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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/228,728	10/27/2020	10817157	115539-0215	3978

147491 7590 10/07/2020
FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON, DC 20007-5109

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 8 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):

Balasubrahmanyam Kuchibhotla, San Ramon, CA;
Nutanix, Inc., San Jose, CA;
Bakul Banthia, San ramon, CA;
Paul James Tangen, Enfield, NH;

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.

IR103 (Rev. 10/09)

PTO/SB/08 (modified)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
Date Submitted: March 6, 2020				**Filing Date**	12/20/2018
				First Named Inventor	Balasubrahmanyam Kuchibhotla
(use as many sheets as necessary)				Art Unit	2141
				Examiner Name	SONG, DAEHO D.
Sheet	1	of	3	Attorney Docket Number	115539-0215

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A1	7,814,057	10-12-2010	KATHURIA ET AL.	
	A2	7,953,764	05-31-2011	BAFFIER ET AL.	
	A3	8,117,165	02-14-2012	WINCKELMANN ET AL.	
	A4	8,150,808	04-03-2012	ZHA ET AL.	
	A5	8,364,648	01-29-2013	SIM-TANG, SIEW YONG	
	A6	8,612,396-B1	12-17-2013	~~AMAZON TECHNOLOGIES, INC.~~ McAlister et al.	
	A7	8,832,028	09-09-2014	SUSAIRAJ ET AL.	
	A8	8,914,567	12-16-2014	MIROSHNICHENKO ET AL.	
	A9	8,972,347	03-03-2015	SIM-TANG, SIEW YONG	
	A10	9,116,737	08-25-2015	ASWATHANARAYANA ET AL.	
	A11	9,244,717	01-26-2016	PISSAY ET AL.	
	A12	9,256,383	02-09-2016	DE SPIEGELEER ET AL.	
	A13	9,389,962	07-12-2016	YUEH ET AL.	
	A14	9,436,556	09-06-2016	SIDEN ET AL.	
	A15	10,185,627	01-22-2019	WONG ET AL.	
	A16	2008/0256311	10-16-2008	LEE, KENT	
	A17	2016/0077923	03-17-2016	ZHANG ET AL.	
	A18	2017/0220777	08-03-2017	WANG ET AL.	
	A19	2017/0264684	09-14-2017	SPILLANE ET AL.	
	A20	2019/0065322	02-28-2019	CHAKANKAR ET AL.	
	A21	2019/0129799	05-02-2019	KUMARASAMY, PARAMASIVAM	
	A22	2019/0155936	05-23-2019	DU ET AL.	
	A23	2019/0324865	10-24-2019	WEISSMAN ET AL.	

Change(s) applied to document, /P.P./ 8/17/2020

UNPUBLISHED U.S. PATENT APPLICATION DOCUMENTS

Examiner Initials*	Cite No.[1]	U.S. Patent Application Document Serial Number-Kind Code[2] (*if known*)	Filing Date of Cited Document MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	A24	EP-1 654 683	05-10-2006	ORACLE INT CORP		
	A25	WO-2016/069029	05-06-2016	HEWLETT PACKARD ENTPR DEV LP		

Examiner Signature	/DAEHO D SONG/	Date Considered	03/18/2020

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.D.S/

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (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)

147491 7590 07/01/2020
FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON, DC 20007-5109

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 transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/228,728	12/20/2018	Balasubrahmanyam Kuchibhotla	115539-0215	3978

TITLE OF INVENTION: USER INTERFACE FOR DATABASE MANAGEMENT SERVICES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	10/01/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
SONG, DAEHO D	2141	715-735000

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 03-09 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 Foley & Lardner LLP
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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: NUTANIX, INC.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): SAN JOSE, CALIFORNIA

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

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

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

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 19-0741

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

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Paul S. Hunter/ Date September 22, 2020

Typed or printed name Paul S. Hunter Registration No. 44,787

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Electronic Patent Application Fee Transmittal

Application Number:	16228728
Filing Date:	20-Dec-2018
Title of Invention:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
First Named Inventor/Applicant Name:	Balasubrahmanyam Kuchibhotla
Filer:	Paul S. Hunter/Walter Lau
Attorney Docket Number:	115539-0215

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

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	1000	1000

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1000**

Electronic Acknowledgement Receipt	
EFS ID:	40631408
Application Number:	16228728
International Application Number:	
Confirmation Number:	3978
Title of Invention:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
First Named Inventor/Applicant Name:	Balasubrahmanyam Kuchibhotla
Customer Number:	147491
Filer:	Paul S. Hunter/Walter Lau
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	115539-0215
Receipt Date:	22-SEP-2020
Filing Date:	20-DEC-2018
Time Stamp:	19:55:31
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1000
RAM confirmation Number	E20209LJ56204169
Deposit Account	190741
Authorized User	Walter Lau
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.21 (Miscellaneous fees and charges)

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)	115539-0215-Issue_Fee_Payment.pdf	1326763 ce6072e125ff1db417ea447342df5cd5b5f876ed	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30642 c8c803e084247f9a4427af232e6cb63c0775de46	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1357405		

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

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

147491 7590 07/01/2020
FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON, DC 20007-5109

EXAMINER
SONG, DAEHO D

ART UNIT	PAPER NUMBER
2141	

DATE MAILED: 07/01/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/228,728	12/20/2018	Balasubrahmanyam Kuchibhotla	115539-0215	3978

TITLE OF INVENTION: USER INTERFACE FOR DATABASE MANAGEMENT SERVICES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	10/01/2020

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 ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

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: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PTOL-85 (Rev. 02/11)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (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)

147491 7590 07/01/2020
FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON, DC 20007-5109

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 transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/228,728	12/20/2018	Balasubrahmanyam Kuchibhotla	115539-0215	3978

TITLE OF INVENTION: USER INTERFACE FOR DATABASE MANAGEMENT SERVICES

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nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	10/01/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
SONG, DAEHO D	2141	715-735000

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 03-09 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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). 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. Fees submitted: ❑Issue Fee ❑Publication Fee (if required) ❑Advance Order - # of Copies _____

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

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

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

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

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NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

Nutanix Exhibit 2003, Page 9 of 377
Tessell v. Nutanix - IPR2025-00322

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/228,728	12/20/2018	Balasubrahmanyam Kuchibhotla	115539-0215	3978

147491 7590 07/01/2020
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WASHINGTON, DC 20007-5109

EXAMINER
SONG, DAEHO D

ART UNIT	PAPER NUMBER
2141	

DATE MAILED: 07/01/2020

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

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

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

PTOL-85 (Rev. 02/11)

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B 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 30 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.

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. 16/228,728	Applicant(s) Kuchibhotla et al.	
	Examiner DAEHO D SONG	Art Unit 2141	AIA (FITF) Status Yes

-- 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 05/14/2020.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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 See Continuation Sheet . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

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

   Certified copies:

   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. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

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

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

Attachment(s)

1. ☑ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 05/14/20.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☑ Interview Summary (PTO-413), Paper No./Mail Date. attached.
5. ☑ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/DAEHO D SONG/
Primary Examiner, Art Unit 2141

Continuation of 3. The allowed claim(s) is/are: 1,3,5-10,21,23-24,26-29 and 31-34

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Applicant's Response

In Applicant's Response dated 05/14/2020, Applicant amended Claims 1-10, 21, 23-25, and 27-30, and argued against all rejections previously set forth in the Office Action dated 03/24/2020.

In light of Applicant's amendments and arguments, the rejections of Claims 1-10 and 21 under 35 U.S.C. §101 previously set forth are withdrawn.

In light of Applicant's amendments and arguments, the prior art rejections of Claims 1-10, 21, and 23-30 under 35 U.S.C. §103(a) previously set forth are withdrawn.

EXAMINER'S AMENDMENT

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

Authorization for this Examiner's Amendment was given in a telephone interview with Paul S. Hunter on 06/23/2020.

The application has been amended as follows:

In the claims:

1. (Currently Amended) A system comprising:

a memory storing computer-readable instructions in a virtual computing system; and

a processor executing the computer-readable instructions to:

present a dashboard to receive [[an]] a user input in a graphical user interface (GUI) to provision a source database;

upon receiving the user input, ~~request additional inputs, via the dashboard, comprising:~~ present options in a first user interface of the GUI to receive a first selection of a database engine type;

upon receiving the first selection of the database engine type, present a plurality of selectable options to be selected via at least one user interface of the GUI, the plurality of selectable options comprising at least a plurality of:

a second selection of a first profile for creating a source database virtual machine;

a third selection of a second profile for creating the source database;

a fourth selection of a Service Level Agreement ("SLA"); and

a fifth selection of a frequency of capturing a snapshot and transactional log; ~~and~~

upon receiving the selections of the database engine type and the at least plurality of the first profile, the second profile, the SLA, and the frequency of capturing the snapshot and transactional log, create the source database and associate the created source database with the source database virtual machine ~~according to the additional inputs~~ ; and

display a status of the created source database on the dashboard.

2. (Canceled)

3. (Previously Presented) The system of claim 1, wherein the dashboard comprises a dynamically changing home page comprising a plurality of cells, wherein a first cell of the plurality of cells displays a list of all source databases in the virtual computing system.

4. (Canceled)

5. (Currently Amended) The system of claim [[4]] 1, wherein to receive the selection of the first profile, the second user interface comprises fields for receiving selection of at least one of a software profile, a compute profile, and a network profile.

6. (Currently Amended) The system of claim [[4]] 1, wherein to receive the selection of the first profile, the second user interface comprises fields for receiving selection of a name and description for the source database virtual machine.

7. (Currently Amended) The system of claim [[21]] 1, wherein the third user interface further comprises fields for receiving selection of a duration for designating at least one of a daily snapshot, a weekly snapshot, a monthly snapshot, and a quarterly snapshot.

8. (Currently Amended) The system of claim [[21]] 1, wherein the plurality of selectable options further comprise ~~processor further executes computer-readable instructions to present a fifth~~

~~user interface between the second user interface and the third user interface for receiving~~ a sixth selection of a name and description as the second profile for the source database.

9. (Currently Amended) The system of claim 1, wherein upon receiving the user input to provision the source database, the processor executes computer-readable instructions to present a ~~first~~ user interface providing a first option to create a new source database and a second option to register an existing database as the new source database.

10. (Currently Amended) The system of claim 9, wherein upon receiving selection of the first option, the ~~database~~ system presents the ~~option~~ options for the database engine type to be selected.

11. – 20. (Canceled)

21. (Currently Amended) The system of claim [[4]] 1, wherein the plurality of selectable options further comprise ~~the processor further executes computer-readable instructions to:~~

~~present a third user interface to receive~~ a sixth selection of at least one level of the SLA and the frequency of capturing the snapshot and the transactional log upon receiving selection of the first profile and the second profile~~; and~~

~~present a fourth user interface that displays the status of provisioning the source database~~.

22. (Canceled)

23. (Currently Amended) A method comprising:

~~receiving, at a dashboard of a virtual computing system, an input to provision a source database;~~

~~upon receiving the input, receiving selection of additional inputs through the dashboard comprising:~~

~~a database engine type;~~

~~a first profile for a source database virtual machine;~~

~~a second profile for the source database;~~

~~a Service Level Agreement ("SLA"); and~~

~~a frequency of capturing a snapshot and a transactional log; and~~

~~creating the source database and associating the source database with the source database virtual machine according to the additional inputs.~~

presenting a dashboard to receive an user input in a graphical user interface (GUI) to provision a source database;

upon receiving the user input, presenting options in a first user interface of the GUI to receive a first selection of a database engine type;

upon receiving the first selection of the database engine type, presenting a plurality of selectable options to be selected via at least one user interface of the GUI, the plurality of selectable options comprising at least a plurality of:

a second selection of a first profile for creating a source database virtual machine;

a third selection of a second profile for provisioning the source database;

a fourth selection of a Service Level Agreement (“SLA”);

a fifth selection of a frequency of capturing a snapshot and transactional log;

upon receiving the selections of the database engine type and the at least plurality of the first profile, the second profile, the SLA, and the frequency of capturing the snapshot and transactional log, creating the source database and associate the created source database with the source database virtual machine; and

displaying a status of the created source database on the dashboard.

24. (Currently Amended) The method of claim 23, further comprising dynamically changing a home page comprising a plurality of cells, wherein a first cell of the plurality of cells displays a list of all source databases ~~associated with~~ in the virtual computing ~~database management~~ system.

25. (Canceled)

26. (Currently Amended) The method of claim [[25]] 23, wherein the second user interface comprises fields for receiving selection of at least one of a software profile, a compute profile, and a network profile.

27. (Currently Amended) The method of claim 23, wherein upon receiving the user input, the method further comprises, presenting at the dashboard a ~~first~~ user interface providing a first option to create a new source database and a second option to register an existing database as the new source database.

28. (Currently Amended) The method of claim 27, further comprising upon receiving selection of the first option, receiving the selection of the database engine type.

29. (Currently Amended) An apparatus comprising:

~~a memory comprising computer-readable instructions stored thereon; and~~

~~a processor that executes the computer-readable instructions to:~~

~~present a dashboard to receive an input to provision a source database;~~

~~upon receiving the input, request additional inputs, via the dashboard, comprising:~~

~~a database engine type;~~

~~a first profile for a source database virtual machine;~~

~~a Service Level Agreement ("SLA"); and~~

~~a frequency of capturing a snapshot and a transactional log; and~~

~~create the source database and associate the source database with the source database virtual machine according to the additional inputs.~~

a memory comprising computer-readable instructions stored thereon; and

a processor that executes the computer-readable instructions to:

present a dashboard to receive an user input in a graphical user interface (GUI) to provision a source database;

upon receiving the user input, present options in a first user interface of the GUI to receive a first selection of a database engine type;

upon receiving the first selection of the database engine type, present a plurality of selectable options to be selected via at least one user interface of the GUI, the plurality of selectable options comprising at least a plurality of:

a second selection of a first profile for creating a source database virtual machine;

a third selection of a second profile for creating the source database;

a fourth selection of a Service Level Agreement (“SLA”);

a fifth selection of a frequency of capturing a snapshot and transactional log;

upon receiving the selections of the database engine type and the at least plurality of the first profile, the second profile, the SLA, and the frequency of capturing the snapshot and transactional log, create the source database and associate the created source database with the source database virtual machine; and

display a status of the created source database on the dashboard.

30. (Canceled)

31. (New) The apparatus of claim 29, wherein the plurality of selectable options further comprise a sixth selection of a name and description as the second profile for the source database.

32. (New) The apparatus of claim 29, wherein upon receiving the user input to provision the source database, the processor executes computer-readable instructions to present a user interface providing a first option to create a new source database and a second option to register an existing database as the new source database.

33. (New) The apparatus of claim 32, wherein upon receiving selection of the first option, the system presents the options for the database engine type to be selected.

34. (New) The apparatus of claim 29, wherein the plurality of selectable options further comprise a sixth selection of at least one level of the SLA and the frequency of capturing the snapshot and the transactional log upon receiving selection of the first profile and the second profile.

Allowable Subject Matter

Claims 1, 3, 5-10, 21, 23-24, 26-29, and 31-34 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

As amended and argued by Applicant in the Response dated 5/14/2020, and further amended in the above Examiner's Amendments, the prior art fails to disclose or suggest the combination of limitations recited in the claims 1, 23, and 29.

Claims 3, 5-10, 21, 24, 26-28, and 31-34:

These claims incorporate the allowable subject matter of Claims 1, 23, and 29, and are thus allowable.

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

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAEHO D SONG whose telephone number is (571)272-7524. The examiner can normally be reached on Mon-Fri. 8:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amy Ng can be reached on (571)270-1698. 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.

/Daeho D Song/
Primary Examiner, Art Unit 2141.

Examiner-Initiated Interview Summary	Application No. 16/228,728	Applicant(s) Kuchibhotla et al.	
	Examiner DAEHO D SONG	Art Unit 2141	AIA (FITF) Status Yes

All participants (applicant, applicant's representative, PTO personnel):

(1) DAEHO D. SONG. (3) _____.

(2) PAUL S. HUNTER. (4) _____.

Date of Interview: 23 June 2020.

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: 1,23 and 29.

Identification of prior art discussed: YUEH.

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...)

Discussed a proposed Examiner's Amendment for Claims 1, 23 and 29 to be allowable subject matter; clarifying amendments for further distinguishing the claimed invention from the cited reference; applicant has accepted the proposed Examiner's Amendment (see attachment)..

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of 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

/DAEHO D SONG/ Primary Examiner, Art Unit 2141	

Notice of References Cited	Application/Control No. 16/228,728	Applicant(s)/Patent Under Reexamination Kuchibhotla et al.	
	Examiner DAEHO D SONG	Art Unit 2141	Page 1 of 3

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20020073089-A1	06-2002	Schwartz, Andrew	G06F16/972	1/1
*	B	US-20050149757-A1	07-2005	Corbett, Christopher J.	H04W12/06	726/4
*	C	US-20070100793-A1	05-2007	Brown; Douglas P.	G06F16/25	1/1
*	D	US-7225189-B1	05-2007	McCormack; Michael J.	G06F40/18	1/1
*	E	US-20080126945-A1	05-2008	Munkvold; Calvin D.	G06Q10/06	715/733
*	F	US-20090028082-A1	01-2009	Wynn; Simon	H04W12/0609	370/310
*	G	US-20090125828-A1	05-2009	Fried; Jeffrey Caldwell	G06F16/288	715/769
*	H	US-20110004586-A1	01-2011	Cherryholmes; Lon Jones	G06F11/1471	707/682
*	I	US-20110071981-A1	03-2011	Ghosh; Sourav	G06F16/27	707/634
*	J	US-20110093435-A1	04-2011	Zha; Charlie Li	G06F16/128	707/639
*	K	US-20120011378-A1	01-2012	Dalton; Damian	G06F11/328	713/300
*	L	US-20130117441-A1	05-2013	Kuchibhotla; Balasubrahmanyam	H04L41/046	709/224
*	M	US-20140189685-A1	07-2014	Kripalani; Sanjay Harakhchand	G06F9/45533	718/1

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC 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.

Notice of References Cited	Application/Control No. 16/228,728	Applicant(s)/Patent Under Reexamination Kuchibhotla et al.	
	Examiner DAEHO D SONG	Art Unit 2141	Page 2 of 3

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20140229698-A1	08-2014	Sivasubramanian; Swaminathan	G06F12/02	711/165
*	B	US-20150019495-A1	01-2015	Siden; Christopher G.	G06F11/1448	707/649
*	C	US-20150121453-A1	04-2015	Gupta; Rashmi	G06F16/21	726/1
*	D	US-20150195347-A1	07-2015	Luft; Siegfried	H04L67/306	709/203
*	E	US-20160041997-A1	02-2016	Gokhale; Parag	G06F16/122	707/694
*	F	US-20160078104-A1	03-2016	CLIFFORD; Paul	G06F3/04842	707/722
*	G	US-20160197835-A1	07-2016	Luft; Siegfried	H04L67/28	709/223
*	H	US-20160267105-A1	09-2016	Sun; Hubert Ken	G06F16/278	1/1
*	I	US-20160292358-A1	10-2016	HEGER; Oliver	G06F19/32	1/1
*	J	US-20160380809-A1	12-2016	Hou; Zhaorong	H04L41/0856	370/254
*	K	US-20170351584-A1	12-2017	Griffith; Douglas	G06F16/2358	1/1
*	L	US-20180025007-A1	01-2018	DAI; Bin	G06F16/252	707/770
*	M	US-20180285201-A1	10-2018	Bangalore; Prashanth Nagabhushana	G06F11/1461	1/1

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
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Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Notice of References Cited	Application/Control No. 16/228,728	Applicant(s)/Patent Under Reexamination Kuchibhotla et al.	
	Examiner DAEHO D SONG	Art Unit 2141	Page 3 of 3

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20180307728-A1	10-2018	Crupi; Gary W.	G06F16/24549	1/1
*	B	US-20190075031-A1	03-2019	Skelton; Andrew	H04L41/22	1/1
*	C	US-20190138631-A1	05-2019	Crane; Tyler H.	G06F16/2358	1/1
*	D	US-10346431-B1	07-2019	Broda; Tal	G06F16/182	1/1
*	E	US-10509798-B2	12-2019	Chow; Jedidiah J D	G06F16/9535	1/1
	F					
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
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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.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/228,728	Kuchibhotla et al.
	Examiner	**Art Unit**
	DAEHO D SONG	2141

CPC - Searched*		
Symbol	**Date**	**Examiner**
G06F3/04847	02/18/2020	/ds/
G06F3/0482	02/18/2020	/ds/
G06F16/27	02/18/2020	/ds/
G06F16/252	02/18/2020	/ds/

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
EAST text search	03/16/2020	/ds/
Inventor/double patenting search via Palm	03/16/2020	/ds/
NPL search- IEEE Periodicals/Conferences; MIT eBooks; IBM Periodicals;Legacy Journals; IBM Redbooks	03/18/2020	/ds/
EAST CPC search - G06F3/04847,G06F3/0482,G06F16/27,G06F16/252	02/18/2020	/ds/
Updated EAST text search - inventive concepts (L99-103)	06/16/2020	/ds/
Updated NPL search- IEEE Periodicals/Conferences; IET Periodicals /Conferences; SMPTE Periodicals/conferences; Wiley eBooks; IBM Periodicals; MIT eBooks; IP.com Journals	06/24/2020	/ds/

/DAEHO D SONG/ Primary Examiner, Art Unit 2141	

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/228,728	Kuchibhotla et al.
	Examiner	**Art Unit**
	DAEHO D SONG	2141

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
	PG-PUB Text search	06/24/2020	/ds/
G06F	3/04847	06/24/2020	/ds/
G06F	3/0482	06/24/2020	/ds/
G06F	16/27	06/24/2020	/ds/
G06F	16/252	06/24/2020	/ds/

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/228,728	Kuchibhotla et al.
	Examiner	**Art Unit**
	DAEHO D SONG	2141

CPC

Symbol					Type	Version
G06F	/	3	/	04847	F	2013-01-01
G06F	/	3	/	0482	I	2013-01-01
G06F	/	16	/	27	I	2019-01-01
G06F	/	16	/	252	I	2019-01-01

CPC Combination Sets

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NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 19	
/DAEHO D SONG/ Primary Examiner, Art Unit 2141 (Primary Examiner)	24 June 2020 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 4G

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Part of Paper No.: 20200624

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/228,728	Kuchibhotla et al.
	Examiner	**Art Unit**
	DAEHO D SONG	2141

INTERNATIONAL CLASSIFICATION				
CLAIMED				
G06F	/	3	/	048
G06F	/	16	/	27
G06F	/	16	/	25

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 19	
/DAEHO D SONG/ Primary Examiner, Art Unit 2141 (Primary Examiner)	24 June 2020 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 4G

U.S. Patent and Trademark Office

Part of Paper No.: 20200624

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/228,728	Kuchibhotla et al.
	Examiner	**Art Unit**
	DAEHO D SONG	2141

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

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	8	10		19	14	28								
	2		11		20	15	29								
2	3		12	9	21		30								
	4		13		22	16	31								
3	5		14	10	23	17	32								
4	6		15	11	24	18	33								
5	7		16		25	19	34								
6	8		17	12	26										
7	9		18	13	27										

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 19	
/DAEHO D SONG/ Primary Examiner, Art Unit 2141 (Primary Examiner)	24 June 2020 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 4G

U.S. Patent and Trademark Office Part of Paper No.: 20200624

Bibliographic Data

Application No: 16/228,728

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No | ☐ Met After Allowance

Verified and Acknowledged: /DAEHO D SONG/ | Examiner's Signature | Initials

Title: USER INTERFACE FOR DATABASE MANAGEMENT SERVICES

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/20/2018 **RULE**	715	2141	115539-0215

APPLICANTS

Nutanix, Inc., San Jose, CA,

INVENTORS

Balasubrahmanyam Kuchibhotla San Ramon, CA, UNITED STATES

Bakul Banthia San ramon, CA, UNITED STATES

Paul James Tangen Enfield, NH, UNITED STATES

CONTINUING DATA

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

02/05/2019

STATE OR COUNTRY

UNITED STATES

ADDRESS

FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON, DC 20007-5109
UNITED STATES

FILING FEE RECEIVED

$1,720

Main Concept Text
==========
Creating a source database in graphical user interface

(No Concept Modifiers)
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Filters (1)
==========
Publication Date: To 2018-12-20

Options
=======
De-dup: None
Cut-off: None
Sort: Relevance

Content: Non-Patent Literature (25)
==========
IEEE Xplore Publications: IEEE Periodicals
IEEE Xplore Publications: IEEE Conferences
IEEE Xplore Publications: IEEE Standards
IEEE Xplore Publications: IEEE Early Access
IEEE Xplore Publications: IET Periodicals
IEEE Xplore Publications: IET Conferences
IEEE Xplore Publications: SMPTE Periodicals
IEEE Xplore Publications: SMPTE Conferences
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OnePetro.org: Periodicals at OnePetro.org
OnePetro.org: Conferences at OnePetro.org
OnePetro.org: Standards at OnePetro.org
Other Literature: IBM Redbooks

PTO/SB/08 (modified)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
Date Submitted: May 14, 2020				**Filing Date**	12/20/2018
				First Named Inventor	Balasubrahmanyam Kuchibhotla
				Art Unit	2141
(use as many sheets as necessary)				Examiner Name	SONG, DAEHO D.
Sheet	1	of	2	Attorney Docket Number	115539-0215

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A1	6,064,975	05-16-2000	MOON ET AL.	
	A2	7,725,671	05-25-2010	PRAHLAD ET AL.	
	A3	7,840,533	11-23-2010	PRAHLAD ET AL.	
	A4	8,447,728	05-21-2013	PRAHLAD ET AL.	
	A5	8,762,335	06-24-2014	PRAHLAD ET AL.	
	A6	9,740,723	08-22-2017	PRAHLAD ET AL.	
	A7	D 753,135-S	04-05-2016	VAZQUEZ, SERAFIN	
	A8	D 753,140-S	04-05-2016	KOUVAS ET AL.	
	A9	D 763,890-S	08-16-2016	PAN, CHONGGUANG	
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	A13	D 838,288-S	01-15-2019	SUNSHINE ET AL.	
	A14	D 839,913-S	02-05-2019	CHEN ET AL.	
	A15	D 862,512-S	10-08-2019	SCHUBART, LEA	
	A16	D 870,762-S	12-24-2019	MENDOZA COROMINAS ET AL.	
	A17	D 875,108-S	02-11-2020	CHITALIA ET AL.	
	A18	D 877,753-S	03-10-2020	CHITALIA ET AL.	
	A19	10,210,048	02-19-2019	SANCHETI, ASHWIN GAUTAMCHAND	
	A20	10,248,657	04-02-2019	PRAHLAD ET AL.	
	A21	2001/0014867-A1	08-16-2001	CONMY, DOUGLAS WALTER	
	A22	2003/0147309-A1	08-07-2003	WEISBERG, PHILIP	
	A23	2009/0022285-A1	01-22-2009	SWANBURG ET AL.	
	A24	2015/0142610-A1	05-21-2015	MANOHARAN ET AL.	
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Examiner Initials*	Cite No.[1]	U.S. Patent Application Document Serial Number-Kind Code[2] (*if known*)	Filing Date of Cited Document MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature	/DAEHO D SONG/	Date Considered	06/23/2020

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.D.S/

PTO/SB/08 (modified)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
Date Submitted: May 14, 2020				**Filing Date**	12/20/2018
				First Named Inventor	Balasubrahmanyam Kuchibhotla
(use as many sheets as necessary)				Art Unit	2141
				Examiner Name	SONG, DAEHO D.
Sheet	2	of	2	Attorney Docket Number	115539-0215

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	A26	Friedman, Vitaly, "Designing the Perfect Date and Time Picker." Smashing Magazine, published July 2017 (Retrieved from the Internet 4/7/2020). Internet URL: <https://www .smashingmagazine.com/2017 /07 /designing-perfect-date-time-picker/> (Year: 2017)	
	A27	Kolasa, Konrad, "Date Picker." Dribbble, published February 28, 2017 (Retrieved from the Internet 4/7/2020). Internet URL: <https:// dribbble.com/shots/3326020-Date-Picker> (Year: 2017)	
	A28	Palmer, Brent, "Date Range." Dribbble, published October 21, 2015 (Retrieved from the Internet 4/7/2020). Internet URL: <https://dribbble.com/shots/2306949-Date-Range> (Year: 2015)	
	A29	Rocheleau, Jake, "30 Best Free Calendar & Datepicker jQuery Plugins." Vandelay Design, published August 29, 2018 (Retrieved from the Internet 4/7/2020). Internet URL: <https://www.vandelaydesign.com/30-best-free-jquery-plugins/> (Year: 2018)	
	A30	Warren, "Internet Archive Wayback Machine Introduces New Beta Version With Calendar View." warren's blog, published January 23, 2011 (Retrieved from the Internet 4/7/2020). Internet URL: <warrenduecker.blogspot.com/2011/01/ internet-archive-wayback-machine.html> (Year: 2011)	

Examiner Signature	/DAEHO D SONG/	Date Considered	06/23/2020

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.D.S/

PROPOSED EXAMINER'S AMENDMENT

16/228,728

The application has been amended as following:

In the claims:

1. (Currently Amended) A system comprising:

a memory storing computer-readable instructions in a virtual computing system; and

a processor executing the computer-readable instructions to:

present a dashboard to receive [[an]] a user input in a graphical user interface (GUI) to provision a source database;

upon receiving the user input, ~~request additional inputs, via the dashboard, comprising:~~ present options in a first user interface of the GUI to receive a first selection of a database engine type;

upon receiving the first selection of the database engine type, present a plurality of selectable options to be selected via at least one user interface of the GUI, the plurality of selectable options comprising at least a plurality of:

a second selection of a first profile for creating a source database virtual machine;

a third selection of a second profile for creating the source database;

a fourth selection of a Service Level Agreement ("SLA"); and

a fifth selection of a frequency of capturing a snapshot and transactional log; ~~and~~

upon receiving the selections of the database engine type and the at least plurality of the first profile, the second profile, the SLA, and the frequency of capturing the snapshot and transactional log, create the source database and associate the created source database with the source database virtual machine ~~according to the additional inputs~~ ; and

display a status of the created source database on the dashboard.

2. (Canceled)

3. (Previously Presented) The system of claim 1, wherein the dashboard comprises a dynamically changing home page comprising a plurality of cells, wherein a first cell of the plurality of cells displays a list of all source databases in the virtual computing system.

4. (Canceled)

5. (Currently Amended) The system of claim [[4]] 1, wherein to receive the selection of the first profile, the second user interface comprises fields for receiving selection of at least one of a software profile, a compute profile, and a network profile.

6. (Currently Amended) The system of claim [[4]] 1, wherein to receive the selection of the first profile, the second user interface comprises fields for receiving selection of a name and description for the source database virtual machine.

7. (Currently Amended) The system of claim [[21]] 1, wherein the third user interface further comprises fields for receiving selection of a duration for designating at least one of a daily snapshot, a weekly snapshot, a monthly snapshot, and a quarterly snapshot.

8. (Currently Amended) The system of claim [[21]] 1, wherein the plurality of selectable options further comprise ~~processor further executes computer-readable instructions to present a fifth user interface between the second user interface and the third user interface for receiving~~ a sixth selection of a name and description as the second profile for the source database.

9. (Currently Amended) The system of claim 1, wherein upon receiving the user input to provision the source database, the processor executes computer-readable instructions to present a ~~first~~ user interface providing a first option to create a new source database and a second option to register an existing database as the new source database.

10. (Currently Amended) The system of claim 9, wherein upon receiving selection of the first option, the ~~database~~ system presents the ~~option~~ options for the database engine type to be selected.

11. – 20. (Canceled)

21. (Currently Amended) The system of claim [[4]] 1, wherein the plurality of selectable options further comprise ~~the processor further executes computer-readable instructions to:~~

~~present a third user interface to receive~~ a sixth selection of at least one level of the SLA and the frequency of capturing the snapshot and the transactional log upon receiving selection of the first profile and the second profile~~; and~~

~~present a fourth user interface that displays the status of provisioning the source database~~.

22. (Canceled)

23. (Currently Amended) A method comprising:

~~receiving, at a dashboard of a virtual computing system, an input to provision a source database;~~

~~upon receiving the input, receiving selection of additional inputs through the dashboard comprising:~~

~~a database engine type;~~

~~a first profile for a source database virtual machine;~~

~~a second profile for the source database;~~

~~a Service Level Agreement ("SLA"); and~~

~~a frequency of capturing a snapshot and a transactional log; and~~

~~creating the source database and associating the source database with the source database virtual machine according to the additional inputs.~~

presenting a dashboard to receive an user input in a graphical user interface (GUI) to provision a source database;

upon receiving the user input, presenting options in a first user interface of the GUI to receive a first selection of a database engine type;

upon receiving the first selection of the database engine type, presenting a plurality of selectable options to be selected via at least one user interface of the GUI, the plurality of selectable options comprising at least a plurality of:

a second selection of a first profile for creating a source database virtual machine;

a third selection of a second profile for provisioning the source database;

a fourth selection of a Service Level Agreement ("SLA");

a fifth selection of a frequency of capturing a snapshot and transactional log;

upon receiving the selections of the database engine type and at the least plurality of the first profile, the second

profile, the SLA, and the frequency of capturing the snapshot and transactional log, creating the source database and associate the created source database with the source database virtual machine; and

displaying a status of the created source database on the dashboard.

