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang (U. S. Patent Application Publication 2003/0126242 A1, hereafter '242) as applied to claims 14-27 above and in view of Kobayashi et al. (U. S. Patent 6,101,576, hereafter '576).

26. Regarding claim 1 (Currently Amended), Chang teaches a system for providing data to a plurality of compute nodes ('242; fig. 1) comprising: a first storage unit for storing blocks of a root image of said compute nodes ('242; fig. 1, element 72); a plurality of second storage units

for storing leaf images of respective compute nodes (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)), said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)), wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes (‘242; ¶ 0025-0026; client-specific blocks are "allocated-on-write" with reads from the unmodified blocks coming from the base image blocks and writes going to the client-specific blocks (client respective leaf images) only); and does not explicitly teach a physical cache for caching blocks of said root image previously accessed by at least one of said compute nodes. Chang does teach caching blocks of said root image previously accessed by at least one of said compute nodes (‘242; ¶ 0010; caching of original blocks is provided in the original volume) and Kobayashi, solving the same problem of caching frequently accessed data sets, however, explicitly teaches physical caches (‘576; fig. 12, memory caches as elements 11a, 11b and a disk cache as element 14b; col. 5, ln. 47-51) for the benefit of increasing the speed of data transfers from the host to client in data streaming or transfer operations as frequently accessed data is kept in high speed memory and not constantly retrieved from slower

disk sources. It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the detailed image/data cache teachings of Kobayashi with the server/client image assess and remotely stored boot/OS system teachings of Chang for the benefit of increasing the speed of data transfers from the host to client in data streaming or transfer operations as frequently accessed data is kept in high speed memory and not constantly retrieved from slower disk sources.

27. In regard to claim 2 (Original), Kobayashi further teaches wherein said cache is configurable to store the X most recently accessed blocks of said root image, and wherein further X represents a cache threshold value ('576; col. 2, ln. 37 through col. 3, ln. 9).

28. Regarding claim 3 (Original), Chang and Kobayashi teach the system as recited in Claim 1 Chang further teaches wherein said first storage unit, said second storage units, and said cache are contained within a single storage appliance ('242; fig. 1, element 60; ¶ 0017, storage controller or server).

29. In regard to claim 4 (Original), Chang and Kobayashi teach the system as recited in Claim 1 and Chang further comprising: a plurality of union block devices for interfacing between respective compute nodes and said first storage unit, respective second storage units, and said cache ('242; ¶ 0020, iSCSI drivers and protocol in element 60 of fig. 1) to distribute application environments to the compute nodes, wherein said union block devices create said application environments by merging the blocks of said root image with the blocks of respective leaf images

('242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients).

30. Regarding claim 5 (Original), Chang further teaches wherein said union block devices comprise low-level drivers for interfacing between the file systems of respective compute nodes and said first storage unit, respective second storage units, and said cache ('242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients).

31. In regard to claim 6 (Original), Chang and Kobayashi teach the system as recited in Claim 1 wherein said first storage unit is read-only ('242; ¶ 0012, writes do not touch common OS and application image blocks).

32. Regarding claim 7 (Currently Amended), Chang teaches a method for providing data to a plurality of compute nodes('242; fig. 1), comprising: storing blocks of a root image of said compute nodes on a first storage unit ('242; fig. 1, element 72); storing leaf images for respective compute nodes on respective second storage units ('242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)), said leaf images comprising additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of the root image ('242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably

allocated and/or updated when writes or similar commands or messages are received (‘242; fig. 1, elements 74, 76, 78; ¶ 0012, The client-specific blocks are preferably allocated and/or updated when writes or similar commands or messages are received (e.g., writes do not touch common OS and application image blocks but instead are client-specific)), wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes (‘242; ¶ 0025-0026; client-specific blocks are "allocated-on-write" with reads from the unmodified blocks coming from the base image blocks and writes going to the client-specific blocks (client respective leaf images) only); and does not explicitly teach caching blocks of said root image that have been accessed by at least one of said compute nodes in a cache memory. Chang does teach caching blocks of said root image previously accessed by at least one of said compute nodes (‘242; ¶ 0010; caching of original blocks is provided in the original volume) and Kobayashi, solving the same problem of caching frequently accessed data sets, however, teaches explicit physical caches (‘576; fig. 12, memory caches as elements 11a, 11b and a disk cache as element 14b; col. 5, ln. 47-51) for the benefit of increasing the speed of data transfers from the host to client in data streaming or transfer operations as frequently accessed data is kept in high speed memory and not constantly retrieved from slower disk sources. It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the detailed image/data cache teachings of Kobayashi with the server/client image assess and remotely stored boot/OS system teachings of Chang for the benefit of increasing the speed of data transfers from the host to client in data streaming or transfer operations as frequently accessed data is kept in high speed memory and not constantly retrieved from slower disk sources.

33. In regard to claim 8 (Original), Chang further teaches the method as further comprising: receiving a read request from at least one of said compute nodes, wherein a first portion of the data requested is currently stored in said cache memory; and providing said first portion of said data to said at least one of said compute nodes from said cache memory (‘242; ¶ 0020-0022).

34. Regarding claim 9 (Original), Chang further teaches the method as further comprising: updating said cache memory based on said read request (‘242; ¶ 0020-0022).

35. In regard to claim 10 (Original), Kobayashi further teaches wherein a second portion of the data requested is not currently stored in said cache memory and said updating comprises: caching said second portion in said cache memory; and removing the least recently accessed data from said cache memory if the amount of data is said cache

36. Regarding claim 11 (Original), Chang and Kobayashi teach the method as recited in Claim 7 and Chang further teaches the method as further comprising: merging the blocks of said root image with the blocks of respective leaf images to create cohesive respective application environments (‘242 ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients).

37. In regard to claim 12 (Original), Chang further teaches wherein said merging occurs at an operational level between the respective file systems of the compute nodes and said first storage

unit, respective second storage units, and said cache memory ('242; ¶ 0020-0021, iSCSI drivers and protocol in element 60 of fig. 1 to allow output of pooled base and client images in element 70 of fig. 1 to be distributed to clients).

38. Regarding claim 13 (Original), Chang and Kobayashi teach the method as recited in Claim 7 and Chang further teaches wherein said first storage unit is read-only ('242; ¶ 0012, writes do not touch common OS and application image blocks).

***Response to Arguments***

39. Applicant's arguments filed 5 April 2010 have been fully considered but they are not persuasive.

40. The Examiner did not find the arguments to the objection to the specification persuasive and the Examiner's response is contained in the continuation of the objection to the specification above. In addition the specification is objected to for minor informalities as shown above.

41. The Examiner did not find the arguments with respect to the 35 USC § 112 second paragraph as persuasive and the Examiner's response is contained in the 35 USC § 112 second paragraph rejection of claims 4, 5, 14, 16 and 17 as shown above in the claim rejection section.

42. As stated in the response to amendment section above, the claim amendments cured the basis for all of the previous 35 USC § 101 rejections.

43. The Applicants' arguments with respect with respect to Claim 14, rejected under 35 USC § 102(b), are addressing the claim as amended. The Examiner has added additional cites from Chang to address the one added limitation to the claim, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes. Chang teaches this feature as cited, '242; ¶ 0025-0026, where client-specific blocks are "allocated-on-write" with reads from the unmodified blocks coming from the base image blocks and writes going to the client-specific blocks (client respective leaf images) only for updating and retrieving as needed by the respective clients.

44. This same argument is repeated for claim 19 which is similar in scope and features to claim 14 and as such it has have been updated with the same additional rejection citation from Chang and are argued as for claim 14 immediately above.

45. Again, the argument for claim 14 is repeated for claim 23 which is similar in scope and features to claim 14 and as such it has have been updated with the same additional rejection citation from Chang and are argued as for claim 14 above. Additionally, the added feature, wherein said logic encoded in the one or more tangible media comprise computer executable instructions executed by the first compute node has been addressed with '242; fig. 1; ¶ 0017 from Chang.

46. Claims 15-18, 20-22 and 24-27 are rejected as being dependent upon a rejected base claim and for the additional features they add as shown in the claim rejection section above.

47. The Applicants' arguments with respect with respect to Claim 1, rejected under 35 USC § 103(a), are addressing the claim as amended. The Examiner has added additional cites from Chang to address the one added limitation to the claim, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes. Chang teaches this feature as cited, '242; ¶ 0025-0026, where client-specific blocks are "allocated-on-write" with reads from the unmodified blocks coming from the base image blocks and writes going to the client-specific blocks (client respective leaf images) only for updating and retrieving as needed by the respective clients.

48. This same argument is repeated for claim 7 which is similar in scope and features to claim 1 and as such claim 7 has been updated with the same additional rejection citation from Chang and the claim is argued as for claim 1 immediately above.

49. Claims 2-6 and 6-13 are rejected as being dependent upon a rejected base claim and for the additional features they add as shown in the claim rejection section above.

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edward Martello whose telephone number is (571) 270-1883. The examiner can normally be reached on M-F 7:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Xiao Wu can be reached on (571) 272-7761. 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.

/Edward Martello/
Examiner, Art Unit 2628

/XIAO M. WU/
Supervisory Patent Examiner, Art Unit 2628

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 11709477 | KULKARNI ET AL. |
| | Examiner | Art Unit |
| | Edward Martello | 2628 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

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

| CLAIM | | DATE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Final | Original | 12/23/2009 | 05/11/2010 | | | | | | | |
| | 1 | ✓ | ✓ | | | | | | | |
| | 2 | ✓ | ✓ | | | | | | | |
| | 3 | ✓ | ✓ | | | | | | | |
| | 4 | ✓ | ✓ | | | | | | | |
| | 5 | ✓ | ✓ | | | | | | | |
| | 6 | ✓ | ✓ | | | | | | | |
| | 7 | ✓ | ✓ | | | | | | | |
| | 8 | ✓ | ✓ | | | | | | | |
| | 9 | ✓ | ✓ | | | | | | | |
| | 10 | ✓ | ✓ | | | | | | | |
| | 11 | ✓ | ✓ | | | | | | | |
| | 12 | ✓ | ✓ | | | | | | | |
| | 13 | ✓ | ✓ | | | | | | | |
| | 14 | ✓ | ✓ | | | | | | | |
| | 15 | ✓ | ✓ | | | | | | | |
| | 16 | ✓ | ✓ | | | | | | | |
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| | 19 | ✓ | ✓ | | | | | | | |
| | 20 | ✓ | ✓ | | | | | | | |
| | 21 | ✓ | ✓ | | | | | | | |
| | 22 | ✓ | ✓ | | | | | | | |
| | 23 | ✓ | ✓ | | | | | | | |
| | 24 | ✓ | ✓ | | | | | | | |
| | 25 | ✓ | ✓ | | | | | | | |
| | 26 | ✓ | ✓ | | | | | | | |
| | 27 | ✓ | ✓ | | | | | | | |

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 11709477 | KULKARNI ET AL. |
| | Examiner | Art Unit |
| | Edward Martello | 2628 |

## SEARCHED

| Class | Subclass | Date | Examiner |
|---|---|---|---|
| 345 | 557 | 10/26/2009 | /EM/ |

## SEARCH NOTES

| Search Notes | Date | Examiner |
|---|---|---|
| eDAN Inventor Name Search | 10/26/2009 | /EM/ |
| See attached EAST Search History | 12/16/2009 | /EM/ |
| See attached EAST Search History | 12/23/2009 | /EM/ |
| See attached EAST Search History | 05/11/2010 | /EM/ |

## INTERFERENCE SEARCH

| Class | Subclass | Date | Examiner |
|---|---|---|---|
| | | | |

## EAST Search History

### EAST Search History (Prior Art)

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
|---|---|---|---|---|---|---|
| S3 | 1 | root WITH image SAME caching | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/16 08:50 |
| S4 | 60 | root WITH image SAME cach$3 | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/16 08:52 |
| S5 | 12 | ("5113523" \| "5127104" \| "5999734" \| "6018747" \| "6502238" \| "7200715" \| "7246351" \| "7263551" \| "7331047" \| "7467293" \| "7475274" \| "7496739").PN. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/16 08:55 |
| S6 | 3 | ("6421777" \| "6751658" \| "20030126242").PN. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 12:30 |
| S7 | 21 | ((base or kernel) WITH code) WITH image SAME cach$3 | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 15:43 |
| S8 | 2 | ("6502238" \| "7475274").PN. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 16:11 |
| S9 | 10 | (US-20030126242-$ or US-20060179308-$ or US-20070061787-$ or US-20070198772-$).did. or (US-6751658-$ or US-6421777-$ or US-6101576-$ or US-6651245-$ or US-7475274-$ or US-6502238-$).did. | US-PGPUB; USPAT | ADJ | ON | 2009/12/23 16:39 |



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| | | | | | | |
|---|---|---|---|---|---|---|
| S10 | 8 | S9 AND cache | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 16:39 |
| S11 | 317 | 345/557.ccls. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/24 11:14 |
| S12 | 6 | ("20020083120" \| "20050131962" \| "5175852" \| "6502238" \| "7269664" \| "7475274").PN. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2010/05/11 08:06 |
| S13 | 283 | (((root OR base OR kernel) WITH (software OR code OR binary)) SAME image) SAME2 cach$3 | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2010/05/11 08:26 |

**EAST Search History (Interference)**

<This search history is empty>

**5/11/2010 4:41:38 PM**
**C:\Documents and Settings\emartello\My Documents\EAST\Workspaces\11709477_Root_Image_Caching.wsp**



IPR2025-00202 / 844 Patent Page 129 of 322 EX1002

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
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**INFORMATION DISCLOSURE STATEMENT BY APPLICANT**
**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 11709477 |
| Filing Date | 2007-02-21 |
| First Named Inventor | Kulkarni |
| Art Unit | 2628 |
| Examiner Name | Edward Martello |
| Attorney Docket Number | PNTA-P006.CIPA |

**U.S.PATENTS** Remove

| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| /E.M./ | 1 | 7269664 | | 2007-09-11 | Hutsch, et al. | |
| /E.M./ | 2 | 5175852 | | 1992-12-29 | Johnson, et al. | |
| /E.M./ | 3 | 6502238 | | 2002-12-31 | Pavan, et al. | |
| /E.M./ | 4 | 7475274 | | 2009-01-09 | Davidson | |

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|---|---|---|---|---|---|---|
| /E.M./ | 1 | 20050131962 | A1 | 2005-06-16 | Deshpande | |
| /E.M./ | 2 | 20020083120 | A1 | 2002-06-27 | Soltis | |

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| Receipt date: 04/22/2010 | | |
|---|---|---|
| **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** ( **Not for submission under 37 CFR 1.99)** | Application Number | 11709477 |
| | Filing Date | 2007-02-21 |
| | First Named Inventor | Kulkarni |
| | Art Unit | 2628 |
| | Examiner Name | |
| | Attorney Docket Number | PNTA-P006.CIPA |

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] ¡ | Kind Code[4] | Publication Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear | T[5] |
|---|---|---|---|---|---|---|---|---|
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|---|---|---|---|
| | 1 | | ☐ |

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**EXAMINER SIGNATURE**

| Examiner Signature | /Edward Martello/ | Date Considered | 05/07/2010 |
|---|---|---|---|

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

PTO/SB/30EFS (07-09)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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# REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
## (Submitted Only via EFS-Web)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Application Number | 11709477 | Filing Date | 2007-02-21 | Docket Number (if applicable) | PNTA-P006.CIPA | Art Unit | 2628 |
| First Named Inventor | KULKARNI, et al. | | | Examiner Name | MARTELLO, Edward | | |

**This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.**
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

### SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

### MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

### FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 504160

### SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

| Signature of Registered U.S. Patent Practitioner | | | |
|---|---|---|---|
| Signature | /Jeffrey A. Lehman/ | Date (YYYY-MM-DD) | 2010-08-25 |
| Name | Jeffrey A. Lehman | Registration Number | 65494 |

This collection of information is required by 37 CFR 1.114. 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 1.11 and 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.

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

# Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 11709477 |
| **Filing Date:** | 21-Feb-2007 |
| **Title of Invention:** | Root image caching and indexing for block-level distributed application management |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Filer:** | Jeffrey A. Lehman/Shannon Warren |
| **Attorney Docket Number:** | PNTA-P006.CIP.A |

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:** | | | | |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| Request for continued examination | 1801 | 1 | 810 | 810 |
| | | **Total in USD ($)** | | **810** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 8288259 |
| **Application Number:** | 11709477 |
| **International Application Number:** | |
| **Confirmation Number:** | 4127 |
| **Title of Invention:** | Root image caching and indexing for block-level distributed application management |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Customer Number:** | 70848 |
| **Filer:** | Jeffrey A. Lehman/Shannon Warren |
| **Filer Authorized By:** | Jeffrey A. Lehman |
| **Attorney Docket Number:** | PNTA-P006.CIP.A |
| **Receipt Date:** | 25-AUG-2010 |
| **Filing Date:** | 21-FEB-2007 |
| **Time Stamp:** | 14:02:02 |
| **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 | $810 |
| RAM confirmation Number | 282 |
| Deposit Account | |
| Authorized User | |

## File Listing:

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

| | | | | | |
|---|---|---|---|---|---|
| 1 | Amendment Submitted/Entered with Filing of CPA/RCE | PNTA-P006-CIPA-RCEResponse.pdf | 152704<br>bf4343c9c7ab7746d0f7f1e3d474d7bb1506ad07 | no | 21 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Request for Continued Examination (RCE) | PNTA-P006CIPA-RCETran.pdf | 768343<br>0a385f69c5928295e8def2815620314ac1eea09d | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Fee Worksheet (PTO-875) | fee-info.pdf | 30262<br>158c6daef0ca0dd944956da543417c33560d2a15 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 951309 | | |

**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.**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | | | |
|---|---|---|---|
| Applicant | : Kulkarni, et al. | Confirmation | : 4127 |
| Serial No. | : 11/709,477 | Examiner | : Martello, Edward |
| Filing Date | : 02/21/2007 | Art Unit | : 2628 |

Attorney Docket No. : PNTA-P006.CIP.A

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For: ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT

AMENDMENT AND RESPONSE TO FINAL OFFICE ACTION AND REQUEST FOR CONTINUED EXAMINATION (RCE)

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

Dear Sir:

In response to the FINAL Office Action mailed May 25, 2010, 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** begin on Page 3 of this paper.

**Remarks** begin on Page 9 of this paper.

I hereby certify that this correspondence is
being electronically transmitted to the USPTO
via EFS on the date shown below:
**August 25, 2010**
/Shannon Warren/
Shannon Warren

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Page 140 of 322
EX1002

Amendments to the Specification:

Please replace Paragraph 0022 with the following:

**[0022]** With reference to FIG. 1, an example system for implementing embodiments includes a general purpose computing system environment, such as compute node 100. In its most basic configuration, compute node 100 typically includes at least one processing unit 102 and memory 104. Depending on the exact configuration and type of compute node, memory 104 may be volatile (such as RAM), non-volatile (such as ROM, flash memory, etc.) or some combination of the two. This most basic configuration is illustrated in Figure 1 by dashed line 106 [[105]]. Additionally, compute node 100 may also have additional features/functionality. For example, compute node 100 may also include additional storage (removable and/or non-removable) including, but not limited to, magnetic or optical disks or tape. Such additional storage is illustrated in FIG. 1 by removable storage 108 and non-removable storage 110. Computer storage media includes volatile and nonvolatile, removable and non-removable media implemented in any method or technology for storage of information such as computer readable instructions, data structures, program modules or other data. Memory 104, removable storage 108 and nonremovable storage 110 are all examples of computer storage media. Computer storage media includes, but is not limited to, RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by compute node 100. Any such computer storage media may be part of compute node 100.

Amendments to the Claims:

1. (Currently amended) A system for providing data to a plurality of compute nodes comprising:

a first storage unit for storing blocks of a root image of said compute nodes;

a plurality of second storage units for storing leaf images of respective compute nodes, said leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; and

a cache for caching blocks of said root image previously accessed by at least one of said compute nodes.

2. (Original) The system as recited in Claim 1 wherein said cache is configurable to store the X most recently accessed blocks of said root image, and wherein further X represents a cache threshold value.

3. (Original) The system as recited in Claim 1 wherein said first storage unit, said second storage units, and said cache are contained within a single storage appliance.

4. (Original) The system as recited in Claim 1 further comprising:

a plurality of union block devices for interfacing between respective compute nodes and said first storage unit, respective second storage units, and said cache to distribute application environments to the compute nodes, wherein said union block devices create said application environments by merging the blocks of said root image with the blocks of respective leaf images.

5. (Currently amended) The system as recited in Claim 4[[0]] wherein said union block devices comprise low-level drivers for interfacing between the file systems of

respective compute nodes and said first storage unit, respective second storage units, and said cache.

6. (Original) The system as recited in Claim 1 wherein said first storage unit is read-only.

7. (Currently amended) A method for providing data to a plurality of compute nodes, comprising:

storing blocks of a root image of said compute nodes on a first storage unit;

storing leaf images for respective compute nodes on respective second storage units, said leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of the root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; and

caching blocks of said root image that have been accessed by at least one of said compute nodes in a cache memory.

8. (Currently amended) The method as recited in Claim 7[[0]] further comprising:

receiving a read request from at least one of said compute nodes, wherein a first portion of the data requested is currently stored in said cache memory; and

providing said first portion of said data to said at least one of said compute nodes from said cache memory.

9. (Currently amended) The method as recited in Claim 8[[0]] further comprising:

updating said cache memory based on said read request.

10. (Currently amended) The method as recited in Claim 9[[0]] wherein a second portion of the data requested is not currently stored in said cache memory and said updating comprises:

caching said second portion in said cache memory; and

removing the least recently accessed data from said cache memory if the amount of data is said cache memory is above a threshold value.

11. (Currently amended) The method as recited in Claim 7[[0]] further comprising:

merging the blocks of said root image with the blocks of respective leaf images to create cohesive respective application environments.

12. (Currently amended) The method as recited in Claim 11[[0]] wherein said merging occurs at an operational level between the respective file systems of the compute nodes and said first storage unit, respective second storage units, and said cache memory.

13. (Currently amended) The method as recited in Claim 7[[0]] wherein said first storage unit is read-only.

14. (Previously presented) A system for indexing file systems for a plurality of compute nodes, comprising:

a first storage unit for storing blocks of a root image of said compute nodes;

a plurality of second storage units for storing leaf images of respective compute nodes, said leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; and

a plurality of union block devices corresponding to said compute nodes, said union block devices for interfacing between said compute nodes and said first and second storage units to distribute said file systems to said compute nodes, wherein said union block devices create said file systems by merging the blocks of said root image stored on the first storage unit with the blocks of respective leaf images stored on respective second storage units, and wherein further at least one of said compute nodes is configurable to index said root image and provide the indexing results to another of said compute nodes.

15. (Currently amended) The system as recited in Claim 14[[0]] wherein said first storage unit and said second storage units are contained within a single storage appliance.

16. (Currently amended) The system as recited in Claim 14[[0]] further comprising:

a plurality of union block devices for interfacing between respective compute nodes and said first storage unit and respective second storage units, said union block devices operable to distribute application environments to the compute nodes, wherein said union block devices create said application environments by merging the blocks of said root image with the blocks of respective leaf images.

17. (Currently amended) The system as recited in Claim 16[[0]] wherein said union block devices comprise low-level drivers for interfacing between the file systems of respective compute nodes and said first storage unit, respective second storage units, and said cache.

18. (Currently amended) The system as recited in Claim 14[[0]] wherein said first storage unit is read-only.