24. (Currently Amended) The method of claim 23, further comprising dynamically changing a home page comprising a plurality of cells, wherein a first cell of the plurality of cells displays a list of all source databases ~~associated with~~ in the virtual computing ~~database management~~ system.

25. (Canceled)

26. (Currently Amended) The method of claim [[25]] 23, wherein the second user interface comprises fields for receiving selection of at least one of a software profile, a compute profile, and a network profile.

27. (Currently Amended) The method of claim 23, wherein upon receiving the user input, the method further comprises, presenting at the dashboard a ~~first~~ user interface providing a first

option to create a new source database and a second option to register an existing database as the new source database.

28. (Currently Amended) The method of claim 27, further comprising upon receiving selection of the first option, receiving the selection of the database engine type.

29. (Currently Amended) An apparatus comprising:

~~a memory comprising computer-readable instructions stored thereon; and~~

~~a processor that executes the computer-readable instructions to:~~

~~present a dashboard to receive an input to provision a source database;~~

~~upon receiving the input, request additional inputs, via the dashboard, comprising:~~

~~a database engine type;~~

~~a first profile for a source database virtual machine;~~

~~a Service Level Agreement ("SLA"); and~~

~~a frequency of capturing a snapshot and a transactional log; and~~

~~create the source database and associate the source database with the source database virtual machine according to the additional inputs.~~

a memory comprising computer-readable instructions stored thereon; and

a processor that executes the computer-readable instructions to:

present a dashboard to receive an user input in a graphical user interface (GUI) to provision a source database;

upon receiving the user input, present options in a first user interface of the GUI to receive a first selection of a database engine type;

upon receiving the first selection of the database engine type, present a plurality of selectable options to be selected via at least one user interface of the GUI, the plurality of selectable options comprising at least a plurality of:

a second selection of a first profile for creating a source database virtual machine;

a third selection of a second profile for creating the source database;

a fourth selection of a Service Level Agreement ("SLA");

a fifth selection of a frequency of capturing a snapshot and transactional log;

upon receiving the selections of the database engine type and the at least plurality of the first profile, the second

profile, the SLA, and the frequency of capturing the snapshot and transactional log, create the source database and associate the created source database with the source database virtual machine; and

display a status of the created source database on the dashboard.

30. (Canceled)

31. (New) The apparatus of claim 29, wherein the plurality of selectable options further comprise a sixth selection of a name and description as the second profile for the source database.

32. (New) The apparatus of claim 29, wherein upon receiving the user input to provision the source database, the processor executes computer-readable instructions to present a user interface providing a first option to create a new source database and a second option to register an existing database as the new source database.

33. (New) The apparatus of claim 32, wherein upon receiving selection of the first option, the system presents the options for the database engine type to be selected.

34. (New) The apparatus of claim 29, wherein the plurality of selectable options further comprise a sixth selection of at least one level of the SLA and the frequency of capturing the snapshot and the transactional log upon receiving selection of the first profile and the second profile.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	0	16/228728.app.	US-PGPUB; USPAT	OR	ON	2020/02/18 13:22
S2	5	("0000002" | "0008601" | "8549518" | "8850130" | "9772866").PN.	US-PGPUB; USPAT	OR	ON	2020/02/18 13:25
S3	1	("0000002").PN.	US-PGPUB; USPAT	OR	ON	2020/02/18 13:27
S4	2	("0000001" | "20170286518").PN.	US-PGPUB; USPAT	OR	ON	2020/02/18 13:28
S5	1	"20130290180".did.	US-PGPUB; USPAT	OR	ON	2020/02/18 13:32
S6	39	kuchibhotla-balasubrahm$5.in.	US-PGPUB; USPAT	OR	ON	2020/02/18 13:52
S7	4	tangen-paul.in.	US-PGPUB; USPAT	OR	ON	2020/02/18 13:57
S8	8,356	g06f3/04847	US-PGPUB; USPAT	OR	ON	2020/02/18 13:59
S9	21,230	g06f3/0482	US-PGPUB; USPAT	OR	ON	2020/02/18 13:59
S10	1,068	g06f16/27	US-PGPUB; USPAT	OR	ON	2020/02/18 14:00
S11	293	g06f16/252	US-PGPUB; USPAT	OR	ON	2020/02/18 14:00
S12	3,232	(S8 S9 S10 S11) & database near3 manage$4	US-PGPUB; USPAT	OR	ON	2020/02/18 14:01
S13	121	(S8 S9 S10 S11) & database near3 manage$4 with user near interface	US-PGPUB; USPAT	OR	ON	2020/02/18 14:08

S14	7	S11 & database near3 manage$4 with user near interface	US-PGPUB; USPAT	OR	ON	2020/02/18 14:08
S15	1	("2016/0078104").URPN.	USPAT	OR	ON	2020/02/18 14:17
S16	7	select$3 near3 database near3 engine near3 type	US-PGPUB; USPAT	OR	ON	2020/02/18 14:26
S17	14	("2008/0126945").URPN.	USPAT	OR	ON	2020/02/18 14:27
S18	375	(creat$3 generat$3) near3 new near4 database near4 (clone replica$4 reproduc$4 duplicat$4 copy$3 mirror$3)	US-PGPUB; USPAT	OR	ON	2020/02/18 15:02
S19	161	S18 & database near manage$4	US-PGPUB; USPAT	OR	ON	2020/02/18 15:03
S20	82	S19 & user near interface	US-PGPUB; USPAT	OR	ON	2020/02/18 15:03
S21	3	S20 & dashboard	US-PGPUB; USPAT	OR	ON	2020/02/18 15:05
S22	10,849	database near3 virtual near4 (machine apparatus system device terminal server)	US-PGPUB; USPAT	OR	ON	2020/02/18 15:48
S23	737	(creat$3 generat$3) near4 database near3 virtual near4 (machine apparatus system device terminal server)	US-PGPUB; USPAT	OR	ON	2020/02/18 15:49
S24	19	S23 & exist$3 near4 database near3 virtual near4 (machine apparatus system device terminal server)	US-PGPUB; USPAT	OR	ON	2020/02/18 15:50
S25	38	((("Kuchibhotla") near3 ("Balasubrahmanyam"))).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/16 14:16
S26	2	((("Tangen") near3 ("James"))).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/16 14:20
S27	4	((("Tangen") near3 ("Paul"))).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/16 14:21
S28	55,846	((service near3 level near3 agreement) "sla")	US-PGPUB; USPAT	OR	ON	2020/03/16 14:25

S29	7,984	S28 & database near3 manag$5	US-PGPUB; USPAT	OR	ON	2020/03/16 14:26
S30	1,243	S29 & (dashboard (user adj interface)) with database	US-PGPUB; USPAT	OR	ON	2020/03/16 14:27
S31	27	S30 & select$3 near3 database near3 engine	US-PGPUB; USPAT	OR	ON	2020/03/16 14:27
S32	15	("2016/0197835").URPN.	USPAT	OR	ON	2020/03/16 14:40
S33	10,027	(creat$3 generat$3 render$3) near3 new near3 database	USPAT	OR	ON	2020/03/16 14:51
S34	3	S33 & (display$3 present$3) near3 list near4 source near3 database	USPAT	OR	ON	2020/03/16 14:56
S35	4	S33 & (display$3 present$3) near3 list near4 source near3 data	USPAT	OR	ON	2020/03/16 14:59
S36	87	("7225189").URPN.	USPAT	OR	ON	2020/03/16 15:03
S37	2	11/938749.app.	US-PGPUB; USPAT	OR	ON	2020/03/16 15:08
S38	320	g06f16/252	US-PGPUB; USPAT	OR	ON	2020/03/16 15:19
S39	7	S33 & S38	US-PGPUB; USPAT	OR	ON	2020/03/16 15:20
S40	2,675	select$3 near3 database near4 type	US-PGPUB; USPAT	OR	ON	2020/03/17 15:24
S41	109	select$3 near3 database near4 type near4 (server engine)	US-PGPUB; USPAT	OR	ON	2020/03/17 15:26
S42	3	S41 & snapshot	US-PGPUB; USPAT	OR	ON	2020/03/17 15:29
S43	2	14/257927.app.	US-PGPUB; USPAT	OR	ON	2020/03/17 15:34
S44	5,700	((service near3 level near3 agreement) sla) near4 (select$3 determin$3)	US-PGPUB; USPAT	OR	ON	2020/03/17 15:59
S45	2,529	((service near3 level near3 agreement)) near4 (select$3 determin$3)	US-PGPUB; USPAT	OR	ON	2020/03/17 15:59

S46	691	S45 & database near3 management	US-PGPUB; USPAT	OR	ON	2020/03/17 16:00
S47	12	S40 & S46	US-PGPUB; USPAT	OR	ON	2020/03/17 16:00
S48	39	("2007/0100793").URPN.	USPAT	OR	ON	2020/03/17 16:11
S49	23	("0000002" | "10185627" | "20080256311" | "20160077923" | "20170220777" | "20170264684" | "20190065322" | "20190129799" | "20190155936" | "20190324865" | "7953764" | "8117165" | "8150808" | "8364648" | "8612396" | "8832028" | "8914567" | "8972347" | "9116737" | "9244717" | "9256383" | "9389962" | "9436556").PN.	US-PGPUB; USPAT	OR	ON	2020/03/17 17:42
S50	1	14/573761.app.	US-PGPUB; USPAT	OR	ON	2020/03/17 18:27
S51	1,181	select$3 with ((software adj profile) (computer adj profile) (network adj profile))	US-PGPUB; USPAT	OR	ON	2020/03/18 14:51
S52	13	select$3 with ((software adj profile) (computer adj profile) (network adj profile)) same database near manag$5	US-PGPUB; USPAT	OR	ON	2020/03/18 14:52
S53	4	select$3 near3 ("service level agreement") & (creat$3 generat$3) near3 new near4 database	US-PGPUB; USPAT	OR	ON	2020/03/18 15:28
S54	94	select$3 near3 ("service level agreement") & database near manag$5	US-PGPUB; USPAT	OR	ON	2020/03/18 15:33
S55	6	S54 & (creat$3 generat$3 render$3 provid$3) near3 new near3 database	US-PGPUB; USPAT	OR	ON	2020/03/18 15:36
S56	25	S51 & (creat$3 generat$3) near3 new near4 database	US-PGPUB; USPAT	OR	ON	2020/03/18 16:14
S57	394	select$3 near3 profile with ((software adj profile) (computer adj profile) (network adj profile))	US-PGPUB; USPAT	OR	ON	2020/03/18 16:20
S58	1,400	select$3 near3 (sample template) near4 profile	US-PGPUB; USPAT	OR	ON	2020/03/18 16:23
S59	29	S58 & (creat$3 generat$3) near3 new near4 database	US-PGPUB; USPAT	OR	ON	2020/03/18 16:24

S60	2	S59 & ((software adj profile) (computer adj profile) (network adj profile))	US-PGPUB; USPAT	OR	ON	2020/03/18 16:26
S61	757	select$3 near3 (sample) near4 profile	US-PGPUB; USPAT	OR	ON	2020/03/18 16:28
S62	13	S61 & ((software adj profile) (computer adj profile) (network adj profile))	US-PGPUB; USPAT	OR	ON	2020/03/18 16:29
S63	106	select$3 with ((software adj profile) (computer adj profile) (network adj profile)) with database	US-PGPUB; USPAT	OR	ON	2020/03/18 16:32
S64	35	select$3 near4 ((software adj profile) (computer adj profile) (network adj profile)) with database	US-PGPUB; USPAT	OR	ON	2020/03/18 16:32
S65	19	select$3 near4 ((software adj profile) (computer adj profile) (network adj profile)) with user near interface	US-PGPUB; USPAT	OR	ON	2020/03/18 16:38
S66	117	database near3 (engine server) near4 type & profile & ((software adj profile) (computer adj profile) (network adj profile))	US-PGPUB; USPAT	OR	ON	2020/03/18 16:49
S67	147	(select$3 option) near4 database near3 (engine server) near4 type	US-PGPUB; USPAT	OR	ON	2020/03/18 16:55
S68	3	(select$3 option) near4 database near3 (engine server) near4 type & (display$3 present$3) near3 profile	US-PGPUB; USPAT	OR	ON	2020/03/18 16:59
S69	2	(select$3 option) near4 ((software adj profile) (computer adj profile) (network adj profile)) with database near3 (engine server)	US-PGPUB; USPAT	OR	ON	2020/03/18 17:08
S70	87	user near interface near4 ((software adj profile) (computer adj profile) (network adj profile))	US-PGPUB; USPAT	OR	ON	2020/03/18 17:18
S71	25	("0000002" | "10210048" | "10248657" | "20010014867" | "20030147309" | "20090022285" | "20150142610" | "20160162845" | "7725671" | "7840533" | "8447728" | "8762335" | "9740723" | "D753135" | "D753140" | "D763890" | "D779514" | "D803231" | "D807902" | "D838288" | "D839913" | "D862512" | "D870762" | "D875108" | "D877753").PN.	US-PGPUB; USPAT	OR	ON	2020/06/15 13:49
S72	1	"20070198307".did.	US-PGPUB; USPAT	OR	ON	2020/06/15 13:57

S73	2	15/334127.app.	US-PGPUB; USPAT	OR	ON	2020/06/15 14:03
S74	3	("2018/0113623").URPN.	USPAT	OR	ON	2020/06/15 14:28
S75	7,777	(select$3 input$4) near3 (database storage) near (engine server)	US-PGPUB; USPAT	OR	ON	2020/06/15 15:02
S76	78	S75 & (database) near3 (creation registration) near4 (system)	US-PGPUB; USPAT	OR	ON	2020/06/15 15:03
S77	12	S76 & (select$3 input$4) with (oracle sql sap lotus)	US-PGPUB; USPAT	OR	ON	2020/06/15 15:04
S78	59	(select$3 input$4) near3 (database storage) near (engine server) near4 type	US-PGPUB; USPAT	OR	ON	2020/06/15 15:16
S79	2	S78 & (creat$3 generat$3) near3 (source original) near4 database	US-PGPUB; USPAT	OR	ON	2020/06/15 15:17
S80	4,637	(creat$3 generat$3) near3 (source original) near4 database	US-PGPUB; USPAT	OR	ON	2020/06/15 15:20
S81	15	S80 & user near interface with (select$3 input$4) near3 (database storage) near (engine server)	US-PGPUB; USPAT	OR	ON	2020/06/15 15:21
S82	2	S80 & (select$3 input$4) near3 (database storage) near (engine server) near4 type	US-PGPUB; USPAT	OR	ON	2020/06/15 15:28
S83	2	14/322597.app.	US-PGPUB; USPAT	OR	ON	2020/06/15 15:38
S84	1	(creat$3 generat$3 output$4 render$3) near4 database with (based accord$4) near3 (engine server) near type	US-PGPUB; USPAT	OR	ON	2020/06/15 15:41
S85	2	14/657708.app.	US-PGPUB; USPAT	OR	ON	2020/06/15 16:05
S86	10	(configur$4) near4 database with (based accord$4) near3 (engine server) near type	US-PGPUB; USPAT	OR	ON	2020/06/15 16:13
S87	27	("2012/0011378").URPN.	USPAT	OR	ON	2020/06/15 17:34
S88	16	virtualiz$4 near3 (original source) near4 database	USPAT	OR	ON	2020/06/15 17:37

S89	2	12/603541.app.	US-PGPUB; USPAT	OR	ON	2020/06/16 12:05
S90	45	("2011/0093435").URPN.	USPAT	OR	ON	2020/06/16 12:12
S91	7	compatible near3 database near (engine server) near3 type	US-PGPUB; USPAT	OR	ON	2020/06/16 12:15
S92	2	12/795135.app.	US-PGPUB; USPAT	OR	ON	2020/06/16 12:32
S93	1	virtual near3 database with (compatible) near3 database near4 (original source)	US-PGPUB; USPAT	OR	ON	2020/06/16 12:35
S94	479	(original source) near database & hypervisor	US-PGPUB; USPAT	OR	ON	2020/06/16 12:42
S95	23	S94 & virtual near database	US-PGPUB; USPAT	OR	ON	2020/06/16 12:42
S96	17	S95 & database near (engine server)	US-PGPUB; USPAT	OR	ON	2020/06/16 12:43
S97	9	S96 & (mysql sql oracle sap lotus)	US-PGPUB; USPAT	OR	ON	2020/06/16 12:44
S98	3	("2017/0351584").URPN.	USPAT	OR	ON	2020/06/16 13:09
S99	16	(creat$3 generat$3 render$3 output$4 produc$3 replicat$3 synch$5) near3 (source original primary) near database with virtual near machine	US-PGPUB; USPAT	OR	ON	2020/06/16 13:40
S100	2	(creat$3 generat$3 render$3 output$4 produc$3 replicat$3 synch$5) near3 (source original primary) near database with (based accord$4) near3 (server engine data) near type	US-PGPUB; USPAT	OR	ON	2020/06/16 13:50
S101	104	(creat$3 generat$3 render$3 output$4 produc$3 replicat$3 synch$5) near3 database with (based accord$4) near3 (server engine data) near type	US-PGPUB; USPAT	OR	ON	2020/06/16 13:52
S102	11	S101 & hypervisor	US-PGPUB; USPAT	OR	ON	2020/06/16 13:57
S103	59	S101 & (mysql sql oracle sap lotus)	US-PGPUB; USPAT	OR	ON	2020/06/16 14:06

S104	1	S103 & sla	US-PGPUB; USPAT	OR	ON	2020/06/16 14:06
S105	846	select$3 near3 database near4 management near4 system	US-PGPUB; USPAT	OR	ON	2020/06/16 14:12
S106	56	S105 & select$3 near3 profile	US-PGPUB; USPAT	OR	ON	2020/06/16 14:14
S107	4	S106 & snapshot	US-PGPUB; USPAT	OR	ON	2020/06/16 14:15
S108	24,572	(creat$3 generat$3 render$3 register$3) near3 (database) near4 (new exist$3)	US-PGPUB; USPAT	OR	ON	2020/06/16 14:38
S109	3	S108 & user near interface with database near3 (engine server) near4 type	US-PGPUB; USPAT	OR	ON	2020/06/16 14:40
S110	148	select$3 near4 database near3 (engine server) near4 type	US-PGPUB; USPAT	OR	ON	2020/06/16 14:48
S111	10	S110 & virtual near machine	US-PGPUB; USPAT	OR	ON	2020/06/16 14:49
S112	92	S110 & user near interface	US-PGPUB; USPAT	OR	ON	2020/06/16 14:58
S113	95	dashboard with database near3 management near4 system	US-PGPUB; USPAT	OR	ON	2020/06/16 15:16
S114	44	S113 & database near3 (engine server)	US-PGPUB; USPAT	OR	ON	2020/06/16 16:44
S115	33	S114 & (mysql sql oracle sap lotus)	US-PGPUB; USPAT	OR	ON	2020/06/16 16:44
S116	1	15/937796.app.	US-PGPUB; USPAT	OR	ON	2020/06/16 17:00
S117	249	greenplum	US-PGPUB; USPAT	OR	ON	2020/06/16 17:01
S118	92	S117 & database near3 (engine server)	US-PGPUB; USPAT	OR	ON	2020/06/16 17:01

S119	2	S117 & select$3 near3 database near3 (engine server)	US-PGPUB; USPAT	OR	ON	2020/06/16 17:02
S120	61	S110 & (creat$3 generat$3 render$3) near3 database	US-PGPUB; USPAT	OR	ON	2020/06/16 17:06
S121	13	S120 & virtual$4	US-PGPUB; USPAT	OR	ON	2020/06/16 17:06

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	0	(present$3 with dashboard with input with graphical near3 user near3 interface with source near database same receiv$3 with input with present$3 near3 option with interface with select$3 with database near3 engine near3 type same receiv$3 with select$3 with database near3 engine with plurality near3 options with interface same select$3 with profile with source near3 database near4 virtual same select$3 with profile with source near3 database same select$3 with service with level with agreement same select$3 with frequency with snapshot with transaction$3 near3 log same receiv$3 with database near3 engine with profile with sla with frequency with creat$3 with source near3 database with virtual near3 database same display$3 with status with database with dashboard).clm.	US-PGPUB	OR	ON	2020/06/24 14:38
L2	13,872	g06f3/0482	US-PGPUB	OR	ON	2020/06/24 14:39
L3	1,564	2 & database near3 manag$5	US-PGPUB	OR	ON	2020/06/24 14:40
L4	1,101	3 & ((graphical near3 user near3 interface) gui)	US-PGPUB	OR	ON	2020/06/24 14:41
L5	5,461	g06f3/04847	US-PGPUB	OR	ON	2020/06/24 15:23
L6	513	5 & database near3 manag$5	US-PGPUB	OR	ON	2020/06/24 15:23
L7	713	g06f16/27	US-PGPUB	OR	ON	2020/06/24 15:41
L8	233	g06f16/252	US-PGPUB	OR	ON	2020/06/24 16:17

6/24/2020 4:35:43 PM
C:\Users\dsong\Documents\EAST\Workspaces\16228728.wsp

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/228,728	12/20/2018	Balasubrahmanyam Kuchibhotla	115539-0215

CONFIRMATION NO. 3978

PUBLICATION NOTICE

147491
FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON, DC 20007-5109

OC000000118014950

Title:USER INTERFACE FOR DATABASE MANAGEMENT SERVICES

Publication No.US-2020-0201526-A1
Publication Date:06/25/2020

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The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

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Doc Code: ECOMM.AUTH/ECOMM.WTDW
Doc Description: Internet Communications Authorized/Internet Communications Authorization Withdrawn

PTO/SB/439 (11-15)

AUTHORIZATION FOR INTERNET COMMUNICATIONS IN A PATENT APPLICATION OR REQUEST TO WITHDRAW AUTHORIZATION FOR INTERNET COMMUNICATIONS		
	Application No.	16/228728
	Filing Date	12/20/2018
	First Named Inventor	Balasubrahmanyam Kuchibhotla
	Art Unit	2141
	Examiner Name	SONG, DAEHO D
	Practitioner Docket No.	115539-0215

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

I. To authorize permission for Internet Communications.

☑ Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with the undersigned and practitioners in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via video conferencing, instant messaging, or electronic mail. I understand that a copy of these communications will be made of record in the application file. (MPEP 502.03)

II. To withdraw authorization for Internet Communications.

☐ The authorization given on _____, to the USPTO to communicate with the undersigned and any practitioner in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via Internet communications such as video conferencing, instant messaging, or electronic mail is hereby withdrawn. I understand that the withdrawal is effective when approved rather than when received.

I am the

☐ applicant.

☑ attorney or agent of record. Registration number 44,787.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Paul S. Hunter/	6/22/2020
Signature	Date
Paul S. Hunter	(858) 847-6733
Typed or printed name	Telephone Number

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☑ * Total of 1 forms are submitted.

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Electronic Acknowledgement Receipt

EFS ID:	39786618
Application Number:	16228728
International Application Number:	
Confirmation Number:	3978
Title of Invention:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
First Named Inventor/Applicant Name:	Balasubrahmanyam Kuchibhotla
Customer Number:	147491
Filer:	Paul S. Hunter/Maria Lopes-Carvalho
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	115539-0215
Receipt Date:	22-JUN-2020
Filing Date:	20-DEC-2018
Time Stamp:	13:48:43
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	Internet Communications Authorized	115539-0215_Authorization_for_Internet_Communication.pdf	91864 a1fd07aad0d5b04bc8fc1503a1839417dfda831e	no	2

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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.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
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<u>New International Application Filed with the USPTO as a Receiving Office</u>
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Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
Date Submitted: May 14, 2020				**Filing Date**	12/20/2018
				First Named Inventor	Balasubrahmanyam Kuchibhotla
				Art Unit	2141
(use as many sheets as necessary)				Examiner Name	SONG, DAEHO D.
Sheet	1	of	2	Attorney Docket Number	115539-0215

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A1	6,064,975	05-16-2000	MOON ET AL.	
	A2	7,725,671	05-25-2010	PRAHLAD ET AL.	
	A3	7,840,533	11-23-2010	PRAHLAD ET AL.	
	A4	8,447,728	05-21-2013	PRAHLAD ET AL.	
	A5	8,762,335	06-24-2014	PRAHLAD ET AL.	
	A6	9,740,723	08-22-2017	PRAHLAD ET AL.	
	A7	D 753,135-S	04-05-2016	VAZQUEZ, SERAFIN	
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	A15	D 862,512-S	10-08-2019	SCHUBART, LEA	
	A16	D 870,762-S	12-24-2019	MENDOZA COROMINAS ET AL.	
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	A20	10,248,657	04-02-2019	PRAHLAD ET AL.	
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UNPUBLISHED U.S. PATENT APPLICATION DOCUMENTS

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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature		Date Considered	

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
Date Submitted: May 14, 2020				**Filing Date**	12/20/2018
				First Named Inventor	Balasubrahmanyam Kuchibhotla
				Art Unit	2141
(use as many sheets as necessary)				Examiner Name	SONG, DAEHO D.
Sheet	2	of	2	Attorney Docket Number	115539-0215

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	A26	Friedman, Vitaly, "Designing the Perfect Date and Time Picker." Smashing Magazine, published July 2017 (Retrieved from the Internet 4/7/2020). Internet URL: <https://www .smashingmagazine.com/2017 /07 /designing-perfect-date-time-picker/> (Year: 2017)	
	A27	Kolasa, Konrad, "Date Picker." Dribbble, published February 28, 2017 (Retrieved from the Internet 4/7/2020). Internet URL: <https:// dribbble.com/shots/3326020-Date-Picker> (Year: 2017)	
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Examiner Signature		Date Considered	

Electronic Patent Application Fee Transmittal

Application Number:	16228728
Filing Date:	20-Dec-2018
Title of Invention:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
First Named Inventor/Applicant Name:	Balasubrahmanyam Kuchibhotla
Filer:	Paul S. Hunter/Walter Lau
Attorney Docket Number:	115539-0215

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

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($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
		Total in USD ($)		**240**

Electronic Acknowledgement Receipt	
EFS ID:	39447889
Application Number:	16228728
International Application Number:	
Confirmation Number:	3978
Title of Invention:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
First Named Inventor/Applicant Name:	Balasubrahmanyam Kuchibhotla
Customer Number:	147491
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Attorney Docket Number:	115539-0215
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Authorized User	Walter Lau
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		115539-0215-Non-Final_Office_Action_Response.pdf	148872 8abbb6dd3453f93d7f5be1416f9bd134e65c6d53	yes	15
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Amendment/Req. Reconsideration-After Non-Final Reject		1	1	
	Claims		2	9	
	Applicant Arguments/Remarks Made in an Amendment		10	15	
Warnings:					
Information:					
2	Transmittal Letter	115539-0215-_IDS_Transmittal.pdf	112301 aa8936d1c88a90834c06aa382c51209e3e8aaacb	no	2
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	115539-0215-_IDS_SB-08.pdf	112439 61db622cbeb6e4894061191e4278dc9afb5e293f	no	2
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
4	Non Patent Literature	Friedman-Designing_the_Perfect_Date_and_Time_Picker.pdf	707456 ee8f171dbc288a2b9fbb786a496f8c2255fe5eff	no	7
Warnings:					
Information:					

5	Non Patent Literature	Kolasa-Date_Picker.pdf	40035 fe51a07afbb81b7b3a453a5e5b303dde6831520c	no	2
Warnings:					
Information:					
6	Non Patent Literature	Palmer-Date_Range.pdf	41787 d294a1477f36e1e501a8af660452ff9805481fc0	no	2
Warnings:					
Information:					
7	Non Patent Literature	Rocheleau-30_Best_Free_Calendar_and_Datepicker_jQuery_Plugins.pdf	631245 cc3b303fd18a6953b9db32b08aaabe66d04d274e	no	6
Warnings:					
Information:					
8	Non Patent Literature	Warren-Internet_Archive_Wayback_Machine_Introduces_New_Beta_Version_with_Calendar_View.pdf	153443 585cff2cbeec54349cb787007c02a7a891aee5fd	no	1
Warnings:					
Information:					
9	Fee Worksheet (SB06)	fee-info.pdf	30789 5202d46a3e31a23bd135b69885c7e3f98bb4bf9a	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1978367		

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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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Inventor Name:	Balasubrahmanyam Kuchibhotla
Title:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
Appl. No.:	16/228,728
Filing Date:	12/20/2018
Examiner:	SONG, DAEHO D.
Art Unit:	2141
Confirmation Number:	3978

AMENDMENT AND REPLY UNDER 37 C.F.R. § 1.111

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

Commissioner:

This communication is responsive to the Non-Final Office Action mailed March 24, 2020, concerning the above-referenced patent application.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this document.

Remarks begin on page 10 of this document.

Please amend the application as follows:

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A ~~database management~~ system comprising:

a memory storing computer-readable instructions in a virtual computing system; and

a processor executing the computer-readable instructions to:

present a dashboard to receive ~~a dashboard that receives input from and provides output to a user, the dashboard comprising a main menu providing a plurality of control functions, wherein upon receiving selection of a first control function~~ an input to provision a source database;~~,~~ ~~the dashboard:~~

upon receiving the input, ~~presents~~ request additional inputs, via the dashboard, comprising:

~~an option to select~~ a database engine type;

~~upon receiving selection of the database engine type, presents for user selection:~~

a ~~sample~~ first profile for a ~~to create a new~~ source database virtual machine;

a second profile for the source database;

~~at least one level of~~ a Service Level Agreement ("SLA"); and

a frequency of capturing a snapshot and transactional log ~~snapshots and transactional logs~~; and

~~upon receiving the user selection of the sample profile, one of the at least one level of the SLA, and the frequency of capturing snapshots and transactional logs, displays a status as the source database is provisioned~~

create the source database and associate the source database with the source database virtual machine according to the additional inputs.

2. (Currently Amended) The ~~database management~~ system of claim 1, wherein the processor ~~dashboard~~ further executes computer-readable instructions to display ~~comprises a portion that displays~~ the source database on the dashboard upon creating ~~provisioning~~.

3. (Currently Amended) The ~~database management~~ system of claim 1, wherein the dashboard comprises a dynamically changing home page comprising a plurality of cells, wherein a first cell of the plurality of cells displays a list of all source databases in the virtual computing ~~associated with the database management~~ system.

4. (Currently Amended) The ~~database management~~ system of claim 1, wherein the processor further executes computer-readable instructions to: ~~dashboard presents:~~

present a first user interface to receive selection of ~~that displays the option for~~ the database engine type; and

present a second user interface to receive selection of ~~for displaying~~ the first ~~sample~~ profile upon receiving selection of the database engine type.

5. (Currently Amended) The ~~database management~~ system of claim 4, wherein to receive the selection of the first profile, the second user interface comprises fields for receiving selection of at least one of a software profile, a compute profile, and a network profile.

6. (Currently Amended) The ~~database management~~ system of claim 4, wherein to receive the selection of the first profile, the second user interface comprises fields for receiving selection of a name and description for the [[new]] source database virtual machine.

7. (Currently Amended) The ~~database management~~ system of claim 21, wherein the third user interface further comprises fields for receiving selection of a duration for designating at least one of a daily snapshot, a weekly snapshot, a monthly snapshot, and a quarterly snapshot.

8. (Currently Amended) The ~~database management~~ system of claim 21, wherein the processor further executes computer-readable instructions to present ~~comprising displaying~~ a fifth user interface between the second user interface and the third user interface ~~, wherein the fifth user interface comprises fields~~ for receiving selection of a name and description as the second profile for the source database.

9. (Currently Amended) The ~~database management~~ system of claim 1, wherein upon receiving the input to provision the source database ~~selection of the first control function~~, the processor executes computer-readable instructions to present ~~dashboard presents~~ a first user interface providing a first option to create a new source database and a second option to register an existing database as the new source database.

10. (Currently Amended) The ~~database management~~ system of claim 9, wherein upon receiving selection of the first option, the database presents the option for the database engine type.

11. (Withdrawn) A database management system comprising:

a dashboard that receives input from and provides output to a user, the dashboard comprising a main menu providing a plurality of control functions, wherein upon receiving selection of a first control function to create a cloned database from a source database, the dashboard presents for user selection:

a calendar highlighting at least one day covered by at least one protection parameter;

a time scale highlighting at least one time slot that is available for selection; and

a first option for creating a new target database virtual machine and a second option for using an existing target database virtual machine;

wherein upon receiving selection of one day from the calendar, a time slot from the time scale, and selection of either the first option or the second option, the dashboard displays a status as the cloned database is being created.

12. (Withdrawn) The database management system of claim 11, wherein the at least one protection parameter comprises a continuous protection parameter, a daily protection parameter, a weekly protection parameter, a monthly protection parameter, and a quarterly protection parameter.

13. (Withdrawn) The database management system of claim 12, wherein each of the continuous protection parameter, the daily protection parameter, the weekly protection parameter, the monthly protection parameter, and the quarterly protection parameter is color coded with a different color on the calendar.