19. (Currently amended) A method for indexing file systems for a plurality of compute nodes, comprising:

storing blocks of a root image of said compute nodes on a first storage unit;

storing leaf images for respective compute nodes on respective second storage units, said leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of the root image, wherein said leaf images for respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes;

merging the blocks of said root image with the blocks of respective leaf images stored on respective second storage units to create respective file systems for respective compute nodes;

receiving indexing results pertaining to said root image from one of said compute nodes; and

providing said indexing results to the others of said compute nodes.

20. (Currently amended) The method as recited in Claim 19[[0]] further comprising:

storing said indexing results on a shared storage unit.

21. (Currently amended) The method as recited in Claim 19[[0]] wherein said merging occurs at an operational level between the respective file systems of the compute nodes and said first storage unit and respective second storage units.

22. (Currently amended) The method as recited in Claim 19[[0]] wherein said first storage unit is read-only.

23. (Currently amended) A non-transitory computer readable media comprising computer-executable instructions stored therein, the computer-executable instructions comprising ~~Logic encoded in one or more tangible media for execution by a first compute node, and when executed said logic operable to~~:

instructions to receive data blocks of a file system, said data blocks comprising a root image portion and leaf image portion, said leaf image portion comprising only additional data blocks not previously contained in said root image portion and changes made by said first compute node to the blocks of said root image, wherein said leaf image portion does not include blocks of said root image that are unchanged by said first compute node, wherein said file system is the result of merging said root image portion and said leaf image portion together at the block-level;

instructions to index said root image portion; and

instructions to provide the results of said indexing to a second compute node, wherein said logic encoded in the one or more tangible media comprise computer executable instructions executed by the first compute node.

24. (Currently amended) The non-transitory computer readable media of ~~The logic as recited in~~ Claim 23[[0]], further comprising instructions to store ~~wherein said providing further comprises: storing~~ said results of said indexing on a shared storage unit accessible by said second compute node.

25. (Currently amended) The non-transitory computer readable media of ~~The logic as recited in~~ Claim 23[[0]], further comprising instructions to ~~wherein said logic is further operable to:~~ index said leaf image portion.

26. (Currently amended) The non-transitory computer readable media of ~~The logic as recited in Claim~~ 25[[0]], further comprising instructions to ~~wherein said logic is further operable to:~~ re-index said file system by re-indexing said leaf image portion and merging the results of said re-indexing of said leaf image portion with said results of said indexing of said root image portion.

27. (Currently amended) The non-transitory computer readable media of ~~The logic as recited in~~ Claim 23[[0]] wherein said root image portion is read-only.

## REMARKS

Claims 1-27 are pending. Claims 5, 8-13, 15-18, 20-22, and 23-27 are amended. No new matter has been added as a result of these amendments.

## Claim Objections

Claims 5, 8-13, 15-18, 20-22, and 24-27 are objected to because of typographical errors. Claims 5, 8-13, 15-18, 20-22, and 24-27 have been amended as appropriate.

## Objection to the Specification

Paragraph 22 of the Specification is objected to as it calls out "dashed line 105," while the dashed line in Figure 1 is labeled "106." Paragraph 22 of the Specification has been amended as appropriate.

The Specification is further objected to as failing to provide proper antecedent basis for the claimed subject matter. In particular, the rejection contends that Claims 4, 5, 14, 16, and 17 all allegedly incorporate features called "union block devices" with insufficient basis within the claims to define their character. Applicants respectfully disagree. Applicants respectfully assert that Figure 2 illustrates an exemplary block-level distributed application environment that can contain both physical and virtual elements (Paragraph 26). As illustrated in Figure 2 and discussed in Paragraphs 12 and 22-29, a "union block device" is a driver implemented by and for each respective compute node. As such each union block device driver provides an interface between the first and second storage devices and the file system of its compute node, providing the compute

node with an instantiation of the application environment by accessing the compute node's leaf image containing portions of the application environment that the compute node has changed as well as locating portions of the application environment that have not been changed by the compute node (Paragraphs 27-28). In one exemplary embodiment, the portions that have not been changed by the compute node can be found in the root image (Paragraph 28). Applicants respectfully assert that one skilled in the art would understand the nature and function of such a union block device driver, as described in Paragraphs 12 and 22-29. Applicants respectfully assert that drivers serving as interfaces between operating system file systems for a computer system and associated storage devices are well known in the art. Further, one skilled in the art would understand how a driver may serve as an interface between storage devices and a file system of a computer system.

As understood by Applicants, the rejection contends that Figure 2 illustrates a union block device implemented as a stand-alone "device" that would need its own separate processor. Applicants respectfully disagree. As discussed above, Applicants respectfully assert that Figure 2 illustrates an exemplary block-level distributed application environment that can contain both physical and virtual elements (Paragraph 26). As illustrated in Figure 2 and discussed in Paragraphs 12 and 22-29, a "union block device" is therefore a driver implemented by and for a particular compute node. In other words, union block devices are not "devices" as understood by the rejection, requiring their own separate processor to run the driver. Rather, union block devices are drivers implemented on and for each compute node.

As understood by Applicants, the rejection further questions how a union block device can create a new leaf image on a respective second storage union when the respective compute node makes changes to its instantiation of the application environment. Applicants respectfully assert that the Specification describes that the union block device is a driver that serves to interface between an OS file system in a compute node and the first storage unit and its respective second storage unit (Figure 2; Paragraphs 24-30). Applicants respectfully assert that Paragraphs 28 and 29 state that when the instantiation of the application environment has been changed the union block device will do one of two things: create a new leaf image (thereby replacing the obsolete leaf image) or by modifying the existing leaf image. As the union block device is a driver serving as an interface between the first and second storage devices and the file system of the compute node, Applicants respectfully assert that one skilled in the art would understand how a low-level driver may create or modify a leaf image comprising blocks of data stored in the second storage unit.

Claim Rejections – 35 U.S.C. §101

Claims 23-27 are rejected under 35 U.S.C. 101 because the claimed invention is allegedly directed to non-statutory subject matter. Applicants have amended Claims 24-27 as appropriate. Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. §101.

Claim Rejections – 35 U.S.C. §112

Claims 4, 5, 14, 16, and 17 are rejected under 35 U.S.C. 112, second paragraph, as being allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which the application regards as the invention. In particular, and as discussed above, the rejection alleges that the above claims all incorporate "union block devices" with insufficient basis within the claims to define their character. Applicants respectfully disagree. For at least the same or similar reason as discussed above, Applicants respectfully assert that the union block device, as claimed in Claims 4, 5, 14, 16, and 17 would be understood by one skilled in the art to be low-level drivers that are implemented by and for the compute nodes to serve as an interface between the storage units and the file system of each respective compute node. Applicants respectfully assert that one skilled in the art would understand that a union block device is implemented by and for a compute node, rather than existing as a separate "device" requiring a separate processor. Further, Applicants respectfully assert that one skilled in the art would understand that the union block device as a driver serving as an interface between the first and second storage devices and the file system of the compute node, can create or modify a leaf image comprising blocks of data stored in the second storage unit as an instantiation of an operating system is changed by the compute node. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. §112.

Claim Rejections – 35 U.S.C. §102

Claims 14-27 are rejected under 35 U.S.C. 102(b) as being allegedly anticipated by Chang (US 2003/0126242), hereinafter "Chang."

As is well established, anticipation requires the presence of a single prior art reference to disclose each and every element of the claimed invention, arranged as in the claim. There must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention. Scripps Clinic & Research Found. v. Genentech Inc., 18 USPQ 2d 1001, 1010 (Fed. Cir. 1991).

Applicants contend that Chang fails to teach all of the claimed elements of Independent Claims 14, 19, and 23.

Claim 14:

Amended Claim 14 recites in part:

> a plurality of second storage units for storing leaf images of respective compute nodes, said leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; and
>
> a plurality of union block devices corresponding to said compute nodes, said union block devices for interfacing between said compute nodes and said first and second storage units to distribute said file systems to said compute nodes, wherein said union block devices create said file systems by merging the blocks of said root image stored on the first storage unit with the blocks of respective leaf images stored on respective second storage units, and wherein further at least one of said compute nodes is configurable to index said root image and provide the indexing results to another of said compute nodes (emphasis added).

Applicants respectfully assert that Chang does not teach or suggest "leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes," as claimed in Claim 14.

As understood by Applicants, the rejection is reading the client image copy 74, 76, 78 of Chang on Applicants' claimed "leaf image," as claimed in Claim 14. Applicants respectfully disagree.

As understood by Applicants, Chang discloses a client image copy that is created using a snapshot of a base boot image with a virtual copy or reverse snapshot of the base image stored for each client device, wherein each client image copy includes both a base boot image and information specific to the client (Abstract). In particular, Chang teaches that each client image copy includes both common operating system (OS) and application blocks for storing the base boot image, and client-specific blocks for storing information specific to the particular client device (Paragraph 0012; and Figures 1 and 2). Chang discloses in Figure 2 that each client image copy includes common OS and application blocks 80 containing the reverse snapshot of the base image as well as client specific blocks 82 for storing client specific files (Paragraphs 0030-0034).

To the extent that Chang discloses client image copies that include client-specific blocks for storing information specific to the particular client device, Chang also

discloses that the client image copies also include physically common operating system (OS) and application blocks for storing the base boot image (Paragraph 0012; and Figures 1 and 2). In other words, where Applicants' claim "leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes," as claimed in Claim 14, Chang discloses client image copies that comprise common OS and Application blocks and client specific blocks. Applicants respectfully assert that the client image copy of Chang is not a leaf image, as claimed in Claim 14, because the client image copy of Chang includes blocks of the root image that are unchanged by a compute node (e.g., the common OS and application blocks for storing the base boot image).

Therefore, Applicants respectfully assert that embodiments as recited by Claim 14 are not rendered anticipated by Chang. Accordingly, Applicants respectfully assert that dependent Claims 15-18 are patentable by virtue of their dependency on an allowable base claim, as well as for their additional recited patentable features.

Claim 19:

Independent Claim 19 recites features similar to that of independent Claim 14 and is therefore patentable for at least the same or similar reasons as recited above. Accordingly, Applicants respectfully assert that dependent Claims 20-22 are patentable

by virtue of their dependency on an allowable base claim, as well as for their additional recited patentable features.

Claim 23:

Independent Claim 23 recites features similar to that of independent Claim 14 and is therefore patentable for at least the same or similar reasons as recited above. Accordingly, Applicants respectfully assert that dependent Claims 24-27 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. §102.

Claim Rejections – 35 U.S.C. §103

Claims 1-13 are rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Chang, in view of Kobayashi et al. (US 6,101,576), hereinafter "Kobayashi." Applicants respectfully assert that Claims 1-13 are patentable over the cited combination in view of the following.

Applicants respectfully point out that the Examiner has the burden of establishing a prima facie 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 respectfully assert the combination of Chang and Kobayashi fails to teach or suggest all the claimed elements of Claims 1-13 in view of the following rationale.

Claim 1:

Amended Claim 1 recites in part:

> a plurality of second storage units for storing leaf images of respective compute nodes, said leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes (emphasis added).

Applicants respectfully assert the combination of Chang and Kobayashi does not teach or suggest "leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes," as claimed in Claim 1.

For at least the same or similar reasons as recited above with regards to Claim 14, Applicants respectfully assert that Chang does not teach or suggest leaf images comprising only changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes, as claimed in Claim 1. Applicants respectfully assert the deficiencies of Chang are not remedied by Kobayashi.

Therefore, Applicants respectfully assert that Claim 1 is not rendered obvious by the combination of Chang and Kobayashi. Accordingly, Applicants respectfully assert

that dependent Claims 2-6 are patentable by virtue of their dependency on an allowable base claim, as well as for their additional recited patentable features.

Claim 7:

Independent Claim 7 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 8-13 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 1-27 overcome the rejections of record and, therefore, allowance of Claims 1-27 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: August 25, 2010

/Jeffrey A. Lehman/
Jeffrey A. Lehman
Registration No. 65,494

MURABITO, HAO & BARNES LLP
Two North Market Street
Third Floor
San Jose, California 95113

(408) 938-9060 Voice
(408) 938-9069 Facsimile

PTO/SB/06 (07-06)
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# PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

| Application or Docket Number | Filing Date | ☐ To be Mailed |
|---|---|---|
| 11/709,477 | 02/21/2007 | |

## 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 08/25/2010 | (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)) | * 27 | Minus | ** 27 | = 0 | X $ = | | OR | X $52= | 0 |
| Independent (37 CFR 1.16(h)) | * 5 | Minus | ***5 | = 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:
/MARQUETTA MCGEE/

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.*

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Two Market Street
3rd Floor
San Jose, CA 95113

**Paper No.**

| **Application No.:** | **11/709,477** | **Date Mailed:** | **08/27/2010** |
|---|---|---|---|
| First Named Inventor: | Kulkarni, Pradip, | Examiner: | MARTELLO, EDWARD |
| Attorney Docket No.: | PNTA-P006.CIP.A | Art Unit: | 2628 |
| Confirmation No.: | 4127 | Filing Date: | 02/21/2007 |

**Please find attached an Office communication concerning this application or proceeding.**

**Commissioner for Patents**

PTO-90c (Rev.08-06)

| Notice of Non-Compliant Amendment (37 CFR 1.121) | Application No. 11/709,477 | Applicant(s) KULKARNI ET AL. | |
|---|---|---|---|
| | | Art Unit 2600 | |

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

The amendment document filed on *25 August, 2010* is considered non-compliant because it has failed to meet the requirements of 37 CFR 1.121 or 1.4. In order for the amendment document to be compliant, correction of the following item(s) is required.

THE FOLLOWING MARKED (X) ITEM(S) CAUSE THE AMENDMENT DOCUMENT TO BE NON-COMPLIANT:

- ☐ 1. Amendments to the specification:
  - ☐ A. Amended paragraph(s) do not include markings.
  - ☐ B. New paragraph(s) should not be underlined.
  - ☐ C. Other _____.
- ☐ 2. Abstract:
  - ☐ A. Not presented on a separate sheet. 37 CFR 1.72.
  - ☐ B. Other _____.
- ☐ 3. Amendments to the drawings:
  - ☐ A. The drawings are not properly identified in the top margin as "Replacement Sheet," "New Sheet," or "Annotated Sheet" as required by 37 CFR 1.121(d).
  - ☐ B. The practice of submitting proposed drawing correction has been eliminated. Replacement drawings showing amended figures, without markings, in compliance with 37 CFR 1.84 are required.
  - ☐ C. Other _____.
- ☒ 4. Amendments to the claims:
  - ☐ A. A complete listing of all of the claims is not present.
  - ☐ B. The listing of claims does not include the text of all pending claims (including withdrawn claims)
  - ☒ C. Each claim has not been provided with the proper status identifier, and as such, the individual status of each claim cannot be identified. Note: the status of every claim must be indicated after its claim number by using one of the following status identifiers: (Original), (Currently amended), (Canceled), (Previously presented), (New), (Not entered), (Withdrawn) and (Withdrawn-currently amended).
  - ☐ D. The claims of this amendment paper have not been presented in ascending numerical order.
  - ☐ E. Other: _____.
- ☐ 5. Other (e.g., the amendment is unsigned or not signed in accordance with 37 CFR 1.4): For further explanation of the amendment format required by 37 CFR 1.121, see MPEP § 714.

TIME PERIODS FOR FILING A REPLY TO THIS NOTICE:

1. Applicant is given **no new time period** if the non-compliant amendment is an after-final amendment or an amendment filed after allowance, or a drawing submission (only) If applicant wishes to resubmit the non-compliant after-final amendment with corrections, the **entire corrected amendment** must be resubmitted.

2. Applicant is given **one month**, or thirty (30) days, whichever is longer, from the mail date of this notice to supply the correction, if the non-compliant amendment is one of the following: a preliminary amendment, a non-final amendment (including a submission for a request for continued examination (RCE) under 37 CFR 1.114), a supplemental amendment filed within a suspension period under 37 CFR 1.103(a) or (c), and an amendment filed in response to a Quayle action. If any of above boxes 1 to 4 are checked, the correction required is only the corrected section of the non-compliant amendment in compliance with 37 CFR 1.121.

**Extensions of time** are available under 37 CFR 1.136(a) only if the non-compliant amendment is a non-final amendment or an amendment filed in response to a *Quayle* action.

**Failure to timely respond** to this notice will result in:

**Abandonment** of the application if the non-compliant amendment is a non-final amendment or an amendment filed in response to a *Quayle* action; or

**Non-entry** of the amendment if the non-compliant amendment is a preliminary amendment or supplemental amendment.

Legal Instruments Examiner (LIE), if applicable /MARQUETTA MCGEE/ Telephone No: (571)272-2956

Continuation of 4C. Claim 14 has a marking, but the status identifier reads "Previously Presented".

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | | | |
|---|---|---|---|
| Applicant | : Kulkarni, et al. | Confirmation | : 4127 |
| Serial No. | : 11/709,477 | Examiner | : Martello, Edward |
| Filing Date | : 02/21/2007 | Art Unit | : 2628 |

Attorney Docket No. : PNTA-P006.CIP.A

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For: ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT

AMENDMENT AND RESPONSE TO FINAL OFFICE ACTION AND REQUEST FOR CONTINUED EXAMINATION (RCE)

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

Dear Sir:

In response to the FINAL Office Action mailed August 27, 2010, 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** begin on Page 3 of this paper.

**Remarks** begin on Page 9 of this paper.

Amendments to the Specification:

Please replace Paragraph 0022 with the following:

**[0022]** With reference to FIG. 1, an example system for implementing embodiments includes a general purpose computing system environment, such as compute node 100. In its most basic configuration, compute node 100 typically includes at least one processing unit 102 and memory 104. Depending on the exact configuration and type of compute node, memory 104 may be volatile (such as RAM), non-volatile (such as ROM, flash memory, etc.) or some combination of the two. This most basic configuration is illustrated in Figure 1 by dashed line 106 [[105]]. Additionally, compute node 100 may also have additional features/functionality. For example, compute node 100 may also include additional storage (removable and/or non-removable) including, but not limited to, magnetic or optical disks or tape. Such additional storage is illustrated in FIG. 1 by removable storage 108 and non-removable storage 110. Computer storage media includes volatile and nonvolatile, removable and non-removable media implemented in any method or technology for storage of information such as computer readable instructions, data structures, program modules or other data. Memory 104, removable storage 108 and nonremovable storage 110 are all examples of computer storage media. Computer storage media includes, but is not limited to, RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by compute node 100. Any such computer storage media may be part of compute node 100.

Amendments to the Claims:

1. (Currently amended) A system for providing data to a plurality of compute nodes comprising:

a first storage unit for storing blocks of a root image of said compute nodes;

a plurality of second storage units for storing leaf images of respective compute nodes, said leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; and

a cache for caching blocks of said root image previously accessed by at least one of said compute nodes.

2. (Original) The system as recited in Claim 1 wherein said cache is configurable to store the X most recently accessed blocks of said root image, and wherein further X represents a cache threshold value.

3. (Original) The system as recited in Claim 1 wherein said first storage unit, said second storage units, and said cache are contained within a single storage appliance.

4. (Original) The system as recited in Claim 1 further comprising:

a plurality of union block devices for interfacing between respective compute nodes and said first storage unit, respective second storage units, and said cache to distribute application environments to the compute nodes, wherein said union block devices create said application environments by merging the blocks of said root image with the blocks of respective leaf images.

5. (Currently amended) The system as recited in Claim 4[[0]] wherein said union block devices comprise low-level drivers for interfacing between the file systems of

respective compute nodes and said first storage unit, respective second storage units, and said cache.

6. (Original) The system as recited in Claim 1 wherein said first storage unit is read-only.

7. (Currently amended) A method for providing data to a plurality of compute nodes, comprising:

storing blocks of a root image of said compute nodes on a first storage unit;

storing leaf images for respective compute nodes on respective second storage units, said leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of the root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; and

caching blocks of said root image that have been accessed by at least one of said compute nodes in a cache memory.

8. (Currently amended) The method as recited in Claim 7[[0]] further comprising:

receiving a read request from at least one of said compute nodes, wherein a first portion of the data requested is currently stored in said cache memory; and

providing said first portion of said data to said at least one of said compute nodes from said cache memory.

9. (Currently amended) The method as recited in Claim 8[[0]] further comprising:

updating said cache memory based on said read request.

10. (Currently amended) The method as recited in Claim 9[[0]] wherein a second portion of the data requested is not currently stored in said cache memory and said updating comprises:

caching said second portion in said cache memory; and

removing the least recently accessed data from said cache memory if the amount of data is said cache memory is above a threshold value.

11. (Currently amended) The method as recited in Claim 7[[0]] further comprising:

merging the blocks of said root image with the blocks of respective leaf images to create cohesive respective application environments.

12. (Currently amended) The method as recited in Claim 11[[0]] wherein said merging occurs at an operational level between the respective file systems of the compute nodes and said first storage unit, respective second storage units, and said cache memory.

13. (Currently amended) The method as recited in Claim 7[[0]] wherein said first storage unit is read-only.

14. (Currently amended) A system for indexing file systems for a plurality of compute nodes, comprising:

a first storage unit for storing blocks of a root image of said compute nodes;

a plurality of second storage units for storing leaf images of respective compute nodes, said leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; and

a plurality of union block devices corresponding to said compute nodes, said union block devices for interfacing between said compute nodes and said first and second storage units to distribute said file systems to said compute nodes, wherein said union block devices create said file systems by merging the blocks of said root image stored on the first storage unit with the blocks of respective leaf images stored on respective second storage units, and wherein further at least one of said compute nodes is configurable to index said root image and provide the indexing results to another of said compute nodes.

15. (Currently amended) The system as recited in Claim 14[[0]] wherein said first storage unit and said second storage units are contained within a single storage appliance.

16. (Currently amended) The system as recited in Claim 14[[0]] further comprising:

a plurality of union block devices for interfacing between respective compute nodes and said first storage unit and respective second storage units, said union block devices operable to distribute application environments to the compute nodes, wherein said union block devices create said application environments by merging the blocks of said root image with the blocks of respective leaf images.

17. (Currently amended) The system as recited in Claim 16[[0]] wherein said union block devices comprise low-level drivers for interfacing between the file systems of respective compute nodes and said first storage unit, respective second storage units, and said cache.

18. (Currently amended) The system as recited in Claim 14[[0]] wherein said first storage unit is read-only.

19. (Currently amended) A method for indexing file systems for a plurality of compute nodes, comprising:

storing blocks of a root image of said compute nodes on a first storage unit;

storing leaf images for respective compute nodes on respective second storage units, said leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of the root image, wherein said leaf images for respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes;

merging the blocks of said root image with the blocks of respective leaf images stored on respective second storage units to create respective file systems for respective compute nodes;

receiving indexing results pertaining to said root image from one of said compute nodes; and

providing said indexing results to the others of said compute nodes.

20. (Currently amended) The method as recited in Claim 19[[0]] further comprising:

storing said indexing results on a shared storage unit.

21. (Currently amended) The method as recited in Claim 19[[0]] wherein said merging occurs at an operational level between the respective file systems of the compute nodes and said first storage unit and respective second storage units.

22. (Currently amended) The method as recited in Claim 19[[0]] wherein said first storage unit is read-only.

23. (Currently amended) A non-transitory computer readable media comprising computer-executable instructions stored therein, the computer-executable instructions comprising ~~Logic encoded in one or more tangible media for execution by a first compute node, and when executed said logic operable to~~:

instructions to receive data blocks of a file system, said data blocks comprising a root image portion and leaf image portion, said leaf image portion comprising only additional data blocks not previously contained in said root image portion and changes made by said first compute node to the blocks of said root image, wherein said leaf image portion does not include blocks of said root image that are unchanged by said first compute node, wherein said file system is the result of merging said root image portion and said leaf image portion together at the block-level;

instructions to index said root image portion; and

instructions to provide the results of said indexing to a second compute node, wherein said logic encoded in the one or more tangible media comprise computer executable instructions executed by the first compute node.