14. (Withdrawn) The database management system of claim 11, wherein upon receiving selection of the first control function, the dashboard presents a first user interface providing a plurality of additional control functions, and wherein the dashboard presents the calendar in response to receiving selection of a clone database control function from the plurality of additional control functions.

15. (Withdrawn) The database management system of claim 11, wherein the dashboard presents:

a first user interface that presents the calendar; and

a second user interface that presents the time scale upon receiving selection of the one day from the calendar.

16. (Withdrawn) The database management system of claim 22, wherein the dashboard presents a fifth user interface between the third user interface and the fourth user interface for receiving selection of a name for the cloned database.

17. (Withdrawn) The database management system of claim 11, wherein the dashboard sends the user selections to a database engine via an Application Programming Interface.

18. (Withdrawn) A database management system comprising:

a dashboard comprising a main menu for providing a plurality of control functions and a body that dynamically changes based upon the plurality of control functions that are selected;

wherein the main menu comprises a first control function, wherein the selection of the first control function triggers a database provisioning service by presenting an option within the body to either create a new source database or register an existing database; and

wherein the main menu comprises a second control function, wherein the selection of the second control function triggers a copy data management service by presenting an option to create a new cloned database.

19. (Withdrawn) The database management system of claim 18, wherein upon selecting either the option to create the new source database or register the existing database, the dashboard presents a plurality of user interfaces for receiving user selections and creating the new source database or register the existing database.

20. (Withdrawn) The database management system of claim 19, wherein the dashboard displays the new source database or the registered existing database on a homepage of the dashboard.

21. (Currently Amended) The ~~database~~ system of claim 4, wherein the processor further executes computer-readable instructions to ~~dashboard presents~~:

present a third user interface to receive selection of at least one level of the ~~that displays the at least one level of the~~ SLA and the frequency of capturing the snapshot ~~snapshots~~ and the transactional [[logs]] log upon receiving selection of the first profile and the second profile ~~sample profiles~~; and

present a fourth user interface that displays the status of provisioning the source database.

22. (Withdrawn) The database system of claim 15, wherein the dashboard presents:

a third user interface that presents the first option and the second option; and

a fourth user interface that displays the status.

23. (Currently Amended) A method comprising:

receiving, at a dashboard of a virtual computing system, an input ~~from a user, the dashboard comprising a main menu providing a plurality of control functions, wherein upon receiving selection of a first control function~~ to provision a source database;

~~presenting at the dashboard an option to select~~ upon receiving the input, receiving selection of additional inputs through the dashboard comprising:

a database engine type;

~~upon receiving selection of the database engine type, presenting for user selection:~~

a ~~sample~~ first profile for a ~~to create a new~~ source database virtual machine;

a second profile for the source database;

~~at least one level of~~ a Service Level Agreement ("SLA"); and

a frequency of capturing a snapshot and a transactional log ~~snapshots and transactional logs~~; and

creating the source database and associating the source database with the source database virtual machine according to the additional inputs

~~upon receiving the user selection of the sample profile, one of the at least one level of the SLA, and the frequency of capturing snapshots and transactional logs, displaying a status as the source database is provisioned~~.

24. (Currently Amended) The method of claim 23, further comprising dynamically changing a home page comprising a plurality of cells, wherein a first cell of the plurality of cells displays a list of all source databases ~~associated with~~ in the virtual computing ~~database management~~ system.

25. (Currently Amended) The method of claim 23, further comprising:

presenting at the dashboard a first user interface for receiving selection of ~~that displays the option for~~ the database engine type; and

presenting a second user interface for receiving selection of the first ~~displaying the sample~~ profile upon receiving the selection of the database engine type.

26. (Previously Presented) The method of claim 25, wherein the second user interface comprises fields for receiving selection of at least one of a software profile, a compute profile, and a network profile.

27. (Currently Amended) The method of claim 23, wherein upon receiving ~~selection of~~ the input, the method further comprises ~~first control function,~~ presenting at the dashboard a first user interface providing a first option to create a new source database and a second option to register an existing database as the new source database.

28. (Currently Amended) The method of claim 27, further comprising ~~wherein~~ upon receiving selection of the first option, receiving selection of ~~presenting at the database the option for~~ the database engine type.

29. (Currently Amended) An apparatus comprising:

a memory comprising computer-readable ~~having stored~~ instructions stored thereon; and

a processor ~~that upon execution of~~ that executes the computer-readable instructions to ~~the stored instructions performs operations including~~:

~~receiving via~~ present a dashboard to receive an ~~interface~~ input ~~from and providing output to a user, the dashboard interface including a main menu providing a plurality of control functions, wherein upon receiving selection of a first control function~~ to provision a source database~~, the dashboard interface:~~

upon receiving the input, request additional inputs, via the dashboard, comprising:

~~presents an option to select~~ a database engine type;

~~upon receiving selection of the database engine type, presents for user selection:~~

a ~~sample~~ first profile for a ~~to create a new~~ source database virtual machine;

~~at least one level of~~ a Service Level Agreement ("SLA"); and

a frequency of capturing a snapshot and a transactional log ~~snapshots and transactional logs~~; and

create the source database and associate the source database with the source database virtual machine according to the additional inputs

~~upon receiving the user selection of the sample profile, one of the at least one level of the SLA, and the frequency of capturing snapshots and transactional logs, displaying a status as the source database is provisioned~~.

30. (Currently Amended) The apparatus of claim 29, wherein the processor further executes computer-readable instructions to ~~dashboard interface presents for user selection~~:

present a first user interface to receive selection of the database engine type;

present a second user interface to receive selection of the first profile;

present a third user interface to receive selection of the second profile; and

present a fourth user interface to receive selection of the SLA

~~a calendar highlighting a day covered by a protection parameter;~~

~~a time scale highlighting a time slot that is available for selection; and~~

~~a first option for creating a new target database virtual machine and a second option for using an existing target database virtual machine~~.

REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and the reasons that follow. Independent Claims 1, 23, and 29 have been amended. Dependent Claims 2-10, 21, 24, 25, 27, 28, and 30 have also been amended to reflect the amendments to their respective base independent claims, and to increase clarity. No new subject matter has been added with any of the amendments to the claims. Support for the amendments can be found at least in FIGS. 3-5E and their associated description as originally filed. Claims 11-20 and 22 were previously withdrawn from consideration.

After the amendments as set forth above, Claims 1-30 remain pending in the present application, with Claims 11-20 and 22 being withdrawn from consideration herein.

I. <u>Claim Rejections Under 35 U.S.C. § 101</u>

On page 3, the Office Action rejected Claims 1-10 and 21 under 35 U.S.C. § 101 as allegedly being directed to non-statutory subject matter.

Without agreeing to the propriety of the rejection and simply to advance prosecution, Applicant has amended independent Claim 1 to recite a "memory" and a "processor." Applicant respectfully submits that the amended claims are directed to eligible subject matter.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the 35 U.S.C. §101 rejection of Claims 1-10 and 21.

II. <u>Claim Rejections Under 35 U.S.C. § 103</u>

On page 5, the Office Action rejected Claims 1-10, 21 and 23-30 under 35 U.S.C. § 103 as allegedly being unpatentable over U.S. Patent Application Publication No. 9,389,962 to Yueh *et al.* ("Yueh") in view of U.S. Patent Application Publication No. 2018/0307728 to Crupi *et al.* ("Crupi").

As indicated above, independent Claim 1 has been amended to recite:

1. (Currently Amended) A system comprising:

a memory storing computer-readable instructions in a virtual computing system; and

a processor executing the computer-readable instructions to:

present a dashboard to receive an input to provision a source database;

upon receiving the input, request additional inputs, via the dashboard, comprising:

a database engine type;

a first profile for a source database virtual machine;

a second profile for the source database;

a Service Level Agreement ("SLA"); and

a frequency of capturing a snapshot and transactional log; and

create the source database and associate the source database with the source database virtual machine according to the additional inputs.

Independent Claims 23 and 29, while of varying scope, recite similar elements. Applicant respectfully submits that Yueh, either alone or in combination with Crupi, fails to teach, suggest, or disclose the combination of elements above. For example, Yueh, either alone or in combination with Crupi, fails to teach, suggest, or disclose at least "to receive an input to provision a source database" and "a first profile for a source database virtual machine," as claimed.

On page 5, the Office Action relied upon FIG. 4 of Yueh to allege that Yueh discloses provisioning a source database, as claimed. Applicant respectfully disagrees. Col. 11, lines 38-40 of Yueh note that "FIG. 4 shows a user interface for allowing a user to <u>select a source database for creating a virtual database</u>." Thus, Yueh discloses "creating a virtual database" from a "source database." Creating another database from a source database is <u>not</u> the same as creating the source database. The abstract of Yueh also notes that Yueh discloses "creation of virtual databases based on point-in-time copies associated with a <u>source</u> database."

As discussed in paragraph [0061] of the present application, the "original instances of the databases … that are created or registered with the database system" are called "source databases." On the other hand, paragraph [0024] of the present application explains that "copies of the original

or source database" are called "clones" and "may be created by periodically capturing snapshots of the source database." Paragraph [0024] of the present application further explains that a "snapshot" "stores the state of the source database at the point in time at which the snapshot is captured." Thus, Yueh's disclosure of "creat[ing] … databases based on point-in-time copies associated with a source database" is in fact creating "clones" of source databases – not provisioning source databases. There is no teaching, suggestion, or disclosure in Yueh of creating original databases that are not copies of another database. Yueh only discloses creating "clones" of source databases.

Further, Yueh fails to disclose "a first profile for a source database virtual machine," as claimed. On page 5, the Office Action relied upon FIG. 8 and col. 11, lines 38-53 of Yueh for allegedly disclosing the claimed "source database virtual machine." Col. 11, lines 38-53 of Yueh are reproduced below, with emphasis added:

> FIG. 4 shows a user interface for <u>allowing a user to select a source database for creating a virtual database</u>, in accordance with an embodiment of the invention. The user interface shown in FIG. 4 displays production database systems 110 as data sources 420. Each data source may display one or more source databases 410. In an embodiment, a data source may be selected by default, for example, the last used data source 420. A data source 420 corresponds to a server and can be added by the system administrator by specifying <u>information identifying the server, for example, the host name of the server or the internet protocol (IP) address of the server along with authentication information</u>. The authentication information is required so that the database storage system 100 is permitted to sent libraries comprising code for allowing the database storage system 100 to perform various actions on the production database system 110

The above lines simply disclose "allowing a user to select a source database," by "specifying information identifying the server [associated with the source database]" such as the "host name" and the "internet protocol (IP) address." There is no teaching, suggestion, or disclosure in the lines above or anywhere else in Yueh for receiving a "profile for a source database virtual machine," as claimed. Paragraph [0066] of the present application explains that a "source

database virtual machine" is a virtual machine on which the database being created or provisioned will reside. Indeed, since Yueh fails to teach, suggest, or disclose provisioning a source database, as claimed, Yueh does not even need to receive a "profile for a source database virtual machine," as claimed.

Similarly, description of FIG. 8 of Yueh is reproduced below, with emphasis added:

> FIG. 8 shows a user interface for allowing a user to change parameters associated with the **virtual database** being created, in accordance with an embodiment of the invention. The virtual database manager 275 can determine values for the database parameters of the virtual database. These database parameters determine various attributes associated with the virtual database, for example, the block size used, attributes describing runtime structures created by the virtual database, allocation of memory used for various types of data and structures associated with the virtual database, and the like. The database parameters values can be based on previous values specified by the user, the database parameter of the source database, information describing the virtual database system 130 and related information. The user interface shown in FIG. 8(a) presents the values determined as database parameters by the virtual database manager 275 to the user as name-value pairs 810. The user is allowed to change the parameter values and save the updated parameters using a button 815. The saved parameter values can be applied by the virtual database manager 275 to subsequent virtual databases created by the user. In an embodiment, the saved parameter values are used for subsequent virtual databases created using the same source database and may be specific to each source database.
>
> The user interface shown in FIG. 8(b) allows the user to specify a database name 820 or identifier value for uniquely identifying the virtual database being created. The user can specify scripts 830 comprising instructions to be executed before creating the virtual database and/or scripts 840 comprising instructions to be executed after creating the virtual database. The user can also specify file paths or names for the files used in the file structure created for the virtual database. For example, certain database applications require a specific type of file structure for the database. The required file structure can be obtained by the user by specifying the file paths and/or names of the files created for the virtual database.

Again, there is no teaching, suggestion, or disclosure in the lines above or anywhere else in Yueh of a "profile for a source database virtual machine," as claimed. The above lines disclose parameters for the "virtual database," which is created from the source database. Since there is no teaching, suggestion, or disclosure in Yueh of provisioning a source database, Yueh cannot teach, suggest, or disclose a "profile for a source database virtual machine," as claimed. Moreover, none of the parameters of the "virtual database" that are disclosed in the lines above teach, suggest, or disclose a "source database virtual machine."

Thus, Yueh fails to teach, suggest, or disclose all of the elements of the independent claims, and their associated dependent claims. Further, Crupi fails to cure the deficiencies of Yueh. There is no teaching, suggestion, or disclosure in Crupi of "provision[ing] a source database" and "a first profile for a source database virtual machine," as claimed. Indeed, the Office Action relied upon Crupi for allegedly disclosing only the SLA – not any other element of the claims. Thus, Crupi fails to cure Yueh's deficiencies.

Thus, Yueh, either alone or in combination with Crupi, fails to teach, suggest, or disclose all of the elements of the claims.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the 35 U.S.C. §103 rejection of Claims 1-10, 21 and 23-30.

III. Conclusion

It is submitted that each outstanding rejection to the application has been overcome, and that the Application is in condition of allowance. Applicant respectfully requests reconsideration and allowance of all pending claims. The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance prosecution.

It should also be noted that although arguments have been presented with respect to certain claims herein, the recited subject matter as well as various other subject matter and/or combinations of subject matter may be patentable for other reasons. Further, the failure to address any statement by the Examiner herein should not be interpreted as acquiescence or

agreement with such statement. Applicant expressly reserves the right to set forth additional and/or alternative reasons for patentability and/or allowance with the present Application or in any other future proceeding, and to rebut any statement presented by the Examiner in this or other papers during prosecution of the present Application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application, or credit any overpayment, to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date May 14, 2020

By */Paul S. Hunter/*

FOLEY & LARDNER LLP
Customer Number: 147491
Telephone: (858) 847-6733

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Inventor Name:	Balasubrahmanyam Kuchibhotla
Title:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
Application No.:	16/228,728
Filing Date:	12/20/2018
Examiner:	SONG, DAEHO D
Art Unit:	2141
Confirmation No.:	3978

INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §1.56

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

Commissioner:

Applicant submits herewith documents for the Examiner's consideration in accordance with 37 CFR §§1.56, 1.97 and 1.98.

Applicants respectfully request that each listed document be considered by the Examiner and be made of record in the present application and that an initialed copy of Form PTO/SB/08 be returned in accordance with MPEP §609.

The submission of any document herewith is not an admission that such document constitutes prior art against the claims of the present application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicants do not waive any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference any document submitted herewith.

TIMING OF THE DISCLOSURE

The listed documents are being submitted in compliance with 37 CFR §1.97(c), after a Non-Final Action on the merits as issued.

The requisite Information Disclosure Statement fees under 37 CFR §1.17(p) are enclosed herewith. Commissioner is hereby authorized to charge any additional fees which may be due to Deposit Account No. 19-0741.

Respectfully submitted,

Date May 14, 2020

By */Paul S. Hunter/*

FOLEY & LARDNER LLP
Customer Number: 147491
Telephone: (858) 847-6733
Facsimile: (858) 792-6773

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. 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 16/228,728	Filing Date 12/20/2018	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 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	

APPLICATION AS AMENDED - PART II

AMENDMENT	05/14/2020	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 30	Minus	** 30	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 5	Minus	*** 5	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/FREDERICK E BRISCOE/
*** 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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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/228,728	12/20/2018	Balasubrahmanyam Kuchibhotla	115539-0215	3978

147491 7590 03/24/2020
FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON, DC 20007-5109

EXAMINER
SONG, DAEHO D

ART UNIT	PAPER NUMBER
2141	

NOTIFICATION DATE	DELIVERY MODE
03/24/2020	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):

ipdocketing@foley.com

PTOL-90A (Rev. 04/07)

Office Action Summary	Application No. 16/228,728	Applicant(s) Kuchibhotla et al.	
	Examiner DAEHO D SONG	Art Unit 2141	AIA (FITF) Status Yes

-- 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 MONTHS 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 12/20/2018.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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) 1-30 is/are pending in the application.

5a) Of the above claim(s) 11-20 and 22 is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-10,21 and 23-30 is/are rejected.

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

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

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

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

11)☑ The drawing(s) filed on 12/20/18 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).

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).

Certified copies:

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)).

** 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) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date 08/02/19;11/13/19;12/17/19;03/06/20.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

This is the initial Office Action based on the application number 16/228728, filed 12/20/2018. Claims 1-20 was originally filed. Applicant have made preliminary amendment, and amended Claims 1-20, and added Claims 21 and 22.

In response to Restriction/Election requirement dated 02/28/2020, Applicants have elected, without traverse, to prosecute Claims 1-10 and 21, and added Claims 23-30 which have been considered below. Claims 1, 23, and 29 are the independent claim.

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection would be the same under either status.

A reference to specific paragraphs, columns, pages, or figures in a cited prior art reference is not limited to preferred embodiments or any specific examples. It is well settled that a prior art reference, in its entirety, must be considered for all that it expressly teaches and fairly suggests to one having ordinary skill in the art. Stated differently, a prior art disclosure reading on a limitation of Applicant's claim cannot be ignored on the ground that other

embodiments disclosed were instead cited. Therefore, the Examiner's citation to a specific portion of a single prior art reference is not intended to exclusively dictate, but rather, to demonstrate an exemplary disclosure commensurate with the specific limitations being addressed. In re Heck, 699 F.2d 1331,1332-33,216 USPQ 1038, 1039 (Fed. Cir. 1983) (quoting In re Lemelson, 397 F.2d 1006,1009,158 USPQ 275, 277 (CCPA 1968)). In re: Upsher-Smith Labs. v. Pamlab, LLC, 412 F.3d 1319, 1323, 75 USPQ2d 1213,1215 (Fed. Cir. 2005); In re Fritch, 972 F.2d 1260,1264, 23 USPQ2d 1780,1782 (Fed. Cir. 1992); Merck & Co. v. Biocraft Labs., Inc., 874 F.2d 804, 807,10 USPQ2d 1843,1846 (Fed. Cir. 1989); In re Fracalossi, 681 F.2d 792,794 n.1,215 USPQ 569, 570 n.1 (CCPA 1982); In re Lamberti, 545 F.2d 747, 750,192 USPQ 278, 280 (CCPA 1976); In re Bozek, 416 F.2d 1385,1390,163 USPQ 545, 549 (CCPA 1969).

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.

1. Claims 1-10 and 21 are rejected because the claimed invention is directed to non-statutory subject matter. Claim 1 recites a “system” comprising software components. Thus, the claim in its entirety encompasses software *per se*. That is, the claim lacks the necessary physical articles or objects to constitute a machine or a manufacture within the meaning of 35 USC §101. Also, the claim is clearly not a series of steps or acts to be a process nor is it a

combination of chemical compounds to be a composition of matter. As such, it fails to fall within a statutory category of 35 USC §101.

Claims 2-10 and 21 depend upon Claim 1, and merely recite additional features of the software modules.

Claim Rejections - 35 USC § 103

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

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102 of this title, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

2. 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 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.

3. Claims 1-10, 21, and 23-30 are rejected under 35 U.S.C. 103 as being unpatentable over Yueh et al. (hereinafter Yueh): U.S. Patent No. 9,389,962, in view of Crupi et al. (hereinafter Crupi): U.S. Patent Application Pub. No. 2018/0307728.

Claim 1:

Yueh expressly discloses:

A database management system comprising:

a dashboard that receives input from and provides output to a user, the dashboard comprising a main menu providing a plurality of control functions, wherein upon receiving selection of a first control function to provision a source database (fig. 4: a dashboard including a menu providing multiple control functions to receive input/output for a source database), the dashboard:

presents an option to select a database engine type (col. 10 lines 46-55: allowing to select a destination database server);

upon receiving selection of the database engine type, presents for user selection:

a sample profile to create a new source database virtual machine (fig. 8; col. 11 lines 38-53: selecting a source database using templates for creating a new virtual database); and

a frequency of capturing snapshots and transactional logs (col. 11 lines 16-25: based on a snapshot and transaction logs); and upon receiving the user selection of the sample profile, one of the at least one level of the SLA, and the frequency of capturing snapshots and transactional logs, displays a status as the source database is provisioned (figs. 4-6; col. 11 lines 54-65: presenting a status as the source database being provisioned in response to user selections).

Yueh fails to disclose:

at least one level of a Service Level Agreement ("SLA").

Crupi, however, expressly teaches:

at least one level of a Service Level Agreement ("SLA") ([0088][0106]: providing a Service Level Agreement).

Accordingly, it would have been obvious to one having ordinary skill in the art before the effective filing date of the claimed invention to modify the system, disclosed in Yueh, to include: at least one level of a Service Level Agreement ("SLA"), for the purpose of creating remote data sources on back-end servers for query offload so as to improve runtime data access processing within complex distributed computing environments, as taught in Crupi.

Claim 2. The database management system of claim 1, wherein the dashboard further comprises a portion that displays the source database on the dashboard upon provisioning (Yueh- fig. 4: presenting source databases 410).

Claim 3. The database management system of claim 1, wherein the dashboard comprises a dynamically changing home page comprising a plurality of cells, wherein a first cell of the plurality of cells displays a list of all source databases associated with the database management system (Yueh-fig. 4: presenting a list of the source databases 410 in a cell). .

Claim 4. The database management system of claim 1, wherein the dashboard presents: a first user interface that displays the option for the database engine type; and a second user interface for displaying the sample profile upon receiving selection of the database engine type

(Yueh-figs. 4 & 8: presenting data sources server and a template according to a selected data source server).

Claim 5. The database management system of claim 4, wherein the second user interface comprises fields for receiving selection of at least one of a software profile, a compute profile, and a network profile (Yueh-fig. 8A: presenting a computer profile).

Claim 6. The database management system of claim 4, wherein the second user interface comprises fields for receiving selection of a name and description for the new source database virtual machine (Yueh-fig. 8B: presenting a name and description for the new virtual database).

Claim 7. The database management system of claim 21, wherein the third user interface further comprises fields for receiving selection of a duration for designating at least one of a daily snapshot, a weekly snapshot, a monthly snapshot, and a quarterly snapshot (Yueh-figs. 5-6: presenting a daily snapshot).

Claim 8. The database management system of claim 21, further comprising displaying a fifth user interface between the second user interface and the third user interface, wherein the fifth user interface comprises fields for receiving selection of a name and description for the source database (Yueh-fig. 4: presenting a name and description for the source database).

Claim 9. The database management system of claim 1, wherein upon receiving selection of the first control function, the dashboard presents a first user interface providing a first option to create a new database and a second option to register an existing database (Yueh-col. 8 lines 45-67: options for creation of a virtual database and for storing an existing database on a production database system).

Claim 10. The database management system of claim 9, wherein upon receiving selection of the first option, the database presents the option for the database engine type (Yueh-fig. 4: presenting an option for a database source server).

Claim 21. The database system of claim 4, wherein the dashboard presents: a third user interface that displays the at least one level of the SLA (Crupi- [0056][0088]: an option for SLA level) and the frequency of capturing snapshots and transactional logs upon receiving selection of the sample profiles; and a fourth user interface that displays the status of provisioning the source database (Yueh-figs. 5-6 & 8; col. 12 lines 20-35 & 55-67: capturing snapshots and transactional logs and presenting the status of provisioning the source database).

Claim 30. The apparatus of claim 29, wherein the dashboard interface presents for user selection:

a calendar highlighting a day covered by a protection parameter (Yueh-fig. 5; col. 9 lines 20-34: setting up policies specifying the schedule including a highlighted calendar day by taking an action);

a time scale highlighting a time slot that is available for selection (Yueh-figs. 5-6; col. 12 lines 20-54: a time line for allowing to select an available time point); and

a first option for creating a new target database virtual machine and a second option for using an existing target database virtual machine (Yueh-col. 8 lines 45-67: options for creation of a virtual database and for storing an existing database on a production database system).

Claims 23-28:

The subject matter recited in Claims 23-28 corresponds to the subject matter recited in Claims 1, 3-5, and 9-10, respectively. Thus Yueh in view of Crupi discloses every limitation of Claims 23-28, as indicated in the above rejections for Claims 1, 3-5, and 9-10.

Claim 29:

The subject matter recited in Claim 29 corresponds to the subject matter recited in Claim 1. Thus Yueh in view of Crupi discloses every limitation of Claim 29, as indicated in the above rejections for Claim 1.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAEHO D SONG whose telephone number is (571)272-7524. The examiner can normally be reached on Mon-Fri. 8:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amy Ng can be reached on (571)270-1698. 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.

/Daeho D Song/
Primary Examiner, Art Unit 2141

Notice of References Cited	Application/Control No. 16/228,728	Applicant(s)/Patent Under Reexamination Kuchibhotla et al.	
	Examiner DAEHO D SONG	Art Unit 2141	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-9389962-B1	07-2016	Yueh; Jedidiah	G06F11/1448	1/1
*	B	US-20180307728-A1	10-2018	Crupi; Gary W.	G06F16/24553	1/1
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC 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.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/228,728	Kuchibhotla et al.
	Examiner	**Art Unit**
	DAEHO D SONG	2141

CPC - Searched*		
Symbol	**Date**	**Examiner**
G06F3/04847	02/18/2020	/ds/
G06F3/0482	02/18/2020	/ds/
G06F16/27	02/18/2020	/ds/
G06F16/252	02/18/2020	/ds/

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
EAST search	03/16/2020	/ds/
Inventor search	03/16/2020	/ds/
NPL search- IEEE Periodicals/Conferences; MIT eBooks; IBM Periodicals;Legacy Journals; IBM Redbooks	03/18/2020	/ds/

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

/DAEHO D SONG/ Primary Examiner, Art Unit 2141	

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/228,728	Kuchibhotla et al.
	Examiner	**Art Unit**
	DAEHO D SONG	2141

/DAEHO D SONG/ Primary Examiner, Art Unit 2141	

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/228,728	Kuchibhotla et al.
	Examiner	**Art Unit**
	DAEHO D SONG	2141

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

CLAIMS

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

CLAIM		DATE								
Final	Original	02/18/2020	03/19/2020							
	1	÷	✓							
	2	÷	✓							
	3	÷	✓							
	4	÷	✓							
	5	÷	✓							
	6	÷	✓							
	7	÷	✓							
	8	÷	✓							
	9	÷	✓							
	10	÷	✓							
	11	÷	N							
	12	÷	N							
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	19	÷	N							
	20	÷	N							
	21	÷	✓							
	22	÷	N							
	23		✓							
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	25		✓							
	26		✓							
	27		✓							
	28		✓							
	29		✓							
	30		✓							

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	0	16/228728.app.	US-PGPUB; USPAT	OR	ON	2020/02/18 13:22
S2	5	("0000002" | "0008601" | "8549518" | "8850130" | "9772866").PN.	US-PGPUB; USPAT	OR	ON	2020/02/18 13:25
S3	1	("0000002").PN.	US-PGPUB; USPAT	OR	ON	2020/02/18 13:27
S4	2	("0000001" | "20170286518").PN.	US-PGPUB; USPAT	OR	ON	2020/02/18 13:28
S5	1	"20130290180".did.	US-PGPUB; USPAT	OR	ON	2020/02/18 13:32
S6	39	kuchibhotla-balasubrahm$5.in.	US-PGPUB; USPAT	OR	ON	2020/02/18 13:52
S7	4	tangen-paul.in.	US-PGPUB; USPAT	OR	ON	2020/02/18 13:57
S8	8356	g06f3/04847	US-PGPUB; USPAT	OR	ON	2020/02/18 13:59
S9	21230	g06f3/0482	US-PGPUB; USPAT	OR	ON	2020/02/18 13:59
S10	1068	g06f16/27	US-PGPUB; USPAT	OR	ON	2020/02/18 14:00
S11	293	g06f16/252	US-PGPUB; USPAT	OR	ON	2020/02/18 14:00
S12	3232	(S8 S9 S10 S11) & database near3 manage$4	US-PGPUB; USPAT	OR	ON	2020/02/18 14:01
S13	121	(S8 S9 S10 S11) & database near3 manage$4 with user near interface	US-PGPUB; USPAT	OR	ON	2020/02/18 14:08
S14	7	S11 & database near3 manage$4 with user near interface	US-PGPUB; USPAT	OR	ON	2020/02/18 14:08
S15	1	("2016/0078104").URPN.	USPAT	OR	ON	2020/02/18 14:17
S16	7	select$3 near3 database near3 engine near3 type	US-PGPUB; USPAT	OR	ON	2020/02/18 14:26

S17	14	("2008/0126945").URPN.	USPAT	OR	ON	2020/02/18 14:27
S18	375	(creat$3 generat$3) near3 new near4 database near4 (clone replica$4 reproduc$4 duplicat$4 copy$3 mirror$3)	US-PGPUB; USPAT	OR	ON	2020/02/18 15:02
S19	161	S18 & database near manage$4	US-PGPUB; USPAT	OR	ON	2020/02/18 15:03
S20	82	S19 & user near interface	US-PGPUB; USPAT	OR	ON	2020/02/18 15:03
S21	3	S20 & dashboard	US-PGPUB; USPAT	OR	ON	2020/02/18 15:05
S22	10849	database near3 virtual near4 (machine apparatus system device terminal server)	US-PGPUB; USPAT	OR	ON	2020/02/18 15:48
S23	737	(creat$3 generat$3) near4 database near3 virtual near4 (machine apparatus system device terminal server)	US-PGPUB; USPAT	OR	ON	2020/02/18 15:49
S24	19	S23 & exist$3 near4 database near3 virtual near4 (machine apparatus system device terminal server)	US-PGPUB; USPAT	OR	ON	2020/02/18 15:50
S25	38	((("Kuchibhotla") near3 ("Balasubrahmanyam"))).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/16 14:16
S26	2	((("Tangen") near3 ("James"))).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/16 14:20
S27	4	((("Tangen") near3 ("Paul"))).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/16 14:21
S28	55846	((service near3 level near3 agreement) "sla")	US-PGPUB; USPAT	OR	ON	2020/03/16 14:25
S29	7984	S28 & database near3 manag$5	US-PGPUB; USPAT	OR	ON	2020/03/16 14:26
S30	1243	S29 & (dashboard (user adj interface)) with database	US-PGPUB; USPAT	OR	ON	2020/03/16 14:27
S31	27	S30 & select$3 near3 database near3 engine	US-PGPUB; USPAT	OR	ON	2020/03/16 14:27
S32	15	("2016/0197835").URPN.	USPAT	OR	ON	2020/03/16 14:40
S33	10027	(creat$3 generat$3 render$3) near3 new near3 database	USPAT	OR	ON	2020/03/16 14:51
S34	3	S33 & (display$3 present$3) near3 list near4 source near3 database	USPAT	OR	ON	2020/03/16 14:56
S35	4	S33 & (display$3 present$3) near3 list near4 source near3 data	USPAT	OR	ON	2020/03/16 14:59
S36	87	("7225189").URPN.	USPAT	OR	ON	2020/03/16 15:03

S37	2	11/938749.app.	US-PGPUB; USPAT	OR	ON	2020/03/16 15:08
S38	320	g06f16/252	US-PGPUB; USPAT	OR	ON	2020/03/16 15:19
S39	7	S33 & S38	US-PGPUB; USPAT	OR	ON	2020/03/16 15:20
S40	2675	select$3 near3 database near4 type	US-PGPUB; USPAT	OR	ON	2020/03/17 15:24
S41	109	select$3 near3 database near4 type near4 (server engine)	US-PGPUB; USPAT	OR	ON	2020/03/17 15:26
S42	3	S41 & snapshot	US-PGPUB; USPAT	OR	ON	2020/03/17 15:29
S43	2	14/257927.app.	US-PGPUB; USPAT	OR	ON	2020/03/17 15:34
S44	5700	((service near3 level near3 agreement) sla) near4 (select$3 determin$3)	US-PGPUB; USPAT	OR	ON	2020/03/17 15:59
S45	2529	((service near3 level near3 agreement)) near4 (select$3 determin$3)	US-PGPUB; USPAT	OR	ON	2020/03/17 15:59
S46	691	S45 & database near3 management	US-PGPUB; USPAT	OR	ON	2020/03/17 16:00
S47	12	S40 & S46	US-PGPUB; USPAT	OR	ON	2020/03/17 16:00
S48	39	("2007/0100793").URPN.	USPAT	OR	ON	2020/03/17 16:11
S49	23	("0000002" | "10185627" | "20080256311" | "20160077923" | "20170220777" | "20170264684" | "20190065322" | "20190129799" | "20190155936" | "20190324865" | "7953764" | "8117165" | "8150808" | "8364648" | "8612396" | "8832028" | "8914567" | "8972347" | "9116737" | "9244717" | "9256383" | "9389962" | "9436556").PN.	US-PGPUB; USPAT	OR	ON	2020/03/17 17:42
S50	1	14/573761.app.	US-PGPUB; USPAT	OR	ON	2020/03/17 18:27
S51	1181	select$3 with ((software adj profile) (computer adj profile) (network adj profile))	US-PGPUB; USPAT	OR	ON	2020/03/18 14:51
S52	13	select$3 with ((software adj profile) (computer adj profile) (network adj profile)) same database near manag$5	US-PGPUB; USPAT	OR	ON	2020/03/18 14:52
S53	4	select$3 near3 ("service level agreement") & (creat$3 generat$3) near3 new near4 database	US-PGPUB; USPAT	OR	ON	2020/03/18 15:28
S54	94	select$3 near3 ("service level agreement") &	US-	OR	ON	2020/03/18

		database near manag$5	PGPUB; USPAT			15:33
S55	6	S54 & (creat$3 generat$3 render$3 provid$3) near3 new near3 database	US-PGPUB; USPAT	OR	ON	2020/03/18 15:36
S56	25	S51 & (creat$3 generat$3) near3 new near4 database	US-PGPUB; USPAT	OR	ON	2020/03/18 16:14
S57	394	select$3 near3 profile with ((software adj profile) (computer adj profile) (network adj profile))	US-PGPUB; USPAT	OR	ON	2020/03/18 16:20
S58	1400	select$3 near3 (sample template) near4 profile	US-PGPUB; USPAT	OR	ON	2020/03/18 16:23
S59	29	S58 & (creat$3 generat$3) near3 new near4 database	US-PGPUB; USPAT	OR	ON	2020/03/18 16:24
S60	2	S59 & ((software adj profile) (computer adj profile) (network adj profile))	US-PGPUB; USPAT	OR	ON	2020/03/18 16:26
S61	757	select$3 near3 (sample) near4 profile	US-PGPUB; USPAT	OR	ON	2020/03/18 16:28
S62	13	S61 & ((software adj profile) (computer adj profile) (network adj profile))	US-PGPUB; USPAT	OR	ON	2020/03/18 16:29
S63	106	select$3 with ((software adj profile) (computer adj profile) (network adj profile)) with database	US-PGPUB; USPAT	OR	ON	2020/03/18 16:32
S64	35	select$3 near4 ((software adj profile) (computer adj profile) (network adj profile)) with database	US-PGPUB; USPAT	OR	ON	2020/03/18 16:32
S65	19	select$3 near4 ((software adj profile) (computer adj profile) (network adj profile)) with user near interface	US-PGPUB; USPAT	OR	ON	2020/03/18 16:38
S66	117	database near3 (engine server) near4 type & profile & ((software adj profile) (computer adj profile) (network adj profile))	US-PGPUB; USPAT	OR	ON	2020/03/18 16:49
S67	147	(select$3 option) near4 database near3 (engine server) near4 type	US-PGPUB; USPAT	OR	ON	2020/03/18 16:55
S68	3	(select$3 option) near4 database near3 (engine server) near4 type & (display$3 present$3) near3 profile	US-PGPUB; USPAT	OR	ON	2020/03/18 16:59
S69	2	(select$3 option) near4 ((software adj profile) (computer adj profile) (network adj profile)) with database near3 (engine server)	US-PGPUB; USPAT	OR	ON	2020/03/18 17:08
S70	87	user near interface near4 ((software adj profile) (computer adj profile) (network adj profile))	US-PGPUB; USPAT	OR	ON	2020/03/18 17:18

EAST Search History (Interference)

<This search history is empty>

3/19/2020 5:05:40 PM
C:\Users\dsong\Documents\EAST\Workspaces\16228728.wsp

Main Concept Text
==========
Database management in user interface by creating virtual database

(No Concept Modifiers)
==========

Filters (1)
==========
Publication Date: To 2018-12-20

Options
=======
De-dup: None
Cut-off: None
Sort: Relevance

Content: Non-Patent Literature (25)
==========
IEEE Xplore Publications: IEEE Periodicals
IEEE Xplore Publications: IEEE Conferences
IEEE Xplore Publications: IEEE Standards
IEEE Xplore Publications: IEEE Early Access
IEEE Xplore Publications: IET Periodicals
IEEE Xplore Publications: IET Conferences
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OnePetro.org: Periodicals at OnePetro.org
OnePetro.org: Conferences at OnePetro.org
OnePetro.org: Standards at OnePetro.org
Other Literature: IBM Redbooks

PTO/SB/08 (modified)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
Date Submitted: August 2, 2019				**Filing Date**	12/20/2018
				First Named Inventor	Balasubrahmanyam Kuchibhotla
(use as many sheets as necessary)				Art Unit	2173
				Examiner Name	VU, KIEU D.
Sheet	1	of	2	Attorney Docket Number	115539-0215

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number / Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
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	A2	8,601,473-B2	12-03-2013	ARON ET AL.	
	A3	8,850,130-B2	09-30-2014	ARON ET AL.	
	A4	9,772,866-B2	09-26-2017	ARON ET AL.	

UNPUBLISHED U.S. PATENT APPLICATION DOCUMENTS

Examiner Initials*	Cite No.[1]	U.S. Patent Application Document / Serial Number-Kind Code[2] (*if known*)	Filing Date of Cited Document MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

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Examiner Initials*	Cite No.[1]	Foreign Patent Document / Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	A5	POITRAS, STEVEN. "The Nutanix Bible" (11 January 2014), from http://stevenpoitras.com/the-nutanix-bible/ (Publication date based on indicated capture date by Archive.org; first publication date unknown)	
	A6	POITRAS, STEVEN. "The Nutanix Bible" (12 January 2016), from https://nutanixbible.com/	
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	A9	POITRAS, STEVEN. "The Nutanix Bible" (25 June 2018), from https://nutanixbible.com/	
	A10	POITRAS, STEVEN. "The Nutanix Bible" (3 January 2017), from https://nutanixbible.com/	
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	A12	POITRAS, STEVEN. "The Nutanix Bible" (4 September 2015), from https://nutanixbible.com/	

Examiner Signature	/DAEHO D SONG/	Date Considered	03/18/2020

4810-9183-4014.1

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PTO/SB/08 (modified)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
Date Submitted: August 2, 2019				**Filing Date**	12/20/2018
				First Named Inventor	Balasubrahmanyam Kuchibhotla
(use as many sheets as necessary)				Art Unit	2173
				Examiner Name	VU, KIEU D.
Sheet	2	of	2	Attorney Docket Number	115539-0215

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Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	A13	POITRAS, STEVEN. "The Nutanix Bible" (7 January 2015), from http://stevenpoitras.com/the-nutanix-bible/ (Publication date based on indicated capture date by Archive.org; first publication date unknown)	
	A14	POITRAS, STEVEN. "The Nutanix Bible" (8 June 2017), from https://nutanixbible.com/	
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Examiner Signature	/DAEHO D SONG/	Date Considered	03/18/2020

4810-9183-4014.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.D.S/

Bibliographic Data

Application No: 16/228,728

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /DAEHO D SONG/ (Examiner's Signature) [ ] (Initials)

Title: USER INTERFACE FOR DATABASE MANAGEMENT SERVICES

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/20/2018 **RULE**	715	2141	115539-0215

APPLICANTS

Nutanix, Inc., San Jose, CA,

INVENTORS

Balasubrahmanyam Kuchibhotla San Ramon, CA, UNITED STATES

Bakul Banthia San ramon, CA, UNITED STATES

Paul James Tangen Enfield, NH, UNITED STATES

CONTINUING DATA

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

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STATE OR COUNTRY

UNITED STATES

ADDRESS

FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON, DC 20007-5109
UNITED STATES

FILING FEE RECEIVED

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PTO/SB/08 (modified)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
				Filing Date	12/20/2018
Date Submitted: November 13, 2019				**First Named Inventor**	Balasubrahmanyam Kuchibhotla
				Art Unit	2141
(use as many sheets as necessary)				Examiner Name	SONG, DAEHO D.
Sheet	1	of	1	Attorney Docket Number	115539-0215

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Examiner Initials*	Cite No.[1]	Document Number / Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

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Examiner Signature	/DAEHO D SONG/	Date Considered	03/18/2020

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PTO/SB/08 (modified)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
				Filing Date	12/20/2018
Date Submitted: March 6, 2020				**First Named Inventor**	Balasubrahmanyam Kuchibhotla
				Art Unit	2141
(use as many sheets as necessary)				Examiner Name	SONG, DAEHO D.
Sheet	1	of	3	Attorney Docket Number	115539-0215

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Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
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Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
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Examiner Signature	/DAEHO D SONG/	Date Considered	03/18/2020

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.D.S/

PTO/SB/08 (modified)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
				Filing Date	12/20/2018
Date Submitted: March 6, 2020				**First Named Inventor**	Balasubrahmanyam Kuchibhotla
				Art Unit	2141
(use as many sheets as necessary)				Examiner Name	SONG, DAEHO D.
Sheet	2	of	3	Attorney Docket Number	115539-0215

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Examiner Signature	/DAEHO D SONG/	Date Considered	03/18/2020

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.D.S/

PTO/SB/08 (modified)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
				Filing Date	12/20/2018
Date Submitted: March 6, 2020				**First Named Inventor**	Balasubrahmanyam Kuchibhotla
				Art Unit	2141
(use as many sheets as necessary)				Examiner Name	SONG, DAEHO D.
Sheet	3	of	3	Attorney Docket Number	115539-0215

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Examiner Signature	/DAEHO D SONG/	Date Considered	03/18/2020

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.D.S/

PTO/SB/08 (modified)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
Date Submitted: December 17, 2019				**Filing Date**	12/20/2018
				First Named Inventor	Balasubrahmanyam Kuchibhotla
(use as many sheets as necessary)				Art Unit	2141
				Examiner Name	SONG, DAEHO D.
Sheet	1	of	2	Attorney Docket Number	115539-0215

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Examiner Initials*	Cite No.[1]	Document Number / Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A1	2013/0290180	10-31-2013	BAFFIER ET AL.	
	A2	2017/0286518	10-05-2017	HOROWITZ ET AL.	

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Examiner Initials*	Cite No.[1]	Foreign Patent Document / Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	A3	NETAPP SUPPORT, "Cloning databases using SnapManager" (August 2013) from, https://library.netapp.com/ecmdocs/ECMP1217281/html/GUID-EAA4950A-C186-423D-9574-6EA12A92E53D.html (accessed 12/17/2019).	
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Examiner Signature		Date Considered	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.D.S/

PTO/SB/08 (modified)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
				Filing Date	12/20/2018
Date Submitted: December 17, 2019				**First Named Inventor**	Balasubrahmanyam Kuchibhotla
				Art Unit	2141
(use as many sheets as necessary)				Examiner Name	SONG, DAEHO D.
Sheet	2	of	2	Attorney Docket Number	115539-0215

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	A5	ORACLE COMMUNICATIONS, "Provisioning Database Interface User's Guide, Release 16.0" (September 2014) Oracle, p. 1-174.	
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Examiner Signature	/DAEHO D SONG/	Date Considered	03/18/2020

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.D.S/

United States Patent and Trademark Office

Office of the Chief Financial Officer

Document Code:WFEE

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Sale Accounting Date:03/12/2020

Sale Item Reference Number	Effective Date
16228728	03/06/2020

Document Number	Fee Code	Fee Code Description	Amount Paid	Payment Method
I20203BL38188624	1201	INDEPENDENT CLAIMS IN EXCESS OF 3	$920.00	Deposit Account
I20203BL38188624	1202	CLAIMS IN EXCESS OF 20	$800.00	Deposit Account

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. 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 16/228,728	Filing Date 12/20/2018	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 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	

APPLICATION AS AMENDED - PART II

AMENDMENT	03/06/2020	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 30	Minus	** 22	= 8		x $100 =	800
	Independent (37 CFR 1.16(h))	* 5	Minus	*** 3	= 2		x $460 =	920
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	1720

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							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".	/DARRYL FORTE/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

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

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

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
Date Submitted: March 6, 2020				**Filing Date**	12/20/2018
				First Named Inventor	Balasubrahmanyam Kuchibhotla
				Art Unit	2141
(use as many sheets as necessary)				Examiner Name	SONG, DAEHO D.
Sheet	1	of	3	Attorney Docket Number	115539-0215

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
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Examiner Initials*	Cite No.[1]	U.S. Patent Application Document Serial Number-Kind Code[2] (*if known*)	Filing Date of Cited Document MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

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Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	A24	EP-1 654 683	05-10-2006	ORACLE INT CORP		
	A25	WO-2016/069029	05-06-2016	HEWLETT PACKARD ENTPR DEV LP		

Examiner Signature		Date Considered	

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
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Date Submitted: March 6, 2020				**First Named Inventor**	Balasubrahmanyam Kuchibhotla
				Art Unit	2141
(use as many sheets as necessary)				Examiner Name	SONG, DAEHO D.
Sheet	2	of	3	Attorney Docket Number	115539-0215

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Examiner Signature		Date Considered	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
				Filing Date	12/20/2018
Date Submitted: March 6, 2020				**First Named Inventor**	Balasubrahmanyam Kuchibhotla
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Sheet	3	of	3	Attorney Docket Number	115539-0215

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(11) EP 1 654 683 B1

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PCT/US2004/025805

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(54) **AUTOMATIC AND DYNAMIC PROVISIONING OF DATABASES**

AUTOMATISCHES UND DYNAMSICHES BEREITSTELLEN VON DATENBANKEN

APPROVISIONNEMENT AUTOMATIQUE DYNAMIQUE DE BASES DE DONNEES

(84) Designated Contracting States:
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(30) Priority: **14.08.2003 US 495368 P**
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03.09.2003 US 500096 P
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(73) Proprietor: **Oracle International Corporation**
Redwood Shores, CA 94065 (US)

(72) Inventors:
- **SOUDER, Benny**
  Belmont, CA 94002 (US)
- **STAMOS, James**
  Saratoga, CA 95070 (US)
- **WONG, Lik**
  Union City, CA 94587 (US)
- **CIMINSKI, John**
  Redwood City, CA 94065 (US)
- **LAKSHMINATH, Anand**
  Fremont, CA 94536 (US)
- **DOWNING, Alan**
  Fremont, CA 94555 (US)

(74) Representative: **Dendorfer, Claus et al**
Dendorfer & Herrmann
Patentanwälte Partnerschaft mbB
Bayerstrasse 3
80335 München (DE)

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Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

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Description

RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application No. 60/495,368, entitled *Computer Resource Provisioning,* filed by Debashish Chatterjee, et al. on August 14, 2003; this application claims priority to U.S. Provisional Application No. 60/500,050, entitled *Automatic And Dynamic Provisioning Of Databases,* filed by Benny Souder, et al. on September 3, 2003; this application claims priority to U.S. Provisional Application 60/500,096, entitled *Service Based Workload Management and Measurement in a Distributed System,* filed by Carol Colrain, et al. on September 3, 2003; and this application claims priority to U.S. Application No. 10/718,747, *Automatic and Dynamic Provisioning of Databases,* filed on November 21, 2003.

[0002] The following applications are related to the current application:

U.S. ApplicationNo. 10/449,873, entitled *Utilizing Rules in a Distributed Information Sharing System,* filed by Edwina Lu, et al. on May 30, 2003; and
U.S. Application No. 10/353,381, erititled *Pluggable Tablespaces For Database Systems,* filed by Juan R. Loaiza, et al. on January 28, 2003.

FIELD OF THE INVENTION

[0003] The present invention relates to distributed database systems, and in particular, to allocating resources in a database system to meet varying workload demands.

BACKGROUND OF THE INVENTION

[0004] Enterprises are looking at ways of reducing costs and increasing efficiencies of their data processing system. A typical enterprise data processing system allocates individual resources for each of the enterprise's applications. Enough resources are acquired for each application to handle the estimated peak load of the application. Each application has a different load characteristics; some applications are busy during the day; some others during the night; some reports are run once a week and some others once a month. As a result, there is a lot of resource capacity that is left unutilized. Grid computing enables the utilization or elimination of this unutilized capacity. In fact, Grid computing is poised to drastically change the economics of computing.

[0005] A grid is a collection of commodity computing elements that provide processing and some degree of shared storage; the resources of a grid are allocated dynamically to meet the computational needs and priorities of its clients. An example of a grid is a rack of server blades. Each server blade is an inclusive computer system, with processor, memory, network connections, and associated electronics on a single motherboard. Typically, server blades do not include onboard storage (other than volatile memory), and they share storage units (e.g. shared disks) along with a power supply, cooling system, and cabling within a rack.

[0006] Grid computing can dramatically lower the cost of computing, extend the availability of computing resources, and deliver higher productivity and higher quality. The basic idea of Grid computing is the notion of computing as a utility, analogous to the electric power grid or the telephone network. A client of the Grid does not care where its data is or where the computation is performed. All a client wants is to have computation done and have the information delivered to the client when it wants.

[0007] At a high level, the central idea of Grid computing is computing as a utility. A client of a Grid should not have to care where its data resides, or what computer element processes a request. The client need only request information or computation and have it delivered - as much as needed and whenever needed. This is analogous to the way electric utilities work; a customer does not know where the generator is, or how the electric grid is wired. The customer just asks for electricity and gets it. The goal is to make computing a utility -- a ubiquitous commodity. Hence it has the name, the Grid.

[0008] This view of Grid computing as a utility is, of course, a client side view. From the server side, or behind the scenes, the Grid is about resource allocation, information sharing, and high availability. Resource allocation ensures that all those that need or request resources are getting what they need. Resources are not standing idle while requests are left unserviced. Information sharing makes sure that the information clients and applications need is available where and when it is needed. High availability ensures that all the data and computation must always be there -- just as a utility company must always provide electric power.

Grid Computing for Databases

[0009] One area of computer technology that can benefit from Grid computing is database technology. A grid can support multiple databases and dynamically allocate resources as needed to support the load on each database. As the load for a database increases, more resources are allocated for that database. For example, on an enterprise grid, a database is being serviced by one database server running on one server blade on the grid. The number of users requesting data from a database increases. In response to this increase in the demand for the database, another database server is provisioned on one or more other server blades.

Provisioning for Database Grid

[0010] The term provisioning refers to providing and configuring the computational resources and data needed to provide a service. With respect to database servers, provisioning includes configuring a server blade to run

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the database server and configuring the database server to manage a database. With respect to databases, provisioning includes configuring a database server to manage access to the database.

[0011] The process of provisioning data or a database is referred to herein as data provisioning. Provisioning a database in a grid may require cloning all or part of the database, and then provisioning a new database server to manage the clone or incorporating the clone into another database already being managed by an already running database server.

[0012] Data provisioning of a database can involve the bulk transfer of data between file systems and/or databases. Unfortunately, techniques for bulk transfer of data that are used for database provisioning entail manual intervention and therefore cannot be used to effectively provision data automatically and dynamically as is required for grid computing.

[0013] An example of an approach for data provisioning that uses a technique for bulk transfer of data is the transportable tablespace approach. A tablespace is a collection of storage containers (e.g. files) used to store data for database objects (e.g. relational tables). Under this approach, tablespaces are exported from a "source database" and imported into a "target database". This capability allows the files of a tablespace to be copied using operating system utilities for copying files, which run much faster than the other techniques for bulk transfer of data between database. Such other techniques involve executing queries and insert statements.

[0014] To transport a tablespace, a human database administrator ("DBA") performs manual steps. First, the tablespace must be imported into the target tablespace by attaching the tablespace. With respect to a tablespace, database, and database server, the term "attach" refers to configuring a database and/or database server so that the database objects in the tablespace are incorporated within the database and the tablespace is used to store data for the database. Configuring a database to attach a tablespace involves modifying the database metadata so that it defines the tablespace and database objects as part of the database. The database metadata may be altered using a variety of techniques involving manual steps performed by a DBA. The DBA can run utilities available on the source database system that may be executed to export the metadata into a "metadata dump file", and run utilities on the target database system to construct metadata from the metadata dump file. Alternately, metadata can be included with the data being transported in the tablespace, and the target database would reconstruct the metadata from the metadata included in the tablespace. The DBA can also manually reconstruct the metadata on the target database system.

[0015] A tablespace may be transported to a database by creating a separate copy of the tablespace from the original source database and attaching it to the target database. While the copy is being made, operations on the tablespace should be restricted to read-only operations. The DBA sends commands to instruct a database server managing the database to restrict database operations performed on the tablespace to read-only operations. Once the copy is complete, the DBA may send commands to instruct the database server that modification operations can be performed.

[0016] The term "copy," as used herein, refers to both the source data and a duplicate of the source data. For example, a copy of a source file may be the source file itself, or another file that is a duplicate that can be generated using, for example, readily available copy utilities, such as operating system utilities for creating copies of data files.

[0017] The copy of a tablespace transported may also be detached from a database. With respect to particular tablespace and database and database server, the term detach refers to configuring a database and/or database server so that a tablespace is no longer used to store data for the database. Configuring a database to detach a tablespace includes altering database metadata in the source database system, by, for example, removing metadata defining the tablespace as part of the source database system, or setting a flag to indicate that the tablespace is no longer used. This step is performed by the DBA by running utilities or by manually editing the source database metadata.

[0018] The tablespaces for the source database are stored in a "source directory" of a file system and the tablespaces of the target database system are stored in a "target directory" of a file system. The source and target directories may be within the same file system or a different file system on a different computer system. In any case, the DBA needs to transfer the tablespace using operating system utilities. This requires that the DBA have an operating system account on the computer system of the target directory. The DBA logs onto the computer system and runs a utility to transfer the tables from the source directory to the target directory. If the target directory is in another file system of another computer system, the DBA can use FTP to transfer the file (i.e. use a utility that follows the File Transfer Protocol). To use FTP, the DBA needs an operating system account on the computer system of the target directory to log onto the computer system and transfer the tablespace files.

[0019] As demonstrated above, conventional bulk transfer of data techniques for provisioning database require manual intervention on the part of a human DBA. Because Grid computing requires that data provisioning be performed automatically and dynamically, database provisioning that requires the bulk transfer of databases is not amenable for Grid computing. Clearly, there is need for automated bulk transferring of databases that is suitable for dynamic data provisioning within a grid.

[0020] The approaches described in this section are approaches that could be pursued, but not necessarily approaches that have been previously conceived or pursued. Therefore, unless otherwise indicated, it should

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not be assumed that any of the approaches described in this section qualify as prior art merely by virtue of their inclusion in this section.

[0021] U.S. Patent No. 5,890,167 discloses pluggable tablespaces for database systems. A pluggable set of tablespaces is unplugged by exporting associated metadata and making a binary copy of the tablespaces. The pluggable set of tablespaces is plugged into a target database by making the pluggable set accessible to the target database and importing the associated metadata.

[0022] WO 02/05116 A2 discloses a system and method for automatically replicating database information. A database replication server queries a subscription database to obtain custom attributes defined in a plurality of custom database information subscriptions. The custom attributes for each database subscription include (a) the identification of one or more master subscription databases, and (b) at least one operation to be performed on the one or more master subscription databases to create a custom information database. The operations to be performed can include merging, partitioning and filtering operations. The operations are used to automatically generate custom information databases containing preferred database information from the master subscription databases:

[0023] WO 02/097676 A2 discloses a mechanism that allows a given database system to access data blocks from another database system, where data blocks from the given database system and data blocks from the other database system have different sizes. A tablespace in the other database system may be detached from the other database system and integrated into the given database.

[0024] US 2002/0073139 A1 discloses a tightly integrated palmtop computer system and personal computer system with a number of synchronization functions.

[0025] EP 0 992 909 A2 discloses the use of active redundant copies of a database schema to provide continuous database service and scalable query performance.

SUMMARY OF THE INVENTION

[0026] The present invention is defined by the independent claims. The dependent claims concern optional features of some embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] The present invention is illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings and in which like reference numerals refer to similar elements and in which:

FIG. 1 is a block diagram depicting a distributed database system upon which an embodiment of the present invention may be implemented.

FIG. 2 is a block diagram of procedure used to automatically and dynamically provision tablespaces according to an embodiment of the present invention.

FIG. 3 is a flow chart depicting a process for automatically and dynamically provisioning tablespaces according to an embodiment of the present invention.

FIG. 4 is a block diagram depicting a mechanism for synchronizing tablespaces that may be automatically and dynamically provisioned according to an embodiment of the present invention.

FIG. 5 is a flow chart for automatically and dynamically provisioning a tablespace and tablespace synchronization mechanism according to an embodiment of the present invention.

FIG. 6 is a block diagram depicting a computer system that may be used to implement an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0028] A method and apparatus for automatic and dynamic provisioning of databases is described. In the following description, for the purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent, however, that the present invention may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to avoid unnecessarily obscuring the present invention.

[0029] Approaches described herein may be used for provisioning of databases that requires a bulk transfer of data within in a distributed computing environment, such as a grid. The approaches do not require the manual intervention of a DBA to, for example, transfer a tablespace between the file systems of operating systems. Instead, the tablespaces may be provisioned automatically and dynamically by a grid computing system whenever it determines the need to dynamically provision a database. In addition, as copies of tablespaces are provisioned, synchronization mechanisms can also be automatically provisioned to keep the tablespaces and their copies in sync.

EXEMPLARY DISTRIBUTED DATABASE SYSTEM

[0030] FIG. 1 shows a distributed database system 101 that may be used to implement an embodiment of the present invention. Distributed database system 101 includes database server 112 and database server 122. Database server 112 manages access to database 114 and database server 122 manages access to database 124. A database server, such as database servers 112 and 122, is a combination of a set of integrated software components and an allocation of computational resources, such as memory and processes for executing the set of integrated software components on a processor,

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where the combination of software and computational resources are used for managing a database. Among other functions of database management, a database server governs and facilitates access to a database, processing requests by database clients to access the database. The database clients of a database server may include other database servers. Database 110 is a collection of database objects. Database objects include any form of structured data. Structured data is data structured according to a metadata description defining the structure. Structured data includes relational tables, object tables, object-relational tables, and bodies of data structured according to the Extensible Markup Language ("XML"), such as XML documents.

[0031] Tablespaces 119 and 129 are "online" because each of them is defined as being part of a database. Offline tablespaces, such as offline tablespaces 180, are tablespaces that are detached, that is, not defined as being part of a database. The approaches described herein can be used to provision copies of online tablespaces and offline tablespaces.

[0032] Database 114 is referred to as a local database with respect to database server 112 because database server 112 does not require another database server to access database 114 on database server 112's behalf. However, to access database 124, database server 112 must request access from database server 122, which accesses the data on behalf of database server 112. Therefore, database 124 is not a local database of database server 112.

[0033] As mentioned before, a tablespace is a collection of storage containers. According to an embodiment of the present invention, the storage containers are files defined and managed by an operating system. An operating system is software that controls and manages a computer element's resources. Other software that is executed on the computer element, herein "applications", are executed by processes that operate under the control of the operating system. The software components of a database server are an example of an application. Access by processes executing the applications to the resources is also controlled by the operating system. Applications access the resources by calling operating system routines and utilities.

[0034] Files defined and managed by an operating system are stored in persistent storage, such as disk storage, and organized as a hierarchy of directories that contain files and other directories. A file system directly controlled by an operating system on a computer element is referred to as a local file system with respect to the operating system. The files within the file system are referred to as local files with respect to the operating system. A file system is directly controlled by a particular operating system if access to the file system does not require another operating system to access the file system on the particular operating system's behalf. Thus, a file system in a shared disk system may be controlled by more than one operating system.

[0035] An operating system on a computing element that controls an application or a process is referred to herein as a local operating system with respect to the application or process. Likewise, the application or process is referred to as a local application or local process with respect to the operating system.

[0036] Processes executing under the control of an operating system are associated with an operating system account established by operating system functions responsible for registering accounts. Initiating a process for a user requires that the user logon under an account using an operating system function for logging on users.

[0037] While an operating system controls the resources of a computing element, the control can be shared with applications, which share control jointly with and subordinate to an operating system. For example, database server 112 is comprised of multiple "database server processes" associated with an operating system account. Processes associated with this operating system account, which include the multiple database server processes, are granted exclusive read and write privileges by the operating system of computer element 110 to directories in the local file system of the operating system. Access by the database server processes to data in the directories is managed by database server 112. Processes associated with other operating system accounts may not access these directories. In this way, database server 112 shares joint and subordinate control over these directories and the files within them.

[0038] An operating system provides various functions and utilities that allow resources to be managed and handled in a certain way. For example, the operating system of computer element 110 can treat disk drives as a Redundant Array of Independent (or Inexpensive) Disks. Likewise, a database server can provide similar capabilities.

[0039] Database transport procedures 150 include routines that may be invoked by a database server to perform a specific set of steps needed to provision a tablespace. A procedure may perform some or all the steps needed to provision a tablespace, including steps conventionally and manually performed by a DBA. The procedures may be invoked to automatically and dynamically provision a database.

Data Transport Mechanisms

[0040] Database servers 112 and 122 transmit data between each other using various data transport mechanisms ("transport mechanisms"). These transport mechanisms include Database Server to Database Server file transport mechanism 130 ("DB file transport mechanism") and rule-based messaging system 140. For purposes of exposition, DB file transport mechanism 130 and rule-based messaging system 140 are depicted in Fig. 1 using blocks that are separate and distinct from those used to represent database servers 112 and 122. However, these mechanisms may include software com-

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ponents that are integrated within either database server 112 and 122 and that participate to transmit data along an interconnect (e.g. network, bus) between the database servers. In fact, these transport mechanisms may use queues and tables within databases 114 and 124, or files under the control of database servers 112 and 122, and may use procedures from database transport procedures 150.

[0041] DB file transport mechanism 130 is a transport mechanism dedicated to transferring files between database servers 112 and 122. The files may be transported from one or more directories in a local file system of database server 112 to one or more directories of a local file system of database server 122. A local file system of a database server is a local file system of an operating system that controls the database server. Thus, a local file system of database server 112 is the local file system of the operating system of computer element 110. According to an embodiment of the present invention, the files are transported using a protocol similar to FTP.

[0042] DB file transport mechanism 130 is distinguishable from conventional file transport mechanisms as follows. It is a database server component that (1) only transports data in the form of files, and (2) transports a file between database servers, which either retrieve the file from a local file system and, upon receipt of the file, stores it in a local file system, and (3) transports files in this way in response to a request to transport them, where the request designates the specific files to transport and the location (e.g. directory) of the source and the destinations. The files transported maybe binary files or text files. DB file transport mechanism 130 also performs character-set conversion, converting the character-set format of the file transported.

[0043] While clearly transport mechanisms have transported files between file system directories, such mechanisms did not comprise software components that are integrated components of a database server. Furthermore, database servers 112 and 122, unlike conventional database servers, are configured to recognize commands that specify files to be transported between directories. Such commands can be entered by a user via a command line interface that also accepts queries that conform to a database language, such as SQL. The commands that specify files to transport specify a file name, including a directory path of the file's location, and a file name and directory path to which to transport the file.

Rule-based Messaging System

[0044] Rule-based messaging system 140 transmits messages between database server 112 and database server 122. The message contains information about events, events such as the creation or modification of data. Messages are used to propagate events that occur at one database server to another database server. The other database server may then transmit the message to yet another database server.

[0045] A common use of a messaging system is to replicate data. DML changes made to a database object at a database server are propagated to another database server that maintains replicas of at least a portion of the database object. Rule-based messaging system 140 may be used to transport a wide range of types of data, including files.

[0046] The message flow needed from one messaging system to another messaging system may differ. Various types of messaging systems provide the ability for users to configure the message flow between nodes in a network. One type of messaging system is a rule-based messaging system, such as rule-based messaging system 140, which allows a user to specify rules that govern the flow of messages.

[0047] A rule specifies a condition and an action to perform if the condition is met. In general, rules comply with a rules language, which is like a computer language. Messaging systems that use rules expose information about events through variables or attributes that can be referenced by the rules. The condition in a rule may be expressed using boolean expressions that reference the variables and attributes. The rules may be used to select which events for which messages are sent to other nodes, and what to do with a message received from another node.

Database Transport Procedures

[0048] FIG. 2 depicts database transport procedures 150 in greater detail according to an embodiment of the present invention. Database transport procedures 150 include file transport procedures 210 and transportable tablespace procedures 220. File transport procedures 210 include routines related to transferring files between database servers while tablespace transport procedures 220 include procedures related to transporting tablespaces. These procedures may be invoked by a database server or user through a user interface, such as a command line interface. An invocation of a database server may specify one or more parameters and may return one or more values (e.g. function call value or parameter return values). The parameters are used to specify, for example, what tablespace to detach or which file to transport.

[0049] According to an embodiment of the present invention, database transport procedures 150 are written in a combination of C and PL/SQL™. PL/SQL is a procedural database language available from Oracle™ Corporation. However, the present invention is not limited to database transport procedures that are written in a particular computer language.

[0050] File transport procedures 210 include procedures get 212, put 214, and copy 216, as follows.

[0051] **Get 212** This procedure causes a "destination" database server to request from a "source" database server a file local to the source database server. The source database server transmits the requested file to

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the destination database server. The request and the file may be transported using DB file transport mechanism 130.