24. (Currently amended) The non-transitory computer readable media of ~~The logic as recited in~~ Claim 23[[0]], further comprising instructions to store ~~wherein said providing further comprises: storing~~ said results of said indexing on a shared storage unit accessible by said second compute node.

25. (Currently amended) The non-transitory computer readable media of ~~The logic as recited in~~ Claim 23[[0]], further comprising instructions to ~~wherein said logic is further operable to:~~ index said leaf image portion.

26. (Currently amended) The non-transitory computer readable media of ~~The logic as recited in Claim~~ 25[[0]], further comprising instructions to ~~wherein said logic is further operable to:~~ re-index said file system by re-indexing said leaf image portion and merging the results of said re-indexing of said leaf image portion with said results of said indexing of said root image portion.

27. (Currently amended) The non-transitory computer readable media of ~~The logic as recited in~~ Claim 23[[0]] wherein said root image portion is read-only.

## REMARKS

Claims 1-27 are pending. Claims 5, 8-18, 20-22, and 23-27 are amended. No new matter has been added as a result of these amendments.

## Claim Objections

Claims 5, 8-13, 15-18, 20-22, and 24-27 are objected to because of typographical errors. Claims 5, 8-13, 15-18, 20-22, and 24-27 have been amended as appropriate.

## Objection to the Specification

Paragraph 22 of the Specification is objected to as it calls out "dashed line 105," while the dashed line in Figure 1 is labeled "106." Paragraph 22 of the Specification has been amended as appropriate.

The Specification is further objected to as failing to provide proper antecedent basis for the claimed subject matter. In particular, the rejection contends that Claims 4, 5, 14, 16, and 17 all allegedly incorporate features called "union block devices" with insufficient basis within the claims to define their character. Applicants respectfully disagree. Applicants respectfully assert that Figure 2 illustrates an exemplary block-level distributed application environment that can contain both physical and virtual elements (Paragraph 26). As illustrated in Figure 2 and discussed in Paragraphs 12 and 22-29, a "union block device" is a driver implemented by and for each respective compute node. As such each union block device driver provides an interface between the first and second storage devices and the file system of its compute node, providing the compute

node with an instantiation of the application environment by accessing the compute node's leaf image containing portions of the application environment that the compute node has changed as well as locating portions of the application environment that have not been changed by the compute node (Paragraphs 27-28). In one exemplary embodiment, the portions that have not been changed by the compute node can be found in the root image (Paragraph 28). Applicants respectfully assert that one skilled in the art would understand the nature and function of such a union block device driver, as described in Paragraphs 12 and 22-29. Applicants respectfully assert that drivers serving as interfaces between operating system file systems for a computer system and associated storage devices are well known in the art. Further, one skilled in the art would understand how a driver may serve as an interface between storage devices and a file system of a computer system.

As understood by Applicants, the rejection contends that Figure 2 illustrates a union block device implemented as a stand-alone "device" that would need its own separate processor. Applicants respectfully disagree. As discussed above, Applicants respectfully assert that Figure 2 illustrates an exemplary block-level distributed application environment that can contain both physical and virtual elements (Paragraph 26). As illustrated in Figure 2 and discussed in Paragraphs 12 and 22-29, a "union block device" is therefore a driver implemented by and for a particular compute node. In other words, union block devices are not "devices" as understood by the rejection, requiring their own separate processor to run the driver. Rather, union block devices are drivers implemented on and for each compute node.

As understood by Applicants, the rejection further questions how a union block device can create a new leaf image on a respective second storage union when the respective compute node makes changes to its instantiation of the application environment. Applicants respectfully assert that the Specification describes that the union block device is a driver that serves to interface between an OS file system in a compute node and the first storage unit and its respective second storage unit (Figure 2; Paragraphs 24-30). Applicants respectfully assert that Paragraphs 28 and 29 state that when the instantiation of the application environment has been changed the union block device will do one of two things: create a new leaf image (thereby replacing the obsolete leaf image) or by modifying the existing leaf image. As the union block device is a driver serving as an interface between the first and second storage devices and the file system of the compute node, Applicants respectfully assert that one skilled in the art would understand how a low-level driver may create or modify a leaf image comprising blocks of data stored in the second storage unit.

Claim Rejections – 35 U.S.C. §101

Claims 23-27 are rejected under 35 U.S.C. 101 because the claimed invention is allegedly directed to non-statutory subject matter. Applicants have amended Claims 24-27 as appropriate. Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. §101.

Claim Rejections – 35 U.S.C. §112

Claims 4, 5, 14, 16, and 17 are rejected under 35 U.S.C. 112, second paragraph, as being allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which the application regards as the invention. In particular, and as discussed above, the rejection alleges that the above claims all incorporate "union block devices" with insufficient basis within the claims to define their character. Applicants respectfully disagree. For at least the same or similar reason as discussed above, Applicants respectfully assert that the union block device, as claimed in Claims 4, 5, 14, 16, and 17 would be understood by one skilled in the art to be low-level drivers that are implemented by and for the compute nodes to serve as an interface between the storage units and the file system of each respective compute node. Applicants respectfully assert that one skilled in the art would understand that a union block device is implemented by and for a compute node, rather than existing as a separate "device" requiring a separate processor. Further, Applicants respectfully assert that one skilled in the art would understand that the union block device as a driver serving as an interface between the first and second storage devices and the file system of the compute node, can create or modify a leaf image comprising blocks of data stored in the second storage unit as an instantiation of an operating system is changed by the compute node. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. §112.

Claim Rejections – 35 U.S.C. §102

Claims 14-27 are rejected under 35 U.S.C. 102(b) as being allegedly anticipated by Chang (US 2003/0126242), hereinafter "Chang."

As is well established, anticipation requires the presence of a single prior art reference to disclose each and every element of the claimed invention, arranged as in the claim. There must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention. Scripps Clinic & Research Found. v. Genentech Inc., 18 USPQ 2d 1001, 1010 (Fed. Cir. 1991).

Applicants contend that Chang fails to teach all of the claimed elements of Independent Claims 14, 19, and 23.

Claim 14:

Amended Claim 14 recites in part:

> a plurality of second storage units for storing leaf images of respective compute nodes, said leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; and
>
> a plurality of union block devices corresponding to said compute nodes, said union block devices for interfacing between said compute nodes and said first and second storage units to distribute said file systems to said compute nodes, wherein said union block devices create said file systems by merging the blocks of said root image stored on the first storage unit with the blocks of respective leaf images stored on respective second storage units, and wherein further at least one of said compute nodes is configurable to index said root image and provide the indexing results to another of said compute nodes (emphasis added).

Applicants respectfully assert that Chang does not teach or suggest "leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes," as claimed in Claim 14.

As understood by Applicants, the rejection is reading the client image copy 74, 76, 78 of Chang on Applicants' claimed "leaf image," as claimed in Claim 14. Applicants respectfully disagree.

As understood by Applicants, Chang discloses a client image copy that is created using a snapshot of a base boot image with a virtual copy or reverse snapshot of the base image stored for each client device, wherein each client image copy includes both a base boot image and information specific to the client (Abstract). In particular, Chang teaches that each client image copy includes both common operating system (OS) and application blocks for storing the base boot image, and client-specific blocks for storing information specific to the particular client device (Paragraph 0012; and Figures 1 and 2). Chang discloses in Figure 2 that each client image copy includes common OS and application blocks 80 containing the reverse snapshot of the base image as well as client specific blocks 82 for storing client specific files (Paragraphs 0030-0034).

To the extent that Chang discloses client image copies that include client-specific blocks for storing information specific to the particular client device, Chang also

discloses that the client image copies also include physically common operating system (OS) and application blocks for storing the base boot image (Paragraph 0012; and Figures 1 and 2). In other words, where Applicants' claim "leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes," as claimed in Claim 14, Chang discloses client image copies that comprise common OS and Application blocks and client specific blocks. Applicants respectfully assert that the client image copy of Chang is not a leaf image, as claimed in Claim 14, because the client image copy of Chang includes blocks of the root image that are unchanged by a compute node (e.g., the common OS and application blocks for storing the base boot image).

Therefore, Applicants respectfully assert that embodiments as recited by Claim 14 are not rendered anticipated by Chang. Accordingly, Applicants respectfully assert that dependent Claims 15-18 are patentable by virtue of their dependency on an allowable base claim, as well as for their additional recited patentable features.

Claim 19:

Independent Claim 19 recites features similar to that of independent Claim 14 and is therefore patentable for at least the same or similar reasons as recited above. Accordingly, Applicants respectfully assert that dependent Claims 20-22 are patentable

by virtue of their dependency on an allowable base claim, as well as for their additional recited patentable features.

Claim 23:

Independent Claim 23 recites features similar to that of independent Claim 14 and is therefore patentable for at least the same or similar reasons as recited above. Accordingly, Applicants respectfully assert that dependent Claims 24-27 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. §102.

Claim Rejections – 35 U.S.C. §103

Claims 1-13 are rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Chang, in view of Kobayashi et al. (US 6,101,576), hereinafter "Kobayashi." Applicants respectfully assert that Claims 1-13 are patentable over the cited combination in view of the following.

Applicants respectfully point out that the Examiner has the burden of establishing a prima facie 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 respectfully assert the combination of Chang and Kobayashi fails to teach or suggest all the claimed elements of Claims 1-13 in view of the following rationale.

Claim 1:

Amended Claim 1 recites in part:

> a plurality of second storage units for storing leaf images of respective compute nodes, said leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes (emphasis added).

Applicants respectfully assert the combination of Chang and Kobayashi does not teach or suggest "leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes," as claimed in Claim 1.

For at least the same or similar reasons as recited above with regards to Claim 14, Applicants respectfully assert that Chang does not teach or suggest leaf images comprising only changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes, as claimed in Claim 1. Applicants respectfully assert the deficiencies of Chang are not remedied by Kobayashi.

Therefore, Applicants respectfully assert that Claim 1 is not rendered obvious by the combination of Chang and Kobayashi. Accordingly, Applicants respectfully assert

that dependent Claims 2-6 are patentable by virtue of their dependency on an allowable base claim, as well as for their additional recited patentable features.

Claim 7:

Independent Claim 7 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 8-13 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 1-27 overcome the rejections of record and, therefore, allowance of Claims 1-27 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: 08/31, 2010

/Jeffrey A. Lehman/
Jeffrey A. Lehman
Registration No. 65,494

MURABITO, HAO & BARNES LLP
Two North Market Street
Third Floor
San Jose, California 95113

(408) 938-9060 Voice
(408) 938-9069 Facsimile

I hereby certify that this correspondence is being electronically transmitted to the USPTO via EFS on the date shown below:
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IPR2025-00202 / 844 Patent
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EX1002

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 8331669 |
| **Application Number:** | 11709477 |
| **International Application Number:** | |
| **Confirmation Number:** | 4127 |
| **Title of Invention:** | Root image caching and indexing for block-level distributed application management |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Customer Number:** | 70848 |
| **Filer:** | Jeffrey A. Lehman/Shannon Warren |
| **Filer Authorized By:** | Jeffrey A. Lehman |
| **Attorney Docket Number:** | PNTA-P006.CIP.A |
| **Receipt Date:** | 31-AUG-2010 |
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| **Time Stamp:** | 18:48:53 |
| **Application Type:** | Utility under 35 USC 111(a) |

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| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Amendment Submitted/Entered with Filing of CPA/RCE | PNTA-P006-CIPA-RCEResponseNONComply.pdf | 152636<br>ab13a322fb519cb1104f39fead128251f94df24d | no | 21 |

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**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
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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# PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

| Application or Docket Number | Filing Date | ☐ To be Mailed |
|---|---|---|
| 11/709,477 | 02/21/2007 | |

## 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 | 08/31/2010 | (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)) | * 27 | Minus | ** 27 | = 0 | X $ = | | OR | X $52= | 0 |
| | Independent (37 CFR 1.16(h)) | * 5 | Minus | ***5 | = 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 ($) | ADDITIONAL FEE ($) | OR | 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:
/SONYA HILLIARD/

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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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 11/709,477 | 02/21/2007 | Pradip Kulkarni | PNTA-P006.CIP.A | 4127 |

70848 7590 03/12/2012

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

| EXAMINER | |
|---|---|
| MARTELLO, EDWARD | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2628 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 03/12/2012 | 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) | |
|---|---|---|---|
| | 11/709,477 | KULKARNI ET AL. | |
| | Examiner | Art Unit | |
| | EDWARD MARTELLO | 2628 | |

*-- 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 *31 August 2010*.

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

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ 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**

5)☒ Claim(s) *1-27* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-27* is/are rejected.

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

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

**Application Papers**

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

11)☐ The drawing(s) filed on _____ 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).

12)☐ 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**

13)☐ 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

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 25 August 2010 has been entered.

### *Response to Amendment*

2. Claims 1, 5 and 7-27 are amended and claims 2-4 and 6 are as originally presented.

3. In summary, claims 1-27 are pending in the application.

4. The amendment of claims 5, 8-13, 15-18, 20-22 and 24-27 has cured the basis for the objection to the claims, thus, the objection to claims 5, 8-13, 15-18, 20-22 and 24-27 is hereby withdrawn.

5. The amendment of claims 23-27 has cured the basis for the 35 U.S.C. § 101 rejection of the claims, thus, the 35 U.S.C. § 101 rejection of claims 23-27 is hereby withdrawn.

6. The amendment of Paragraph [0022] of the specification is accepted and entered into the record, thus, the objection to Paragraph [0022] of the specification is hereby withdrawn.

7. The Applicants' argument with respect to the objection to the specification due the lack of antecedent basis for the union block devices is persuasive with respect to this feature, thus, the objection to the specification is hereby withdrawn.

***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.

8. Claims 4, 5, 14, 16 and 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 4, 5, 14, 16 and 17 all incorporate features called "union block devices" with insufficient basis within the claims to define their character. Union block devices are described in paragraph [0024] and in paragraphs [0027]-[0028]. Paragraph 27 states that they may be low level drivers and that the file system resides on the server side of system 200, but as they are shown in figure 2, they appear to be standalone devices and not part of the compute nodes. The functionality described in paragraphs [0027]-[0028] requires a processor that is not part of the "union block devices" as shown in figure 2, thus they must be part of their respective compute nodes which they would be if they were a low-level driver as now presented in claims 5 and 17. Paragraph [0028] claims that the "union block devices" may create new leaf images on a second storage unit when their respective compute nodes make changes to their instantiation of the application environment and they do this without knowledge of the file system as claimed in the last sentence in paragraph [0027]. The Examiner would like to know how a "union block devices" can create files on a disk that are associated with files on

another disk, the main disk 260 which is managed with a file system on the server or compute node side of the overall environment, and **not have any knowledge of the file system**. Each of the compute nodes 220a-220n are typified as being able to be running different operating systems and the server, if there is one in a particular configuration, could be running yet another operating system. For example, these nodes and server could be running a combination of operating systems that could include a mixed environment of file systems such as NTFS, FAT32, and a UNIX (4.4BSD and descendants) file systems and it would be most interesting to be informed as to how the UDB's know where on a disk to find a particular set of clusters or even down to disk sectors to modify the contents of them and possibly have to request additional clusters for an update without knowing anything about the operating system file system on the nodes or the server. These UBD's are "effectively low-level drivers that operate as an interface…." according to the specification and are made equal to drivers in claims 5 and 17. There is insufficient information provided in the claims and the specification as to the where/ how the functionality of this UBD joining device or device driver is accomplished in the broadly defined embodiments covered in the specification and as such, the claimed subject matter does not meet the requirements of UCS 112 second paragraph in that it does not enable one of ordinary skill in the art at the time of the invention to make and use the invention.

### *Prior Art Claim Rejections*

9. A new ground of rejection based upon Nguyen et al.; U. S. Patent 7,870,106 B1, follows.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

10. Claims 19-27 are rejected under 35 U.S.C. 102(e) as being anticipated by Nguyen et al. (U. S. Patent 7,870,106 B1, hereafter '106).

11. Regarding claim 19 (Currently Amended), Nguyen teaches a method for indexing file systems for a plurality of compute nodes ('106; fig. 1), comprising: storing blocks of a root image of said compute nodes on a first storage unit ('106; fig. 1, element 104; col. 3, ln. 63-67); storing leaf images for respective compute nodes on respective second storage units ('106; fig. 1, elements 105a, 105b, 105n; col. 4, ln. 3-10), said leaf images comprising only additional data blocks not previously contained in said root image ('106; col. 4, ln. 35-37; updates to the base image) and changes made by respective compute nodes to the blocks of the root image ('106; col. 4, ln. 4-10, col. 4, ln. 12-14; changes are made on a block by block basis), wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes ('106; col. 4, ln. 33-35; only changes are stored in the leaf nodes; the base nodes is not changed by the compute nodes; col. 3, ln. 65-67); merging the blocks of said root image with the blocks of respective leaf images stored on respective second storage

units to create respective file systems for respective compute nodes (‘106; fig. 3; col 5, ln. 23 through col. 6, ln. 2); receiving indexing results pertaining to said root image from one of said compute nodes (‘106; col. 5, ln. 34-43); and providing said indexing results to the others of said compute nodes (‘106; col. 5, ln. 34-43).

12. In regard to claim 20 (Currently Amended), Nguyen teaches the method as recited in claim 19 and further teaches the method as further comprising: storing said indexing results on a shared storage unit (‘106; fig. 8, col. 8, ln. 66 through col. 9, ln. 8; storage controller or server).

13. Regarding claim 21 (Currently Amended), Nguyen teaches the method as recited in claim 19 and further teaches wherein said merging occurs at an operational level between the respective file systems of the compute nodes and said first storage unit and respective second storage units (‘106; fig. 3; col 5, ln. 23 through col. 6, ln. 2).

14. In regard to claim 22 (Currently Amended), Nguyen teaches the method as recited in claim 19 and further teaches wherein said first storage unit is read-only (‘106; col. 4, ln. 54-55).

15. Regarding claim 23 (Currently Amended), Nguyen teaches a non-transitory computer readable media comprising computer-executable instructions stored therein (‘106; col. 7, ln. 25-28), the computer-executable instructions comprising: instructions to receive data blocks of a file system (‘106; fig. 1), said data blocks comprising a root image portion (‘106; fig. 1, element 104; col. 3, ln. 63-67) and leaf image portion (‘106; fig. 1, elements 105a, 105b, 105n; col. 4, ln. 3-

10), said leaf image portion comprising only additional data blocks not previously contained in said root image portion ('106; col. 4, ln. 35-37; updates to the base image) and changes made by said first compute node to the blocks of said root image ('106; col. 4, ln. 4-10, col. 4, ln. 12-14; changes are made on a block by block basis), wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute node ('106; col. 4, ln. 33-35; only changes are stored in the leaf nodes; the base nodes is not changed by the compute nodes; col. 3, ln. 65-67), wherein said file system is the result of merging said root image portion and said leaf image portion together at the block-level ('106; fig. 3; col 5, ln. 23 through col. 6, ln. 2; col. 4, ln. 12-14; changes are made on a block by block basis); instructions to index said root image portion ('106; col. 5, ln. 34-43); and instructions to provide the results of said indexing to a second compute node ('106; col. 5, ln. 34-43), wherein said logic encoded in the one or more tangible media comprise computer executable instructions executed by the first compute node ('106; col. 7, ln. 25-55).

16. In regard to claim 24 (Currently Amended), Nguyen teaches the non-transitory computer readable media of claim 23, and further teaches the media as further comprising instructions to store said results of said indexing on a shared storage unit accessible by said second compute node ('106; fig. 4; col. 6, ln. 3-24).

17. Regarding claim 25 (Currently Amended), Nguyen teaches the non-transitory computer readable media of claim 23, and further teaches the media as further comprising instructions to index said leaf image portion ('106; col. 5, ln. 34-43).

18. In regard to claim 26 (Currently Amended), Nguyen teaches the non-transitory computer readable media of claim 25, and further teaches the media as further comprising instructions to re-index said file system by re-indexing said leaf image portion ('106; col. 8, ln. 50-61) and merging the results of said re-indexing of said leaf image portion with said results of said indexing of said root image portion ('106; fig. 3; col 5, ln. 23 through col. 6, ln. 2).

19. Regarding claim 27 (Currently Amended), Nguyen teaches the non-transitory computer readable media of claim 23 and further teaches wherein said root image portion is read-only ('106; col. 4, ln. 54-55).

***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.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

20. Claims 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al. (U. S. Patent 7,870,106 B1, hereafter '106) as applied to claims 19-27 above.

21. In regard to claim 14 (Currently Amended), Nguyen teaches a system for indexing file systems for a plurality of compute nodes ('106; fig. 1), comprising: a first storage unit for storing blocks of a root image of said compute nodes ('106; fig. 1, element 104; col. 3, ln. 63-67); a plurality of second storage units for storing leaf images of respective compute nodes ('106; fig. 1, elements 105a, 105b, 105n; col. 4, ln. 3-10), said leaf images comprising only additional data blocks not previously contained in said root image ('106; col. 4, ln. 35-37; updates to the base image) and changes made by respective compute nodes to the blocks of said root image ('106; col. 4, ln. 4-10, col. 4, ln. 12-14; changes are made on a block by block basis), wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes ('106; col. 4, ln. 33-35; only changes are stored in the leaf nodes; the base nodes is not changed by the compute nodes; col. 3, ln. 65-67); and a plurality of union block devices ('106; fig. 1, element 110, filter with ports or paths to each compute node; col. 4, ln. 18-29, essentially one or more low-level driver(s) of the instant application that service each node; fig. 4, element 110, col. 6, ln. 25-26, there is a copy of filter 110 at each compute node - a plurality union block devices) corresponding to said compute nodes ('106; fig. 2, col. 38-48; fig. 4, element 110, col. 6, ln. 25-26), said union block devices ('106; fig. 1, element 110, filter with ports or paths to each compute node; col. 4, ln. 18-29, essentially one or more low-level driver(s) of the instant application that service each node; fig. 4, element 110, col. 6, ln. 25-26, there is a copy of filter 110 at each compute node - a plurality union block devices) for interfacing between

said compute nodes and said first and second storage units to distribute said file systems to said compute nodes (‘106; fig. 2, col. 38-48; fig. 4, element 110, col. 6, ln. 25-26), wherein said union block devices (‘106; fig. 1, element 110, filter with ports or paths to each compute node; col. 4, ln. 18-29, essentially one or more low-level driver(s) of the instant application that service each node; fig. 4, element 110, col. 6, ln. 25-26, there is a copy of filter 110 at each compute node - a plurality union block devices) create said file systems by merging the blocks of said root image stored on the first storage unit with the blocks of respective leaf images stored on respective second storage unit (‘106; fig. 3; col 5, ln. 23 through col. 6, ln. 2), and wherein further at least one of said compute nodes is configurable to index said root image and provide the indexing results to another of said compute nodes (‘106; col. 5, ln. 34-43).

22. While Nguyen does not explicitly teach union block devices, the filter element 110 of Nguyen is equivalent to the concept of a plurality of union block devices and an embodiment described at fig. 4, element 110, col. 6, ln. 25-26, has a copy of filter 110 at each compute node yielding a plurality union block devices performing the function of a low-level driver as described in the instant application and in the Applicants’ remarks provided with the RCE.

23. It would have been obvious to one of ordinary skill in the art at the time of the invention to have comprehended that the plurality of union block devices of the instant application are equivalent to the filter teachings of Nguyen.