[0052] **Put 214** This procedure causes a source database server to contact a destination database server to create, in the local file system of the destination database server, a copy of a file from the local file system of the source database server. The source database server transmits the requested file to the destination database server. The file may be transported using DB file transport mechanism 130. This procedure may be used by rule-base messaging system 140 to propagate a file via DB file transport mechanism 130.

[0053] **Copy 216** This procedure causes a database server to make a local copy of the file to the local file system.

[0054] Database Transport Procedures 150 include detach 222, clone 224, attach 226, pull 228, and push 229, as follows.

[0055] **Detach 222** This procedure causes a database server to make a set of tablespaces read-only, to detach the tablespaces from the database, and return the names of the files in the tablespace ("tablespace files"). A database server makes a set of tablespaces read-only by only honoring and processing requests to read data from the tablespaces and preventing DML changes to data in the tablespace. Tablespace metadata for the set of tablespaces is exported to a separate file, referred to as a "metadata dump file."

[0056] The tablespace files and the metadata dump file together form a "transportable tablespace package". A transportable tablespace package can be transported using file transport procedures 210. A transportable tablespace package detached in this way can also be "re-attached" to a database from which it was detached.

[0057] **Clone 224** This procedure copies tablespaces without detaching them. Specifically, the procedure causes a database server to make a set of tablespaces read-only, to copy their tablespace files to another set of tablespace files that may be specified by a parameter, and then making the set of tablespaces read-write (if read-write before invoking the procedure). The procedure also exports metadata for the set of tablespaces to a metadata dump file. The procedure returns the names of the new tablespace files and the metadata dump file.

[0058] **Attach 226** This procedure causes a database server to attach a set of tablespaces in a transportable set package.

[0059] **Pull 228** This procedure causes a database server to copy a set of tablespaces from a remote database (one that is not local to the database server) of a remote database server and attach the tablespace into a local database of the database server. Thus, the procedure completely provisions a tablespace. FIG. 3 illustrates this procedure.

[0060] Referring to FIG. 3, at step 310 the tablespaces at the remote server are made read-only. At step 320, the database server gets metadata describing the tables using metadata import/export utilities. Such utilities allow clients and database servers to connect to another database server and get metadata describing database objects, including metadata describing tables and tablespaces and database objects within tablespaces. At step 330, the database server uses get 212 to get a copy of the tablespaces and store them in the local file system. At step 340, the tablespaces are imported into the local database by attaching them, using the tablespace metadata obtained at step 320. At step 350, the tablespaces at the remote server are made read-write.

[0061] **Push 229** This procedure causes a source database server to copy a set of tablespaces and import them into a local database of a remote database server. This procedure may be implemented by sending a message via rules-based messaging system 140 to the remote database server, the message specifying the tablespaces to "pull". The remote database server then invokes pull 228 to provision the tablespaces in the local database. Another way to implement this procedure is for a source database server to use put 214 to transport a copy of the tablespace to a remote database, to invoke metadata import/export utilities to transmit the tablespace metadata describing the tablespaces to the remote database server, and instruct the remote database server to attach the copies using the tablespace metadata.

AUTOMATIC PROVISIONING OF TABLESPACE SYNCHRONIZATION MECHANISMS

[0062] Once a copy of a tablespace is provisioned into another database, rule-based messaging system 140 may be used to keep the tablespace and its copy synchronized. To do so, various components of a rule-based messaging system 140 must be provisioned.

[0063] FIG. 4 is a block diagram illustrating components provisioned to synchronize a tablespace and its provisioned copy. FIG. 5 is a flowchart depicting a process for automatically provisioning a tablespace copy and rule-based messaging system components that are needed to synchronize the tablespace copy with the tablespace. These components and processes are illustrated using distributed database system 101.

[0064] FIG. 4 shows a rule-based messaging system 140 in greater detail, according to an embodiment of the present invention. Referring to FIG. 4, it shows that database server 112 includes a capture process 413, which captures events (e.g. DML changes and DDL changes) recorded by database server 112 in change log 417. Change log 417 contains redo and/or undo records. Capture process 413 queues messages reflecting those events into message queue 418. Propagate process 414 propagates messages from message queue 418 to message queue 422. Message queue 422 is a staging area for messages to be applied by database server 122 to database 124.

[0065] Rules engines 451 and 453 execute rules 452

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and 454, respectively, in response to requests from clients to evaluate rule sets in rules 452 or 454, and then returns the evaluation results of evaluating the rule sets to the clients. Clients of rules engine 451 include capture process 413 and propagate process 414. Clients of rules engine 453 include apply process 423. Capture process 413, propagate process 414, and apply process 423 use the results of rules evaluation provided by rules engine 451 and 453 to determine how to process events and messages. This is accomplished by transmitting a request to execute rule sets to a rules engine. In response to such a request, rules engines 451 and 453 execute one or more of the rule sets. Rules-based messaging system are described in greater detail in *Utilizing Rules in Distributed Information Sharing* and *Utilising Rules in a Distributed Information Sharing System.*

[0066] The process depicted in FIG. 5 is illustrated by using it to provision a copy of tablespace 419 (FIG. 4) into database 124 as tablespace 419'. Database 114 is referred to as the source database because it contains the tablespace copied and database 124 as the destination database because it is the database to which the copy is attached. Database servers 112 and 122 are referred to as the source database server and destination database server, respectively, because they are the local database servers of source database 114 and destination database 124, respectively.

[0067] Referring to FIG. 5, at step 510, source database server 112 is configured to log DML changes to tablespace 419 (i.e. changes to database objects stored in tablespace 419), to run capture process 413 to capture changes to tablespace 419, and to run propagate process 414 to propagate changes to tablespace 419 to destination database server 122.

[0068] At step 520, rules 452 are configured to cause capture process 413, to capture changes to tablespace 419 and to propagate the changes to destination database server 122 and message queue 422.

[0069] At step 530, a clone of tablespace 419, tablespace 419', is provisioned at destination database server 122 by invoking pull procedure 228.

[0070] At step 540, destination database server 122 is configured to run an apply process to apply changes from message queue 422.

[0071] At step 550, rulers 454 are configured to cause apply process 423 to apply changes to tablespace 419 to tablespace 419' (i.e. to apply changes to database objects within tablespace 419 to database objects within 419').

[0072] So that the process depicted in FIG. 4 may be used to automatically and dynamically provision a tablespace, the process can be implemented as a procedure that is invoked to provision a tablespace and rule-based messaging components to a particular database or database server. Alternately, a script can be generated and later executed to provision the tablespace and/or the synchronization mechanism.

[0073] A16414 The process depicted in FIG. 4 provisions a synchronization mechanism that is unilateral, that is, changes to a tablespace are only propagated from one tablespace to another and not vice versa. However, an embodiment of the present invention is not so limited. Bilateral synchronization mechanisms may also be automatically provisioned. For example, the rules and message flow processes may be configured to propagate changes from tablespace 419' to tablespace 419 by configuring capture, propagate, and apply processes, and rules in a manner similar to that described to propagate changes from tablespace 419 to tablespace 419'.

ADDITIONAL FEATURES OF EMBODIMENTS OF THE INVENTION

[0074] While the approaches to provisioning tablespaces have been illustrated by provisioning online tablespaces, the present invention is not so limited. The approaches described herein may be used to automatically and dynamically provision copies of offline tablespaces.

[0075] For example, an offline tablespace 180 may contain information about quarterly financial results. The data in the tablespace is only processed and reported quarterly for a brief period of time each quarter. Rather than keeping the tablespace online where it occupies resources (e.g. storage capacity), the information can be kept offline and provisioned and "unprovisioned" quarterly, freeing up resources and allowing the resources to be used for other services.

[0076] Although the approaches described herein provision data in the form of tablespaces, the present invention is not limited to provisioning data that is identified by tablespace. The present invention may be used to automatically provision a list of tables, schemas and databases, and a synchronization mechanism needed to keep them in sync, both bilaterally and unilaterally. Provisioning lists of tables, schemas, or databases gives customers more flexibility and a logical way to automatically provision data and keep it synchronized.

[0077] Synchronization mechanisms can be provisioned within distributed database systems that fall into numerous kinds of topologies. A network of database servers interlinked by messaging systems may be represented by directed graphs of nodes. Edges join the nodes, each edge representing a flow of messages from a "source" node to another adjacent "destination" node. For a given node, multiple edges can emanate from the node or terminate at the node. In addition, there can be cycles, representing messages flowing from a source node back to the source node along a path that may include one or more other nodes. Data and/or synchronization mechanisms can be automatically provisioned in topologies that can be represented by various types of directed graphs, such as an acyclic graph or a completely connected graph, where changes between the adjacent nodes are bilaterally synchronized.

[0078] Nor are the approaches for automatically and

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dynamically provisioning data limited to provisioning database data. The approaches may be used to provision software and computer code, such as PL/SQL packages. Database servers provide code import/export utilities for exporting code to "code dump files", and for importing code from code dump files. To automatically provision code, for example, a database server could invoke a code import/export utility to export the code from a remote database server and store the code in a dump file in the local file system, and then invoke the code import/export utility to import the code into the local database or code repository. The automatic provisioning of code could be used for remote job scheduling on a remote database server. A database server could delegate a job or task to a remote database server and provide the needed code and/or data to perform the job or task by automatically provisioning the code and data.

USE OF OTHER FILE-BASED DATABASE PROVISIONING APPROACHES

[0079] Embodiments of the present invention have been illustrated using transportable tablespaces as an approach for instantiating a database, that is making a copy of a database and provisioning it. However, the present invention is not so limited. Embodiments of the present invention may use other techniques for this purpose.

[0080] For example, a database may be instantiated using the command generation approach. Under the command generation approach, a database server creates a file that contains a description of database objects (i.e. metadata) and database language commands that insert data into the database objects. Such a file is referred to herein as an import/export file. The import/export file may be created using, for example, export utilities designed to export database data for selected database objects in the database by creating metadata that describes the database objects and SQL insert commands that insert rows in the database object. To provision the database data, a database server executes import utilities designed to import the data by reading the description of the database objects, ensuring that the database objects are defined in the target database (defining them if necessary), and then executing the SQL insert commands. The execution of the SQL insert commands inserts the data row-by-row into the target database, which requires more work than attaching a tablespace when inserting greater than a threshold amount of data.

[0081] This approach may be advantageous for provisioning a target database under various circumstances. One is when the target database already defines the database objects for the data to provision and the overhead of creating a definition of the database objects is therefore not incurred, and the amount of data to provision is small and the overhead of row-by-row insertion is therefore not significant.

[0082] Another circumstance is when, under the tablespace approach, a set of database objects to instantiate cannot be instantiated without having to instantiate other database objects. A tablespace is used to store data for a particular set of database objects. In some implementations of tablespaces, when using the tablespace to instantiate database objects, all the database objects in the set must be instantiated. However, under the command generation approach, it is possible to create import/export files for only a selected subset of the database objects in the set or even from other tablespaces, enabling the ability to instantiate only the selected database objects no matter which tablespace is used to store their data. Thus, the command generation approach can provide more flexibility in forming combinations of database objects to instantiate.

[0083] To instantiate a copy of the database dynamically, a database server runs export utilities to create an import/export file, which is then transported between database servers using a database server file transport mechanism or messaging system, such as database server file transport mechanism 130 or rule based messaging system 140. Alternatively, import/export files may be stored as part of a library, to be transported and provisioned sometime later when needed.

[0084] Another approach to instantiating a database is the recovery manager approach. The recovery manager approach uses the capabilities of a recovery manager to instantiate a database. A recovery manager is used to create backup files of all database files (e.g. tablespace files) and restore database files from the backup files. Restoring the database files instantiates a copy of a database at the time of creation of the backup files. If changes to a database are archived in an archive log, the archive log may be used to restore the changes. In fact, a database can be restored to any particular point in time covered by an archive log.

[0085] A source database can be instantiated by using a recovery manager to create the backup files and using the backups and a recovery manager to create a target database at another location. If the backups are stored for a period time before creating the target database, and during the period time the source database changes, an archive log of the source database may be used to make the target database current or consistent with the source database at some particular point in time. In fact, it may be more efficient to instantiate multiple instances at different times from one set of backup files by using the archive log of the source database to update the multiple instances to make them consistent with a given point of time.

HARDWARE OVERVIEW

[0086] Figure 6 is a block diagram that illustrates a computer system 600 upon which an embodiment of the invention may be implemented. Computer system 600 includes a bus 602 or other communication mechanism for communicating information, and a processor 604 cou-

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pled with bus 602 for processing information. Computer system 600 also includes a main memory 606, such as a random access memory (RAM) or other dynamic storage device, coupled to bus 602 for storing information and instructions to be executed by processor 604. Main memory 606 also may be used for storing temporary variables or other intermediate information during execution of instructions to be executed by processor 604. Computer system 600 further includes a read only memory (ROM) 608 or other static storage device coupled to bus 602 for storing static information and instructions for processor 604. A storage device 610, such as a magnetic disk or optical disk, is provided and coupled to bus 602 for storing information and instructions.

[0087] Computer system 600 may be coupled via bus 602 to a display 612, such as a cathode ray tube (CRT), for displaying information to a computer user. An input device 614, including alphanumeric and other keys, is coupled to bus 602 for communicating information and command selections to processor 604. Another type of user input device is cursor control 616, such as a mouse, a trackball, or cursor direction keys for communicating direction information and command selections to processor 604 and for controlling cursor movement on display 612. This input device typically has two degrees of freedom in two axes, a first axis (e.g., x) and a second axis (e.g., y), that allows the device to specify positions in a plane.

[0088] The invention is related to the use of computer system 600 for implementing the techniques described herein. According to one embodiment of the invention, those techniques are performed by computer system 600 in response to processor 604 executing one or more sequences of one or more instructions contained in main memory 606. Such instructions may be read into main memory 606 from another computer-readable medium, such as storage device 610. Execution of the sequences of instructions contained in main memory 606 causes processor 604 to perform the process steps described herein. In alternative embodiments, hard-wired circuitry may be used in place of or in combination with software instructions to implement the invention. Thus, embodiments of the invention are not limited to any specific combination of hardware circuitry and software.

[0089] The term "computer-readable medium" as used herein refers to any medium that participates in providing instructions to processor 604 for execution. Such a medium may take many forms, including but not limited to, non-volatile media, volatile media, and transmission media. Non-volatile media includes, for example, optical or magnetic disks, such as storage device 610. Volatile media includes dynamic memory, such as main memory 606. Transmission media includes coaxial cables, copper wire and fiber optics, including the wires that comprise bus 602. Transmission media can also take the form of acoustic or light waves, such as those generated during radio-wave and infra-red data communications.

[0090] Common forms of computer-readable media include, for example, a floppy disk, a flexible disk, hard disk, magnetic tape, or any other magnetic medium, a CD-ROM, any other optical medium, punchcards, papertape, any other physical medium with patterns of holes, a RAM, a PROM, and EPROM, a FLASH-EPROM, any other memory chip or cartridge, a carrier wave as described hereinafter, or any other medium from which a computer can read.

[0091] Various forms of computer readable media may be involved in carrying one or more sequences of one or more instructions to processor 604 for execution. For example, the instructions may initially be carried on a magnetic disk of a remote computer. The remote computer can load the instructions into its dynamic memory and send the instructions over a telephone line using a modem. A modem local to computer system 600 can receive the data on the telephone line and use an infra-red transmitter to convert the data to an infra-red signal. An infra-red detector can receive the data carried in the infra-red signal and appropriate circuitry can place the data on bus 602. Bus 602 carries the data to main memory 606, from which processor 604 retrieves and executes the instructions. The instructions received by main memory 606 may optionally be stored on storage device 610 either before or after execution by processor 604.

[0092] Computer system 600 also includes a communication interface 618 coupled to bus 602. Communication interface 618 provides a two-way data communication coupling to a network link 620 that is connected to a local network 622. For example, communication interface 618 may be an integrated services digital network (ISDN) card or a modem to provide a data communication connection to a corresponding type of telephone line. As another example, communication interface 618 may be a local area network (LAN) card to provide a data communication connection to a compatible LAN. Wireless links may also be implemented. In any such implementation, communication interface 618 sends and receives electrical, electromagnetic or optical signals that carry digital data streams representing various types of information.

[0093] Network link 620 typically provides data communication through one or more networks to other data devices. For example, network link 620 may provide a connection through local network 622 to a host computer 624 or to data equipment operated by an Internet Service Provider (ISP) 626. ISP 626 in turn provides data communication services through the world wide packet data communication network now commonly referred to as the "Internet" 628. Local network 622 and Internet 628 both use electrical, electromagnetic or optical signals that carry digital data streams. The signals through the various networks and the signals on network link 620 and through communication interface 618, which carry the digital data to and from computer system 600, are exemplary forms of carrier waves transporting the information.

[0094] Computer system 600 can send messages and receive data, including program code, through the net-

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work(s), network link 620 and communication interface 618. In the Internet example, a server 630 might transmit a requested code for an application program through Internet 628, ISP 626, local network 622 and communication interface 618.

[0095] The received code may be executed by processor 604 as it is received, and/or stored in storage device 610, or other non-volatile storage for later execution. In this manner, computer system 600 may obtain application code in the form of a carrier wave.

[0096] In the foregoing specification, embodiments of the invention have been described with reference to numerous specific details that may vary from implementation to implementation. Thus, the sole and exclusive indicator of what is the invention, and is intended by the applicants to be the invention, is the set of claims that issue from this application, in the specific form in which such claims issue, including any subsequent correction. Any definitions expressly set forth herein for terms contained in such claims shall govern the meaning of such terms as used in the claims. Hence, no limitation, element, property, feature, advantage or attribute that is not expressly recited in a claim should limit the scope of such claim in any way. The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense.

Claims

1. A method for automatically instantiating database data in a distributed database system (101), the method comprising the steps:

the distributed database system (101) automatically determining, based on an increase in demand for a certain database (114, 124), to provision a destination database server for said certain database (114, 124);
wherein a set of one or more files located in a first file system of a source database server store data for said certain database (114, 124); and
in response to automatically determining, based on an increase in demand for a certain database (114, 124), to provision a destination database server for said certain database (114, 124), said distributed database system (101) automatically performing an operation that includes:

said source or destination database server (112, 122) causing the set of one or more files to be transported from said first file system of said source database server to a second file system of said destination database server; and
after transporting said set of one or more files to said second file system, said source or destination database server (112, 122) provisioning said certain database (114, 124) as a database (114, 124) managed by said destination database server (112, 122).

2. The method of claim 1, wherein said distributed database system (101) is a grid computing system.

3. The method of claim 1 or claim 2, wherein the set of one or more files is a tablespace (119, 129, 180), wherein the step of provisioning includes:

attaching said tablespace (119, 129, 180) to said certain database (114, 124).

4. The method of claim 1 or claim 2, wherein said set of one or more files includes metadata describing database objects and commands for inserting data into the database objects, wherein the step of provisioning includes importing said data into said database (114, 124) by executing said commands.

5. The method of any of claims 1 - 4, wherein said set of one or more files includes backup files created by a recovery manager, wherein the step of provisioning includes causing a recovery manager to create said certain database (114, 124) from said backup files.

6. The method of claim 5, wherein an archive log stores data recording changes to said certain database (114, 124) made after creating the backup files, wherein the step of provisioning further includes changing said database to reflect changes recorded in said archive log.

7. The method of any of claims 1 - 6, wherein the step of said source or destination database server (112, 122) causing the set of one or more files to be transported and the step of said source or destination database server (112, 122) provisioning said certain database (114, 124) are both performed in response to invocation of a file transport or database transport routine.

8. The method of claim 7, wherein said file transport or database transport routine is written in code that conforms to a database language and that may be executed by a database server (112, 122).

9. The method of claim 3, wherein the tablespace (119, 129, 180) is attached to another database (114, 124) before and during performance of the step of said source or destination database server (112, 122) causing the set of one or more files to be transported.

10. The method of claim 3, wherein the tablespace (119, 129, 180) is offline before and during performance

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of the step of said source or destination database server (112, 122) causing the set of one or more files to be transported.

11. The method of claim 3, wherein:

the step of attaching the tablespace (119, 129, 180) includes attaching a copy of the tablespace (119, 129, 180), wherein the copy is different than said tablespace (119, 129, 180); and
said source or destination database server (112, 122) provisions a synchronization mechanism that applies changes made to the tablespace (119, 129, 180) to the copy.

12. The method of claim 11, wherein the synchronization mechanism applies changes made to the copy to the tablespace (119, 129, 180).

13. The method of claim 11, wherein the steps further include:

the synchronization mechanism determining which changes to the tablespace (119, 129, 180) to propagate to the copy based on the results of an evaluation of a set of rules by a rules engine; and
wherein the step of provisioning the synchronization mechanism includes configuring said set of rules.

14. A computer-readable medium carrying one or more sequences of instructions which, when executed by one or more processors (604), causes the one or more processors (604) to perform the method recited in any one of claims 1 - 13.

Patentansprüche

1. Verfahren zum automatischen Instanziieren von Datenbankdaten in einem verteilten Datenbanksystem (101), wobei das Verfahren die Schritte umfasst:

das verteilte Datenbanksystem (101) bestimmt automatisch, beruhend auf einer Zunahme der Nachfrage nach einer bestimmten Datenbank (114, 124), einen Ziel-Datenbankserver für die bestimmte Datenbank (114, 124) bereitzustellen;
wobei ein Satz einer Datei oder mehrerer Dateien, die sich in einem ersten Dateisystem eines Quell-Datenbankservers befindet/befinden, Daten für die bestimmte Datenbank (114, 124) speichert/speichern; und
ansprechend auf das automatische Bestimmen, beruhend auf einer Zunahme der Nachfrage nach einer bestimmten Datenbank (114, 124), einen Ziel-Datenbankserver für die bestimmte Datenbank (114, 124) bereitzustellen, führt das verteilte Datenbanksystem (101) automatisch einen Vorgang aus, der umfasst:

der Quell- oder Ziel-Datenbankserver (112, 122) veranlasst, dass der Satz einer Datei oder mehrerer Dateien von dem ersten Dateisystem des Quell-Datenbankservers zu einem zweiten Dateisystem des Ziel-Datenbankservers übertragen wird; und
nach dem Übertragen des Satzes einer Datei oder mehrerer Dateien zu dem zweiten Dateisystem stellt der Quell- oder Ziel-Datenbankserver (112, 122) die bestimmte Datenbank (114, 124) als eine Datenbank (114, 124) bereit, die von dem Ziel-Datenbankserver (112, 122) verwaltet wird.

2. Verfahren nach Anspruch 1, bei dem das verteilte Datenbanksystem (101) ein Gitterverbundnetz-System (*grid computing system*) ist.

3. Verfahren nach Anspruch 1 oder Anspruch 2, bei dem der Satz einer Datei oder mehrerer Dateien ein Tabellenraum (*tablespace*) (119, 129, 180) ist, wobei der Schritt des Bereitstellens umfasst:

Anbinden des Tabellenraums (119, 129, 180) an die bestimmte Datenbank (114, 124).

4. Verfahren nach Anspruch 1 oder Anspruch 2, bei dem der Satz einer Datei oder mehrerer Dateien Metadaten aufweist, die Datenbankobjekte und Befehle zum Einfügen von Daten in die Datenbankobjekte beschreiben, wobei der Schritt des Bereitstellens umfasst, dass die Daten in die Datenbank (114, 124) importiert werden, indem die Befehle ausgeführt werden.

5. Verfahren nach einem der Ansprüche 1-4, bei dem der Satz einer Datei oder mehrerer Dateien Backup-Dateien aufweist, die von einer Wiederherstellungsverwaltung erzeugt werden, wobei der Schritt des Bereitstellens umfasst, dass eine Wiederherstellungsverwaltung veranlasst wird, die bestimmte Datenbank (114, 124) aus den Wiederherstellungsdateien zu erzeugen.

6. Verfahren nach Anspruch 5, bei dem ein Archivprotokoll Daten speichert, die nach der Erzeugung der Wiederherstellungsdateien vorgenommene Änderungen an der bestimmten Datenbank (114, 124) aufzeichnen, wobei der Schritt des Bereitstellens ferner umfasst, dass die Datenbank geändert wird, so dass sie Änderungen, die in dem Archivprotokoll aufgezeichnet sind, wiederspiegelt.

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7. Verfahren nach einem der Ansprüche 1-6, bei dem der Schritt, dass der Quell- oder Ziel-Datenbankserver (112, 122) veranlasst, dass der Satz einer Datei oder mehrerer Dateien übertragen wird, und der Schritt, dass der Quell- oder Ziel-Datenbankserver (112, 122) die bestimmte Datenbank (114, 124) bereitstellt, beide ansprechend auf den Aufruf einer Dateitransport- oder Datenbanktransport-Programmroutine ausgeführt werden.

8. Verfahren nach Anspruch 7, bei dem die Dateitransport- oder Datenbanktransport-Programmroutine in Programmcode geschrieben ist, der einer Datenbanksprache entspricht und der von einem Datenbankserver (112, 122) ausgeführt werden kann.

9. Verfahren nach Anspruch 3, bei dem der Tabellenraum (119, 129, 180) vor und während der Ausführung des Schritts, dass der Quell- oder der Ziel-Datenbankserver (112, 122) veranlasst, dass der Satz einer Datei oder mehrerer Dateien übertragen wird, an eine andere Datenbank (114, 124) angebunden ist.

10. Verfahren nach Anspruch 3, bei dem der Tabellenraum (119, 129, 180) vor und während der Ausführung des Schritts, dass der Quell- oder der Ziel-Datenbankserver (112, 122) veranlasst, dass der Satz einer Datei oder mehrerer Dateien übertragen wird, nicht-angebunden (*offline*) ist.

11. Verfahren nach Anspruch 3, bei dem:

der Schritt des Anbindens des Tabellenraums (119, 129, 180) umfasst, dass eine Kopie des Tabellenraums (119, 129, 180) angebunden wird, wobei sich die Kopie von dem Tabellenraum (119, 129, 180) unterscheidet; und
der Quell- oder der Ziel-Datenbankserver (112, 122) einen Synchronisierungsmechanismus bereitstellt, der Änderungen, die an dem Tabellenraum (119, 129, 180) vorgenommen werden, auf die Kopie anwendet.

12. Verfahren nach Anspruch 11, bei dem der Synchronisierungsmechanismus Änderungen, die an der Kopie des Tabellenraums (119, 129, 180) vorgenommen werden, anwendet.

13. Verfahren nach Anspruch 11, bei dem die Schritte ferner umfassen:

der Synchronisierungsmechanismus bestimmt, welche Änderungen an dem Tabellenraum (119, 129, 180) zu der Kopie weitergeleitet werden sollen, und zwar beruhend auf den Ergebnissen einer Auswertung eines Regelsatzes durch eine Regelverarbeitungseinrichtung (*rule engine*); und
wobei der Schritt des Bereitstellens des Synchronisierungsmechanismus umfasst, dass der Regelsatz konfiguriert wird.

14. Computerlesbares Medium mit einer Folge oder mehreren Folgen von Befehlen, die, wenn sie von einem Prozessor (604) oder mehreren Prozessoren (604) ausgeführt werden, den einen Prozessor (604) oder die mehreren Prozessoren (604) veranlassen, das in einem der Ansprüche 1-13 genannte Verfahren auszuführen.

Revendications

1. Procédé permettant d'instancier automatiquement des données de base de données dans un système réparti de base de données (101) le procédé comprenant les étapes suivantes :

la détermination automatique par le système réparti de base de données (101), sur la base d'une augmentation de la demande pour une certaine base de données (114, 124), de l'approvisionnement d'un serveur de base de données de destination pour ladite certaine base de données (114, 124),
dans lequel un ensemble, constitué d'un ou de plusieurs fichiers situés dans un premier système de fichiers appartenant à un serveur source de base de données, mémorise des données pour ladite certaine base de données (114, 124), et
l'exécution automatique par ledit système réparti de base de données d'une opération, en réponse à la détermination automatique, sur la base d'une augmentation de la demande pour une certaine base de données (114, 124), destinée à approvisionner un serveur de destination de base de données pour ladite certaine base de données (114, 124), laquelle inclut :

le fait que le serveur, source ou de destination, de base de données (112, 122) provoque le transport de l'ensemble d'un ou de plusieurs fichiers depuis ledit premier système de fichiers dudit serveur source de base de données jusqu'à un second système de fichiers dudit serveur de destination de base de données, et
après avoir transporté ledit ensemble d'un ou de plusieurs fichiers vers ledit second système de fichiers, le fait que ledit serveur, source ou de destination, de base de données (112, 122) approvisionne ladite certaine base de données (114, 124) comme étant une base de données (114, 124) gé-

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rée par le serveur de destination de base de données (112, 122).

2. Procédé selon la revendication 1, dans lequel ledit système réparti de base de données (101) est un système de calcul partagé.

3. Procédé selon la revendication 1 ou la revendication 2, dans lequel l'ensemble d'un ou de plusieurs fichiers est un espace de table (119, 129, 180), dans lequel l'étape d'approvisionnement inclut :

le fait de joindre ledit espace de table (119, 129, 180) à ladite certaine base de données (114, 124).

4. Procédé selon la revendication 1 ou la revendication 2, dans lequel ledit ensemble d'un ou de plusieurs fichiers inclut des métadonnées décrivant des objets de base de données et des instructions permettant d'insérer des données dans les objets de base de données, l'étape d'approvisionnement incluant l'importation desdites données dans ladite base de données (114, 124) en exécutant lesdites instructions.

5. Procédé selon l'une quelconque des revendications 1 à 4, dans lequel ledit ensemble d'un ou de plusieurs fichiers inclut des fichiers de sauvegarde créés par un gestionnaire de restauration, l'étape d'approvisionnement incluant le fait d'amener le gestionnaire de restauration à créer ladite certaine base de données (114, 124) à partir desdits fichiers de sauvegarde.

6. Procédé selon la revendication 5, dans lequel un journal d'archivage mémorise des données enregistrant des modifications sur ladite certaine base de données (114, 124), réalisées après avoir créé les fichiers de sauvegarde, l'étape d'approvisionnement incluant en outre la modification de ladite base de données afin de refléter les changements enregistrés dans ledit journal d'archivage.

7. Procédé selon l'une quelconque des revendications 1 à 6, dans lequel l'étape où ledit serveur, source ou de destination, de base de données (112, 122) provoque le transport de l'ensemble d'un ou de plusieurs fichiers, et l'étape où ledit serveur, source ou de destination, de base de données (112, 122) approvisionne ladite certaine base de données (114, 124) sont toutes les deux exécutées en réponse à l'invocation d'un sous programme de transport de fichiers ou de transport de base de données.

8. Procédé selon la revendication 7, dans lequel ledit sous programme de transport de fichiers ou de transport de base de données est écrit dans un code qui est conforme à un langage de base de données et qui peut être exécuté par un serveur de base de données (112, 122).

9. Procédé selon la revendication 3, dans lequel l'espace de table (119, 129, 180) est joint à une autre base de données (114, 124) avant et pendant l'exécution de l'étape où ledit serveur, source ou de destination, de base de données (112, 122) provoque le transport de l'ensemble d'un ou de plusieurs fichiers.

10. Procédé selon la revendication 3, dans lequel l'espace de table (119, 129, 180) est placé hors ligne avant et pendant l'exécution de l'étape où ledit serveur, source ou de destination, de base de données (112, 122) provoque le transport de l'ensemble d'un ou de plusieurs fichiers.

11. Procédé selon la revendication 3, dans lequel :

l'étape d'attachement de l'espace de table (119, 129, 180) inclut l'attachement d'une copie de l'espace de table (119, 129, 180), la copie étant différente dudit espace de table (119, 129, 180), et
ledit serveur, source ou de destination, de base de données (112, 122) approvisionne un mécanisme de synchronisation qui applique à la copie les modifications faites sur l'espace de table (119, 129, 180).

12. Procédé selon la revendication 11, dans lequel le mécanisme de synchronisation applique à l'espace de table (119, 129, 180) les modifications faites à la copie.

13. Procédé selon la revendication 11, dans lequel les étapes incluent en outre :

la détermination par le mécanisme de synchronisation des modifications sur l'espace de table (119, 129, 180) à propager vers la copie sur la base des résultats d'une évaluation d'un ensemble de règles réalisée par un moteur de règles, et dans lequel l'étape d'approvisionnement du mécanisme de synchronisation inclut la configuration dudit ensemble de règles.

14. Support pouvant être lu par ordinateur transportant une ou plusieurs séquences d'instructions qui, lorsqu'elles sont exécutées par un ou plusieurs processeurs (604), amènent le ou les processeurs (604) à réaliser le procédé décrit dans l'une quelconque des revendications 1 à 13.