24. Regarding claim 15 (Currently Amended), Nguyen teaches the system as recited in claim 14 and further teaches wherein said first storage unit and said second storage units are contained

within a single storage appliance (‘106; fig. 1, element 102; col. 10, ln. 18, comprises a physical storage device).

25. In regard to claim 16 (Currently Amended), Nguyen teaches the system as recited in Claim 14 and further teaches the system as further comprising: a plurality of union block devices for interfacing between respective compute nodes and said first storage unit and respective second storage units (‘106; fig. 1, element 110, filter with ports or paths to each compute node; col. 4, ln. 18-29, essentially one or more low-level driver(s) of the instant application that service each node; fig. 4, element 110, col. 6, ln. 25-26, there is a copy of filter 110 at each compute node - a plurality union block devices), said union block devices (‘106; fig. 1, element 110, filter with ports or paths to each compute node; col. 4, ln. 18-29, essentially one or more low-level driver(s) of the instant application that service each node; fig. 4, element 110, col. 6, ln. 25-26, there is a copy of filter 110 at each compute node - a plurality union block devices) operable to distribute application environments to the compute nodes, wherein said union block devices create said application environments by merging the blocks of said root image with the blocks of respective leaf images (‘106; fig. 3; col 5, ln. 23 through col. 6, ln. 2).

26. Regarding claim 17 (Currently Amended), Nguyen teaches the system as recited in claim 16 and further teaches wherein said union block devices comprise low-level drivers for interfacing between the file systems of respective compute nodes and said first storage unit, respective second storage units, and said cache (‘106; fig. 1, element 110, filter with ports or paths to each compute node; col. 4, ln. 18-29, essentially one or more low-level driver(s) of the

instant application that service each node; fig. 4, element 110, col. 6, ln. 25-26, there is a copy of filter 110 at each compute node - a plurality union block devices).

27. In regard to claim 18 (Currently Amended), Nguyen teaches the system as recited in claim 14 and further teaches wherein said first storage unit is read-only ('106; col. 4, ln. 54-55).

28. Claims 1-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen (U. S. Patent Application Publication 2003/0126242 A1, hereafter '106) as applied to claims 14-27 above and in view of Kobayashi et al. (U. S. Patent 6,101,576, already of record, hereafter '576).

29. Regarding claim 1 (Currently Amended), Nguyen teaches a system for providing data to a plurality of compute nodes ('106; fig. 1) comprising: a first storage unit for storing blocks of a root image of said compute nodes ('106; fig. 1, element 104; col. 3, ln. 63-67); a plurality of second storage units for storing leaf images of respective compute nodes ('106; fig. 1, elements 105a, 105b, 105n; col. 4, ln. 3-10), said leaf images comprising only additional data blocks not previously contained in said root image ('106; col. 4, ln. 35-37; updates to the base image) and changes made by respective compute nodes to the blocks of said root image ('106; col. 4, ln. 4-10, col. 4, ln. 12-14; changes are made on a block by block basis), wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes ('106; col. 4, ln. 33-35; only changes are stored in the leaf nodes; the base nodes is not changed by the compute nodes; col. 3, ln. 65-67); and does not explicitly teach

a cache for caching blocks of said root image previously accessed by at least one of said compute nodes.

30. Nguyen does teach caching blocks of said root image previously accessed by at least one of said compute nodes (‘106; col. 9, ln. 45-61); caching of modified blocks is provided).

31. Kobayashi, solving the same problem of caching frequently accessed data sets, however, explicitly teaches physical caches (‘576; fig. 12, memory caches as elements 11a, 11b and a disk cache as element 14b; col. 5, ln. 47-51) for the benefit of increasing the speed of data transfers from the host to client in data streaming or transfer operations as frequently accessed data is kept in high speed memory and not constantly retrieved from slower disk sources.

32. It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the detailed image/data cache teachings of Kobayashi with the server/client image assess and remotely stored boot/OS system teachings of Nguyen for the benefit of increasing the speed of data transfers from the host to client in data streaming or transfer operations as frequently accessed data is kept in high speed memory and not constantly retrieved from slower disk sources.

33. In regard to claim 2 (Original), Kobayashi further teaches wherein said cache is configurable to store the X most recently accessed blocks of said root image, and wherein further X represents a cache threshold value (‘576; col. 2, ln. 37 through col. 3, ln. 9).

34. Regarding claim 3 (Original), Nguyen and Kobayashi teach the system as recited in claim 1 and Kobayashi further teaches wherein said first storage unit, said second storage units, and said cache are contained within a single storage appliance (‘106; fig. 1).

35. In regard to claim 4 (Original), Nguyen and Kobayashi teach the system as recited in claim 1 and they further teach a plurality of union block devices for interfacing between respective compute nodes and said first storage unit (‘106; fig. 1, element 110, filter with ports or paths to each compute node; col. 4, ln. 18-29, essentially one or more low-level driver(s) of the instant application that service each node; fig. 4, element 110, col. 6, ln. 25-26, there is a copy of filter 110 at each compute node - a plurality union block devices), respective second storage units, and said cache (‘576; fig. 12, memory caches as elements 11a, 11b and a disk cache as element 14b; col. 5, ln. 47-51) to distribute application environments to the compute nodes (‘106; fig. 1, element 110, filter with ports or paths to each compute node; col. 4, ln. 18-29, essentially one or more low-level driver(s) of the instant application that service each node; fig. 4, element 110, col. 6, ln. 25-26, there is a copy of filter 110 at each compute node - a plurality union block devices), wherein said union block devices create said application environments by merging the blocks of said root image with the blocks of respective leaf images (‘106; fig. 3; col 5, ln. 23 through col. 6, ln. 2).

36. Regarding claim 5 (Currently Amended), Nguyen and Kobayashi teach the system as recited in claim 4 and Nguyen further teaches wherein said union block devices comprise low-level drivers for interfacing between the file systems of respective compute nodes and said first

storage unit, respective second storage units, and said cache (‘106; fig. 1, element 110, filter with ports or paths to each compute node; col. 4, ln. 18-29, essentially one or more low-level driver(s) of the instant application that service each node; fig. 4, element 110, col. 6, ln. 25-26, there is a copy of filter 110 at each compute node - a plurality union block devices).

37. In regard to claim 6 (Original), Nguyen and Kobayashi teach the system as recited in claim 1 and Nguyen further teaches wherein said first storage unit is read-only (‘106; col. 4, ln. 54-55).

38. Regarding claim 7 (Currently Amended), Nguyen teaches a method for providing data to a plurality of compute nodes (‘106; fig. 1), comprising: storing blocks of a root image of said compute nodes on a first storage unit (‘106; fig. 1, element 104; col. 3, ln. 63-67); storing leaf images for respective compute nodes on respective second storage units (‘106; fig. 1, elements 105a, 105b, 105n; col. 4, ln. 3-10), said leaf images comprising only additional data blocks not previously contained in said root image (‘106; col. 4, ln. 35-37; updates to the base image) and changes made by respective compute nodes to the blocks of the root image (‘106; col. 4, ln. 4-10, col. 4, ln. 12-14; changes are made on a block by block basis), wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes (‘106; col. 4, ln. 33-35; only changes are stored in the leaf nodes; the base nodes is not changed by the compute nodes; col. 3, ln. 65-67); and does not explicitly teach caching blocks of said root image that have been accessed by at least one of said compute nodes in a cache memory.

39. Nguyen does teach caching blocks of said root image previously accessed by at least one of said compute nodes (‘106; col. 9, ln. 45-61); caching of modified blocks is provided).

40. Kobayashi, solving the same problem of caching frequently accessed data sets, however, explicitly teaches physical caches (‘576; fig. 12, memory caches as elements 11a, 11b and a disk cache as element 14b; col. 5, ln. 47-51) for the benefit of increasing the speed of data transfers from the host to client in data streaming or transfer operations as frequently accessed data is kept in high speed memory and not constantly retrieved from slower disk sources.

41. It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the detailed image/data cache teachings of Kobayashi with the server/client image assess and remotely stored boot/OS system teachings of Nguyen for the benefit of increasing the speed of data transfers from the host to client in data streaming or transfer operations as frequently accessed data is kept in high speed memory and not constantly retrieved from slower disk sources.

42. In regard to claim 8 (Currently Amended), Nguyen and Kobayashi teach the method as recited in claim 7 and they further teach the method as further comprising: receiving a read request from at least one of said compute nodes (‘106; col. 9, ln. 45-61), wherein a first portion of the data requested is currently stored in said cache memory; and providing said first portion of said data to said at least one of said compute nodes from said cache memory (‘576; fig. 12, memory caches as elements 11a, 11b and a disk cache as element 14b; col. 5, ln. 47-51).

43. Regarding claim 9 (Currently Amended), Nguyen and Kobayashi teach the method as recited in claim 8 and Nguyen further teaches the method as further comprising: updating said cache memory based on said read request ('106; col. 9, ln. 45-61).

44. In regard to claim 10 (Currently Amended), Nguyen and Kobayashi teach the method as recited in claim 9 and Kobayashi further teaches wherein a second portion of the data requested is not currently stored in said cache memory and said updating comprises: caching said second portion in said cache memory; and removing the least recently accessed data from said cache memory if the amount of data is said cache ('576; col. 12, ln. 59-65, LRU algorithm).

45. Regarding claim 11 (Currently Amended), Nguyen and Kobayashi teach the method as recited in claim 7 and Nguyen further teaches the method as further comprising: merging the blocks of said root image with the blocks of respective leaf images to create cohesive respective application environments ('106; fig. 3; col 5, ln. 23 through col. 6, ln. 2).

46. In regard to claim 12 (Currently Amended), Nguyen and Kobayashi teach the method as recited in claim 11 and Nguyen further teaches wherein said merging occurs at an operational level between the respective file systems of the compute nodes and said first storage unit, respective second storage units, and said cache memory ('106; fig. 3; col 5, ln. 23 through col. 6, ln. 2).

47. Regarding claim 13 (Currently Amended), Nguyen and Kobayashi teach the method as recited in claim 7 and Nguyen further teaches wherein said first storage unit is read-only ('106; col. 4, ln. 54-55).

### *Response to Arguments*

48. Applicant's arguments with respect to claims 1-27 have been considered but are moot because the arguments do not apply to any of the reference being used in the current rejection.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edward Martello whose telephone number is (571) 270-1883. The examiner can normally be reached on M-F 7:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Xiao Wu can be reached on (571) 272-7761. 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.

/Edward Martello/

Primary Examiner, Art Unit 2628

| Notice of References Cited | Application/Control No. 11/709,477 | Applicant(s)/Patent Under Reexamination KULKARNI ET AL. | |
|---|---|---|---|
| | Examiner EDWARD MARTELLO | Art Unit 2628 | Page 1 of 1 |

**U.S. PATENT DOCUMENTS**

| * | | Document Number Country Code-Number-Kind Code | Date MM-YYYY | Name | Classification |
|---|---|---|---|---|---|
| * | A | US-7,870,106 B1 | 01-2011 | Nguyen et al. | 707/694 |
| | B | US- | | | |
| | C | US- | | | |
| | D | US- | | | |
| | E | US- | | | |
| | F | US- | | | |
| | G | US- | | | |
| | H | US- | | | |
| | I | US- | | | |
| | J | US- | | | |
| | K | US- | | | |
| | L | US- | | | |
| | M | US- | | | |

**FOREIGN PATENT DOCUMENTS**

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

**NON-PATENT DOCUMENTS**

| * | | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|---|---|
| | U | |
| | V | |
| | W | |
| | X | |

*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.

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 11709477 | KULKARNI ET AL. |
| | **Examiner** | **Art Unit** |
| | Edward Martello | 2628 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

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

| CLAIM | | DATE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Final | Original | 12/23/2009 | 05/11/2010 | 03/08/2012 | | | | | | |
| | 1 | ✓ | ✓ | ✓ | | | | | | |
| | 2 | ✓ | ✓ | ✓ | | | | | | |
| | 3 | ✓ | ✓ | ✓ | | | | | | |
| | 4 | ✓ | ✓ | ✓ | | | | | | |
| | 5 | ✓ | ✓ | ✓ | | | | | | |
| | 6 | ✓ | ✓ | ✓ | | | | | | |
| | 7 | ✓ | ✓ | ✓ | | | | | | |
| | 8 | ✓ | ✓ | ✓ | | | | | | |
| | 9 | ✓ | ✓ | ✓ | | | | | | |
| | 10 | ✓ | ✓ | ✓ | | | | | | |
| | 11 | ✓ | ✓ | ✓ | | | | | | |
| | 12 | ✓ | ✓ | ✓ | | | | | | |
| | 13 | ✓ | ✓ | ✓ | | | | | | |
| | 14 | ✓ | ✓ | ✓ | | | | | | |
| | 15 | ✓ | ✓ | ✓ | | | | | | |
| | 16 | ✓ | ✓ | ✓ | | | | | | |
| | 17 | ✓ | ✓ | ✓ | | | | | | |
| | 18 | ✓ | ✓ | ✓ | | | | | | |
| | 19 | ✓ | ✓ | ✓ | | | | | | |
| | 20 | ✓ | ✓ | ✓ | | | | | | |
| | 21 | ✓ | ✓ | ✓ | | | | | | |
| | 22 | ✓ | ✓ | ✓ | | | | | | |
| | 23 | ✓ | ✓ | ✓ | | | | | | |
| | 24 | ✓ | ✓ | ✓ | | | | | | |
| | 25 | ✓ | ✓ | ✓ | | | | | | |
| | 26 | ✓ | ✓ | ✓ | | | | | | |
| | 27 | ✓ | ✓ | ✓ | | | | | | |

**EAST Search History**

**EAST Search History (Prior Art)**

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
|---|---|---|---|---|---|---|
| S3 | 1 | root WITH image SAME caching | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/16 08:50 |
| S4 | 60 | root WITH image SAME cach$3 | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/16 08:52 |
| S5 | 12 | ("5113523" \| "5127104" \| "5999734" \| "6018747" \| "6502238" \| "7200715" \| "7246351" \| "7263551" \| "7331047" \| "7467293" \| "7475274" \| "7496739").PN. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/16 08:55 |
| S6 | 3 | ("6421777" \| "6751658" \| "20030126242").PN. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 12:30 |
| S7 | 21 | ((base or kernel) WITH code) WITH image SAME cach$3 | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 15:43 |
| S8 | 2 | ("6502238" \| "7475274").PN. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 16:11 |
| S9 | 10 | (US-20030126242-$ or US-20060179308-$ or US-20070061787-$ or US-20070198772-$).did. or (US-6751658-$ or US-6421777-$ or US-6101576-$ or US-6651245-$ or US-7475274-$ or US-6502238-$).did. | US-PGPUB; USPAT | ADJ | ON | 2009/12/23 16:39 |
| S10 | 8 | S9 AND cache | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 16:39 |
| S11 | 317 | 345/557.ccls. | US-PGPUB; USPAT; | ADJ | ON | 2009/12/24 11:14 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | USOCR; EPO; JPO | | | |
| S12 | 6 | ("20020083120" \| "20050131962" \| "5175852" \| "6502238" \| "7269664" \| "7475274").PN. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2010/05/11 08:06 |
| S13 | 283 | (((root OR base OR kernel) WITH (software OR code OR binary)) SAME image) SAME2 cach$3 | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2010/05/11 08:26 |
| S14 | 22 | ("5999734" \| "7475274" \| "7496739" \| "5764902" \| "7263551" \| "7467293" \| "6195680" \| "5127104" \| "6990513" \| "7331047" \| "6779177" \| "7127712" \| "7150015" \| "6502238" \| "6606744" \| "5113523" \| "7246351" \| "6018747" \| "7200715" \| "6292941" \| "7155714" \| "7454462").PN. | US-PGPUB; USPAT; EPO | ADJ | ON | 2012/02/29 16:51 |
| S15 | 3 | (6721846\|7870106\|8001323).PN. | US-PGPUB; USPAT; EPO | ADJ | ON | 2012/03/08 11:19 |

**EAST Search History (Interference)**

< This search history is empty>

**3/8/2012 5:32:18 PM**
**C:\ Users\ emartello\ Documents\ EAST\ Workspaces\ 11709477_Root_Image_Caching.wsp**

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 11709477 | KULKARNI ET AL. |
| | Examiner | Art Unit |
| | Edward Martello | 2628 |

## SEARCHED

| Class | Subclass | Date | Examiner |
|---|---|---|---|
| 345 | 557 | 10/26/2009 | /EM/ |

## SEARCH NOTES

| Search Notes | Date | Examiner |
|---|---|---|
| eDAN Inventor Name Search | 10/26/2009 | /EM/ |
| See attached EAST Search History | 12/16/2009 | /EM/ |
| See attached EAST Search History | 12/23/2009 | /EM/ |
| See attached EAST Search History | 05/11/2010 | /EM/ |
| See attached EAST Search History | 02/29/2012 | /EM/ |
| See attached EAST Search History | 03/08/2012 | /EM/ |

## INTERFERENCE SEARCH

| Class | Subclass | Date | Examiner |
|---|---|---|---|
| | | | |

PTO/SB/80 (11-08)
Approved for use through 11/30/2011. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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.

# POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

[X] Practitioners associated with the Customer Number: **52531**

*OR*

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

| Name | Registration Number | Name | Registration Number |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

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).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

[X] The address associated with Customer Number: **52531**

*OR*

| | | | | | |
|---|---|---|---|---|---|
| [ ] Firm or Individual Name | | | | | |
| Address | | | | | |
| City | | State | | Zip | |
| Country | | Telephone | | Email | |

Assignee Name and Address:

Emendable Assets Limited Liability Company
2711 Centerville Rd
Suite 400
Wilmington, Delaware U.S.A.
19808

**A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.**

**SIGNATURE of Assignee of Record**

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

| | | | |
|---|---|---|---|
| Signature | Peter Kwon | Date | 5/31/2012 |
| Name | Peter Kwon | Telephone | |
| Title | Authorized Person for Emendable Assets Limited Liability Company | | |

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. 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 1.11 and 1.14. This collection is estimated to take 3 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.*

DECLARATION REGARDING AUTHORITY TO SIGN
ON BEHALF OF A LEGAL ENTITY
37 C.F.R. 3.73(b)(2)(i)

I, Peter Kwon (whose title is supplied below), hereby declare that I am authorized to sign documents on behalf of Emendable Assets Limited Liability Company

Peter Kwon
Authorized Person for Emendable Assets Limited Liability Company

5/31/2012
Date

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | | |
|---|---|---|
| Applicants: | P. Kulkarni et al. | OLD Attorney Docket No.: PNTA-P006.CIP.A<br>**NEW** Attorney Docket No.: 139537 |
| Application No.: | 11/709,477 | Art Unit: 2628 / Confirmation No.: 4127 |
| Filed: | February 21, 2007 | Examiner: E. Martello |
| Title: | ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT | |

## STATEMENT OF OWNERSHIP UNDER 37 C.F.R. § 3.73(b)

June 7, 2012

TO THE COMMISSIONER FOR PATENTS:

Emendable Assets Limited Liability Company, a limited liability company, certifies that it is the assignee of the entire right, title, and interest in the above-identified patent application by a chain of title from the inventors of the above-identified patent application to the current assignee as shown below:

1. From: Pradip Kulkarni, Mukul Kumar, Adhir Potdar, Richard Au, and Tung M. Nguyen
   To: Panta Systems, Inc.

   The document was recorded in the U.S. Patent and Trademark Office at Reel 018975, Frame 0285.

2. From: Panta Systems, Inc.
   To: Venture Lending & Leasing IV, Inc.

   The document was recorded in the U.S. Patent and Trademark Office at Reel 028324, Frame 0627.

3. From: Venture Lending & Leasing IV, Inc.
   To: Emendable Assets Limited Liability Company

   The document was recorded in the U.S. Patent and Trademark Office at Reel 028321, Frame 0563.

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1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100

The undersigned is an attorney of record and is authorized to act on behalf of the assignee.

Respectfully submitted,

**/Kevan L. Morgan/**

Kevan L. Morgan
Attorney of Record
Registration No. 42,015

KLM:cae



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CHRISTENSEN O'CONNOR JOHNSON KINDNESS PLLC
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100



IPR2025-00202 / 844 Patent Page 216 of 322 EX1002

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 12964904 |
| **Application Number:** | 11709477 |
| **International Application Number:** | |
| **Confirmation Number:** | 4127 |
| **Title of Invention:** | Root image caching and indexing for block-level distributed application management |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Customer Number:** | 70848 |
| **Filer:** | Kevan L Morgan/Constance Edgar |
| **Filer Authorized By:** | Kevan L Morgan |
| **Attorney Docket Number:** | PNTA-P006.CIP.A |
| **Receipt Date:** | 07-JUN-2012 |
| **Filing Date:** | 21-FEB-2007 |
| **Time Stamp:** | 21:32:41 |
| **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 | | 39537_Rev_POA.pdf | 938863<br>eddb597874c75d4cbe8584f776598e8ba28df86c | yes | 4 |

| | Multipart Description/PDF files in .zip description | | |
|---|---|---|---|
| | **Document Description** | **Start** | **End** |
| | Power of Attorney | 1 | 2 |
| | Assignee showing of ownership per 37 CFR 3.73(b). | 3 | 4 |
| **Warnings:** | | | |
| **Information:** | | | |
| | **Total Files Size (in bytes):** | 938863 | |

**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.**

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 | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 11/709,477 | 02/21/2007 | Pradip Kulkarni | PNTA-P006.CIP.A |

**CONFIRMATION NO. 4127**

52531
CHRISTENSEN O'CONNOR JOHNSON KINDNESS PLLC
1420 FIFTH AVENUE
SUITE 2800
SEATTLE, WA 98101-2347

**POA ACCEPTANCE LETTER**

*OC000000054795033*

Date Mailed: 06/14/2012

## NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/07/2012.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/agizaw/

---

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
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| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 11/709,477 | 02/21/2007 | Pradip Kulkarni | PNTA-P006.CIP.A |

**CONFIRMATION NO. 4127**

**POWER OF ATTORNEY NOTICE**

70848
PANTA c/o MURABITO HAO & BARNES LLP
Two Market Street
3rd Floor
San Jose, CA 95113

*OC000000054794984*

Date Mailed: 06/14/2012

## NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/07/2012.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/agizaw/

---

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | | | |
|---|---|---|---|
| Applicants: | P. Kulkarni et al. | Attorney Docket No.: | 139537 |
| Application No.: | 11/709477 | Art Unit: 2628 / Confirmation No.: | 4127 |
| Filed: | February 21, 2007 | Examiner: E. Martello | |
| Title: | ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT | | |

AMENDMENT AFTER NON-FINAL REJECTION

Seattle, Washington 98101

July 11, 2012

TO THE COMMISSIONER FOR PATENTS:

INTRODUCTORY COMMENTS

Please amend the above-identified application as follows:

**Amendments to the Specification** begin on page 2 of this paper.

**Amendments to the Claims** are reflected in the listing of the claims, which begins on page 10 of this paper.

**Remarks/Arguments** begin on page 17 of this paper.

LAW OFFICES OF
CHRISTENSEN O'CONNOR JOHNSON KINDNESS[PLLC]
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100





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## REMARKS

In the Office Action mailed March 12, 2012 (hereinafter "Office Action"), the arguments submitted with the previous response were deemed persuasive. Claims 4, 5, 14, 16, and 17 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. Claims 19-27 were rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by U.S. Patent No. 7,870,106, to Nguyen et al. (hereinafter "Nguyen"). Claims 14-18 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Nguyen. Claims 1-13 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Nguyen[1] in view of U.S. Patent No. 6,101,576, to Kobayashi et al. (hereinafter "Kobayashi"). Applicants respectfully traverse these rejections.

With this response, Claims 1, 2, 4, 7, 10, 12, 14, 16, 21, and 23-27 have been amended for clarity. Claims 1-27 remain pending in the present application. Applicants have carefully considered the issues raised in the Office Action, and respectfully request reconsideration and allowance of the pending claims in view of the remarks set forth below.

### Claims 4, 5, 14, 16, and 17 Are Definite

The Office Action rejected Claims 4, 5, 14, 16, and 17 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. Specifically, the Office Action alleged that the claimed "union block devices" have insufficient basis within the claims to define their character. Applicants respectfully traverse this rejection. Claims 4, 5, 14, 16, and 17 each recite "systems"

---

[1] The Office Action, on page 12, listed this rejection as being over U.S. Patent Application Publication No. 2003/0126242, which is not the same disclosure as U.S. Patent No. 7,870,106, to Nguyen et al. However, the Office Action proceeded to apparently refer to drawings and sections of Nguyen, and referred back to the discussion of Nguyen with respect to Claims 14-27. As such, applicants have treated this Section 103 rejection as being based on U.S. Patent No. 7,870,106.

LAW OFFICES OF
CHRISTENSEN O'CONNOR JOHNSON KINDNESS[PLLC]
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100





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that comprise "union block devices." Such union block devices are disclosed in the application as originally filed, at least in paragraphs 27-29, and are recited in the claims in a definite manner.

Accordingly, applicants respectfully request withdrawal of the Section 112 rejections of Claims 4, 5, 14, 16, and 17.

The Section 102 Rejections Should Be Withdrawn Because Nguyen Does Not Anticipate Claims 19-27

The Office Action rejected Claims 19-27 under 35 U.S.C. § 102(e) as allegedly being anticipated by Nguyen. Applicants respectfully traverse this rejection.

Independent Claim 19 recites, *inter alia*, "receiving indexing results pertaining to said root image from one of said compute nodes; and providing said indexing results to the others of said compute nodes." Independent Claim 23 recites, *inter alia*, "indexing said root image portion; and providing the results of said indexing to a second compute node." The Office Action alleged that Nguyen discloses these features, but applicants respectfully disagree.

The cited portion of Nguyen states:

> The root file system 104 has a root metadata structure 205 and a root data structure 210. Entries in the root metadata structure 205 point to associated entries in the root data structure 210. The root data structure 210 comprises the base instance of the distributed application. Neither the root data structure 210 nor the root metadata structure 205 is modified by compute nodes. However, a system management node or the like may modify the root file system 104, such that changes to the distributed application are easily and rapidly deployed to compute nodes.

(Nguyen, Col. 5, lines 34-43.) Nothing in this passage relates to indexing a root image portion, or to receiving or providing indexing results. Indeed, indexing and indexing results are not discussed anywhere within Nguyen. Accordingly, applicants respectfully submit that Nguyen does not disclose each and every feature recited in independent Claims 19 and 23, and therefore fails to anticipate Claims 19 and 23.

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CHRISTENSEN O'CONNOR JOHNSON KINDNESS®
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100





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Claims 20-22 depend from Claim 19. Claims 24-27 depend from Claim 23. Applicants respectfully submit that Nguyen fails to anticipate Claims 20-22 and 24-27 for at least the reasons discussed above with respect to Claims 19 and 23, as well as for additional reasons.

Accordingly, applicants respectfully request withdrawal of the Section 102 rejections of Claims 19-27.

The Section 103 Rejections Should Be Withdrawn Because Nguyen Is Not Valid Prior Art Under Section 103

The Office Action rejected Claims 14-18 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Nguyen, and rejected Claims 1-13 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Nguyen in view of Kobayashi. Applicants respectfully traverse these rejections.

Nguyen was patented on January 11, 2011, and was not published before being issued. As this date is after the date of filing of the present application, Nguyen does not qualify as prior art under Section 102(a) or Section 102(b). Accordingly, Nguyen could only qualify as prior art under Section 102(e)(2).

At the time of filing of the present application, both the present application and Nguyen were owned by or under obligation of assignment to Panta Systems, Inc. As such, applicants respectfully submit that, pursuant to Section 103(c), Nguyen is not valid prior art with respect to the present application.

Since each of the Section 103 rejection relies at least in part on Nguyen, applicants respectfully submit that the Section 103 rejections were made in error. Applicants respectfully request withdrawal of the Section 103 rejections of Claims 1-18.

LAW OFFICES OF
CHRISTENSEN O'CONNOR JOHNSON KINDNESS PLLC
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100





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No Disclaimers or Disavowals

Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, applicants are not conceding in this application that previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. Applicants reserve the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that applicants have made any disclaimers or disavowals of any subject matter supported by the present application.

## CONCLUSION

In view of the foregoing amendments and remarks, applicants respectfully submit that Claims 1-27 are in condition for allowance over the patents and publications of record, and respectfully request reconsideration and allowance of the same. The Examiner is invited to contact the undersigned attorney at the number provided below to resolve any issues that may arise in order to advance prosecution of this application.

Respectfully submitted,

CHRISTENSEN O'CONNOR
JOHNSON KINDNESS[PLLC]



David P. Sheldon
Registration No. 62,494
Direct Dial No. 206.695.1611

DPS:lal

LAW OFFICES OF
CHRISTENSEN O'CONNOR JOHNSON KINDNESS[PLLC]
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100





IPR2025-00202 / 844 Patent Page 225 of 322 EX1002

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 11709477 |
| **Filing Date:** | 21-Feb-2007 |
| **Title of Invention:** | Root image caching and indexing for block-level distributed application management |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Filer:** | David Patrick Sheldon/Lori Lewis |
| **Attorney Docket Number:** | 139537 |

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:** | | | | |
| **Extension-of-Time:** | | | | |
| Extension - 1 month with $0 paid | 1251 | 1 | 150 | 150 |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| | | | **Total in USD ($)** | **150** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 13230706 |
| **Application Number:** | 11709477 |
| **International Application Number:** | |
| **Confirmation Number:** | 4127 |
| **Title of Invention:** | Root image caching and indexing for block-level distributed application management |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Customer Number:** | 52531 |
| **Filer:** | David Patrick Sheldon/Lori Lewis |
| **Filer Authorized By:** | David Patrick Sheldon |
| **Attorney Docket Number:** | 139537 |
| **Receipt Date:** | 11-JUL-2012 |
| **Filing Date:** | 21-FEB-2007 |
| **Time Stamp:** | 19:32:19 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | Credit Card |
| Payment was successfully received in RAM | $150 |
| RAM confirmation Number | 8513 |
| Deposit Account | 031740 |
| Authorized User | CHRISTENSEN, O'CONNOR, JOHNSON & KINDNESS |

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## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | 39537_Amendment_After_Non Final_Rejection_07-11-2012.pdf | 4439252<br>e0dfd9afe1e2ab7cd30081a7fd68e538fc690b46 | yes | 20 |

| Multipart Description/PDF files in .zip description | | |
|---|---|---|
| **Document Description** | **Start** | **End** |
| Amendment/Req. Reconsideration-After Non-Final Reject | 1 | 1 |
| Specification | 2 | 9 |
| Claims | 10 | 15 |
| Applicant Arguments/Remarks Made in an Amendment | 16 | 20 |

**Warnings:**

**Information:**

| | | | | | |
|---|---|---|---|---|---|
| 2 | Fee Worksheet (SB06) | fee-info.pdf | 29760<br>9241784496f52adc6ee5ae3049f73f4761853cf6 | no | 2 |

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| Total Files Size (in bytes): | 4469012 |
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# PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

| Application or Docket Number | Filing Date | ☐ To be Mailed |
|---|---|---|
| 11/709,477 | 02/21/2007 | |

## 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)) | | | | | | | |
| | | | TOTAL | | | TOTAL | |

* If the difference in column 1 is less than zero, enter "0" in column 2.

## APPLICATION AS AMENDED – PART II

| AMENDMENT | 07/11/2012 | (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)) | * 27 | Minus | ** 27 | = 0 | X $ = | | OR | X $60= | 0 |
| | Independent (37 CFR 1.16(h)) | * 5 | Minus | ***5 | = 0 | X $ = | | OR | X $250= | 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:
/LINDA HUMES/

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

AMENDMENTS TO THE SPECIFICATION

Please amend paragraph [0001] as follows:

**[0001]** The present Application for Patent is a continuation-in-part of ~~Patent Serial~~ Application No. 11/395,816, entitled "BLOCK-LEVEL I/O SUBSYSTEM FOR DISTRIBUTED APPLICATION ENVIRONMENT ~~MANGEMENT~~ MANAGEMENT," filed March 30, 2006, ~~pending and~~ now U.S. Patent No. 7,721,282, assigned to the assignee hereof and hereby expressly incorporated by reference herein.

Please amend paragraph [0002] as follows:

**[0002]** The present Application for Patent is related to the following co-pending U.S. Patent Application:.

"VIRUS SCANNING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT," by Kulkarni et [[al]] al., ~~having Attorney Docket No. PNTA P006.CON.B, filed concurrently herewith~~ filed February 28, 2007, now U.S. Patent No. 8,065,737, assigned to the assignee hereof[[,]] and expressly incorporated by reference herein.

Please delete paragraph [0003] and the preceding heading.

Please amend paragraph [0012] as follows:

**[0012]** Thus, embodiments of the present ~~invention~~ disclosure 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~~ disclosure 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

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1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100





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require copying the contents of the root image. Rather it involves registering a new UBD with the system, which occurs very quickly. Bring up time, and access time in general, can be further improved by caching commonly accessed the portions of the root image. Moreover, updating the boot image for the entire cluster simply involves updating the root image. Additionally, because of the commonality of the root image and the fact that its contents are not directly changed, certain operations performed on the root image (e.g., indexing) only need to be performed once by one compute node. Thereafter, the results of that operation can be shared with the other compute nodes in the cluster, thus saving the other compute nodes valuable time and resources.

Please amend paragraphs [0014]-[0017] as follows:

**[0014]** FIG. 2 is a diagram of a system for root image caching and indexing in a block-level distributed application environment, in accordance with various embodiments of the present ~~invention~~ disclosure.

**[0015]** FIGS. 3A-3B are flowcharts illustrating a process for root image caching and indexing in a block-level distributed application environment, in accordance with various embodiments of the present ~~invention~~ disclosure.

**[0016]** FIG. 4 illustrates a flowchart for a process for updating the cache based on a read request, in accordance with an embodiment of the present ~~invention~~ disclosure.

**[0017]** FIG. 5 illustrates a flowchart for a process for indexing a root image, in accordance with various embodiments of the present ~~invention~~ disclosure.

Please amend paragraphs [0018]-[0019] as follows:

**[0018]** Reference will now be made in detail to ~~the preferred~~ various embodiments of the ~~invention~~ disclosure, examples of which are illustrated in the accompanying drawings. While

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Seattle, Washington 98101
206.682.8100

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

**[0019]** 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~~ disclosure.

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CHRISTENSEN O'CONNOR JOHNSON KINDNESS$^{PLLC}$
1420 Fifth Avenue
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Please amend paragraph [0024] as follows:

**[0024]** FIG. 2 is a diagram of a system 200 for root image caching and indexing in a block-level distributed application environment, in accordance with various embodiments of the present ~~invention~~ disclosure. In one embodiment, system 200 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 200 has a number of compute nodes 220a-n coupled to first storage unit 240 and a corresponding second storage unit 250a-n though a corresponding union block device (UBD) 230a-n. To the compute nodes 220a-n, it appears that they have access to their own version of a distributed application environment. However, a separate and complete boot image is not created and stored for each compute node 220a-n.

Please amend paragraph [0031] as follows:

**[0031]** An embodiment of the present ~~invention~~ disclosure provides for caching of portions of the root image. Because several compute nodes in a cluster may often access the same data (e.g., same drivers, same library files, etc.) on the root image, tremendous speed improvements can be realized by caching such data in cache 260. For example, by current standards, it is common for a storage disk to achieve a data transfer rate around 76 MB/s, whereas cache memory can achieve speeds up to and greater than 800 MB/s. In one embodiment, the cache may be contained within a single storage appliance, along with the first storage unit 240 and the second storage units 250a-n.

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1420 Fifth Avenue
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Please amend paragraph [0034] as follows:

**[0034]** An embodiment of the present ~~invention~~ disclosure provides for indexing the root image. From the standpoint of seek time, it is beneficial for each compute node to have access to an index of its file system. In a traditional clustered computing situation, each compute node would independently index its file system. To the extent that each compute node in a cluster has similar operating environments to the others, indexing performed on common data is therefore redundant.

Please amend paragraph [0036] as follows:

**[0036]** FIGS. 3A-3B are flowcharts illustrating a process 300 for root image caching and indexing in a block-level distributed application environment, in accordance with various embodiments of the present ~~invention~~ disclosure. Although specific operations are disclosed in process 300, such operations are exemplary. Process 300 may not include all of the operations illustrated by FIGS. 3A-3B. Also, process 300 may include various other operations and/or variations of the operations shown by FIGS. 3A-3B. Likewise, the sequence of the operations of process 300 can be modified. Steps of process 300 may be stored as instructions on a computer readable medium and executed on a computer processor.

Please amend paragraph [0044] as follows:

**[0044]** FIG. 4 illustrates a flowchart for a process 345 for updating the cache based on a read request, in accordance with an embodiment of the present ~~invention~~ disclosure. [[Is]] It should be appreciated that the steps illustrated in FIG. 4 are exemplary and the updating performed in block 345 of process 300 may be achieved in many other ways as well. Process 345 may not include all of the operations illustrated by FIG. 4. Also, process 345 may include various other

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1420 Fifth Avenue
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operations and/or variations of the operations shown by FIG. 4. Likewise, the sequence of the operations of process 345 can be modified. Steps of process 345 may be stored as instructions on a computer readable medium and executed on a computer processor.

Please amend paragraphs [0049]-[0054] as follows:

**[0049]** FIG. 5 illustrates a flowchart for a process 500 for indexing a root image, in accordance with various embodiments of the present ~~invention~~ disclosure. Although specific operations are disclosed in process 500, such operations are exemplary. Process 500 may not include all of the operations illustrated by FIG. 5. Also, process 500 may include various other operations and/or variations of the operations shown by FIG. 5. Likewise, the sequence of the operations of process 500 can be modified. Steps of process 500 may be stored as instructions on a computer readable medium and executed on a computer processor.

**[0050]** Step 510 involves receiving data blocks of a file system at a compute node. The data blocks include a root image portion in the leaf image portion. As described above, the leaf image portion includes additional data blocks not previously contained in the root image portion and also changes made by the compute node to the blocks of the root image. Thus, the file system actually seen by the compute node is a product of ~~urging~~ merging the root image portion in the leaf image portion together at the block level.

**[0051]** Step 520 involves the compute node indexing the root image portion of its file system. In such a case, the compute node is to some extent ~~agonizing~~ agnostic to the fact that its file system is divided between a root image portion and a leaf image portion. At step 540, the compute node provides the indexing results of the root image portion to another compute node. It is appreciated that this may be achieved a number of ways. For example, the first compute node may simply provide the indexing results to the second compute node directly.

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Alternatively, the first compute node may store the indexing results on a shared storage unit that is accessible by the second compute node (step 530).

**[0052]** Thereafter, the compute node may complete its indexing of its file system by indexing the leaf image portion of the file system (step 550). Further down the road, the benefits of indexing the root image separately from the leaf image are realized when the compute node requires that its file system be re-indexed. At step 560, the compute node re-indexes its file system by re-indexing its corresponding leaf image portion with the previous indexing results of the root portion.

[[In]]

**[0053]** Thus, by operating at the block level, embodiments of the present ~~invention~~ disclosure provide file system and operating system independent systems and methods for distributing an application environment to a compute node. By utilizing a branching store system of application environment distribution, embodiments of the present ~~invention~~ disclosure 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. Bring up time, and access time in general, can be further improved by caching commonly accessed the portions of the root image. Moreover, updating the boot image for the entire cluster simply involves updating the root image.

**[0054]** Embodiments of the present ~~invention~~ disclosure 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

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1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100

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. For example, and with reference to FIG. 2, cache 261, first storage unit 241, and second storage units 251a-n provide failover/redundancy security for system 200. 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).

Please amend paragraph [0056] as follows:

**[0056]** The previous description of the disclosed embodiments is provided to enable any person skilled in the art to make or use the present ~~invention~~ disclosure. 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~~ disclosure. Thus, the present ~~invention~~ disclosure 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.

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1420 Fifth Avenue
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206.682.8100

AMENDMENTS TO THE CLAIMS

1. (Currently amended) A system for providing data to a plurality of compute nodes, the system comprising:

a first storage unit ~~for storing~~ configured to store blocks of a root image of said compute nodes;

a plurality of second storage units ~~for storing~~ configured to store leaf images of respective compute nodes, said leaf images ~~comprising~~ including only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; and

a cache ~~for caching~~ configured to cache blocks of said root image previously accessed by at least one of said compute nodes.

2. (Currently amended) The system as recited in Claim 1 wherein said cache is ~~configurable~~ configured to store [[the]] X most recently accessed blocks of said root image, and wherein ~~further~~ X represents a cache threshold value.

3. (Original) The system as recited in Claim 1 wherein said first storage unit, said second storage units, and said cache are contained within a single storage appliance.

4. (Currently amended) The system as recited in Claim 1 further comprising:

a plurality of union block devices ~~for interfacing~~ configured to interface between respective compute nodes and said first storage unit, respective second storage units, and said cache to distribute application environments to the compute nodes, wherein said union block

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devices ~~create~~ are configured to create said application environments by merging the blocks of said root image with the blocks of respective leaf images.

5. (Previously presented) The system as recited in Claim 4 wherein said union block devices comprise low-level drivers for interfacing between the file systems of respective compute nodes and said first storage unit, respective second storage units, and said cache.

6. (Original) The system as recited in Claim 1 wherein said first storage unit is read-only.

7. (Currently amended) A method for providing data to a plurality of compute nodes, comprising:

storing blocks of a root image of said compute nodes on a first storage unit;

storing leaf images for respective compute nodes on respective second storage units, said leaf images ~~comprising~~ including only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of the root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; and

caching blocks of said root image that have been accessed by at least one of said compute nodes in a cache memory.

8. (Previously presented) The method as recited in Claim 7 further comprising:

receiving a read request from at least one of said compute nodes, wherein a first portion of the data requested is currently stored in said cache memory; and

providing said first portion of said data to said at least one of said compute nodes from said cache memory.

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1420 Fifth Avenue
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9. (Previously presented) The method as recited in Claim 8 further comprising:

updating said cache memory based on said read request.

10. (Currently amended) The method as recited in Claim 9 wherein a second portion of the data requested is not currently stored in said cache memory and said updating comprises:

caching said second portion in said cache memory; and

removing the least recently accessed data from said cache memory if the amount of data [[is]] in said cache memory is above a threshold value.

11. (Previously presented) The method as recited in Claim 7 further comprising:

merging the blocks of said root image with the blocks of respective leaf images to create cohesive respective application environments.

12. (Currently amended) The method as recited in Claim 11 wherein said merging occurs at an operational level between ~~the respective~~ file systems of the respective compute nodes and said first storage unit, respective second storage units, and said cache memory.

13. (Previously presented) The method as recited in Claim 7 wherein said first storage unit is read-only.

14. (Currently amended) A system for indexing file systems for a plurality of compute nodes, the system comprising:

a first storage unit ~~for storing~~ configured to store blocks of a root image of said compute nodes;

a plurality of second storage units ~~for storing~~ configured to store leaf images of respective compute nodes, said leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of said root

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1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100

image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; and

a plurality of union block devices corresponding to said compute nodes, said union block devices ~~for interfacing~~ configured to interface between said compute nodes and said first and second storage units to distribute said file systems to said compute nodes, wherein said union block devices are configured to create said file systems by merging the blocks of said root image stored on the first storage unit with the blocks of respective leaf images stored on respective second storage units, and wherein further at least one of said compute nodes is ~~configurable~~ configured to index said root image and provide the indexing results to another of said compute nodes.

15. (Previously presented) The system as recited in Claim 14 wherein said first storage unit and said second storage units are contained within a single storage appliance.

16. (Currently amended) The system as recited in Claim 14 further comprising:

a plurality of union block devices ~~for interfacing~~ configured to interface between respective compute nodes and said first storage unit and respective second storage units, said union block devices ~~operable~~ configured to distribute application environments to the compute nodes, wherein said union block devices are configured to create said application environments by merging the blocks of said root image with the blocks of respective leaf images.

17. (Previously presented) The system as recited in Claim 16 wherein said union block devices comprise low-level drivers for interfacing between the file systems of respective compute nodes and said first storage unit, respective second storage units, and said cache.

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1420 Fifth Avenue
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Seattle, Washington 98101
206.682.8100

18. (Previously presented) The system as recited in Claim 14 wherein said first storage unit is read-only.

19. (Previously presented) A method for indexing file systems for a plurality of compute nodes, comprising:

storing blocks of a root image of said compute nodes on a first storage unit;

storing leaf images for respective compute nodes on respective second storage units, said leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of the root image, wherein said leaf images for respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes;

merging the blocks of said root image with the blocks of respective leaf images stored on respective second storage units to create respective file systems for respective compute nodes;

receiving indexing results pertaining to said root image from one of said compute nodes; and

providing said indexing results to the others of said compute nodes.

20. (Previously presented) The method as recited in Claim 19 further comprising:

storing said indexing results on a shared storage unit.

21. (Currently amended) The method as recited in Claim 19 wherein said merging occurs at an operational level between [[the]] respective file systems of the compute nodes and said first storage unit and respective second storage units.

22. (Previously presented) The method as recited in Claim 19 wherein said first storage unit is read-only.

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1420 Fifth Avenue
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Seattle, Washington 98101
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23. (Currently amended) A ~~non-transitory computer-readable media comprising computer-executable~~ computer-readable storage medium having instructions stored ~~therein~~ thereon that, ~~the computer-executable instructions comprising~~ in response to execution by at least one computing device, cause the at least one computing device to:

~~instructions to~~ receive data blocks of a file system, said data blocks comprising a root image portion and leaf image portion, said leaf image portion comprising only additional data blocks not previously contained in said root image portion and changes made by said first compute node to the blocks of said root image, wherein said leaf image portion does not include blocks of said root image that are unchanged by said first compute node, wherein said file system is the result of merging said root image portion and said leaf image portion together at the block-level;

~~instructions to~~ index said root image portion; and

~~instructions to~~ provide the results of said indexing to a second compute node, wherein said logic encoded in the one or more tangible media comprise computer executable instructions executed by the first compute node.

24. (Currently amended) The ~~non-transitory computer readable media~~ computer-readable storage medium of Claim 23, wherein the instructions further ~~comprising instructions~~ cause the at least one computing device to store said results of said indexing on a shared storage unit accessible by said second compute node.

25. (Currently amended) The ~~non-transitory computer readable media~~ computer-readable storage medium of Claim 23, wherein the instructions further ~~comprising instructions~~ cause the at least one computing device to index said leaf image portion.

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Seattle, Washington 98101
206.682.8100

26. (Currently amended) The ~~non-transitory computer readable media~~ computer-readable storage medium of Claim 25, wherein the instructions further ~~comprising instruetions~~ cause the at least one computing device to re-index said file system by re-indexing said leaf image portion and merging the results of said re-indexing of said leaf image portion with said results of said indexing of said root image portion.

27. (Currently amended) The ~~non-transitory computer readable media~~ computer-readable storage medium of Claim 23 wherein said root image portion is read-only.