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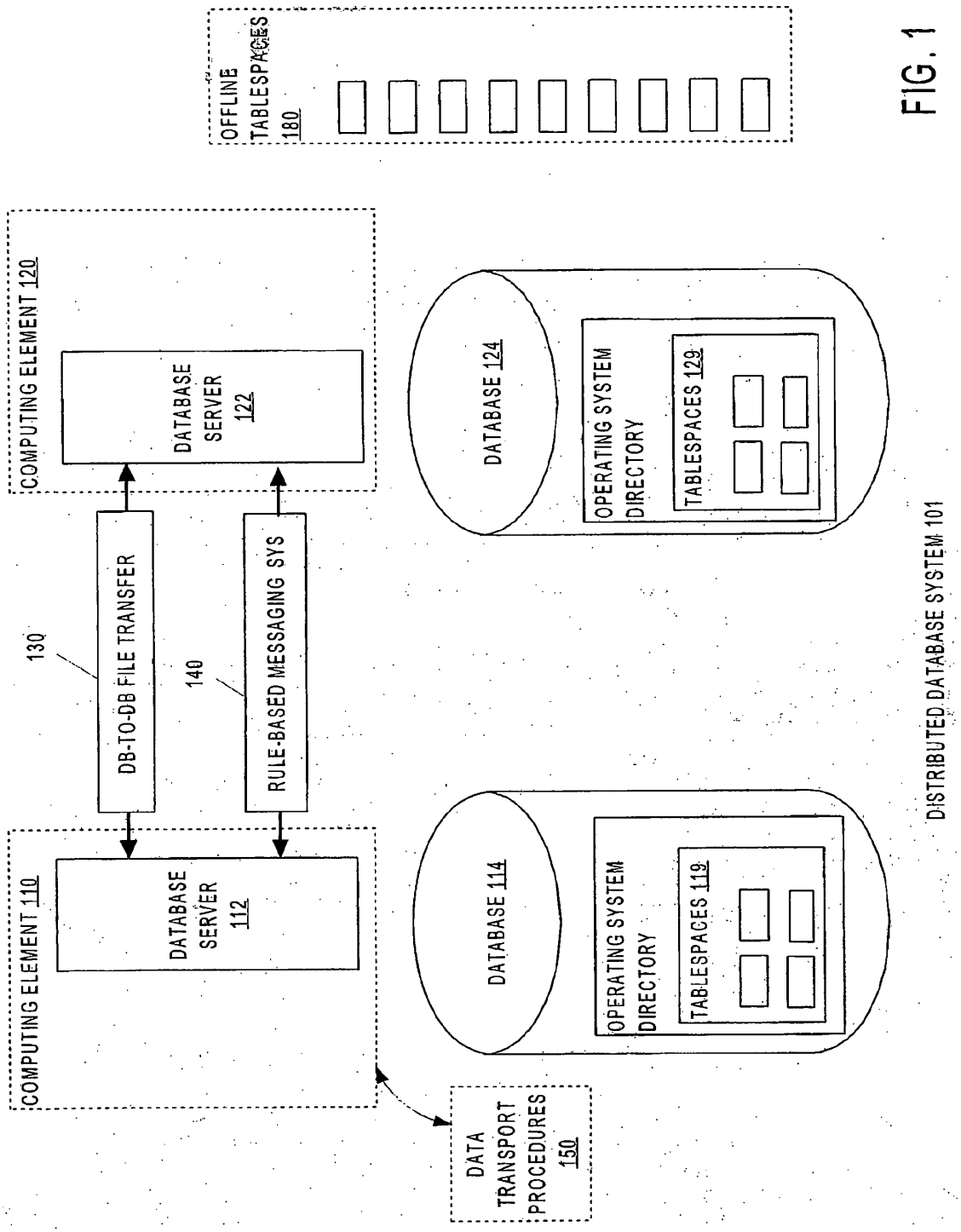
COMPUTING ELEMENT 110
DATABASE SERVER 112
130
DB-TO-DB FILE TRANSFER
140
RULE-BASED MESSAGING SYS
COMPUTING ELEMENT 120
DATABASE SERVER 122
DATA TRANSPORT PROCEDURES 150
DATABASE 114
OPERATING SYSTEM DIRECTORY
TABLESPACES 119
DATABASE 124
OPERATING SYSTEM DIRECTORY
TABLESPACES 129
OFFLINE TABLESPACES 180
DISTRIBUTED DATABASE SYSTEM 101

FIG. 1

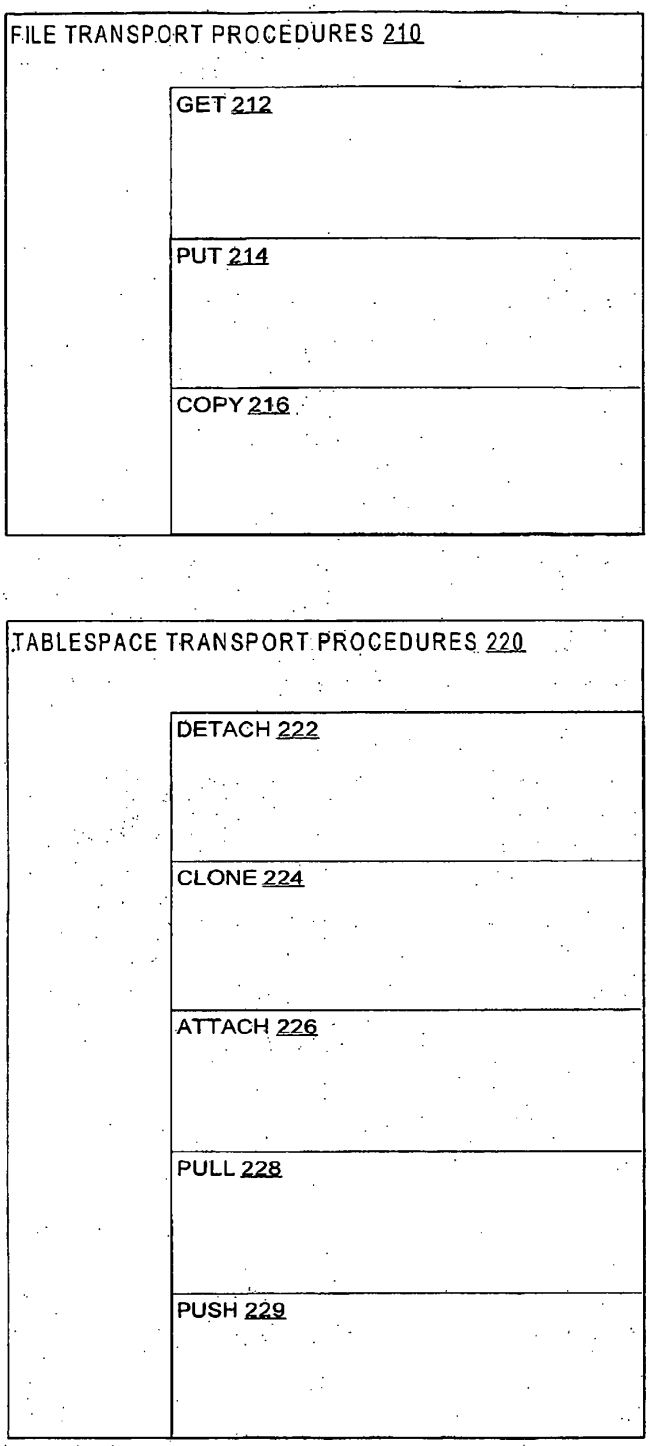
FILE TRANSPORT PROCEDURES 210
GET 212
PUT 214
COPY 216
TABLESPACE TRANSPORT PROCEDURES 220
DETACH 222
CLONE 224
ATTACH 226
PULL 228
PUSH 229

FIG. 2

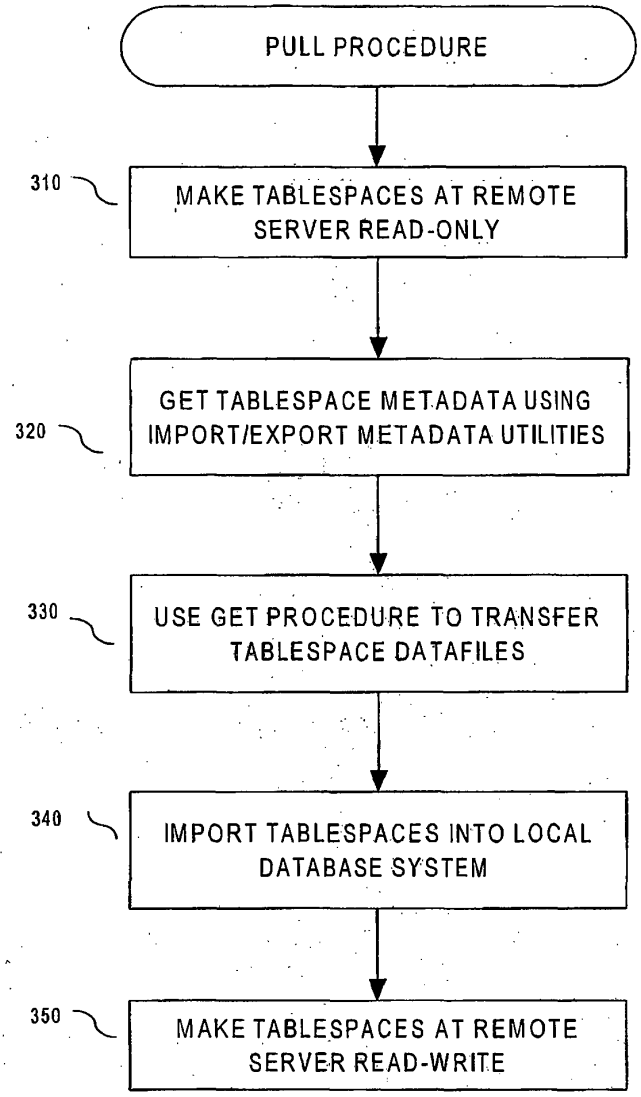
PULL PROCEDURE
310
MAKE TABLESPACES AT REMOTE SERVER READ-ONLY
320
GET TABLESPACE METADATA USING IMPORT/EXPORT METADATA UTILITIES
330
USE GET PROCEDURE TO TRANSFER TABLESPACE DATAFILES
340
IMPORT TABLESPACES INTO LOCAL DATABASE SYSTEM
350
MAKE TABLESPACES AT REMOTE SERVER READ-WRITE

FIG. 3

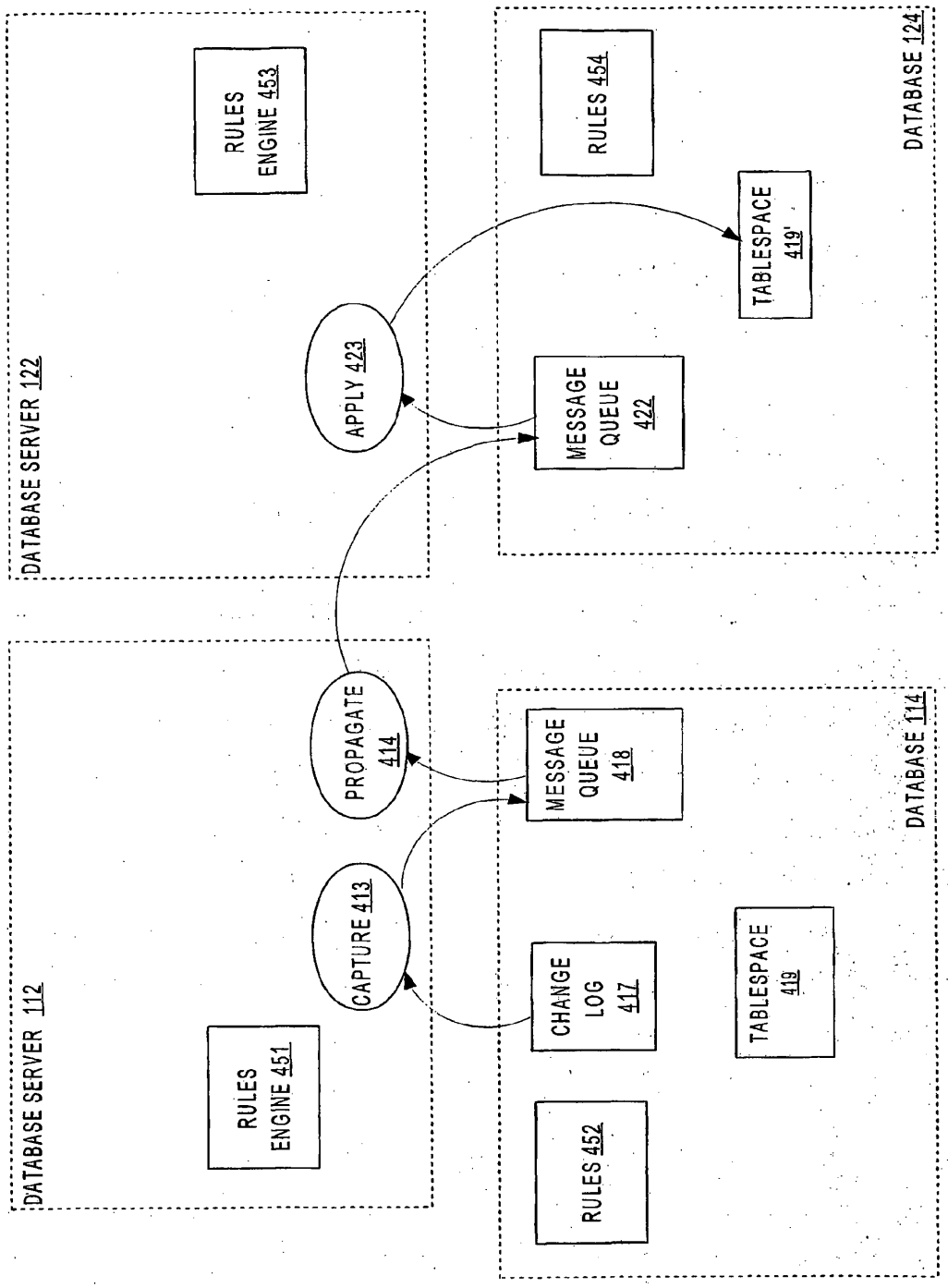

FIG. 4

DISTRIBUTED DATABASE SYSTEM 101

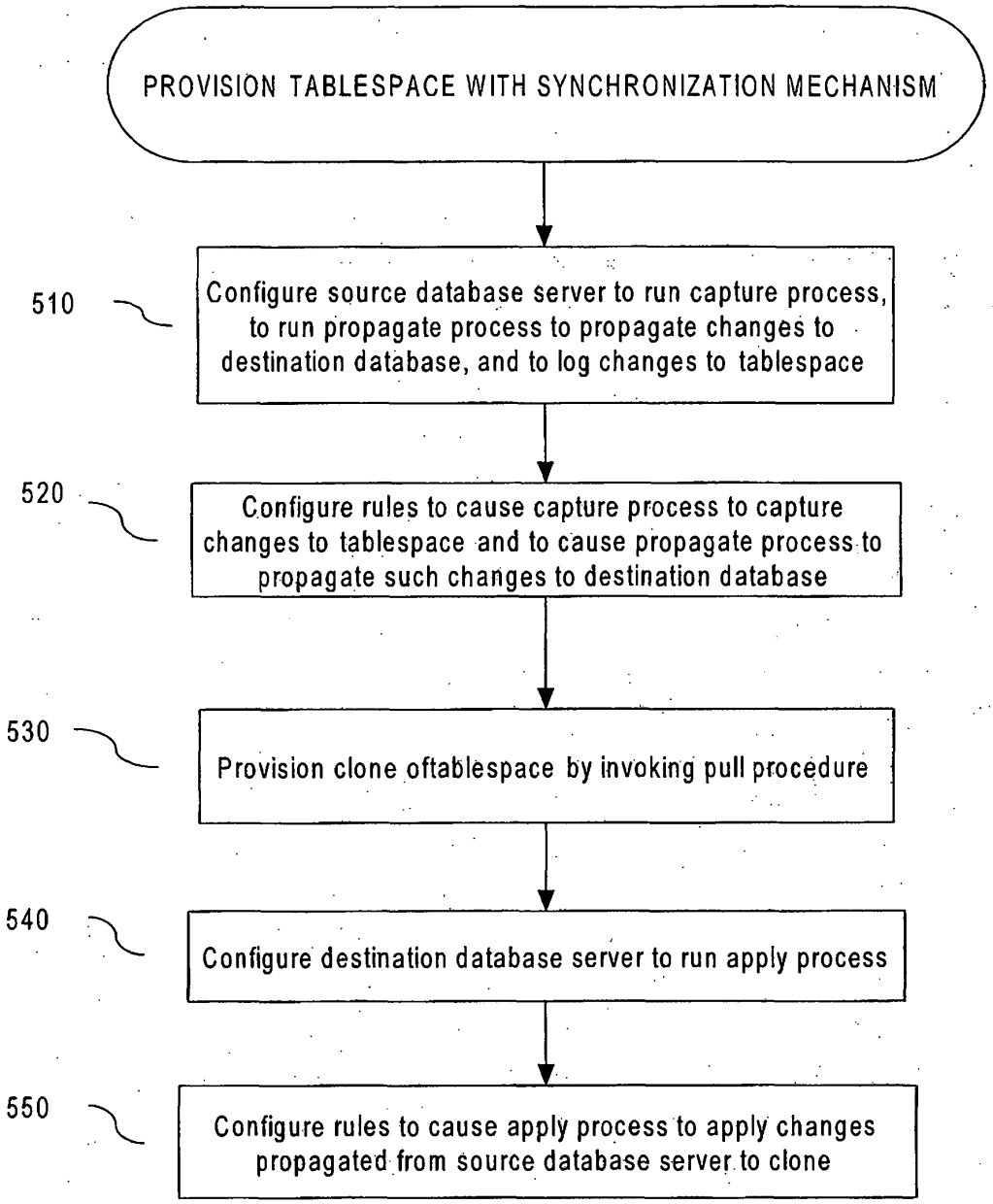
PROVISION TABLESPACE WITH SYNCHRONIZATION MECHANISM
510
Configure source database server to run capture process, to run propagate process to propagate changes to destination database, and to log changes to tablespace
520
Configure rules to cause capture process to capture changes to tablespace and to cause propagate process to propagate such changes to destination database
530
Provision clone oftablespace by invoking pull procedure
540
Configure destination database server to run apply process
550
Configure rules to cause apply process to apply changes propagated from source database server to clone

FIG. 5

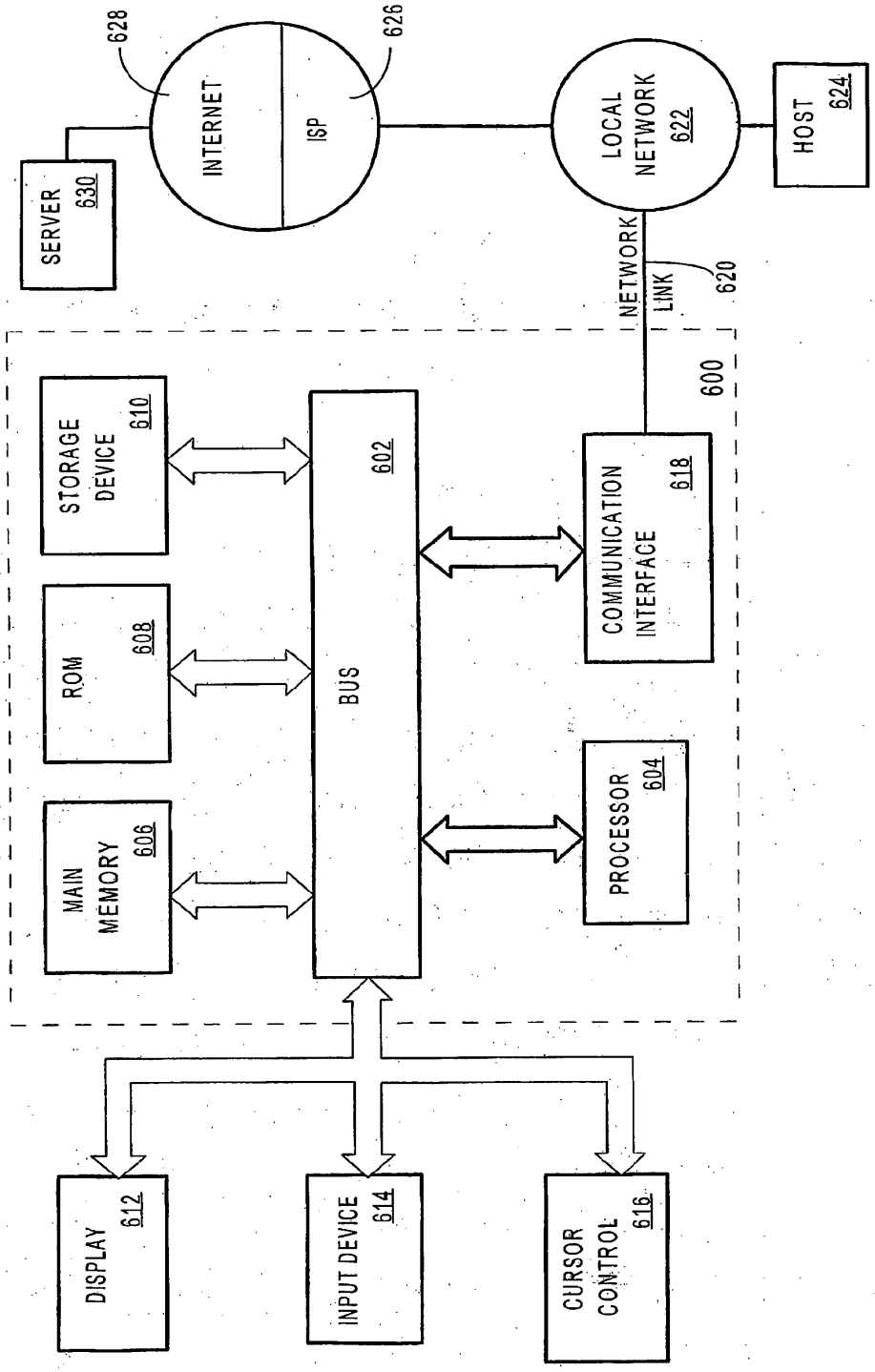
628
626
INTERNET
ISP
SERVER
630
LOCAL
NETWORK
622
HOST
624
NETWORK
LINK
620
600
STORAGE
DEVICE
610
ROM
608
MAIN
MEMORY
606
602
BUS
COMMUNICATION
INTERFACE
618
PROCESSOR
604
DISPLAY
612
INPUT DEVICE
614
CURSOR
CONTROL
616

FIG. 6

REFERENCES CITED IN THE DESCRIPTION

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(71) Applicant: **HEWLETT PACKARD ENTERPRISE DEVELOPMENT LP** [US/US]; 11445 Compaq Center Drive West, Houston, TX 77070 (US).

(72) Inventors: **BS, Girish Chandra;** Sy.No. 192, Whitefield Road, Mahadevapura Post, Karnataka, Bangalore 560048 (IN). **B, Santosh Balaraj;** Sy.No.192, Whitefield Road, Mahadevapura Post, Karnataka, Bangalore 560048 (IN). **SLATER, Alastair;** Longdown Avenue $ Stoke Gifford, Bristol Bristol BS34 8QZ (GB). **NALLUSAMY, Subramani;** Sy.No. 192, Whitefield Road, Mahadevapura Post, Karnataka, Bangalore 560048 (IN).

(74) Agents: **ORTEGA, Arthur** et al; Hewlett Packard Enterprise, 3404 E. Harmony Road, Mail Stop 79, Fort Collins, CO 80528 (US).

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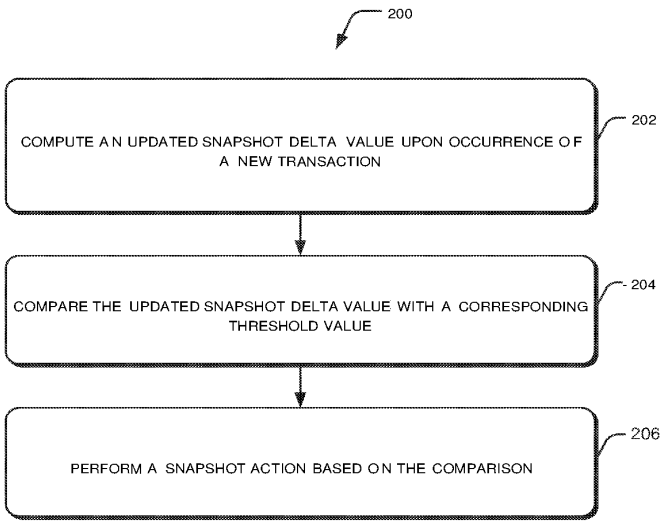

Figure 2

(57) Abstract: In one example an updated snapshot delta value is computed upon occurrence of a new transaction. The new transaction is a data modification operation performed on data blocks of the storage device. Further, the delta value indicates at least one of volume of data modified since creation of a reference snapshot and number of transactions performed since the creation. Subsequently, the updated snapshot delta value is compared with a corresponding threshold value. The threshold value is at least one of a predetermined volume of data modified and a predetermined number of transactions. A snapshot action is subsequently performed based on the comparison.

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SNAPSHOT CREATION

BACKGROUND

[0001] With increase in data generation and data processing capabilities in enterprises, an ever-increasing amount of data are being produced which is stored for short, medium, or long periods. Enterprises implement data management through a file system or a block storage system. Storing the data using a file system involves performing file related actions, at a host level through an application. Examples of the actions include creating a file, adding data in the file, and deleting or archiving the file. Each of these actions results into a file system input or output (I/O). A given I/O to a file system generally includes multiple storage disk I/O requests which are acted upon by the block storage system. The block storage systems further create snapshots, i.e., a point in time image of the data stored in the storage disk. The snapshots can be used for various purposes, such as backup, creating a checkpoint for restoring the state of an application, a source for data mining.

BRIEF DESCRIPTION OF FIGURES

[0002] The detailed description is described with reference to the accompanying figures. In the figures, the left-most digit(s) of a reference number identifies the figure in which the reference number first appears. The same numbers are used throughout the figures to reference like features and components. Systems and/or methods, in accordance with examples of the present subject matter are now described, by way of example, and with reference to the accompanying figures, in which:

[0003] Figure 1(a) illustrates a block diagram of an example computing system for snapshot creation, in accordance with an example of the present subject matter.

[0004] Figure 1(b) illustrates various example components of the example computing system for snapshot creation, in accordance with an example of the present subject matter.

[0005] Figure 2 illustrates an example method for snapshot creation, in accordance with an example of the present subject matter.

[0006] Figure 3 illustrates another example method for snapshot creation, in accordance with an example of the present subject matter.

[0007] Figure 4 illustrates an example network environment implementing a non-transitory computer readable medium for snapshot creation, according to an example of the present subject matter.

DETAILED DESCRIPTION

[0008] Systems and methods for snapshot creation are described herein. The methods can be implemented in various systems, such as computing devices connected through various networks. Typically, data is stored in a storage device and managed through a file system. A file system may be understood as an abstraction for organizing and storing data, as files. The file system may also facilitate in controlling the manner in which the data is stored, modified, and retrieved from the storage device.

[0009] The file systems periodically may create snapshots, i.e., a point in time image of the file system. Such snapshots may be later used for creating a copy of the data stored within the file system. The file system may create the snapshots for various data processing and storage purposes, such as backup, creating a checkpoint for restoring state of an application, data mining, and software debugging and testing. For instance, in case of a system crash or data getting corrupted, the snapshots can be used for restoring the data. Typically, the snapshots are created by copying the data at

each predetermined point in time to form an image of the data within the file system. The snapshot thus obtained, is saved in a snapshot volume on the storage disk. The point in time at which the snapshot is created is typically predetermined and may be based on a variety of conditions, for example, a number of days and time elapsed since a last snapshot creation. For instance, the file system may be set to periodically create snapshots at a predetermined time intervals.

[0010] Creating the snapshots periodically, may result in unpredictable data loss. For instance, in case the system is set to create snapshots every five hours and the system crashes in between two cycles of snapshot creation, say, in the fourth hour, the file system will be able to restore the data based on the last available snapshot created. In case if a large amount of data is modified since the last snapshot creation, if would result in an unpredictable data loss. The extent of data loss in such a case may not be acceptable from a service point of view.

[0011] Alternately, it may also happen that few or no modifications may happen over the data within the periodic interval. In such a case, the snapshot would still be created even though the modifications on the base data are not significant. Later snapshot thus created would more or less be representative of the previously available data. The later snapshot would however have to be stored. Over a period of time, the number of snapshots representing little or no modifications may be maintained in the storage device. This unnecessarily occupies space in the storage device. As a result, when significant modifications do occur, there may not be enough storage space available for accommodating the next snapshot. It should also be noted that creating such snapshots periodically may also utilize processing resources unnecessarily.

[0012] The present subject matter, describes a system and a method for snapshot creation. The present subject matter facilitates in dynamically creating a snapshot based on number and volume of data write operations performed by the system. The subject matter allows managing snapshots stored in a storage device of the system by dynamically performing snapshot actions, such as creating the snapshot, creating a snapshot at a replicated site, creating a backup of the snapshots, and expiring snapshots based on one or more predefined conditions. For instance, each snapshot action is dynamically performed based on either volume of data modified or number of transactions occurred since a last snapshot action was performed.

[0013] In accordance to an example of the present subject matter, the dynamic creation of a snapshot is based on determining the volume of data which has undergone modifications during a transaction being performed by the system. A transaction, also referred to as a system transaction, may be defined as a singular disk write or modification action. For instance, writing data onto data blocks of the storage device of the system may be referred to as a transaction. In the present example, occurrence of a new transaction is determined based on small computer system interface (SCSI) request received from an operating system of the system. Upon occurrence of the transaction, data blocks of the storage device may be analyzed to determine the volume of data written or modified during the transaction.

[0014] In one example, one or more snapshot delta values are used to determine when a snapshot action, such as creating the snapshot has to be performed. The snapshot delta value indicates the volume of data modified or the number of transactions occurred since creation of a reference snapshot. The reference snapshot is a snapshot having image of data in reference to which the volume of data modification is being determined. In operation, file system of the system computes an updated snapshot delta value upon

occurrence of a new transaction. The updated snapshot delta value is subsequently compared with a corresponding threshold value to determine if the snapshot action corresponding to the snapshot delta value has to be performed. In one example, the threshold value is at least one of a predetermined volume of data modified and a predetermined number of transactions.

[0015] In case the updated snapshot delta value is greater than the threshold value, a snapshot action is performed. In one example, the snapshot action corresponding to the snapshot delta value is performed. For instance, if it is determined that a snapshot delta count is greater than the threshold value, a new snapshot is created. The snapshot delta count is subsequently reset to zero. In case the snapshot delta value is less than the threshold value, no action may be taken and the storage system may continue tracking the transactions being performed.

[0016] The present subject matter thus provides systems and methods for minimizing data loss caused due to delay in snapshot creation and optimizing storage space utilization. For example, an acceptable limit may be prescribed for modifications which have been carried out on a volume of data. Only when the modifications are more than the acceptable limit as prescribed by a threshold value, would the snapshot be created. As will be understood based on the above description, the data loss is minimized by dynamically creating a new snapshot based on the snapshot delta count indicating the volume of data modified or number of transactions performed since a previous snapshot was created. Creating the new snapshot based on the snapshot delta count ensures that a substantial amount of data modifications are captured in the new snapshot. This is because whenever the volume of modified data, being tracked using the snapshot delta count, exceeds a preset threshold value, a snapshot is created. Similarly whenever the number

of transactions, being tracked using the snapshot delta count, exceeds a preset threshold value, the new snapshot is created. Further, creating the snapshots based on the snapshot delta count ensures in minimizing storage space wastage caused due to creation of snapshots having same or similar data as the snapshots are now created when a significant volume of data is modified.

[0017] Additionally, using the snapshot delta values, such as a snapshot-replicate value, a snapshot-backup value, and a snapshot-expire value, the reference snapshot stored in the storage device can be easily and dynamically managed. For instance, in case the snapshot-expire value exceeds the corresponding threshold value, the file system may determine that a substantial data of the reference snapshot has been modified and therefore the reference snapshot may be expired.

[0018] The above systems and methods are further described in conjunction with Fig. 1 to Fig. 4. It should be noted that the description and figures merely illustrate the principles of the present subject matter. It will thus be appreciated that various arrangements that embody the principles of the present subject matter, although not explicitly described or shown herein, can be devised from the description and are included within its scope. Furthermore, all examples recited herein are for pedagogical purposes to aid the reader in understanding the principles of the present subject matter. Moreover, all statements herein reciting principles, aspects, and examples of the present subject matter, as well as specific examples thereof, are intended to encompass equivalents thereof.

[0019] Figure 1(a) illustrates a block diagram of an example computing system 102 for snapshot creation, in accordance with an example of the present subject matter. The computing system 102 is hereinafter referred to as system 102. The system 102 may be implemented in, for example,

desktop computers, multiprocessor systems, personal digital assistants (PDAs), laptops, network computers, cloud servers, minicomputers, mainframe computers, hand-held devices, such as tablets, storage-systems. The system 102 may also be hosting a plurality of applications. The system 102 may further be implemented in a networked environment (not shown in the figure).

[0020] The system 102 may include, for example, processor(s) 104, a delta counter 108 communicatively coupled to the processor 104, a snapshot updating module 108 communicatively coupled to the processor 104, and a storage device 110.

[0021] The processor(s) 104 may include microprocessors, microcomputers, microcontrollers, digital signal processors, central processing units, state machines, logic circuitries, and/or any other devices that manipulate signals and data based on computer-readable instructions. Further, functions of the various elements shown in the figures, including any functional blocks labeled as "processors)", may be provided through the use of dedicated hardware as well as hardware capable of executing computer-readable instructions.