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 11/709,477 | 02/21/2007 | Pradip Kulkarni | 139537 | 4127 |

52531 7590 07/17/2012

CHRISTENSEN O'CONNOR JOHNSON KINDNESS PLLC
1420 FIFTH AVENUE
SUITE 2800
SEATTLE, WA 98101-2347

| EXAMINER | |
|---|---|
| MARTELLO, EDWARD | |
| ART UNIT | PAPER NUMBER |
| 2628 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 07/17/2012 | ELECTRONIC |

**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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

efiling@cojk.com

| Applicant-Initiated Interview Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 11/709,477 | KULKARNI ET AL. | |
| | Examiner | Art Unit | |
| | EDWARD MARTELLO | 2628 | |

All participants (applicant, applicant's representative, PTO personnel):

(1) *EDWARD MARTELLO*. (3)_____.

(2) *David P. Sheldon; 62,494*. (4)_____.

Date of Interview: *10 July 2012*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☒112 ☒102 ☒103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1*.

Identification of prior art discussed: *Nguyen*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

*We discussed the Nguyen reference and how the chain of ownership and the chain of continuation in part of prior applications has the reference disqualified as a prior art reference under 102(e) and 103(c). The Section 112 rejection was discussed and the Examiner is open to withdrawal of the rejection pending review of the remarks received in the forthcoming amendment. No agreement was reached with respect to the claims .*

**Applicant recordation instructions:** The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

**Examiner recordation instructions**: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

| /Edward Martello/<br>Primary Examiner, Art Unit 2628 | |
|---|---|

# Summary of Record of Interview Requirements

**Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record**
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

**Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews**
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

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The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

**Examiner to Check for Accuracy**

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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

# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 11709477 |
| Filing Date | 2007-02-21 |
| First Named Inventor | Kulkarni |
| Art Unit | 2628 |
| Examiner Name | Edward Martello |
| Attorney Docket Number | 139537 |

| U.S.PATENTS | | | | | | Remove |
|---|---|---|---|---|---|---|
| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
| | 1 | 5113523 | A | 1992-05-12 | Colley | |
| | 2 | 5127104 | A | 1992-06-30 | Dennis | |
| | 3 | 5764902 | A | 1998-06-09 | Rothrock | |
| | 4 | 5974547 | A | 1999-10-26 | Klimenko | |
| | 5 | 5999734 | A | 1999-12-07 | Willis | |
| | 6 | 6018747 | A | 2000-01-25 | Burns | |
| | 7 | 6195680 | B1 | 2001-02-27 | Goldszmidt | |
| | 8 | 6292941 | B1 | 2001-09-18 | Jollands | |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
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|---|---|---|---|---|---|---|
| | 9 | 6442605 | B1 | 2002-08-27 | Rodriguez | |
| | 10 | 6597956 | B1 | 2003-07-22 | Aziz | |
| | 11 | 6606744 | B1 | 2003-08-12 | Mikurak | |
| | 12 | 6745192 | B1 | 2004-06-01 | Libenzi | |
| | 13 | 6779177 | B1 | 2004-08-17 | Bahrs | |
| | 14 | 6871219 | B2 | 2005-03-22 | Noordergraaf | |
| | 15 | 6938057 | B2 | 2005-08-30 | Gusler | |
| | 16 | 6986005 | B2 | 2006-01-10 | Vo | |
| | 17 | 6990513 | B2 | 2006-01-24 | Belfiore | |
| | 18 | 6990573 | B2 | 2006-01-24 | Cherian | |
| | 19 | 7127712 | B1 | 2006-10-24 | Noble | |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
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| | Examiner Name | Edward Martello |
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|---|---|---|---|---|---|---|
| | 20 | 7150015 | B2 | 2006-12-12 | Pace | |
| | 21 | 7155714 | B2 | 2006-12-26 | Makris | |
| | 22 | 7200715 | B2 | 2007-04-03 | Kleiman | |
| | 23 | 7246221 | B1 | 2007-07-17 | Soltis | |
| | 24 | 7246351 | B2 | 2007-07-17 | Bloch | |
| | 25 | 7263551 | B2 | 2007-08-28 | Belfiore | |
| | 26 | 7290258 | B2 | 2007-10-30 | Steeb | |
| | 27 | 7331047 | B2 | 2008-02-12 | Chu | |
| | 28 | 7334157 | B1 | 2008-02-19 | Graf | |
| | 29 | 7430610 | B2 | 2008-09-30 | Pace | |
| | 30 | 7454462 | B2 | 2008-11-18 | Belfiore | |

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| | Attorney Docket Number | 139537 |

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|---|---|---|---|---|---|---|
| | 31 | 7467293 | B2 | 2008-12-16 | Zhang | |
| | 32 | 7496739 | B1 | 2009-02-24 | Raghavan | |
| | 33 | 7499988 | B2 | 2009-03-03 | Keohane | |
| | 34 | 7536686 | B2 | 2009-05-19 | Tan | |
| | 35 | 7549055 | B2 | 2009-06-16 | Zimmer | |
| | 36 | 7590653 | B2 | 2009-09-15 | Sparks | |
| | 37 | 7668938 | B1 | 2010-02-23 | Phillips | |
| | 38 | 7685148 | B2 | 2010-03-23 | Engquist | |

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| Examiner Initial* | Cite No | Publication Number | Kind Code[1] | Publication Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1 | 20020016891 | A1 | 2002-02-07 | Noel | |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 11709477 |
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| | Examiner Name | Edward Martello |
| | Attorney Docket Number | 139537 |

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|---|---|---|---|---|---|---|
| | 2 | 20020087813 | A1 | 2002-07-04 | Harris | |
| | 3 | 20020087846 | A1 | 2002-07-04 | Nickolls | |
| | 4 | 20030046511 | A1 | 2003-03-06 | Buch | |
| | 5 | 20030130832 | A1 | 2003-07-10 | Schulter | |
| | 6 | 20030233648 | A1 | 2003-12-18 | Earl | |
| | 7 | 20040015899 | A1 | 2004-01-22 | May | |
| | 8 | 20040078779 | A1 | 2004-04-22 | Dutt | |
| | 9 | 20040088473 | A1 | 2004-05-06 | Ogle | |
| | 10 | 20040199919 | A1 | 2004-10-07 | Tovinkere | |
| | 11 | 20050128319 | A1 | 2005-06-16 | Morino | |
| | 12 | 20060173993 | A1 | 2006-08-03 | Henseler | |

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| | Attorney Docket Number | 139537 |

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|---|---|---|---|---|---|---|
| | 13 | 20080229040 | A1 | 2008-09-18 | Honma | |

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| Examiner Initials* | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T[5] |
|---|---|---|---|
| | 1 | CALZAROSSA, M., and M. KUBÁT, "Processor Allocation in Parallel Systems," Proceedings of the IEEE International Conference on Computer Systems and Software Engineering (COMPEURO '91), Bologna, Italy, May 13–16, 1991, pp. 133–137. | ☐ |
| | 2 | CHEN, D., et al., "Exploiting High-Level Coherence Information to Optimize Distributed Shared State," Proceedings of the 9th ACM Symposium on Principles and Practice of Parallel Programming, San Diego, June 11–13, 2003, pp. 131–142. | ☐ |
| | 3 | COHEN, A., and M. WOODRING, "Win32 Multithreaded Programming," O'Reilly Online Catalog, Chapter 1, <http://www.oreilly.com/catalog/multithread/excerpt/ch01.html> [retrieved November 21, 2006], pp. 1–8. | ☐ |
| | 4 | COUTURIER, R., et al., "A Compiler for Parallel Unity Programs Using OpenMp," Proceedings of the International Conference on Parallel and Distributed Processing Techniques and Applications, Las Vegas, Nevada, June 28–July 1, 1999, pp. 1992–1998. | ☐ |
| | 5 | ISMAIL, I.M., and J.A. DAVIS, "Program-Based Static Allocation Policies for Highly Parallel Computers," Proceedings of the 1995 IEEE Fourteenth Annual International Phoenix Conference on Computers and Communications, Scottsdale, Arizona, March 28–31, 1995, pp. 61–68. | ☐ |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
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| | Application Number | 11709477 |
| | Filing Date | 2007-02-21 |
| | First Named Inventor | Kulkarni |
| | Art Unit | 2628 |
| | Examiner Name | Edward Martello |
| | Attorney Docket Number | 139537 |

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|---|---|---|---|
| | 6 | KANDEMIR, M., et al., "Minimizing Data and Synchronization Costs in One-Way Communication," IEEE Transactions on Parallel and Distributed Systems 11(12):1232–1251, December 2000. | ☐ |
| | 7 | LI, K.-C., et al., "Design Issue of a Novel Toolkit for Parallel Application Performance Monitoring and Analysis in Cluster and Grid Environments," Proceedings of the 8th International Symposium on Parallel Architectures, Algorithms and Networks (ISPAN'05), Las Vegas, Nev., December 7–9, 2005, 6 pages. | ☐ |
| | 8 | NGUYEN, T.M., et al., "Branching Store File System," U.S. Patent Application No. 11/026,622, filed December 30, 2004. | ☐ |
| | 9 | OHTA, K., et al., "Improving Parallel Write by Node Level Request Scheduling," Proceedings of the 9th IEEE/ACM International Symposium on Cluster Computing and the Grid, Shanghai, May 18–21, 2009, pp. 196–203. | ☐ |
| | 10 | OpenMP Fortran Application Program Interface (Version 2.0), November 2000, <http://www.openmp.org/drupal /mp-documents/fspec20.pdf>, pp. 1–3 and 34–36. | ☐ |
| | 11 | OpenMP Fortran Application Program Interface (Version 2.0), November 2000, <http://www.openmp.org/drupal /mp-documents/fspec20.pdf>, pp. 1–3, 18–19, 25–27, 34–37, and 67. | ☐ |
| | 12 | "Sequent's NUMA-Q SMP™ Architecture," Sequent Computer Systems, Inc., 1997, <http://parallel.ru/ftp/computers /sequent/NUMA_SMP_REV.pdf>, pp. 1–18. | ☐ |
| | 13 | SIVATHANU, G., et al., "Ensuring Data Integrity in Storage: Techniques and Applications," Proceedings of the 2005 ACM Workshop on Storage Security and Survivability (StorageSS '05), Alexandria, Va., November 7–10, 2005, pp. 26–36. | ☐ |
| | 14 | ZHU, T., et al., "Scheduling Divisible Loads in the Dynamic Heterogeneous Grid Environment," Proceedings of the First International Conference on Scalable Information Systems, Hong Kong, May 29–June 1, 2006, 10 pages. | ☐ |

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**EXAMINER SIGNATURE**

| Examiner Signature | | Date Considered | |
|---|---|---|---|

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 11709477 |
| | Filing Date | 2007-02-21 |
| | First Named Inventor | Kulkarni |
| | Art Unit | 2628 |
| | Examiner Name | Edward Martello |
| | Attorney Docket Number | 139537 |

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 11709477 |
| | Filing Date | 2007-02-21 |
| | First Named Inventor | Kulkarni |
| | Art Unit | 2628 |
| | Examiner Name | Edward Martello |
| | Attorney Docket Number | 139537 |

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

| Signature | /David P. Sheldon/ | Date (YYYY-MM-DD) | 2012-07-17 |
|---|---|---|---|
| Name/Print | David P. Sheldon | Registration Number | 62,494 |

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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.**

## Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 11709477 |
| **Filing Date:** | 21-Feb-2007 |
| **Title of Invention:** | Root image caching and indexing for block-level distributed application management |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Filer:** | David Patrick Sheldon/Constance Edgar |
| **Attorney Docket Number:** | 139537 |

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:** | | | | |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| Submission- Information Disclosure Stmt | 1806 | 1 | 180 | 180 |
| | | **Total in USD ($)** | | **180** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 13276391 |
| **Application Number:** | 11709477 |
| **International Application Number:** | |
| **Confirmation Number:** | 4127 |
| **Title of Invention:** | Root image caching and indexing for block-level distributed application management |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Customer Number:** | 52531 |
| **Filer:** | David Patrick Sheldon/Constance Edgar |
| **Filer Authorized By:** | David Patrick Sheldon |
| **Attorney Docket Number:** | 139537 |
| **Receipt Date:** | 17-JUL-2012 |
| **Filing Date:** | 21-FEB-2007 |
| **Time Stamp:** | 20:32:26 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | Credit Card |
| Payment was successfully received in RAM | $180 |
| RAM confirmation Number | 6570 |
| Deposit Account | 031740 |
| Authorized User | CHRISTENSEN, O'CONNOR, JOHNSON & KINDNESS |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | 39537_1st_Suppl_IDS.pdf | 614968<br>557e578cc5b30b7099ae41acf46db85bf2f30779 | no | 10 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Non Patent Literature | 39537_Calzarossa.pdf | 239637<br>274f2c7e7658309b32694f6bc62ae99571b827a3 | no | 5 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Non Patent Literature | 39537_Chen.pdf | 1317671<br>63175493168cd06c030b3d14f7471716524044a1 | no | 12 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Non Patent Literature | 39537_Cohen.pdf | 507911<br>fe9a2a3f4d07eea39e9442f3e1fd7b4154e40bd2 | no | 8 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Non Patent Literature | 39537_Couturier.pdf | 447680<br>6b8a745ca7278b85ec4529b85bb403801a9d1078 | no | 8 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 6 | Non Patent Literature | 39537_Ismail.pdf | 584913<br>d67cbf0114b27faa735d347d635eee05f99a4c16 | no | 8 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 7 | Non Patent Literature | 39537_Kandemir.pdf | 1815652<br>c6d5fddd5f475ad4bc25d1781609e5892d48f0cf | no | 20 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 8 | Non Patent Literature | 39537_Li.pdf | 485707<br>ab76031005caadde4d18db6bf7e503af3a6fe02e | no | 6 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

| | | | | | |
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| 9 | Non Patent Literature | 39537_Ohta.pdf | 666239<br>781449125741414422b3e8f91b16dd8a9d22e649 | no | 8 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 10 | Non Patent Literature | 39537_Sequents_NUMA-Q.pdf | 1274157<br>8cbfffc0383c09bce858a84f2c0f8d96438a3919 | no | 21 |
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| **Information:** | | | | | |
| 11 | Non Patent Literature | 39537_Sivathanu.pdf | 1216976<br>8caa4dc9955545233cbd4642aad13ec0369d127d | no | 11 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 12 | Non Patent Literature | 39537_Zhu.pdf | 807932<br>2ecd6f0fa9a939197bf67c8dfe34cd3a31a3ef88 | no | 10 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 13 | Non Patent Literature | 39537_OpenMP.pdf | 292065<br>bf940657891ff510344bee2af697f19941d639d5 | no | 6 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 14 | Non Patent Literature | 39537_OpenMP-2.pdf | 534605<br>99072b3306ebc28a61e72e67ef9b12cd794e8cd4 | no | 15 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 15 | Fee Worksheet (SB06) | fee-info.pdf | 30036<br>1d274c649e7201e7b55ff93ec1435b182fc90495 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | | **Total Files Size (in bytes):** | 10836149 | |

**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.**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | | | |
|---|---|---|---|
| Applicants: | P. Kulkarni et al. | Attorney Docket No.: | 139537 |
| Application No.: | 11/709477 | Art Unit: 2628 / Confirmation No.: | 4127 |
| Filed: | February 21, 2007 | Examiner: | E. Martello |
| Title: | ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT | | |

**REQUEST FOR CORRECTED FILING RECEIPT**

Seattle, Washington 98101
July 23, 2012

TO THE COMMISSIONER FOR PATENTS:
ATTN: OFFICE OF INITIAL PATENT EXAMINATION
FILING RECEIPT CORRECTIONS

In reviewing the official Filing Receipt for the above-identified patent application, applicants' attorney noted that the listing of domestic priority is incomplete.

Applicants' attorney therefore respectfully requests that the Filing Receipt be revised to read as follows:

Domestic Priority data as claimed by applicant:

This application is a CIP of 11/395,816 03/30/2006 **PAT 7,721,282**
**which is a CIP of 11/026,622 12/30/2004 ABN**

Submitted herewith is a Supplemental Application Data Sheet setting forth the complete chain of priority. Attached hereto is page 1 of the Filing Receipt with the correction and changes marked.

Respectfully submitted,

CHRISTENSEN O'CONNOR
JOHNSON KINDNESS[PLLC]

**/David P. Sheldon/**

David P. Sheldon
Registration No. 62,494
Direct Dial No. 206.695.1611

DPS:cae

LAW OFFICES OF
CHRISTENSEN O'CONNOR JOHNSON KINDNESS[PLLC]
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100

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 | FILING or 371(c) DATE | GRP ART UNIT | FIL FEE REC'D | ATTY.DOCKET.NO | TOT CLAIMS | IND CLAIMS |
|---|---|---|---|---|---|---|
| 11/709,477 | 02/21/2007 | 2628 | 1750 | ~~PNTA-P006-CNP-A~~ [3953] | 27 | 5 |

**CONFIRMATION NO. 4127**

41066
MURABITO, HAO & BARNES, LLP
TWO NORTH MARKET STREET, THIRD FLOOR
SAN JOSE, CA95113

**FILING RECEIPT**

Date Mailed: 04/02/2007

Receipt is acknowledged of this regular Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please mail to the Commissioner for Patents P.O. Box 1450 Alexandria Va 22313-1450. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).**

**Applicant(s)**

Pradip Kulkarni, Pune, INDIA;
Mukul Kumar, Pune, INDIA;
Adhir Potdar, ~~Maharashtra~~ INDIA; Pune
Richard Au, Woodside, CA;
Tung Nguyen, Cupertino, CA;

**Assignment For Published Patent Application**

~~Penta Systems, Inc.~~ Emendable Assets Limited Liability Company

**Power of Attorney:** The patent practitioners associated with Customer Number ~~41066~~ 52531

**Domestic Priority data as claimed by applicant**

This application is a CIP of 11/395,816 03/30/2006 PAT 7,721,282
which is a CIP of 11/026,622 12/30/2004 ABN

**Foreign Applications**

**If Required, Foreign Filing License Granted:** 04/02/2007

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US11/709,477**

**Projected Publication Date:** Request for Non-Publication Acknowledged

**Non-Publication Request:** Yes

**Early Publication Request:** No

# Supplemental Application Data Sheet

## Application Information

| | |
|---|---|
| Application Number:: | 11/709,477 |
| Filing Date:: | 02/21/07 |
| Application Type:: | Regular |
| Subject Matter:: | Utility |
| Suggested Classification:: | 345/557 |
| Suggested Group Art Unit:: | 2628 |
| Title:: | Root Image Caching and Indexing for Block-Level Distributed Application Management |
| Attorney Docket Number:: | 137957 |
| Request For Early Publication?:: | No |
| Request For Non-Publication?:: | Yes |
| Suggested Drawing Figure:: | |
| Total Drawing Sheets:: | 6 |
| Small Entity?:: | No |
| Petition Included?:: | No |
| Secrecy Order in Parent Appl.?:: | No |

## Applicant Information 1

| | |
|---|---|
| Applicant Authority Type:: | Inventor |
| Primary Citizenship Country:: | India |
| Status:: | Full Capacity |
| Given Name:: | Pradip |
| Family Name:: | Kulkarni |
| City of Residence:: | Pune |
| Country of Residence:: | India |
| Street of Mailing Address:: | 3B/11, Visava Park, D. P. Road, Aundh |
| City of Mailing Address:: | Pune |
| Country of Mailing Address:: | India |
| Postal or Zip Code of Mailing Address:: | 411007 |

## Applicant Information 2

| | |
|---|---|
| Applicant Authority Type:: | Inventor |
| Primary Citizenship Country:: | India |
| Status:: | Full Capacity |

| | |
|---|---|
| Given Name:: | Mukul |
| Family Name:: | Kumar |
| City of Residence:: | Pune |
| Country of Residence:: | India |
| Street of Mailing Address:: | Flat No. 7, ~~Nont~~ Mont Vert Solitaire,<br>S. No. 260/1, Aundh |
| City of Mailing Address:: | Pune |
| Country of Mailing Address:: | India |
| Postal or Zip Code of Mailing Address:: | 411007 |

**Applicant Information 3**

| | |
|---|---|
| Applicant Authority Type:: | Inventor |
| Primary Citizenship Country:: | India |
| Status:: | Full Capacity |
| Given Name:: | Adhir |
| Family Name:: | Potdar |
| City of Residence:: | ~~Maharahstra~~ Pune |
| Country of Residence:: | India |
| Street of Mailing Address:: | A1-21, Royal Orchard, Wireless Colony,<br>D. P. Road, Aundh |
| City of Mailing Address:: | Pune |
| Country of Mailing Address:: | India |
| Postal or Zip Code of Mailing Address:: | 411007 |

**Applicant Information 4**

| | |
|---|---|
| Applicant Authority Type:: | Inventor |
| Primary Citizenship Country:: | US |
| Status:: | Full Capacity |
| Given Name:: | Richard |
| Family Name:: | Au |
| City of Residence:: | Woodside |
| State or Province of Residence:: | CA |
| Country of Residence:: | US |
| Street of Mailing Address:: | 389 Moore Road |
| City of Mailing Address:: | Woodside |
| State or Province of Mailing Address:: | CA |
| Country of Mailing Address:: | US |

Postal or Zip Code of Mailing Address:: 94062

**Applicant Information 5**

Applicant Authority Type:: Inventor
Primary Citizenship Country:: US
Status:: Full Capacity
Given Name:: Tung
Family Name:: Nguyen
City of Residence:: Cupertino
State or Province of Residence:: CA
Country of Residence:: US
Street of Mailing Address:: 22346 McClellan Road
City of Mailing Address:: Cupertino
State or Province of Mailing Address:: CA
Country of Mailing Address:: US
Postal or Zip Code of Mailing Address:: 95014

**Correspondence Information**

Correspondence Customer Number:: 52531

**Representative Information**

| | | |
|---|---|---|
| Representative Customer Number:: | 52531 | |

**Domestic Priority Information**

| Application:: | Continuity Type:: | Parent Application:: | Parent Filing Date:: |
|---|---|---|---|
| 11/709,477 | Continuation-in-part of | 11/395,816 | 03/30/06 |
| 11/395,816 | Continuation-in-part of | 11/026,622 | 12/30/04 |

**Assignment Information**

Assignee Name:: ~~Panta Systems, Inc.~~ Emendable Assets Limited Liability Company
Street of Mailing Address:: ~~20450 Stevens Creek Blvd~~ 2711 Centerville Road, Suite 400
City of Mailing Address:: ~~Cupertino~~ Wilmington
State or Province of Mailing Address:: ~~CA~~ DE
Country of Mailing Address:: US
Postal or Zip Code of Mailing Address:: ~~95014~~ 19808

DPS:cae/ctg

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 13319233 |
| **Application Number:** | 11709477 |
| **International Application Number:** | |
| **Confirmation Number:** | 4127 |
| **Title of Invention:** | Root image caching and indexing for block-level distributed application management |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Customer Number:** | 52531 |
| **Filer:** | David Patrick Sheldon/Marzena Dixon |
| **Filer Authorized By:** | David Patrick Sheldon |
| **Attorney Docket Number:** | 139537 |
| **Receipt Date:** | 23-JUL-2012 |
| **Filing Date:** | 21-FEB-2007 |
| **Time Stamp:** | 19:12:55 |
| **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 | Request for Corrected Filing Receipt | 39537_Request_for_Corrected_Filing_Receipt.pdf | 200036<br>8708b37822cfeea69b707c65da13e3a0336776dc | no | 2 |

| | |
|---|---|
| **Warnings:** | |
| **Information:** | |

| | | | | | |
|---|---|---|---|---|---|
| 2 | Application Data Sheet | 39537_Supplemental_ADS.pdf | 62613<br>552ec07d87deea9612780ce5ccb98ad71a86edb9 | no | 3 |

| | |
|---|---|
| **Warnings:** | |
| **Information:** | |
| This is not an USPTO supplied ADS fillable form | |
| **Total Files Size (in bytes):** | 262649 |

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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.**

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 | FILING or 371(c) DATE | GRP ART UNIT | FIL FEE REC'D | ATTY.DOCKET.NO | TOT CLAIMS | IND CLAIMS |
|---|---|---|---|---|---|---|
| 11/709,477 | 02/21/2007 | 2628 | 1750 | 139537 | 27 | 5 |

**CONFIRMATION NO. 4127**

**CORRECTED FILING RECEIPT**

52531
CHRISTENSEN O'CONNOR JOHNSON KINDNESS PLLC
1420 FIFTH AVENUE
SUITE 2800
SEATTLE, WA 98101-2347

*OC000000055618546*

Date Mailed: 07/30/2012

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

**Applicant(s)**

Pradip Kulkarni, Pune, INDIA;
Mukul Kumar, Pune, INDIA;
Adhir Potdar, Pune, INDIA;
Richard Au, Woodside, CA;
Tung Nguyen, Cupertino, CA;

**Assignment For Published Patent Application**

Emendable Assets Limited Liability Company, Wilmington, DE

**Power of Attorney:** The patent practitioners associated with Customer Number 52531

**Domestic Priority data as claimed by applicant**

This application is a CIP of 11/395,816 03/30/2006 PAT 7721282
which is a CIP of 11/026,622 12/30/2004 ABN

**Foreign Applications** (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)

**If Required, Foreign Filing License Granted:** 04/02/2007

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 11/709,477**

**Projected Publication Date:** Request for Non-Publication Acknowledged

**Non-Publication Request:** Yes

**Early Publication Request:** No

**Title**

Root image caching and indexing for block-level distributed application management

**Preliminary Class**

345

## PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

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For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

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## Title 37, Code of Federal Regulations, 5.11 & 5.15

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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

# NOTICE OF ALLOWANCE AND FEE(S) DUE

52531 7590 08/06/2012

CHRISTENSEN O'CONNOR JOHNSON KINDNESS PLLC
1420 FIFTH AVENUE
SUITE 2800
SEATTLE, WA 98101-2347

| EXAMINER |
|---|
| MARTELLO, EDWARD |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2628 | |

DATE MAILED: 08/06/2012

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 11/709,477 | 02/21/2007 | Pradip Kulkarni | 139537 | 4127 |

TITLE OF INVENTION: ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT

| APPLN. TYPE | SMALL ENTITY | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE |
|---|---|---|---|---|---|---|
| nonprovisional | NO | $1740 | $0 | $0 | $1740 | 11/06/2012 |

**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.**

# 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)

52531 7590 08/06/2012

CHRISTENSEN O'CONNOR JOHNSON KINDNESS PLLC
1420 FIFTH AVENUE
SUITE 2800
SEATTLE, WA 98101-2347

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. |
|---|---|---|---|---|
| 11/709,477 | 02/21/2007 | Pradip Kulkarni | 139537 | 4127 |

TITLE OF INVENTION: ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT

| APPLN. TYPE | SMALL ENTITY | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE |
|---|---|---|---|---|---|---|
| nonprovisional | NO | $1740 | $0 | $0 | $1740 | 11/06/2012 |

| EXAMINER | ART UNIT | CLASS-SUBCLASS |
|---|---|---|
| MARTELLO, EDWARD | 2628 | 345-557000 |

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)

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.

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 11/709,477 | 02/21/2007 | Pradip Kulkarni | 139537 | 4127 |

52531 7590 08/06/2012

CHRISTENSEN O'CONNOR JOHNSON KINDNESS PLLC
1420 FIFTH AVENUE
SUITE 2800
SEATTLE, WA 98101-2347

| EXAMINER | |
|---|---|
| MARTELLO, EDWARD | |
| ART UNIT | PAPER NUMBER |
| 2628 | |

DATE MAILED: 08/06/2012

**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 1009 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 1009 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.

## Privacy Act Statement

**The Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

| Notice of Allowability | Application No. | Applicant(s) | |
|---|---|---|---|
| | 11/709,477 | KULKARNI ET AL. | |
| | Examiner | Art Unit | |
| | EDWARD MARTELLO | 2628 | |

***-- 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 *the amendment received 11 July 2012*.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-27*.
4. ☐ 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**.

5. ☐ 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.
6. ☐ 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).**
7. ☐ 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 07/17/2012
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 _____.

/Edward Martello/
Primary Examiner, Art Unit 2628

## DETAILED ACTION

### *Response to Amendment*

1. This Office Action is responsive to the Applicant initiated interview conducted on 10 July 2012 and the amendment received 11 July 2012.

2. Claims 1, 2, 4, 7, 10, 12, 14, 16, 21 and 23-27 are amended, claims 5, 8, 9, 11, 13, 15, 17-20 and 22 are as previously presented and claims 3 and 6 are as originally presented.

3. In summary, claims 1-27 are pending in the application.

4. The Applicants' remarks and arguments with respect to the 35 U.S.C. § 112 rejection of claims 4, 5, 14, 16 and 17 are persuasive, thus, the 35 U.S.C. § 112 rejection of claims 4, 5, 14, 16 and 17 is hereby withdrawn.

### *Reasons for Allowance*

5. The following is the Examiner's statement for reasons for allowance: In response to the Applicant initiated interview conducted on 10 July 2012 and the amendment received 11 July 2012, the Examiner has determined that the amended claims have overcome all the art of record and that art deemed available in an updated search as shown in the record, thus claims 1-27 are in condition for allowance and all remaining rejections of the claims are hereby withdrawn.

6. With regard to claim 7, claiming a method for providing data to a plurality of compute nodes, comprising: storing blocks of a root image of said compute nodes on a first storage unit;

storing leaf images for respective compute nodes on respective second storage units, said leaf images including only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of the root image, wherein said leaf images of respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; and caching blocks of said root image that have been accessed by at least one of said compute nodes in a cache memory are a unique combination of features and are non-obvious over the art of record.

7. With regard to claim 19, claiming a method for indexing file systems for a plurality of compute nodes, comprising: storing blocks of a root image of Said compute nodes on a first storage unit; storing leaf images for respective compute nodes on respective second storage units, said leaf images comprising only additional data blocks not previously contained in said root image and changes made by respective compute nodes to the blocks of the root image, wherein said leaf images for respective compute nodes do not include blocks of said root image that are unchanged by respective compute nodes; merging the blocks of said root image with the blocks of respective leaf images stored on respective second storage units to create respective file systems for respective, compute nodes; receiving indexing results pertaining to said root image from one of said compute nodes; and providing said indexing results to the others of said compute nodes are a unique combination of features and are non-obvious over the art of record.

8. Claims 1 and 23, claiming a system and a computer readable storage medium, respectively, incorporate the methods of claim 7, thus, they are of the same features and scope as

claim 7 and contain a unique combination of features which are non-obvious over the art of record.

9. Claim 14, claiming a system incorporating the methods of claim 19, is also a unique combination of features and is non-obvious over the art of record.

10. 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***

11. 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.

/Edward Martello/

Primary Examiner, Art Unit 2628

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

**INFORMATION DISCLOSURE STATEMENT BY APPLICANT**
**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 11709477 |
| Filing Date | 2007-02-21 |
| First Named Inventor | Kulkarni |
| Art Unit | 2628 |
| Examiner Name | Edward Martello |
| Attorney Docket Number | 139537 |

**U.S.PATENTS** Remove

| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1 | 5113523 | A | 1992-05-12 | Colley | |
| | 2 | 5127104 | A | 1992-06-30 | Dennis | |
| | 3 | 5764902 | A | 1998-06-09 | Rothrock | |
| | 4 | 5974547 | A | 1999-10-26 | Klimenko | |
| | 5 | 5999734 | A | 1999-12-07 | Willis | |
| | 6 | 6018747 | A | 2000-01-25 | Burns | |
| | 7 | 6195680 | B1 | 2001-02-27 | Goldszmidt | |
| | 8 | 6292941 | B1 | 2001-09-18 | Jollands | |


ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.M./

| Receipt date: 07/17/2012 | | |
|---|---|---|
| **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** ( **Not for submission under 37 CFR 1.99)** | Application Number | 11709477 |
| | Filing Date | 2007-02-21 |
| | First Named Inventor | Kulkarni |
| | Art Unit | 2628 |
| | Examiner Name | Edward Martello |
| | Attorney Docket Number | 139537 |

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|---|---|---|---|---|---|---|
| | 9 | 6442605 | B1 | 2002-08-27 | Rodriguez | |
| | 10 | 6597956 | B1 | 2003-07-22 | Aziz | |
| | 11 | 6606744 | B1 | 2003-08-12 | Mikurak | |
| | 12 | 6745192 | B1 | 2004-06-01 | Libenzi | |
| | 13 | 6779177 | B1 | 2004-08-17 | Bahrs | |
| | 14 | 6871219 | B2 | 2005-03-22 | Noordergraaf | |
| | 15 | 6938057 | B2 | 2005-08-30 | Gusler | |
| | 16 | 6986005 | B2 | 2006-01-10 | Vo | |
| | 17 | 6990513 | B2 | 2006-01-24 | Belfiore | |
| | 18 | 6990573 | B2 | 2006-01-24 | Cherian | |
| | 19 | 7127712 | B1 | 2006-10-24 | Noble | |



ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.M./

| Receipt date: 07/17/2012 | | |
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| | Art Unit | 2628 |
| | Examiner Name | Edward Martello |
| | Attorney Docket Number | 139537 |

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|---|---|---|---|---|---|---|
| | 20 | 7150015 | B2 | 2006-12-12 | Pace | |
| | 21 | 7155714 | B2 | 2006-12-26 | Makris | |
| | 22 | 7200715 | B2 | 2007-04-03 | Kleiman | |
| | 23 | 7246221 | B1 | 2007-07-17 | Soltis | |
| | 24 | 7246351 | B2 | 2007-07-17 | Bloch | |
| | 25 | 7263551 | B2 | 2007-08-28 | Belfiore | |
| | 26 | 7290258 | B2 | 2007-10-30 | Steeb | |
| | 27 | 7331047 | B2 | 2008-02-12 | Chu | |
| | 28 | 7334157 | B1 | 2008-02-19 | Graf | |
| | 29 | 7430610 | B2 | 2008-09-30 | Pace | |
| | 30 | 7454462 | B2 | 2008-11-18 | Belfiore | |



ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.M./

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| | Art Unit | 2628 |
| | Examiner Name | Edward Martello |
| | Attorney Docket Number | 139537 |

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|---|---|---|---|---|---|---|
| | 31 | 7467293 | B2 | 2008-12-16 | Zhang | |
| | 32 | 7496739 | B1 | 2009-02-24 | Raghavan | |
| | 33 | 7499988 | B2 | 2009-03-03 | Keohane | |
| | 34 | 7536686 | B2 | 2009-05-19 | Tan | |
| | 35 | 7549055 | B2 | 2009-06-16 | Zimmer | |
| | 36 | 7590653 | B2 | 2009-09-15 | Sparks | |
| | 37 | 7668938 | B1 | 2010-02-23 | Phillips | |
| | 38 | 7685148 | B2 | 2010-03-23 | Engquist | |

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| Examiner Initial* | Cite No | Publication Number | Kind Code[1] | Publication Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1 | 20020016891 | A1 | 2002-02-07 | Noel | |

| Receipt date: 07/17/2012 | | |
|---|---|---|
| **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** ( **Not for submission under 37 CFR 1.99**) | Application Number | 11709477 |
| | Filing Date | 2007-02-21 |
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| | Art Unit | 2628 |
| | Examiner Name | Edward Martello |
| | Attorney Docket Number | 139537 |

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|---|---|---|---|---|---|---|
| | 2 | 20020087813 | A1 | 2002-07-04 | Harris | |
| | 3 | 20020087846 | A1 | 2002-07-04 | Nickolls | |
| | 4 | 20030046511 | A1 | 2003-03-06 | Buch | |
| | 5 | 20030130832 | A1 | 2003-07-10 | Schulter | |
| | 6 | 20030233648 | A1 | 2003-12-18 | Earl | |
| | 7 | 20040015899 | A1 | 2004-01-22 | May | |
| | 8 | 20040078779 | A1 | 2004-04-22 | Dutt | |
| | 9 | 20040088473 | A1 | 2004-05-06 | Ogle | |
| | 10 | 20040199919 | A1 | 2004-10-07 | Tovinkere | |
| | 11 | 20050128319 | A1 | 2005-06-16 | Morino | |
| | 12 | 20060173993 | A1 | 2006-08-03 | Henseler | |



ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.M./

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| | Filing Date | 2007-02-21 |
| | First Named Inventor | Kulkarni |
| | Art Unit | 2628 |
| | Examiner Name | Edward Martello |
| | Attorney Docket Number | 139537 |

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|---|---|---|---|---|---|---|
| | 13 | 20080229040 | A1 | 2008-09-18 | Honma | |

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**FOREIGN PATENT DOCUMENTS** Remove

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] ¡ | Kind Code[4] | Publication Date | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear | T[5] |
|---|---|---|---|---|---|---|---|---|
| | 1 | | | | | | | ☐ |

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**NON-PATENT LITERATURE DOCUMENTS** Remove

| Examiner Initials* | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T[5] |
|---|---|---|---|
| | 1 | CALZAROSSA, M., and M. KUBÁT, "Processor Allocation in Parallel Systems," Proceedings of the IEEE International Conference on Computer Systems and Software Engineering (COMPEURO '91), Bologna, Italy, May 13–16, 1991, pp. 133–137. | ☐ |
| | 2 | CHEN, D., et al., "Exploiting High-Level Coherence Information to Optimize Distributed Shared State," Proceedings of the 9th ACM Symposium on Principles and Practice of Parallel Programming, San Diego, June 11–13, 2003, pp. 131–142. | ☐ |
| | 3 | COHEN, A., and M. WOODRING, "Win32 Multithreaded Programming," O'Reilly Online Catalog, Chapter 1, <http://www.oreilly.com/catalog/multithread/excerpt/ch01.html> [retrieved November 21, 2006], pp. 1–8. | ☐ |
| | 4 | COUTURIER, R., et al., "A Compiler for Parallel Unity Programs Using OpenMp," Proceedings of the International Conference on Parallel and Distributed Processing Techniques and Applications, Las Vegas, Nevada, June 28–July 1, 1999, pp. 1992–1998. | ☐ |
| | 5 | ISMAIL, I.M., and J.A. DAVIS, "Program-Based Static Allocation Policies for Highly Parallel Computers," Proceedings of the 1995 IEEE Fourteenth Annual International Phoenix Conference on Computers and Communications, Scottsdale, Arizona, March 28–31, 1995, pp. 61–68. | ☐ |

| Receipt date: 07/17/2012<br>**INFORMATION DISCLOSURE STATEMENT BY APPLICANT**<br>**( Not for submission under 37 CFR 1.99)** | | |
|---|---|---|
| | Application Number | 11709477 |
| | Filing Date | 2007-02-21 |
| | First Named Inventor | Kulkarni |
| | Art Unit | 2628 |
| | Examiner Name | Edward Martello |
| | Attorney Docket Number | 139537 |

| | | | |
|---|---|---|---|
| | 6 | KANDEMIR, M., et al., "Minimizing Data and Synchronization Costs in One-Way Communication," IEEE Transactions on Parallel and Distributed Systems 11(12):1232–1251, December 2000. | ☐ |
| | 7 | LI, K.-C., et al., "Design Issue of a Novel Toolkit for Parallel Application Performance Monitoring and Analysis in Cluster and Grid Environments," Proceedings of the 8th International Symposium on Parallel Architectures, Algorithms and Networks (ISPAN'05), Las Vegas, Nev., December 7–9, 2005, 6 pages. | ☐ |
| | 8 | NGUYEN, T.M., et al., "Branching Store File System," U.S. Patent Application No. 11/026,622, filed December 30, 2004. | ☐ |
| | 9 | OHTA, K., et al., "Improving Parallel Write by Node Level Request Scheduling," Proceedings of the 9th IEEE/ACM International Symposium on Cluster Computing and the Grid, Shanghai, May 18–21, 2009, pp. 196–203. | ☐ |
| | 10 | OpenMP Fortran Application Program Interface (Version 2.0), November 2000, <http://www.openmp.org/drupal /mp-documents/fspec20.pdf>, pp. 1–3 and 34–36. | ☐ |
| | 11 | OpenMP Fortran Application Program Interface (Version 2.0), November 2000, <http://www.openmp.org/drupal /mp-documents/fspec20.pdf>, pp. 1–3, 18–19, 25–27, 34–37, and 67. | ☐ |
| | 12 | "Sequent's NUMA-Q SMP™ Architecture," Sequent Computer Systems, Inc., 1997, <http://parallel.ru/ftp/computers /sequent/NUMA_SMP_REV.pdf>, pp. 1–18. | ☐ |
| | 13 | SIVATHANU, G., et al., "Ensuring Data Integrity in Storage: Techniques and Applications," Proceedings of the 2005 ACM Workshop on Storage Security and Survivability (StorageSS '05), Alexandria, Va., November 7–10, 2005, pp. 26–36. | ☐ |
| | 14 | ZHU, T., et al., "Scheduling Divisible Loads in the Dynamic Heterogeneous Grid Environment," Proceedings of the First International Conference on Scalable Information Systems, Hong Kong, May 29–June 1, 2006, 10 pages. | ☐ |

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**EXAMINER SIGNATURE**

| Examiner Signature | /Edward Martello/ | Date Considered | 07/18/2012 |
|---|---|---|---|

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.M./

EFS Web 2.1.17

Receipt date: 07/17/2012

**INFORMATION DISCLOSURE STATEMENT BY APPLICANT**

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 11709477 |
| Filing Date | 2007-02-21 |
| First Named Inventor | Kulkarni |
| Art Unit | 2628 |
| Examiner Name | Edward Martello |
| Attorney Docket Number | 139537 |

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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Receipt date: 07/17/2012

# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**( Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| Application Number | 11709477 |
| Filing Date | 2007-02-21 |
| First Named Inventor | Kulkarni |
| Art Unit | 2628 |
| Examiner Name | Edward Martello |
| Attorney Docket Number | 139537 |

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

| | | | |
|---|---|---|---|
| Signature | /David P. Sheldon/ | Date (YYYY-MM-DD) | 2012-07-17 |
| Name/Print | David P. Sheldon | Registration Number | 62,494 |

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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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The information provided by you in this form will be subject to the following routine uses:

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# BIB DATA SHEET

**CONFIRMATION NO. 4127**

| SERIAL NUMBER | FILING or 371(c) DATE | CLASS | GROUP ART UNIT | ATTORNEY DOCKET NO. |
|---|---|---|---|---|
| 11/709,477 | 02/21/2007<br>RULE | 345 | 2628 | 139537 |

**APPLICANTS**

Pradip Kulkarni, Pune, INDIA;
Mukul Kumar, Pune, INDIA;
Adhir Potdar, Pune, INDIA;
Richard Au, Woodside, CA;
Tung Nguyen, Cupertino, CA;

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

This application is a CIP of 11/395,816 03/30/2006 PAT 7,721,282
which is a CIP of 11/026,622 12/30/2004 ABN

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

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

04/02/2007

| Foreign Priority claimed | ☐ Yes ☑ No | ☐ Met after Allowance | STATE OR COUNTRY | SHEETS DRAWINGS | TOTAL CLAIMS | INDEPENDENT CLAIMS |
|---|---|---|---|---|---|---|
| 35 USC 119(a-d) conditions met | ☐ Yes ☐ No | | INDIA | 6 | 27 | 5 |
| Verified and Acknowledged | /EDWARD MARTELLO/ Examiner's Signature | Initials | | | | |

**ADDRESS**

CHRISTENSEN O'CONNOR JOHNSON KINDNESS PLLC
1420 FIFTH AVENUE
SUITE 2800
SEATTLE, WA 98101-2347
UNITED STATES

**TITLE**

Root image caching and indexing for block-level distributed application management

| FILING FEE RECEIVED | FEES: Authority has been given in Paper | ☐ All Fees |
|---|---|---|
| 1750 | No._____ to charge/credit DEPOSIT ACCOUNT | ☐ 1.16 Fees (Filing) |
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BIB (Rev. 05/07).

| Issue Classification | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 11709477 | KULKARNI ET AL. |
| | **Examiner** | **Art Unit** |
| | EDWARD MARTELLO | 2628 |

| ORIGINAL | | INTERNATIONAL CLASSIFICATION | |
|---|---|---|---|
| CLASS | SUBCLASS | CLAIMED | NON-CLAIMED |
| 717 | 176 | G 0 6 F 9 / 445 (2006.01.01) | |

**CROSS REFERENCE(S)**

| CLASS | SUBCLASS (ONE SUBCLASS PER BLOCK) | | | | |
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☒ 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 | Final | Original |
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| NONE | | **Total Claims Allowed:** | |
|---|---|---|---|
| (Assistant Examiner) | (Date) | 27 | |
| /EDWARD MARTELLO/<br>Primary Examiner.Art Unit 2628 | 07/26/2012 | O.G. Print Claim(s) | O.G. Print Figure |
| (Primary Examiner) | (Date) | 7 & 19 | 3A |

U.S. Patent and Trademark Office

Part of Paper No. 20120726

**EAST Search History**

**EAST Search History (Prior Art)**

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
|---|---|---|---|---|---|---|
| S3 | 1 | root WITH image SAME caching | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/16 08:50 |
| S4 | 60 | root WITH image SAME cach$3 | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/16 08:52 |
| S5 | 12 | ("5113523" \| "5127104" \| "5999734" \| "6018747" \| "6502238" \| "7200715" \| "7246351" \| "7263551" \| "7331047" \| "7467293" \| "7475274" \| "7496739").PN. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/16 08:55 |
| S6 | 3 | ("6421777" \| "6751658" \| "20030126242").PN. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 12:30 |
| S7 | 21 | ((base or kernel) WITH code) WITH image SAME cach$3 | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 15:43 |
| S8 | 2 | ("6502238" \| "7475274").PN. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 16:11 |
| S9 | 10 | (US-20030126242-$ or US-20060179308-$ or US-20070061787-$ or US-20070198772-$).did. or (US-6751658-$ or US-6421777-$ or US-6101576-$ or US-6651245-$ or US-7475274-$ or US-6502238-$).did. | US-PGPUB; USPAT | ADJ | ON | 2009/12/23 16:39 |
| S10 | 8 | S9 AND cache | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2009/12/23 16:39 |
| S11 | 317 | 345/557.ccls. | US-PGPUB; USPAT; | ADJ | ON | 2009/12/24 11:14 |