[0022] In operation, the delta counter 108 may compute an updated value of a snapshot delta count upon occurrence of a new transaction. The new transaction includes a data modification operation performed on data blocks of the storage device 118. The value of the snapshot delta count indicates at least one of volume of data modified since a last reset of the snapshot delta count and number of transactions performed since the last reset. In one example, the delta counter 106 may compute the updated value of the snapshot delta count based on volume of data modified during the new transaction. The data may be stored in the storage device 110.

[0023] The snapshot updating module 108 may subsequently compare the updated value of the snapshot delta count with a corresponding threshold value. In one example, the threshold value is at least one of a predetermined volume of data modified and a predetermined number of transactions. For instance, in case of a volume based count, the threshold value may be a predetermined percentage, say, 2%, 3%, or 5% of the volume of data stored in the storage device 118. In case of a transaction based count, the threshold value may be a predetermined number, say, 100, 200, or 400.

[0024] On determining the updated value of the snapshot delta count to be greater than the threshold value, the snapshot updating module 108 may create a new snapshot.

[0025] Figure 1(b) illustrates various example components of the system 102, in accordance with an example of the present subject matter. The system 102 includes the processor(s) 104, interface(s) 112, memory 114, modules 118, and data 118. The interfaces 112 may include a variety of commercially available interfaces, for example, interfaces for peripheral device(s), such as data input output devices, referred to as I/O devices, interface cards, storage devices, and network devices.

[0026] The memory 114 may be communicatively coupled to the processor 104 and may include any non-transitory computer-readable medium known in the art including, for example, volatile memory, such as static random access memory (SRAM) and dynamic random access memory (DRAM), and/or non-volatile memory, such as read only memory (ROM), erasable programmable ROM, flash memories, hard disks, optical disks, and magnetic tapes. In one example, the memory 114 may include the storage device 110 and main memory 120. The storage device 110, such as hard disks and magnetic tapes may be used for storing content, such as files in the

system 102. The main memory 120, such as RAM may be used for temporary storage of content for processing by the system 102.

[0027] The modules 116, amongst other things, include routines, programs, objects, components, and data structures, which perform particular tasks or implement particular abstract data types. The modules 116 may also be implemented as, signal processors), state machine(s), logic circuitries, and/or any other device or component that manipulate signals based on operational instructions. Further, the modules 118 can be implemented by hardware, by computer-readable instructions executed by a processing unit, or by a combination thereof.

[0028] The modules 116 may include the delta counter 106, the snapshot updating module 108, a delta reset counter 122, and other module(s) 124. The other modules 124 may include programs or coded instructions that supplement applications and functions, for example, programs in an operating system of the system 102. Further, the data 118 may include snapshot delta count 126, snapshots 128, delta reset count 130, and other data 132.

[0029] The system 102 facilitates dynamically creating a snapshot. The system further facilitates in managing existing snapshots saved in the storage device 110. Dynamically creating the snapshots, such as the snapshots 128 and managing the existing snapshots helps in achieving efficient and smooth working of the system 102. Further, dynamically creating the snapshots minimizes data loss caused due to delay in snapshot creation. In one example, the system 102 may dynamically create the snapshot based upon an updated value of a snapshot delta count indicating at least one of volume of data modified and number of transactions performed since the last reset of the snapshot delta count.

[0030] As previously described, the value of the snapshot delta count is dynamically updated to determine when the corresponding snapshot action has to be performed. In one example, the delta counter 108 computes the updated value of the snapshot delta count upon occurrence of a new transaction. As previously described, a transaction is a singular disk write or modification action performed on data blocks of the storage device 110 of the system 102. In one example, the delta counter 108 may determine the occurrence of the new transaction based on small computer system interface (SCSI) request received from an operating system of the system 102.

[0031] Upon determining the occurrence of the transaction, the delta counter 106 may compute the updated value of the snapshot delta count. In one example, the value of the snapshot delta count may be updated to indicate number of transactions performed since the last reset of the snapshot delta count. In another example, the value of the snapshot delta count may be updated to indicate volume of data modified since the last reset of the snapshot delta count. In yet another example, both, the volume of data modified and the number of transactions may be used to update the value of the snapshot delta count. In such a case, a volume based snapshot delta count and a transaction based snapshot delta count may be simultaneously updated.

[0032] To compute an updated value of the snapshot delta count, the delta counter 108 may obtain a last value of the snapshot delta count from the snapshot delta count 128. The delta counter 106 may then increment the last value of the snapshot delta count by one of the volume of data modified during the new transaction and number of transactions currently occurred, for instance, numeric value one to obtain the updated value of the snapshot delta count. Thus, to compute the snapshot delta count based on the number of transactions, the delta counter 108 may increment the last value of the

snapshot delta count by each the numeric value one each time a transaction occurs. For instance, if the last value of the transaction based snapshot delta count is 10 transactions, then on occurrence of the new transaction the delta counter 106 may increment the transaction based snapshot delta count by one to compute the updated value of the transaction based snapshot delta count as 11 transactions.

[0033] To compute the update value of the snapshot delta count based on the volume of data modified during the new transaction, the delta counter 108 may determine the volume of data modified. In one example, the delta counter 108 may analyze data blocks of the storage device 110 to determine the volume of data written or modified during the new transaction. For instance, the delta counter 106 may identify data blocks in the storage device 110 that are being modified as writes to the storage device 110 are performed during the transaction. Original data that is being written to is copied into a designated storage pool, say, the snapshots 128 in the storage device 110 that is set aside for creating and storing the snapshots before the original data is overwritten. Thus, before a write is allowed to a data block, an original data block is moved to the snapshots 128 based on the copy-on-write technique being used for snapshot creation.

[0034] The delta counter 106 may thus identify the data blocks being modified during the transaction and compute a difference between volume of the identified data blocks before the transaction and volume of the identified data blocks after the transaction. The difference thus computed may be identified as the volume of data modified during the new transaction. The delta counter 106 may then increment the last value of the snapshot delta count by the volume of data modified. For instance, if the last value of the snapshot delta count is 1.8%, say, 100 Megabyte (MB) and the volume of data modified during the new transaction is 30 MB, then the delta counter 106

may add 30 MB to 100 MB to compute the updated value of the snapshot delta count as 130 MB, i.e., 2.3%.

[0035] The updated value of the snapshot delta count is subsequently used by the snapshot updating module 108 to determine if a new snapshot has to be created. In one example, the snapshot updating module 108 may compare the updated value of the snapshot delta count with the corresponding threshold value. As previously described, the threshold value specifies one of the predetermined volume of data modified and the predetermined number of transactions. For instance, the threshold value for creating a new snapshot may be set as 100 transactions or 2% volume of data, i.e., 2% change in volume of data since last snapshot creation.

[0036] The snapshot updating module 108 may compare the updated value of the snapshot delta count with the corresponding threshold value to determine if the new snapshot has to be created. On determining the updated value of the snapshot delta count to be greater than the corresponding threshold value, the snapshot updating module 108 may create the new snapshot. The snapshot updating module 108 may further save the new snapshot in the snapshots 128. Upon creating the new snapshot, the snapshot updating module 108 may reset the corresponding snapshot delta count to zero. In case the snapshot delta count is less than the threshold value, the snapshot updating module 108 may indicate the delta counter 106 to continue tracking the data modifications in the storage device 110.

[0037] Further, the system 102 may use the updated value of the snapshot delta count for managing the existing snapshots 128. In one example, the system 102 may manage the existing snapshots by dynamically performing snapshot actions, such as creating a replicated copy of the snapshots, creating a backup of the snapshots, and expiring the snapshots based on one or more predefined conditions. For instance, each snapshot

action is dynamically performed when a snapshot delta value corresponding to the snapshot action crosses a corresponding threshold value.

[0038] In one example, one or more snapshot delta values are utilized to determine when the corresponding snapshot action has to be performed. The snapshot delta value indicates the volume of data modified or the number of transactions occurred since creation of a reference snapshot. The reference snapshot is a snapshot having image of data in reference to which the volume of data modification is being determined. The snapshot delta values include the snapshot delta count, a snapshot-replicate value, a snapshot-backup value, and a snapshot-expire value. As previously described, the snapshot delta count is used to determine if a new snapshot has to be created. The snapshot-replicate value is used to determine if a replicated volume snapshot of the reference snapshot has to be created. The snapshot-backup value is used to determine if the reference snapshot have to be added to a backup disk, such as a backup partition of a storage device, say, the storage device 110 of the system 102. The snapshot-expire value is used b determine if the reference snapshot has to be deleted.

[0039] In one example, the snapshot updating module 108 may compute the snapshot delta values based on the updated value of the snapshot delta count and a delta reset count. The delta reset count indicates number of times the snapshot delta count has been reset since creation of the reference snapshot. In one example, the delta reset count is computed by the delta reset counter 122. On determining the snapshot delta count to have been reset, the delta reset counter 122 may increment a last value of the delta reset count by a numerical value of one to obtain an updated value of the delta reset count. For instance, since the creation of a snapshot, i.e., the reference snapshot, the snapshot delta count has been reset twice, including the current reset, then the value of the delta reset count will be equal to

numeric value "two". The delta reset counter 122 may save the value of the delta reset count in the delta reset count 130.

[0040] The snapshot updating module 108 may subsequently use the updated value of the snapshot delta count and the delta reset count to compute an updated snapshot delta value. In one example, the updated snapshot delta value may be equal to a value of a cumulative function of the updated value of the snapshot delta count and the delta reset count. For instance, if the value of the delta reset count is two, the updated value of the snapshot delta count is equal to 5%, and the snapshot delta count is reset after every 10% change in volume of data, then the snapshot updating module 108 may determine that updated value of the snapshot delta count is equal to 25%.

[0041] The snapshot updating module 108 may compute the updated value of each of the snapshot delta value, i.e., the snapshot-replicate value, the snapshot-backup value, and the snapshot-expire value upon occurrence of the new transaction. In one example, the snapshot updating module 108 may compute the updated snapshot delta values in a predefined order defined based on a corresponding threshold value and the snapshot action that has to be performed based on the updated snapshot delta value. For instance, once the reference snapshot has been created, the snapshot updating module 108 may initially start computing the snapshot-replicate value upon the occurrence of every new transaction. The snapshot updating module 108 may compute the snapshot-replicate value based on the updated value of the snapshot delta count and the delta reset count. Once the snapshot-replicate value crosses the corresponding threshold value and the replicated volume snapshot of the reference snapshot is created, the snapshot updating module 108 may start computing the snapshot-backup value. The snapshot updating module 108, in such a case may assign the

value of a last snapshot-replicate value as an initial snapshot-backup value. The snapshot updating module 108 may thus update the snapshot delta value upon occurrence of each transaction.

[0042] The updated snapshot delta value is subsequently used by the snapshot updating module 108 to determine if the snapshot action has to be performed. In one example, the snapshot updating module 108 may compare the updated snapshot delta value with the corresponding threshold value. As previously described, the threshold value specifies one of the predetermined volume of data modified and the predetermined number of transactions. Further, a separate threshold value may be predetermined for each of the snapshot action. For instance, the threshold value for creating a replicated volume snapshot of the reference snapshot may be set as 1000 transactions or 20% volume of data, i.e., 20% change in volume of data with respect to the reference snapshot. The threshold value for creating a backup of the reference snapshot may be set as 3000 transactions or 60% volume of data, i.e., 80% change in volume of date with respect to the reference snapshot. The threshold value for expiring the reference snapshot may be set as 5000 transactions or 80% volume of data, i.e., 80% change in volume of data with respect to the reference snapshot. The percentage of delta change is calculated using delta counter 108 and snapshot updating module 108.

[0043] On determining the updated snapshot delta value to be greater than the corresponding threshold value, the snapshot updating module 108 may perform the corresponding snapshot action. For instance, the snapshot updating module 108 may create the replicated volume snapshot of the reference snapshot if the snapshot-replicate value is greater than the corresponding threshold value. In one example, the snapshot updating module 108 may create the replicated volume snapshot of the reference

snapshot in a server (not shown in the figure) remotely connected to the system 100 through a communication network.

[0044] Further, the snapshot updating module 108 may add the reference snapshot to a backup disk (not shown in the figure) connected to the system 102 if the snapshot-backup value is greater than the corresponding threshold value. The snapshot updating module 108 may further expire and delete the reference snapshot if the snapshot-expire value is greater than the corresponding threshold value.

[0045] Further, in one example, the snapshot updating module 108 may create the new snapshot upon occurrence of a snapshot update condition. In one example, the snapshot update condition is at least one of number of errors detected in the storage device 110 being greater than a predetermined error threshold; occurrence of a change in characteristics of existing snapshots saved in the storage device 110; and number of the existing snapshots being less than a minimum snapshot threshold. To determine the occurrence of the snapshot update condition, the snapshot updating module 108 may monitor performance of the storage device 110 and other hardware components connected to the storage device 110.

[0046] In one example, the snapshot updating module 108 may determine occurrence of error in the storage device 110 using SCSI commands received by the storage device 110. A low level of SCSI commands may indicate an error in the storage device 110. In another example, the snapshot updating module 108 may determine occurrence of error using other commands sent to the storage device 110 or array firmware of the system 102 to determine perceived or actual error rates.

[0047] Figures. 2 and 3 illustrate example methods 200 and 300, respectively, for snapshot creation, in accordance with an example of the

present subject matter. The order in which the methods are described is not intended to be construed as a limitation, and any number of the described method blocks may be combined in any order to implement the aforementioned methods, or an alternative method. Furthermore, the methods 200 and 300 may be implemented by processing resource or computing device(s) through any suitable hardware, non-transitory machine readable instructions, or combination thereof.

[0048] It may also be understood that the methods 200 and 300 may be performed by programmed computing devices, such as the system 102 as depicted in Figures. 1(a) and 1(b). Furthermore, the methods 200 and 300 may be executed based on instructions stored in a non-transitory computer readable medium, as will be readily understood. The non-transitory computer readable medium may include, for example, digital memories, magnetic storage media, such as one or more magnetic disks and magnetic tapes, hard drives, or optically readable digital data storage media.

[0049] Further, the methods 200 and 300 are described below with reference to the system 102 as described above, other suitable systems for the execution of these methods can be utilized. Additionally, implementation of these methods is not limited to such examples.

[0050] Referring to Figure 2, at block 202, updated snapshot delta value is computed. In one example, the updated snapshot delta value is computed upon occurrence of a new transaction. The new transaction is a data modification operation performed on data blocks of a storage device, for example, the storage device 110. Further, the snapshot delta value indicates at least one of volume of data modified since creation of a reference snapshot and number of transactions performed since the creation.

[0051] At block 204, the updated snapshot delta value is compared with a corresponding threshold value. The threshold value is at least one of a predetermined volume of data modified and a predetermined number of transactions.

[0052] At block 206, a snapshot action is performed based on the comparison. In one example, upon determining the updated snapshot delta value to be greater than the corresponding threshold value, the system 102 may perform a snapshot action corresponding to the snapshot delta value.

[0053] Referring to Figure 3, at block 302, occurrence of a new transaction is detected. The new transaction is a data modification operation performed on data blocks of a storage device, for example, the storage device 110. In one example, occurrence of the new transaction is determined based on a small computer system interface (SCSI) request received from an operating system of a computing system, for example, the system 102.

[0054] At block 304, an updated value of a snapshot delta count is computed. The value of a snapshot delta count indicates at least one of volume of data modified since a last reset of the snapshot delta count and number of transactions performed since the last reset. in one example, the system 102 may compute the updated value of the snapshot delta count by incrementing a last value of the snapshot delta count by one of the volume of data modified and number of transactions currently occurred to obtain the updated value of the snapshot delta count.

[0055] At block 306, it is determined whether an updated value of the snapshot delta count is greater than a corresponding threshold value. The threshold value is at least one of a predetermined volume of data modified and a predetermined number of transactions. For example, in case the updated value of the snapshot delta count is less than a corresponding

threshold value, ('No' path from block 306), the system computes an updated snapshot delta value based on the updated value of the snapshot delta count and a delta reset count at block 308. The delta reset count indicates number of times the snapshot delta count has been reset since creation of a reference snapshot.

[0056] In case the updated value of the snapshot delta count is more than the corresponding threshold value, ('Yes' path from block 306), the system creates a new snapshot at block 310.

[0057] At block 312, the snapshot delta count is reset. In one example, the snapshot delta count is reset by the snapshot updating module 108 of the system 102.

[0058] At block 314, an updated value of the delta reset count is computed. In one example, a delta reset counter, such as the delta reset counter 122 of the system 102 computes the updated value of the delta reset count. The updated value of the delta reset count is obtained by incrementing a last value of the delta reset count by a numerical value of one.

[0059] At block 318, an updated snapshot delta value is computed based on the updated value of the snapshot delta count and the updated value delta reset count. In one example, the snapshot updating module 108 of the system 102 computes the updated snapshot delta value.

[0060] At block 318, it is determined whether the updated snapshot delta value is greater than another corresponding threshold value. The threshold value is at least one of a predetermined volume of data modified and a predetermined number of transactions. For example, in case the updated snapshot delta value is less than a corresponding threshold value, ('No' path from block 318), the system continues detecting occurrence of new transactions at block 302.

[0061] In case the updated snapshot delta value is greater than a corresponding threshold value, ('Yes' path from block 318), the system performs a snapshot action at block 320. Examples of the snapshot action include, but are not limited to, creating a new snapshot, creating a replicated volume snapshot of the reference snapshot, creating a backup of the reference snapshot, and expiring the reference snapshot.

[0062] Figure 4 illustrates an example network environment 400 for snapshot creation, according to an example of the present disclosure. The system environment 400 may comprise at least a portion of a public networking environment or a private networking environment, or a combination thereof. In one implementation, the system environment 400 includes a processing resource 402 communicatively coupled to a computer readable medium 404 through a communication link 406.

[0063] For example, the processing resource 402 can include one or more processors of a computing device for dynamic snapshot creation and management. The computer readable medium 404 can be, for example, an internal memory device of the computing device or an external memory device. In one implementation, the communication link 406 may be a direct communication link, such as any memory read/write interface. In another implementation, the communication link 406 may be an indirect communication link, such as a network interface. In such a case, the processing resource 402 can access the computer readable medium 404 through a network 408. The network 408 may be a single network or a combination of multiple networks and may use a variety of different communication protocols.

[0064] The processing resource 402 and the computer readable medium 404 may also be coupled to requested data sources 410 through the communication link 406, and/or to communication devices 412 over the

network 408. The coupling with the requested data sources 410 enables in receiving the requested data in an offline environment, and the coupling with the communication devices 412 enables in receiving the requested data in an online environment.

[0065] In one implementation, the computer readable medium 404 includes a set of computer readable instructions, implementing a delta counter 414 and a snapshot updating module 416. The set of computer readable instructions can be accessed by the processing resource 402 through the communication link 406 and subsequently executed to process requested data communicated with the requested data sources 410 in order to facilitate dynamic snapshot creation and management. When executed by processing resource 402, the instructions of delta counter 414 may perform the functionalities described above in relation to the delta counter 106. When executed by processing resource 402, the instructions of the snapshot updating module 416 may perform the functionalities described above in relation to the snapshot updating module 108.

[0066] For example, upon occurrence of a new transaction, the delta counter 414 may compute an updated value of a snapshot delta count. As previously described, the new transaction is a data modification operation performed on data blocks of a storage device of the communication devices 412. In one example, the delta counter 414 may detect the occurrence of the new transaction based on a small computer system interface (SCSI) request received from an operating system of the communication devices 412.

[0067] Further, the value of a snapshot delta count indicates at least one of volume of data modified since a last reset of the snapshot delta count and number of transactions performed since the last reset. In one example, to compute the updated value of the snapshot delta count, the delta counter 414 may increment a last value of the snapshot delta count by either the volume

of data modified or the number of transactions occurred, to obtain the updated value of the snapshot delta count. The last value of the snapshot delta count is the most recent computed value of the snapshot delta count.

[0068] In order to compute a volume based snapshot delta count, the delta counter 414 may initially determine volume of data modified during the new transaction. Based on the volume thus determined, the delta counter 414 may increment the last value of the snapshot delta count by the volume of data modified. In order to compute a transaction based snapshot delta count, the delta counter 414 may increment the last value of the snapshot delta count by the number of transactions currently occurred, for instance, numeric value one.

[0069] The snapshot updating module 416 may subsequently compare the updated value of the snapshot delta count with a corresponding threshold value. As previously described, the threshold value is at least one of a predetermined volume of data modified and a predetermined number of transactions. The snapshot updating module 418 may compare the updated value of the snapshot delta count with the corresponding threshold value to determine whether the snapshot delta count is greater than the corresponding threshold value. For example, on determining the updated value of the snapshot delta count to be greater than the threshold value, the snapshot updating module 416 may create a new snapshot. Further, the snapshot updating module 416 may use the updated value of the snapshot delta count and a delta reset count to compute an updated snapshot delta value. The snapshot delta value indicates at least one of volume of data modified since creation of a reference snapshot and number of transactions performed since creation of the reference snapshot. The delta reset count indicates number of times the snapshot delta count has been reset since creation of the reference snapshot.

[0070] Further, the snapshot updating module 416 may compare the updated snapshot delta value with the corresponding threshold value to determine whether the updated snapshot delta value is greater than the corresponding threshold value. As previously described, the threshold value is at least one of a predetermined volume of data modified and a predetermined number of transactions. On determining the updated value of the snapshot delta count to be greater than the threshold value, the snapshot updating module 416 may perform a snapshot action. The snapshot action is at least one of creating a new snapshot if the snapshot delta value is a snapshot delta count; creating a replicated volume snapshot of the reference snapshot if the snapshot delta count is a snapshot-replicate value; adding the reference snapshot to a backup disk is the snapshot delta count is a snapshot-backup value; and deleting the reference snapshot if the snapshot delta count is a snapshot-expire value.

[0071] Although examples for the present disclosure have been described in language specific to structural features and/or methods, it should be understood that the appended claims are not necessarily limited to the specific features or methods described. Rather, the specific features and methods are disclosed and explained as examples of the present disclosure.

I/We claim:

1. A method comprising:

computing an updated snapshot delta value upon occurrence of a new transaction, wherein the snapshot delta value indicates at least one of volume of data modified since creation of a reference snapshot and number of transactions performed since creation of the reference snapshot, and wherein the new transaction is a data modification operation performed on data blocks of a storage device;

comparing the updated snapshot delta value with a corresponding threshold value, wherein the threshold value is at least one of a predetermined volume of data modified and a predetermined number of transactions; and

performing a snapshot action based on the comparison.

2. The method as claimed in claim 1, wherein the snapshot delta value is one of a snapshot delta count, a snapshot-replicate value, a snapshot-backup value, and a snapshot-expire value.

3. The method of claim 2, wherein the snapshot action is at least one of:

creating a new snapshot if the snapshot delta value is the snapshot delta count;

creating a replicated volume snapshot of the reference snapshot if the snapshot delta value is the snapshot-replicate value;

adding the reference snapshot to a backup disk is the snapshot delta value is the snapshot-backup value; and

deleting the reference snapshot if the snapshot delta value is the snapshot-expire value.

4. The method of claim 1, wherein the computing further comprising:

determining volume of data modified during the new transaction;

incrementing a last value of a snapshot delta count by one of the volume of data modified and number of transactions currently occurred to obtain an updated value of the snapshot delta count, wherein the value of the snapshot delta count indicates at least one of volume of data modified since a last reset of the snapshot delta count and number of transactions performed since the last reset; and

compute the updated snapshot delta value based on the updated value of the snapshot delta count and a delta reset count, wherein the delta reset count indicates number of times the snapshot delta count has been reset since creation of the reference snapshot.

5. The method as claimed in claim 4, wherein the method further comprising:

determining the updated value of the snapshot delta count to be greater than the corresponding threshold;

resetting the snapshot delta count to zero; and

incrementing a last value of the delta reset count by a numerical value of one to obtain an updated value of the delta reset count.

8. A computing system comprising:

a processor;

a delta counter coupled to the processor to:

compute an updated value of a snapshot delta count upon occurrence of a new transaction, wherein the value of the snapshot delta count indicates one of volume of data modified since a last reset of the snapshot delta count and number of transactions performed since the last reset, and wherein the

new transaction includes a data modification operation performed on data blocks of a storage device of the computing system; and

a snapshot updating module coupled to the processor to:

compare the updated value of the snapshot delta count with a corresponding threshold value, wherein the threshold value specifies one of a predetermined volume of data modified and a predetermined number of transactions; and

on determining the updated value of the snapshot delta count to be greater than the threshold value, create a new snapshot.

7. The computing system as claimed in claim 6, wherein the delta counter further is to:

determine volume of data modified during the new transaction; and

increment a last value of the snapshot delta count by one of the volume of data modified and number of transactions currently occurred to obtain the updated value of the snapshot delta count.

8. The computing system as claimed in claim 7, wherein the snapshot updating module further is to:

compute an updated snapshot delta value based on the updated value of the snapshot delta count and a delta reset count to obtain, wherein the snapshot delta value indicates at least one of volume of data modified since creation of a reference snapshot and number of transactions performed since creation of the reference snapshot, and wherein the delta reset count indicates number of times the snapshot delta count has been reset since creation of the reference snapshot; and

compare the updated snapshot delta value with the corresponding threshold value to determine if a snapshot action has to be performed.

9. The computing system as claimed in claim 8, wherein on determining the updated snapshot delta value to be greater than the corresponding threshold value, the snapshot updating module further is to:

create a replicated volume snapshot of the reference snapshot if the snapshot delta value is the snapshot-repiicate value;

add the reference snapshot to a backup disk if the snapshot delta value is the snapshot-backup value; and

delete the reference snapshot if the snapshot delta value is the snapshot-expire value.

10. The computing system as claimed in claim 6 further comprising a delta reset counter coupled to the processor to:

determine the snapshot delta count to have been reset to zero; and

increment a last value of the delta reset count by a numerical value of one to obtain an updated value of the delta reset count, wherein the delta reset count indicates number of times the snapshot delta count has been reset since creation of the reference snapshot.

11. The computing system as claimed in claim 8, wherein the snapshot updating module further is to:

determine occurrence of a snapshot update condition, wherein the snapshot update condition is at least one of:

number of errors detected in the storage device being greater than a predetermined error threshold;

occurrence of a change in characteristics of reference snapshot saved in the storage device; and

number of the reference snapshot being less than a minimum snapshot threshold; and

create the new snapshot occurrence of the snapshot update condition.

12. A non-transitory computer readable medium having a set of computer readable instructions that, when executed, cause a processor to:

compute an updated snapshot delta value upon occurrence of a new transaction, wherein the snapshot delta value indicates at least one of volume of data modified since creation of a reference snapshot and number of transactions performed since creation of the reference snapshot, and wherein the new transaction is a data modification operation performed on data blocks of the storage device;

compare the updated snapshot delta value with a corresponding threshold value, wherein the threshold value is at least one of a predetermined volume of data modified and a predetermined number of transactions; and

on determining the updated snapshot delta value to be greater than the threshold value, perform a snapshot action, wherein the snapshot action is at least one of:

creating a new snapshot if the snapshot delta value is a snapshot delta count;

creating a replicated volume snapshot of the reference snapshot if the snapshot delta value is a snapshot-replicate value;

adding the reference snapshot to a backup disk is the snapshot delta value is a snapshot-backup value; and

deleting the reference snapshot if the snapshot delta value is a snapshot-expire value.

13. The non-transitory computer readable medium of claim 12, wherein the snapshot delta value is one of the snapshot delta count, the snapshot-replicate value, the snapshot-backup value, and the snapshot-expire value.

14. The non-transitory computer readable medium of claim 12, wherein the computer readable instructions, when executed, further cause the processor to:

determine volume of data modified during the new transaction;

increment a last value of a snapshot delta count by one of the volume of data modified and number of transactions currently occurred to obtain an updated value of the snapshot delta count, wherein the value of a snapshot delta count indicates at least one of volume of data modified since a last reset of the snapshot delta count and number of transactions performed since the last reset; and

compute the updated snapshot delta value based on the updated value of the snapshot delta count and a delta reset count, wherein the delta reset count indicates number of times the snapshot delta count has been reset since creation of the reference snapshot.

15. The non-transitory computer readable medium of claim 12, wherein the computer readable instructions, when executed, further cause the processor to:

determine the updated value of the snapshot delta count to be greater than the corresponding threshold;

reset the snapshot delta count to zero; and

increment a last value of the delta reset count by a numerical value of one to obtain an updated value of the delta reset count.