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| | | | USOCR; EPO; JPO | | | |
| S12 | 6 | ("20020083120" \| "20050131962" \| "5175852" \| "6502238" \| "7269664" \| "7475274").PN. | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2010/05/11 08:06 |
| S13 | 283 | (((root OR base OR kernel) WITH (software OR code OR binary)) SAME image) SAME2 cach$3 | US-PGPUB; USPAT; USOCR; EPO; JPO | ADJ | ON | 2010/05/11 08:26 |
| S14 | 22 | ("5999734" \| "7475274" \| "7496739" \| "5764902" \| "7263551" \| "7467293" \| "6195680" \| "5127104" \| "6990513" \| "7331047" \| "6779177" \| "7127712" \| "7150015" \| "6502238" \| "6606744" \| "5113523" \| "7246351" \| "6018747" \| "7200715" \| "6292941" \| "7155714" \| "7454462").PN. | US-PGPUB; USPAT; EPO | ADJ | ON | 2012/02/29 16:51 |
| S15 | 3 | (6721846\|7870106\|8001323).PN. | US-PGPUB; USPAT; EPO | ADJ | ON | 2012/03/08 11:19 |
| S16 | 11 | ("20030236927" \| "6751658" \| "20020083120" \| "6421777" \| "6502238" \| "7475274" \| "5175852" \| "20030126242" \| "20050131962" \| "6101576" \| "7269664").PN. | US-PGPUB; USPAT; EPO | ADJ | ON | 2012/07/09 15:29 |
| S17 | 30 | client node cach$3 | US-PGPUB; USPAT; EPO | ADJ | ON | 2012/07/16 11:49 |
| S18 | 2305 | 709/213.ccls. | US-PGPUB; USPAT; EPO | ADJ | ON | 2012/07/16 12:03 |
| S19 | 1022 | cache AND 709/213.ccls. | US-PGPUB; USPAT; EPO | ADJ | ON | 2012/07/16 12:04 |
| S20 | 195 | ((program WITH (data OR code)) SAME cache) AND 709/213.ccls. | US-PGPUB; USPAT; EPO | ADJ | ON | 2012/07/16 12:07 |
| S21 | 51 | ("20020016891" \| "20020087813" \| "20020087846" \| "20030046511" \| "20030130832" \| "20030233648" \| "20040015899" \| "20040078779" \| "20040088473" \| "20040199919" \| "20050128319" \| "20060173993" \| "20080229040" \| "5113523" \| "5127104" \| "5764902" \| "5974547" \| "5999734" \| "6018747" \| "6195680" \| "6292941" \| "6442605" \| "6597956" \| "6606744" \| "6745192" \| "6779177" \| "6871219" \| "6938057" \| "6986005" \| "6990513" \| | US-PGPUB; USPAT; EPO | ADJ | ON | 2012/07/18 20:10 |

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| | | "6990573" \| "7127712" \| "7150015" \| "7155714" \| "7200715" \| "7246221" \| "7246351" \| "7263551" \| "7290258" \| "7331047" \| "7334157" \| "7430610" \| "7454462" \| "7467293" \| "7496739" \| "7499988" \| "7536686" \| "7549055" \| "7590653" \| "7668938" \| "7685148").PN. | | | | |
| S22 | 854 | 717/176.ccls. | US-PGPUB; USPAT; EPO | ADJ | ON | 2012/07/26 15:47 |
| S23 | 199843 | ((provid&3 OR send$3 OR push$3 OR trans$7 OR updat$3) WITH (data OR code OR iamge OR applicat$3 OR (operat$3 system) OR OS)) AND comput$3 AND node AND (stor$3 OR sav$3) AND (root OR base) | US-PGPUB; USPAT; EPO | ADJ | ON | 2012/07/27 08:06 |

**EAST Search History (Interference)**

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
|---|---|---|---|---|---|---|
| S24 | 208 | (((provid$3 OR send$3 OR push$3 OR trans$7 OR updat$3) WITH (data OR code OR iamge OR applicat$3 OR (operat$3 system) OR OS)) AND cache AND comput$3 AND node AND (stor$3 OR sav$3) AND (root OR base)).CLM. | US-PGPUB; USPAT; UPAD | ADJ | ON | 2012/07/27 08:20 |
| S25 | 14 | (((provid$3 OR send$3 OR push$3 OR trans$7 OR updat$3) WITH (data OR code OR iamge OR applicat$3 OR (operat$3 system) OR OS)) AND cache AND comput$3 AND node AND (first NEAR (stor$3 OR sav$3)) AND (root OR base)).CLM. | US-PGPUB; USPAT; UPAD | ADJ | ON | 2012/07/27 08:24 |
| S26 | 6 | (((provid$3 OR send$3 OR push$3 OR trans$7 OR updat$3) WITH (data OR code OR iamge OR applicat$3 OR (operat$3 system) OR OS)) AND cache AND comput$3 AND node AND (first NEAR (stor$3 OR sav$3)) AND (second NEAR (stor$3 OR sav$3)) AND (root OR base)).CLM. | US-PGPUB; USPAT; UPAD | ADJ | ON | 2012/07/27 08:25 |
| S27 | 1 | (((provid$3 OR send$3 OR push$3 OR trans$7 OR updat$3) WITH (data OR code OR iamge OR applicat$3 OR (operat$3 system) OR OS)) AND cache AND comput$3 AND node AND (first NEAR (stor$3 OR sav$3)) AND (leaf OR termin$3) AND (second NEAR (stor$3 OR sav$3)) AND (root OR base)).CLM. | US-PGPUB; USPAT; UPAD | ADJ | ON | 2012/07/27 08:27 |

**7/27/2012 8:32:55 AM**
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| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 11709477 | KULKARNI ET AL. |
| | Examiner | Art Unit |
| | Edward Martello | 2628 |

## SEARCHED

| Class | Subclass | Date | Examiner |
|---|---|---|---|
| 345 | 557 | 10/26/2009 | /EM/ |
| 717 | 176 | 07/26/2012 | /EM/ |

## SEARCH NOTES

| Search Notes | Date | Examiner |
|---|---|---|
| eDAN Inventor Name Search | 10/26/2009 | /EM/ |
| See attached EAST Search History | 12/16/2009 | /EM/ |
| See attached EAST Search History | 12/23/2009 | /EM/ |
| See attached EAST Search History | 05/11/2010 | /EM/ |
| See attached EAST Search History | 02/29/2012 | /EM/ |
| See attached EAST Search History | 03/08/2012 | /EM/ |
| See attached EAST Search History | 07/09/2012 | /EM/ |
| See attached EAST Search History | 07/16/2012 | /EM/ |
| See attached EAST Search History | 07/18/2012 | /EM/ |
| See attached EAST Search History | 07/26/2012 | /EM/ |
| See attached EAST Search History | 07/27/2012 | /EM/ |

## INTERFERENCE SEARCH

| Class | Subclass | Date | Examiner |
|---|---|---|---|
| All | All | 07/27/2012 | /EM/ |

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | | | |
|---|---|---|---|
| Applicants: | P. Kulkarni et al. | Attorney Docket No.: | 139537 |
| Application No.: | 11/709477 | Art Unit: 2628 / Confirmation No.: | 4127 |
| Filed: | February 21, 2007 | Examiner: | E. Martello |
| Title: | ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT | | |

STATEMENT OF SUBSTANCE OF INTERVIEW

Seattle, Washington 98101

August 17, 2012

TO THE COMMISSIONER FOR PATENTS:

Applicants thank Examiner Martello for his time during a telephone interview with the undersigned attorney on July 10, 2012. Applicants presented reasoning regarding the position that Claims 4, 5, 14, 16, and 17 were definite. Applicants also argued that the Nguyen reference does not anticipate Claims 19-27, and is not valid prior art under Section 103. Though the Examiner stated that the arguments would be considered upon submission of a formal response, no agreement was reached with regard to patentability.

Respectfully submitted,

CHRISTENSEN O'CONNOR
JOHNSON KINDNESS$^{PLLC}$



David P. Sheldon
Registration No. 62,494
Direct Dial No. 206.695.1611

DPS:lal

LAW OFFICES OF
CHRISTENSEN O'CONNOR JOHNSON KINDNESS$^{PLLC}$
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 13527905 |
| **Application Number:** | 11709477 |
| **International Application Number:** | |
| **Confirmation Number:** | 4127 |
| **Title of Invention:** | ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Customer Number:** | 52531 |
| **Filer:** | David Patrick Sheldon/Lori Lewis |
| **Filer Authorized By:** | David Patrick Sheldon |
| **Attorney Docket Number:** | 139537 |
| **Receipt Date:** | 17-AUG-2012 |
| **Filing Date:** | 21-FEB-2007 |
| **Time Stamp:** | 17:48:39 |
| **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 | Applicant summary of interview with examiner | 39537_Statement_of_Substance_of_Interview.pdf | 196520<br>0e997616de3de8ca418d71b68f26737f62a0adc4 | no | 1 |

| | |
|---|---|
| **Warnings:** | |
| **Information:** | |

| | |
|---|---|
| **Total Files Size (in bytes):** | 196520 |

**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.**

# 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)

52531 7590 08/06/2012

CHRISTENSEN O'CONNOR JOHNSON KINDNESS PLLC
1420 FIFTH AVENUE
SUITE 2800
SEATTLE, WA 98101-2347

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. |
|---|---|---|---|---|
| 11/709,477 | 02/21/2007 | Pradip Kulkarni | 139537 | 4127 |

TITLE OF INVENTION: ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT

| APPLN. TYPE | SMALL ENTITY | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE |
|---|---|---|---|---|---|---|
| nonprovisional | NO | ~~$1740~~ $1770 | $0 | $0 | ~~$1740~~ $1770 | 11/06/2012 |

| EXAMINER | ART UNIT | CLASS-SUBCLASS |
|---|---|---|
| MARTELLO, EDWARD | 2628 | 345-557000 |

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 CHRISTENSEN O'CONNOR JOHNSON KINDNESS PLLC

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: Emendable Assets Limited Liability Company

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Wilmington, Delaware

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 attached.

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 03-1740 [illegible]

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 /David P. Sheldon/ Date November 6, 2012

Typed or printed name David P. Sheldon Registration No. 62,494

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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | | | |
|---|---|---|---|
| Applicants: | P. Kulkarni et al. | Attorney Docket No.: | 139537 |
| Application No.: | 11/709477 | Art Unit: 2628 / Confirmation No.: | 4127 |
| Filed: | February 21, 2007 | Examiner: | E. Martello |
| Title: | ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT | | |

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

Seattle, Washington 98101

November 6, 2012

TO THE COMMISSIONER FOR PATENTS:

Applicants thank the Examiner for the issuance of the Notice of Allowance mailed August 6, 2012, in the above-identified application. Applicants agree that the claims are allowable and note that there are reasons for allowance not explicitly stated by the Examiner. For example, applicants do not accede to Examiner's characterization of the cited references, and further note that none of the cited art teaches the claimed invention as a whole. The application also includes allowed claims containing subject matter that is not repeated by the Examiner in the Statement of Reasons for Allowance. The subject matter of these claims provides additional basis for allowance of the application.

Further, applicants disagree with the characterization of the claims provided in the Notice of Allowance. In particular, the Notice of Allowance stated that Claim 23 incorporates the method of Claim 7. Applicants respectfully disagree. For example, Claim 7 includes recitations related to caching blocks of a root image. Claim 23 does not include such a recitation. Hence, applicants respectfully submit that Claim 23 does not incorporate the method of Claim 7.

The Notice of Allowance also stated that Claim 1 incorporates the method of Claim 7, and that Claim 14 incorporates the method of Claim 19. To the extent that the Notice of Allowance alleged that Claim 1 includes all of the limitations of Claim 7, and that Claim 14



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CHRISTENSEN O'CONNOR JOHNSON KINDNESS PLLC
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100

includes all of the limitations of Claim 19, applicants respectfully disagree. The claim language is not identical and should therefore not be considered to have identical scope.

Finally, the Notice of Allowance stated that "In response to the Applicant initiated interview conducted on 10 July 2012 and the amendment received 11 July 2012, the Examiner has determined that the amended claims have overcome all the art of record[.]" (Notice of Allowance, page 2.) To the extent that this comment implies that the amendments submitted on 11 July 2012, were necessary to overcome the art of record, applicants respectfully disagree. The amendments submitted on 11 July 2012, were directed to matters of form and to improve the clarity of the claims, and were not required to overcome the art of record.

Respectfully submitted,

CHRISTENSEN O'CONNOR
JOHNSON KINDNESS[PLLC]

/David P. Sheldon/

David P. Sheldon
Registration No. 62,494
Direct Dial No. 206.695.1611

DPS:dps

LAW OFFICES OF
CHRISTENSEN O'CONNOR JOHNSON KINDNESS[PLLC]
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 11709477 |
| **Filing Date:** | 21-Feb-2007 |
| **Title of Invention:** | ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Filer:** | David Patrick Sheldon/Janet Berdine |
| **Attorney Docket Number:** | 139537 |

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 | 1770 | 1770 |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| | | | **Total in USD ($)** | **1770** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 14165823 |
| **Application Number:** | 11709477 |
| **International Application Number:** | |
| **Confirmation Number:** | 4127 |
| **Title of Invention:** | ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Customer Number:** | 52531 |
| **Filer:** | David Patrick Sheldon/Janet Berdine |
| **Filer Authorized By:** | David Patrick Sheldon |
| **Attorney Docket Number:** | 139537 |
| **Receipt Date:** | 06-NOV-2012 |
| **Filing Date:** | 21-FEB-2007 |
| **Time Stamp:** | 20:20:28 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | Credit Card |
| Payment was successfully received in RAM | $1770 |
| RAM confirmation Number | 18943 |
| Deposit Account | 031740 |
| Authorized User | CHRISTENSEN, O'CONNOR, JOHNSON & KINDNESS |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

## 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) | 39537_Issue_Fee_Transmittal.pdf | 1125041<br>44fb612b2b07eac35c4c27086eab91b72c73c07f | no | 1 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Post Allowance Communication - Incoming | 39537_Comments_on_Reasons_for_Allowance.pdf | 19226<br>35a4be6db9959a3ec11ada9b1e5c17490f916e7c | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Fee Worksheet (SB06) | fee-info.pdf | 30378<br>e4a06b57730cd46ec025418effcd8e43230d5f44 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 1174645 | | |

**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.**

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. | ISSUE DATE | PATENT NO. | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 11/709,477 | 12/11/2012 | 8332844 | 139537 | 4127 |

52531 7590 11/21/2012

CHRISTENSEN O'CONNOR JOHNSON KINDNESS PLLC
1420 FIFTH AVENUE
SUITE 2800
SEATTLE, WA 98101-2347

# 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 1193 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):

Pradip Kulkarni, Pune, INDIA;
Mukul Kumar, Pune, INDIA;
Adhir Potdar, Pune, INDIA;
Richard Au, Woodside, CA;
Tung Nguyen, Cupertino, CA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

PTO/SB/44 (09-07)
Approved for use through 08/31/2013. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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.
(Also Form PTO-1050)

# UNITED STATES PATENT AND TRADEMARK OFFICE
## CERTIFICATE OF CORRECTION



PATENT NO. : 8,332,844 B1

APPLICATION NO. : 11/709,477

ISSUE DATE : December 11, 2012

INVENTOR(S) : Kulkarni, et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On Page 2, in Field (56), under "OTHER PUBLICATIONS", in Column 2, Lines 28-30, delete "OpenMP Fortan……..34-36.".

In Column 3, Line 8, delete "system," and insert - - system - -, therefor.

In Column 3, Line 54, delete "Magnetic" and insert - - magnetic - -, therefor.

In Column 7, Line 55, delete "306" and insert - - 300 - -, therefor.

In Column 8, Line 50, delete "computer, readable" and insert - - computer readable - -, therefor.

In Column 13, Line 11, in Claim 23, delete "and," and insert - - and - -, therefor.

MAILING ADDRESS OF SENDER (Please do not use customer number below):

Maschoff Brennan Laycock Gilmore Israelsen & Wright, PLLC
1389 Center Drive, Suite 300
Park City, Utah 84098, United States

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. 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 1.0 hour 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: Attention Certificate of Corrections Branch, 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.*

# Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

PATENT NO.: 8,332,844

USPTO CONFIRMATION CODE: 4127

APPLICATION NO.: 11/709,477

FILED: February 21, 2007

EXAMINER: Edward Martello

GROUP ART UNIT: 2678

FOR: ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT

37 CFR 1.322 & 37 CFR 1.323 REQUEST FOR CERTIFICATE OF CORRECTION FOR USPTO AND/OR APPLICANT MISTAKE

Commissioner for Patents
Office of Patent Publication
ATTN: Certificate of Correction Branch
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

A certificate of correction under 35 USC 254 is respectfully requested in the above-identified patent.

It is believed that all errors identified herein were the fault of the USPTO, and no fee is required. In the event that a further fee is required, please charge the amount to Deposit Account No. 50-5394.

The exact locations where the errors appear in the patent and patent application are as follows:

On Page 2, in Field (56), under "OTHER PUBLICATIONS", in Column 2, Lines 28-30, delete "OpenMP Fortan……..34-36.".
(LIST OF REFERENCES CITED BY APPLICANT AND CONSIDERED BY EXAMINER DATED AUGUST 6, 2012, SHEET 7 (PAGE 27 OF FW), UNDER "NON PATENT LITERATURE DOCUMENTS", ENTRY 5, LINES 1-2)

In Column 3, Line 8, delete "system," and insert - - system - -, therefor.
(AMENDMENTS TO THE SPECIFICATION DATED JULY 11, 2012, PAGE 3 (PAGE 77 OF FW), PARAGRAPH [0014], LINE 1)

In Column 3, Line 54, delete "Magnetic" and insert - - magnetic - -, therefor.
(AMENDMENTS TO THE SPECIFICATION DATED JULY 11, 2012, PAGE 4 (PAGE 78 OF FW), PARAGRAPH [0019], LINE 8)

In Column 7, Line 55, delete "306" and insert - - 300 - -, therefor.
(AMENDMENTS TO THE SPECIFICATION DATED JULY 11, 2012, PAGE 6 (PAGE 80 OF FW), PARAGRAPH [0036], LINE 7)

In Column 8, Line 50, delete "computer, readable" and insert - - computer readable - -, therefor.
(AMENDMENTS TO THE SPECIFICATION DATED JULY 11, 2012, PAGE 7 (PAGE 81 OF FW), LINE 3)

In Column 13, Line 11, in Claim 23, delete "and," and insert - - and - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED JULY 11, 2012, PAGE 15, CLAIM 23, LINE 7)

The requested corrections are attached on Form PTO/SB/44.

Dated this 30th day of April, 2013.

Respectfully Submitted,

**/R. Burns Israelsen/ Reg. # 42,685**
R. BURNS ISRAELSEN
Acting in Representative Capacity
(37 CFR 1.34)
Registration No. 42,685
Telephone No. (435) 252-1360

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 11709477 |
| **Filing Date:** | 21-Feb-2007 |
| **Title of Invention:** | ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Filer:** | Robert Burns Israelsen/Vanessa Ypina |
| **Attorney Docket Number:** | 139537 |

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:** | | | | |
| Certificate of Correction | 1811 | 1 | 100 | 100 |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| | | | **Total in USD ($)** | **100** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 15650068 |
| **Application Number:** | 11709477 |
| **International Application Number:** | |
| **Confirmation Number:** | 4127 |
| **Title of Invention:** | ROOT IMAGE CACHING AND INDEXING FOR BLOCK-LEVEL DISTRIBUTED APPLICATION MANAGEMENT |
| **First Named Inventor/Applicant Name:** | Pradip Kulkarni |
| **Customer Number:** | 52531 |
| **Filer:** | Robert Burns Israelsen/Vanessa Ypina |
| **Filer Authorized By:** | Robert Burns Israelsen |
| **Attorney Docket Number:** | 139537 |
| **Receipt Date:** | 30-APR-2013 |
| **Filing Date:** | 21-FEB-2007 |
| **Time Stamp:** | 15:36:54 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | Deposit Account |
| Payment was successfully received in RAM | $100 |
| RAM confirmation Number | 2622 |
| Deposit Account | 505394 |
| Authorized User | |

## File Listing:

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

| | | | | | |
|---|---|---|---|---|---|
| 1 | Request for Certificate of Correction | 2873USCP192015_2013-04-02_CoC.pdf | 256103<br>503b8092599dec7adc3c68965abaa6227bf6062c | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Request for Certificate of Correction | 2873USCP192015_2013-04-02_Request_Letter.pdf | 146314<br>0b17850d86b8fc2b5479006fc476a151180ae9d8 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Fee Worksheet (SB06) | fee-info.pdf | 30383<br>5f111c6ac1f1583ab39cd6c81a7ee8d7a775c124 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | | **Total Files Size (in bytes):** | 432800 | |

**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.**

## SPE RESPONSE FOR CERTIFICATE OF CORRECTION

*Paper No.:* _____

**DATE** : May 8, 2013

**TO SPE OF** : ART UNIT 2678Note below

**SUBJECT** : Request for Certificate of Correction for Appl. No.: 11709477 Patent No.: 8332844

**COCIN mailroom date: _April 30, 2013**

Please respond to this request for a certificate of correction within 7 days.

**FOR IFW FILES:**

Please review the requested changes/corrections as shown in the **COCIN** document(s) in the IFW application image. No new matter should be introduced nor should the scope or meaning of the claims be changed.

Please complete the response (see below) and forward the completed response to scanning using document code **COCX**.

**FOR PAPER FILES:**

Please review the requested changes/corrections as shown in the attached certificate of correction. Please complete this form (see below) and forward it with the file to:

**Certificates of Correction Branch (CofC)**
**Randolph Square – 9D10-A**
**Palm Location 7580**

In Particular note: _Page 2, item (56), under Other Publications should this be deleted._____

**Valerie Jackson**
**Certificates of Correction Branch**
**703-756-1814**

**Thank You For Your Assistance**

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**The request for issuing the above-identified correction(s) is hereby:**
Note your decision on the appropriate box.

- ☐ **Approved** — **All** changes apply.
- ☐ **Approved in Part** — Specify below which changes **do not** apply.
- ☐ **Denied** — State the reasons for denial below.

**Comments:** _____

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SPE RESPONSE FOR CERTIFICATE OF CORRECTION

SPE Art Unit



IPR2025-00202 / 844 Patent Page 320 of 322 EX1002

**SPE RESPONSE FOR CERTIFICATE OF CORRECTION**

**Paper No**.:20130509

**DATE** : May 09, 2013

**TO SPE OF** : ART UNIT 2678

**SUBJECT** : Request for Certificate of Correction on Patent No.: 8332844

A response is requested with respect to the accompanying request for a certificate of correction.

Please complete this form and return with file, within **7** days to:
**Certificates of Correction Branch - ST (South Tower) 9A22**
Palm location **7590** - Tel. No. (703) 305-8309

With respect to the change(s) requested, correcting Office and/or Applicant's errors, should the patent read as shown in the certificate of correction? No new matter should be introduced, nor should the scope or meaning of the claims be changed.

**Thank You For Your Assistance** **Certificates of Correction Branch**

**The request for issuing the above-identified correction(s) is hereby:**

Note your decision on the appropriated box.

☒ **Approved** All changes apply.

☐ **Approved in Part** Specify below which changes **do not** apply.

☐ **Denied** State the reasons for denial below.

**Comments:**

/XIAO WU/
Supervisory Patent Examiner.Art Unit 2678

PTOL-306 (Rev. 7/03) U.S. DEPARTMENT OF COMMERCE Patent and Trademark Office

UNITED STATES PATENT AND TRADEMARK OFFICE

# CERTIFICATE OF CORRECTION



| | |
|---|---|
| PATENT NO. | : 8,332,844 B1 |
| APPLICATION NO. | : 11/709477 |
| DATED | : December 11, 2012 |
| INVENTOR(S) | : Kulkarni et al. |

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On Title Page 2, item (56), under "OTHER PUBLICATIONS", in Column 2, Lines 28-30, delete "OpenMP Fortan.....34-36.".

In the Specifications:

In Column 3, Line 8, delete "system," and insert -- system --, therefor.

In Column 3, Line 54, delete "Magnetic" and insert -- magnetic --, therefor.

In Column 7, Line 55, delete "306" and insert -- 300 --, therefor.

In Column 8, Line 50, delete "computer, readable" and insert -- computer readable --, therefor.

In the Claims:

In Column 13, Line 11, in Claim 23, delete "and," and insert -- and --, therefor.

Signed and Sealed this
Eleventh Day of June, 2013

Teresa Stanek Rea

Teresa Stanek Rea
*Acting Director of the United States Patent and Trademark Office*