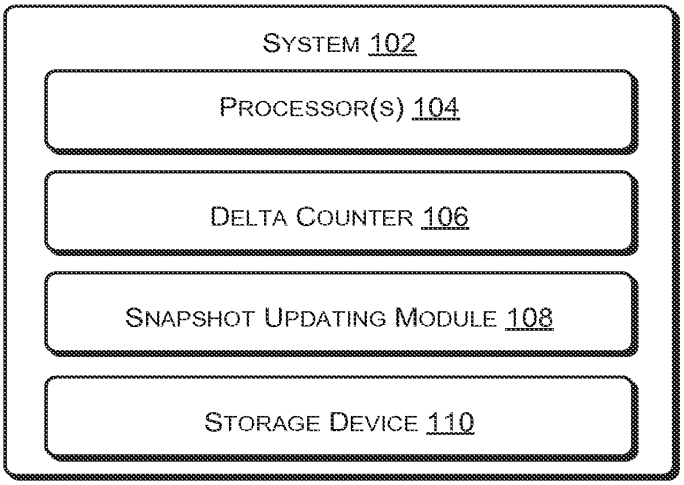
SYSTEM 102
PROCESSOR(S) 104
DELTA COUNTER 106
SNAPSHOT UPDATING MODULE 108
STORAGE DEVICE 110

Figure 1(a)

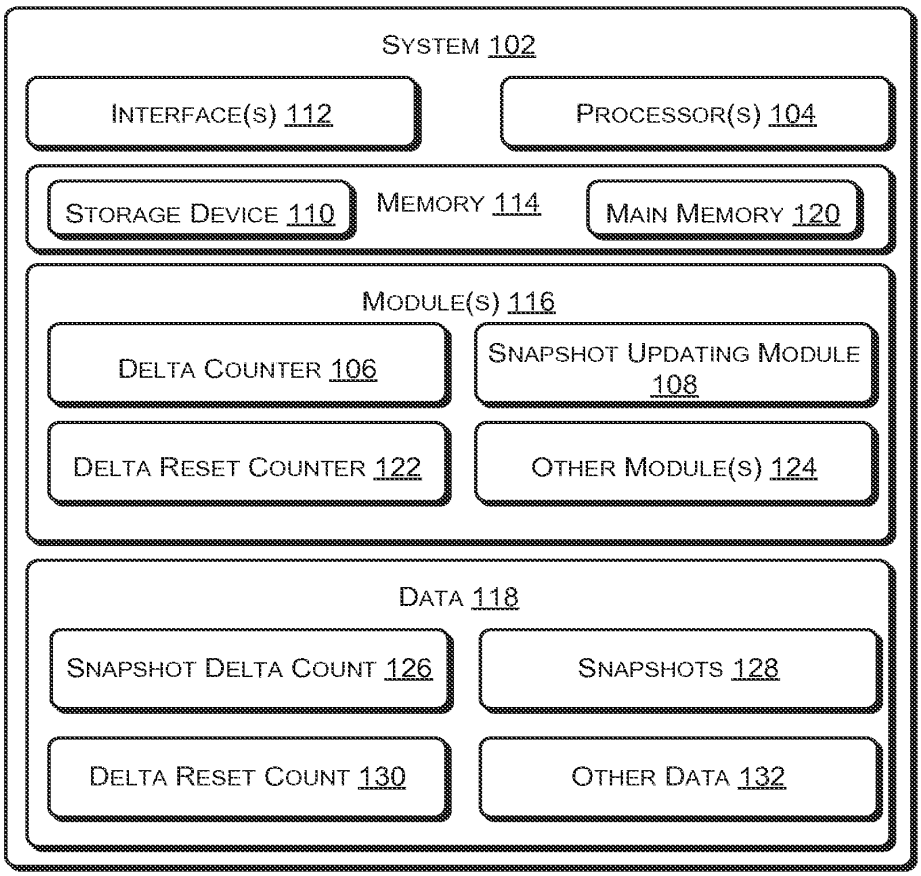
SYSTEM 102
INTERFACE(S) 112
PROCESSOR(S) 104
STORAGE DEVICE 110
MEMORY 114
MAIN MEMORY 120
MODULE(S) 116
DELTA COUNTER 106
SNAPSHOT UPDATING MODULE 108
DELTA RESET COUNTER 122
OTHER MODULE(S) 124
DATA 118
SNAPSHOT DELTA COUNT 126
SNAPSHOTS 128
DELTA RESET COUNT 130
OTHER DATA 132

Figure 1(b)

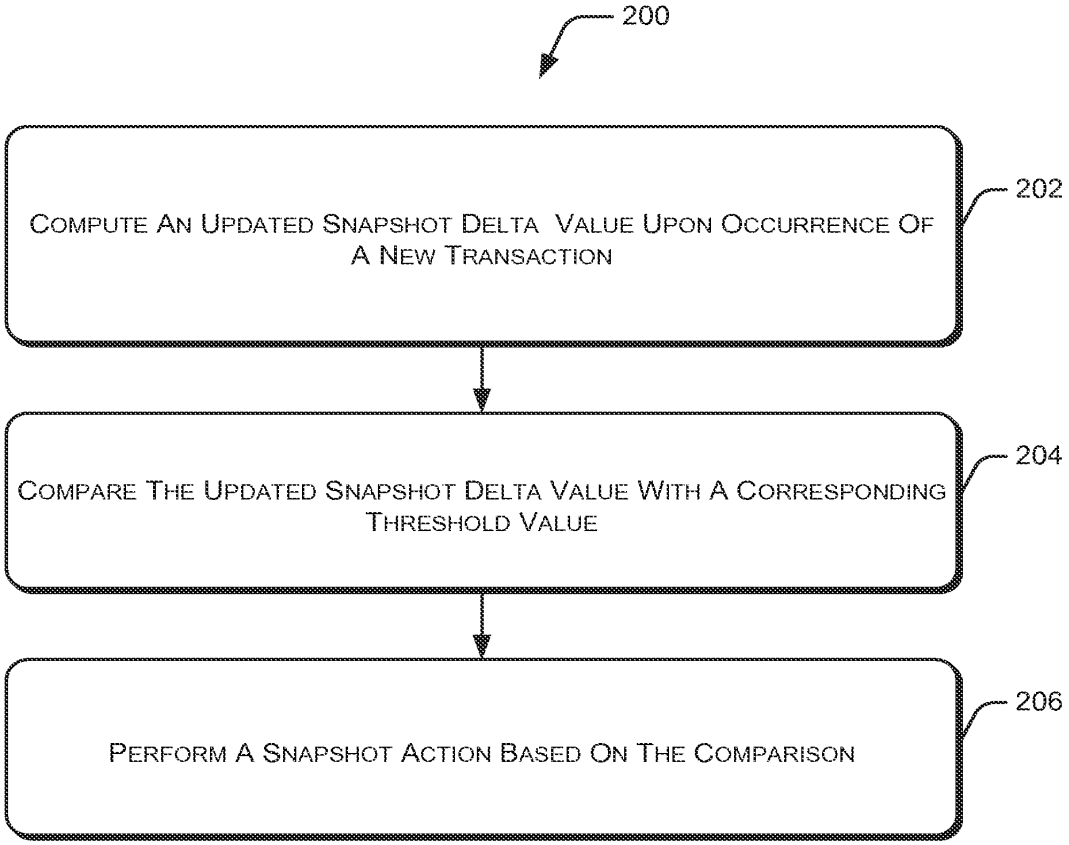
200
Compute An Updated Snapshot Delta Value Upon Occurrence Of A New Transaction
202
Compare The Updated Snapshot Delta Value With A Corresponding Threshold Value
204
Perform A Snapshot Action Based On The Comparison
206

Figure 2

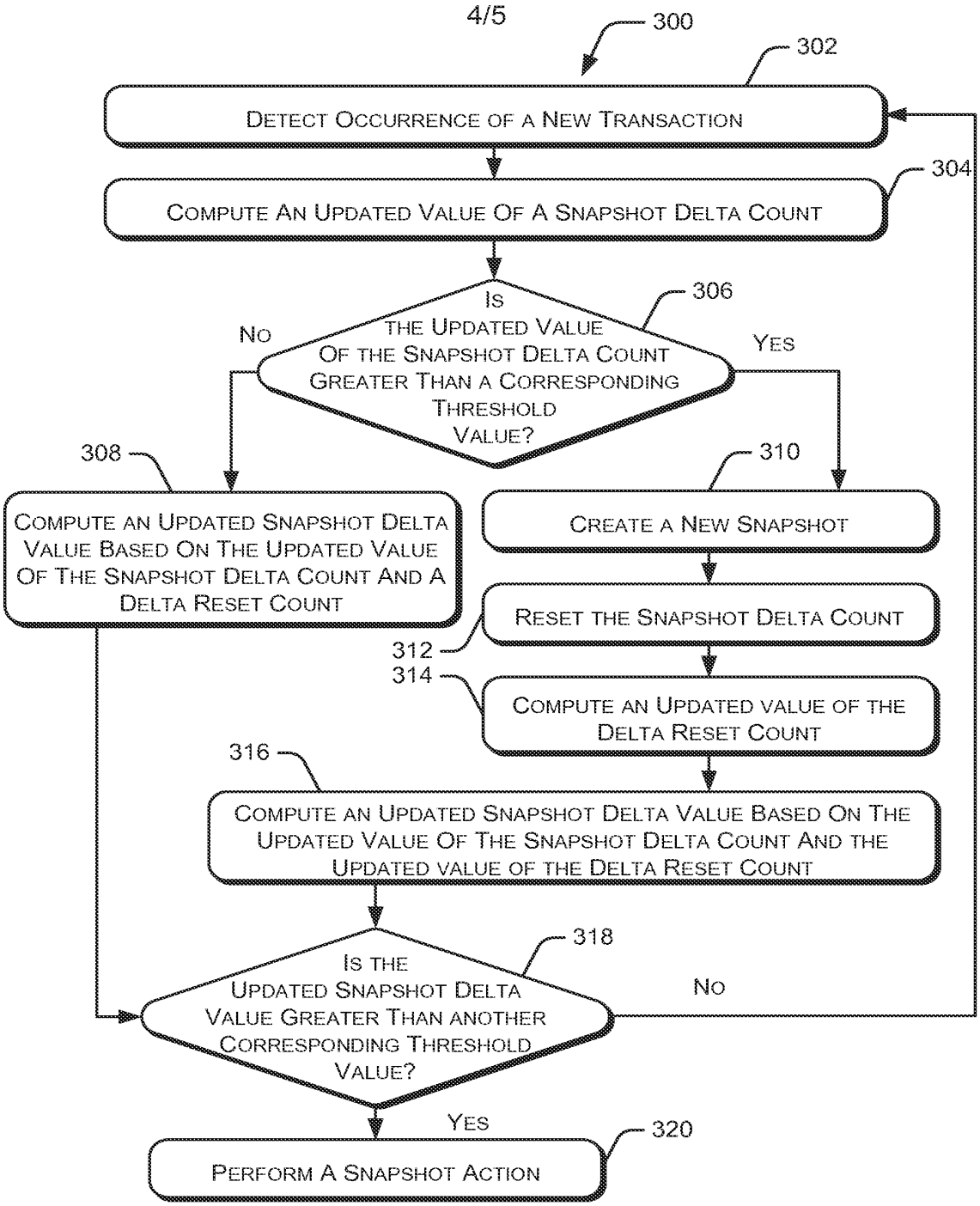
300
302
Detect Occurrence of a New Transaction
304
Compute An Updated Value Of A Snapshot Delta Count
306
Is the Updated Value Of the Snapshot Delta Count Greater Than a Corresponding Threshold Value?
No
Yes
308
Compute an Updated Snapshot Delta Value Based On The Updated Value Of The Snapshot Delta Count And A Delta Reset Count
310
Create a New Snapshot
Reset the Snapshot Delta Count
312
314
Compute an Updated value of the Delta Reset Count
316
Compute an Updated Snapshot Delta Value Based On The Updated Value Of The Snapshot Delta Count And the Updated value of the Delta Reset Count
318
Is the Updated Snapshot Delta Value Greater Than another Corresponding Threshold Value?
No
Yes
320
Perform A Snapshot Action

Figure 3

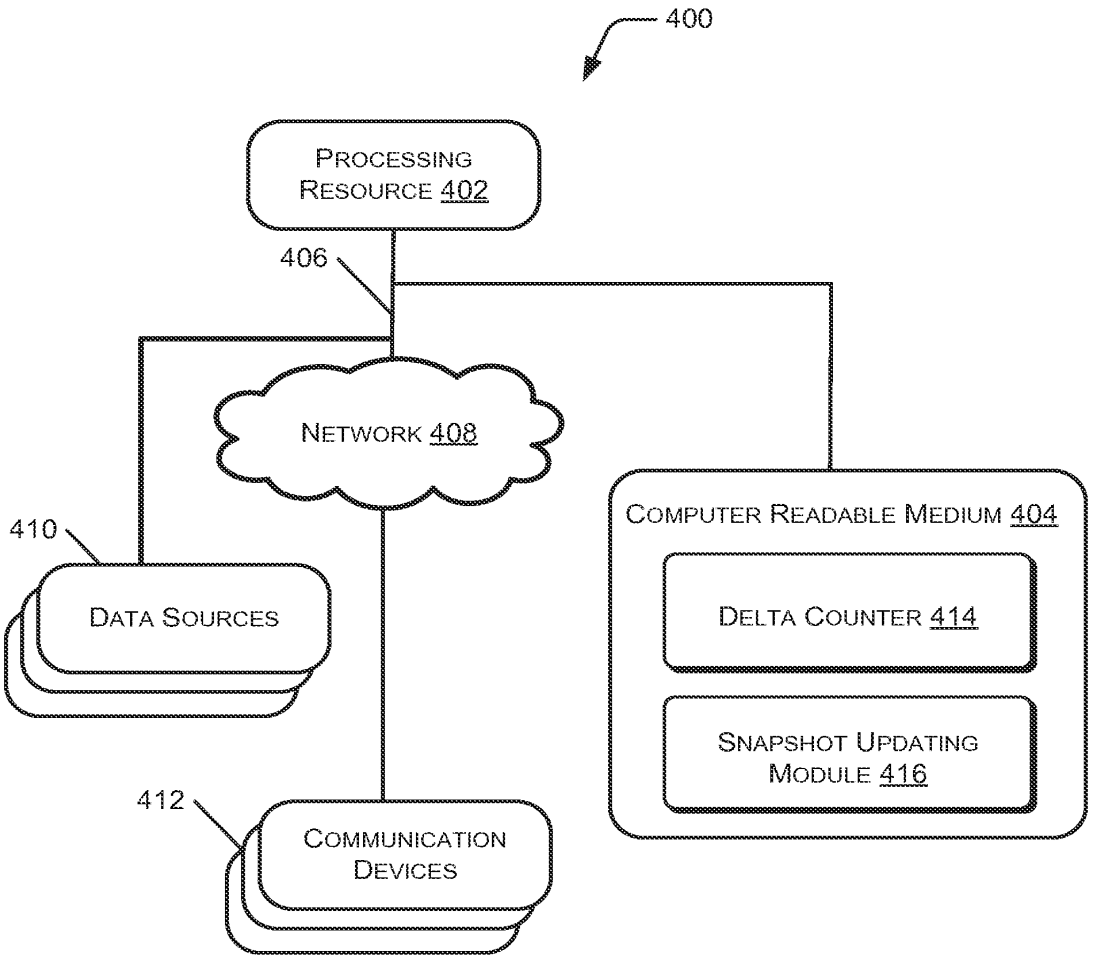
400
PROCESSING RESOURCE 402
406
NETWORK 408
410
DATA SOURCES
412
COMMUNICATION DEVICES
COMPUTER READABLE MEDIUM 404
DELTA COUNTER 414
SNAPSHOT UPDATING MODULE 416

Figure 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/070403

A. CLASSIFICATION OF SUBJECT MATTER

G06Q 10/06(2012.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06Q 10/06; G06F 15/16; G06F 9/44; G06F 17/30; G06F 11/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: compare, updated snapshot delta value, threshold value, snapshot action

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2008-0228879 A1 (RICHARD J. CARDONE et al.) 18 September 2008 See abstract, paragraphs [0049],[0071],[0074] and claims 5,7,17.	1-3,12,13
A		4-11,14,15
Y	US 8103622 B1 (VINEETH KARINTA) 24 January 2012 See abstract and claim 1.	1-3,12,13
A	US 2007-0198605 A1 (NOBUYUKI SAIKA) 23 August 2007 See abstract and claims 1-2.	1-15
A	US 2006-0136771 A1 (HARUAKI WATANABE) 22 June 2006 See abstract, paragraphs [0092],[0093],[0101] and claims 1-2.	1-15
A	US 2014-0122853 A1 (INTERNATIONAL BUSINESS MACHINES CORPORATION) 01 May 2014 See abstract, paragraphs [0055]-[0057] and claim 4.	1-15

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 July 2015 (23.07.2015)	**23 July 2015 (23.07.2015)**

Name and mailing address of the ISA/KR	Authorized officer
International Application Division Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea Facsimile No. +82-42-472-7140	Jang, Gijeong Telephone No. +82-42-481-8364

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2014/070403

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2008-0228879 Al	18/09/2008	US 2006-0036676 Al	16/02/2006
		us 2009-0307373 Al	10/12/2009
		us 7392324 B2	24/06/2008
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us 8103622 Bl	24/01/2012	us 7676510 Bl	09/03/2010
us 2007-0198605 Al	23/08/2007	JP 2007-219609 A	30/08/2007
		us 7882067 B2	01/02/2011
us 2006-0136771 Al	22/06/2006	DE 602005000926 Dl	31/05/2007
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		EP 1667023 Bl	18/04/2007
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		US 2009-0216977 Al	27/08/2009
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us 2014-0122853 Al	01/05/2014	CA 2794132 Al	01/05/2014
		US 2014-0122859 Al	01/05/2014

Electronic Acknowledgement Receipt

EFS ID:	38796191
Application Number:	16228728
International Application Number:	
Confirmation Number:	3978
Title of Invention:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
First Named Inventor/Applicant Name:	Balasubrahmanyam Kuchibhotla
Customer Number:	147491
Filer:	Paul S. Hunter/Walter Lau
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	115539-0215
Receipt Date:	06-MAR-2020
Filing Date:	20-DEC-2018
Time Stamp:	18:55:42
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	Response to Election / Restriction Filed	115539-0215-Restriction_Requirement_Response.pdf	147880 dbe54e10c3e450eec88076e2e5f8bffc0a3d05db	no	9

Warnings:

Information:					
2	Transmittal Letter	115539-0215_-_IDS_Transmittal.pdf	112273 bc986a98cad87616962c6a795d3e6938ff347b70	no	2
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	115539-0215_-_IDS_SB-08.pdf	121042 3debac087b0c643271d4bac3219198b4024cc46c	no	3
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
4	Foreign Reference	EP1654683B1.pdf	342950 e127927118da9afbc1dfba897e1909f74eb30137	no	21
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5	Foreign Reference	WO2016069029A1.pdf	432625 b2c33aba2bccf09ccf38c64fd97f76c51f3e5959	no	38
Warnings:					
Information:					
6	Non Patent Literature	CISCO_PUBLIC-Hyperconvergence_for_databases.pdf	169102 a36e1f05e2142f57dba8cf8898035e47d147c2bb	no	3
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
7	Non Patent Literature	CISCO_PUBLIC-Cisco_Hyperflex_All-Flash_Systems_for_Oracle_Database_Deployments.pdf	1785874 92264644c6b2655c2a55051fae8e4abc68501a30	no	18
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8	Non Patent Literature	CISCO_PUBLIC-Cisco_Hyperflex_All-NVMe_Systems_for_Oracle_Database_Reference_Architecture.pdf	1509050 6f2ee0867636f1cabfe70d0ae0e2321a40d437dd	no	26

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9	Non Patent Literature	CISCO_PUBLIC-Cisco_Hyperflex_HX_Data_Platform.pdf	1444146 0e27d2dd5b71d2a2d65cf584f02457cef1b16ce8	no	17
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Information:					
10	Non Patent Literature	Delphix-Backup_and_Recovery_Strategies_for_the_Delphix_Engine-v1-20191219_171856.pdf	85654 b034cdd50298a730b575d55ae5a48c5082d394eb	no	14
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Information:					
11	Non Patent Literature	Delphix-Database_Provisioning_Overview-v1-20191219_171501.pdf	31559 f3f6f44e4310659ebf2456a10b629b0116163bb6	no	6
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Information:					
12	Non Patent Literature	Delphix-Quick_Start_Guides-v1-20191219_171746.pdf	970005 aace720de2af550527d3162931d7958c7dab15d4	no	123
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Information:					
13	Non Patent Literature	Delphix-Replication-v2-20191219_172010.pdf	446827 f5e5005270aebca86707ed794c4ee9dbfe6e4a2c	no	40
Warnings:					
Information:					
14	Non Patent Literature	DELPHIX-Understanding_SnapSync_and_LogSync_for_Oracle.pdf	132401 31aeb40f47649d74a5eaa4efe4bc1503658d7431	no	10
Warnings:					
Information:					
15	Non Patent Literature	Mellor_18-Beam_Flow_and_Era.pdf	240265 75ee5a62e58aa02bbeda253fb9bbf61a00d098fd	no	6
Warnings:					
Information:					

16	Non Patent Literature	Mellor_17-Delphix_sends_database_virtualization_sailing_up_the_Amazon.pdf	266125 1033108e5d41641bbf2a407ae59260c2ea1c096d	no	6
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Information:					
17	Non Patent Literature	Nutanix_announces_Flow_Era_and_Beam.pdf	835649 823247cf6ee42d1b1bc7b97cf46c173c708b6382	no	4
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Information:					
18	Non Patent Literature	Reed_18-Nutanix_Introduces_Database_Services_with_Era.pdf	204783 2cd7f41b942360ca5769a4cf5dab320c8e8808e2	no	3
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Information:					
19	Non Patent Literature	Nutanix_Press_Releases_2018-Nutanix_Introduces_Database_Services_with_Era.pdf	172308 016db062d8ca67f4d3b8442769ef7ceb388093ea	no	6
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Information:					
20	Non Patent Literature	Sanglaji_2018-Nutanix_Era-Databases_Made_Simple.pdf	604197 dd96022db9f0a9f9ea3000f96c1a441e8f3d6adf	no	7
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Information:					
21	Non Patent Literature	Sanglaji_2018-One-click_Database_Management-London.pdf	125385 344a81cb5a23ec923ca0b8f71276f62e1c035a2e	no	3
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Information:					
22	Non Patent Literature	Sanglaji_et_al_2018-Nutanix_Era-One-click_Database_Management.pdf	5586721 0b8877425e57ff8d3f5e448af756e86421de95f7	no	27
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23	Non Patent Literature	VMWARE-clone_a_database.pdf	110544 2904c0c1886026ad30fe90f5becb1885f6b9ec4b	no	5
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24	Non Patent Literature	VMWARE-Getting_Started_with_Database_Provisioning.pdf	597175 874f61d843fc539feb99583186b2e5391c07bbbd	no	15
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Information:					
			Total Files Size (in bytes):	16474540	

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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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Inventor Name:	Balasubrahmanyam Kuchibhotla
Title:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
Application No.:	16/228,728
Filing Date:	12/20/2018
Examiner:	SONG, DAEHO D
Art Unit:	2141
Confirmation No.:	3978

INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §1.56

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

Commissioner:

Applicant submits herewith documents for the Examiner's consideration in accordance with 37 CFR §§1.56, 1.97 and 1.98.

Applicants respectfully request that each listed document be considered by the Examiner and be made of record in the present application and that an initialed copy of Form PTO/SB/08 be returned in accordance with MPEP §609.

The submission of any document herewith is not an admission that such document constitutes prior art against the claims of the present application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicants do not waive any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference any document submitted herewith.

TIMING OF THE DISCLOSURE

The listed documents are being submitted in compliance with 37 CFR §1.97(b), before the mailing of a first Office Action on the merits.

The Commissioner is hereby authorized to charge any additional fees which may be due to Deposit Account No. 19-0741.

Respectfully submitted,

Date March 6, 2020

By /*Paul S. Hunter*/

FOLEY & LARDNER LLP
Customer No. 147491
Telephone: (858) 847-6733
Facsimile: (858) 792-6773

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Inventor Name:	Balasubrahmanyam Kuchibhotla
Title:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
Appl. No.:	16/228728
Filing Date:	12/20/2018
Examiner:	SONG, DAEHO D
Art Unit:	2141
Confirmation Number:	3978

RESPONSE TO RESTRICTION REQUIREMENT

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

Commissioner:

In response to the restriction requirement set forth in the Office Action mailed January 6, 2020, Applicant hereby provisionally elects **Group I, Claims 1-10 and 21 classified in G06F16/128**, for examination, without traverse.

The Examiner has required restriction between Group I claims 1-10 and 17-23 classified in G06F16/128; Group II, claims 11-17 and 22 classified in G06F16/256; and Group III, claims 18-20 classified in G06F16/27.

Applicant respectfully disagrees but elects **Group 1** to advance prosecution.

Applicant also amends the claims by adding Claims 23 – 30, which Applicant submits are part of Group 1.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

1. (Previously Presented) A database management system comprising:

a dashboard that receives input from and provides output to a user, the dashboard comprising a main menu providing a plurality of control functions, wherein upon receiving selection of a first control function to provision a source database, the dashboard:

presents an option to select a database engine type;

upon receiving selection of the database engine type, presents for user selection:

a sample profile to create a new source database virtual machine;

at least one level of a Service Level Agreement ("SLA"); and

a frequency of capturing snapshots and transactional logs; and

upon receiving the user selection of the sample profile, one of the at least one level of the SLA, and the frequency of capturing snapshots and transactional logs, displays a status as the source database is provisioned.

2. (Previously Presented) The database management system of claim 1, wherein the dashboard further comprises a portion that displays the source database on the dashboard upon provisioning.

3. (Previously Presented) The database management system of claim 1, wherein the dashboard comprises a dynamically changing home page comprising a plurality of cells, wherein a first cell of the plurality of cells displays a list of all source databases associated with the database management system.

4. (Previously Presented) The database management system of claim 1, wherein the dashboard presents:

a first user interface that displays the option for the database engine type; and

a second user interface for displaying the sample profile upon receiving selection of the database engine type.

5. (Previously Presented) The database management system of claim 4, wherein the second user interface comprises fields for receiving selection of at least one of a software profile, a compute profile, and a network profile.

6. (Previously Presented) The database management system of claim 4, wherein the second user interface comprises fields for receiving selection of a name and description for the new source database virtual machine.

7. (Previously Presented) The database management system of claim 21, wherein the third user interface further comprises fields for receiving selection of a duration for designating at least one of a daily snapshot, a weekly snapshot, a monthly snapshot, and a quarterly snapshot.

8. (Previously Presented) The database management system of claim 21, further comprising displaying a fifth user interface between the second user interface and the third user interface, wherein the fifth user interface comprises fields for receiving selection of a name and description for the source database.

9. (Previously Presented) The database management system of claim 1, wherein upon receiving selection of the first control function, the dashboard presents a first user interface providing a first option to create a new database and a second option to register an existing database.

10. (Previously Presented) The database management system of claim 9, wherein upon receiving selection of the first option, the database presents the option for the database engine type.

11. (Withdrawn) A database management system comprising:

a dashboard that receives input from and provides output to a user, the dashboard comprising a main menu providing a plurality of control functions, wherein upon receiving selection of a first control function to create a cloned database from a source database, the dashboard presents for user selection:

a calendar highlighting at least one day covered by at least one protection parameter;

a time scale highlighting at least one time slot that is available for selection; and

a first option for creating a new target database virtual machine and a second option for using an existing target database virtual machine;

wherein upon receiving selection of one day from the calendar, a time slot from the time scale, and selection of either the first option or the second option, the dashboard displays a status as the cloned database is being created.

12. (Withdrawn) The database management system of claim 11, wherein the at least one protection parameter comprises a continuous protection parameter, a daily protection parameter, a weekly protection parameter, a monthly protection parameter, and a quarterly protection parameter.

13. (Withdrawn) The database management system of claim 12, wherein each of the continuous protection parameter, the daily protection parameter, the weekly protection parameter, the monthly protection parameter, and the quarterly protection parameter is color coded with a different color on the calendar.

14. (Withdrawn) The database management system of claim 11, wherein upon receiving selection of the first control function, the dashboard presents a first user interface providing a plurality of additional control functions, and wherein the dashboard presents the calendar in response to receiving selection of a clone database control function from the plurality of additional control functions.

15. (Withdrawn) The database management system of claim 11, wherein the dashboard presents:

a first user interface that presents the calendar; and

a second user interface that presents the time scale upon receiving selection of the one day from the calendar.

16. (Withdrawn) The database management system of claim 22, wherein the dashboard presents a fifth user interface between the third user interface and the fourth user interface for receiving selection of a name for the cloned database.

17. (Withdrawn) The database management system of claim 11, wherein the dashboard sends the user selections to a database engine via an Application Programming Interface.

18. (Withdrawn) A database management system comprising:

a dashboard comprising a main menu for providing a plurality of control functions and a body that dynamically changes based upon the plurality of control functions that are selected;

wherein the main menu comprises a first control function, wherein the selection of the first control function triggers a database provisioning service by presenting an option within the body to either create a new source database or register an existing database; and

wherein the main menu comprises a second control function, wherein the selection of the second control function triggers a copy data management service by presenting an option to create a new cloned database.

19. (Withdrawn) The database management system of claim 18, wherein upon selecting either the option to create the new source database or register the existing database, the dashboard presents a plurality of user interfaces for receiving user selections and creating the new source database or register the existing database.

20. (Withdrawn) The database management system of claim 19, wherein the dashboard displays the new source database or the registered existing database on a homepage of the dashboard.

21. (Previously Presented) The database system of claim 4, wherein the dashboard presents:

a third user interface that displays the at least one level of the SLA and the frequency of capturing snapshots and transactional logs upon receiving selection of the sample profiles; and

a fourth user interface that displays the status of provisioning the source database.

22. (Withdrawn) The database system of claim 15, wherein the dashboard presents:

a third user interface that presents the first option and the second option; and

a fourth user interface that displays the status.

23. (New) A method comprising:

receiving at a dashboard input from a user, the dashboard comprising a main menu providing a plurality of control functions, wherein upon receiving selection of a first control function to provision a source database;

presenting at the dashboard an option to select a database engine type;

upon receiving selection of the database engine type, presenting for user selection:

a sample profile to create a new source database virtual machine;

at least one level of a Service Level Agreement ("SLA"); and

a frequency of capturing snapshots and transactional logs; and

upon receiving the user selection of the sample profile, one of the at least one level of the SLA, and the frequency of capturing snapshots and transactional logs, displaying a status as the source database is provisioned.

24. (New) The method of claim 23, further comprising dynamically changing a home page comprising a plurality of cells, wherein a first cell of the plurality of cells displays a list of all source databases associated with the database management system.

25. (New) The method of claim 23, further comprising presenting at the dashboard a first user interface that displays the option for the database engine type and a second user interface for displaying the sample profile upon receiving selection of the database engine type.

26. (New) The method of claim 25, wherein the second user interface comprises fields for receiving selection of at least one of a software profile, a compute profile, and a network profile.

27. (New) The method of claim 23, wherein upon receiving selection of the first control function, presenting at the dashboard a first user interface providing a first option to create a new database and a second option to register an existing database.

28. (New) The method of claim 27, wherein upon receiving selection of the first option, presenting at the database the option for the database engine type.

29. (New) An apparatus comprising:

a memory having stored instructions;

a processor that upon execution of the stored instructions performs operations including:

receiving via a dashboard interface input from and providing output to a user, the dashboard interface including a main menu providing a plurality of control functions, wherein upon receiving selection of a first control function to provision a source database, the dashboard interface:

presents an option to select a database engine type;

upon receiving selection of the database engine type, presents for user selection:

a sample profile to create a new source database virtual machine;

at least one level of a Service Level Agreement ("SLA"); and

a frequency of capturing snapshots and transactional logs; and

upon receiving the user selection of the sample profile, one of the at least one level of the SLA, and the frequency of capturing snapshots and transactional logs, displaying a status as the source database is provisioned.

30. (New) The apparatus of claim 29, wherein the dashboard interface presents for user selection:

a calendar highlighting a day covered by a protection parameter;

a time scale highlighting a time slot that is available for selection; and

a first option for creating a new target database virtual machine and a second option for using an existing target database virtual machine.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extension fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date March 6, 2020

By */Paul S. Hunter/*

FOLEY & LARDNER LLP
Customer Number: 147491
Telephone: (858) 847-6733
Facsimile: (858) 792-6773

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

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.
16/228,728	12/20/2018	Balasubrahmanyam Kuchibhotla	115539-0215	3978

147491 7590 02/28/2020
FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON, DC 20007-5109

EXAMINER
SONG, DAEHO D

ART UNIT	PAPER NUMBER
2141	

NOTIFICATION DATE	DELIVERY MODE
02/28/2020	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):

ipdocketing@foley.com

PTOL-90A (Rev. 04/07)

Office Action Summary	Application No. 16/228,728	Applicant(s) Kuchibhotla et al.	
	Examiner DAEHO D SONG	Art Unit 2141	AIA (FITF) Status Yes

-- 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 2 MONTHS 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 12/20/2018.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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) 1-22 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) _____ is/are rejected.

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

9) ☑ Claim(s) 1-22 are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

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).

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).

Certified copies:

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)).

** 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) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

This is the initial Office Action based on the application number 16/228728, filed 12/20/2018. Claims 1-20 was originally filed. Applicant have made preliminary amendment, and amended Claims 1-20, added Claims 21 and 22, which are currently pending. Claims 1, 11, and 18 are the independent claims.

Election/Restrictions

This application contains claims directed to the following patentably distinct species I, II and III. The species are independent or distinct because claims to the different species recite the mutually exclusive characteristics of such species. In addition, these species are not obvious variants of each other based on the current record.

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-10 and 21, drawn to file system snapshots on the file-level, classified in G06F16/128.

II. Claims 11-17 and 22, drawn to virtual databases, classified in G06F16/256.

III. Claims 18-20, drawn to replication of data between databases, classified in G06F16/27.

The inventions are distinct, each from the other because of the following reasons: Inventions I through III are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, invention (I) has separate utility such as management of snapshots of file systems on the file-level, including snapshot creation and administration; invention (II) has separate utility such as systems providing a data abstraction layer on top of a set of heterogeneous database systems to convey the concept of a virtual database to the end users; invention (III) has separate utility such as systems that replicate data between databases or a distributed database system and descriptions of architectures thereof. See MPEP § 806.05(d).

There is an examination and search burden for these patentably distinct species due to their mutually exclusive characteristics. The species require a different field of search (e.g., searching different classes/subclasses or electronic resources, or employing different search queries); and/or the prior art applicable to one species would not likely be applicable to another species; and/or the species are likely to raise different non-prior art issues under 35 U.S.C. 101 and/or 35 U.S.C. 112, first paragraph.

Applicant is advised that the reply to this requirement to be complete must include (i) an election of a species to be examined even though the requirement may be traversed (37 CFR 1.143) **and (ii) identification of the claims encompassing the elected species**, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

The election of the species may be made with or without traverse. To preserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the election of species requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable on the elected species.

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the species unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other species.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which depend from or otherwise require all the limitations of an allowable generic claim as provided by 37 CFR 1.141.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAEHO D SONG whose telephone number is (571)272-7524. The examiner can normally be reached on Mon-Fri. 8:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amy Ng can be reached on (571)270-1698. 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.

/Daeho D Song/
Primary Examiner, Art Unit 2141

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/228,728	Kuchibhotla et al.
	Examiner	**Art Unit**
	DAEHO D SONG	2141

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

CLAIMS

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

CLAIM		DATE								
Final	Original	02/18/2020								
	1	÷								
	2	÷								
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	4	÷								
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	22	÷								

PTO/SB/08 (modified)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
Date Submitted: December 17, 2019				**Filing Date**	12/20/2018
				First Named Inventor	Balasubrahmanyam Kuchibhotla
(use as many sheets as necessary)				Art Unit	2141
				Examiner Name	SONG, DAEHO D.
Sheet	1	of	2	Attorney Docket Number	115539-0215

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number / Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A1	2013/0290180	10-31-2013	BAFFIER ET AL.	
	A2	2017/0286518	10-05-2017	HOROWITZ ET AL.	

UNPUBLISHED U.S. PATENT APPLICATION DOCUMENTS

Examiner Initials*	Cite No.[1]	U.S. Patent Application Document / Serial Number-Kind Code[2] (*if known*)	Filing Date of Cited Document MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document / Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	A3	NETAPP SUPPORT, "Cloning databases using SnapManager" (August 2013) from, https://library.netapp.com/ecmdocs/ECMP1217281/html/GUID-EAA4950A-C186-423D-9574-6EA12A92E53D.html (accessed 12/17/2019).	
	A4	NETAPP SUPPORT, "Types of SnapManager restore operations" (August 2013) from, https://library.netapp.com/ecmdocs/ECMP1217281/html/GUID-599DF5AE-C49F-4BF0-A96C-E6E71FAFF102.html (accessed 12/17/2019).	

Examiner Signature		Date Considered	

PTO/SB/08 (modified)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
Date Submitted: December 17, 2019				**Filing Date**	12/20/2018
				First Named Inventor	Balasubrahmanyam Kuchibhotla
(use as many sheets as necessary)				Art Unit	2141
				Examiner Name	SONG, DAEHO D.
Sheet	2	of	2	Attorney Docket Number	115539-0215

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	A5	ORACLE COMMUNICATIONS, "Provisioning Database Interface User's Guide, Release 16.0" (September 2014) Oracle, p. 1-174.	
	A6	ORACLE HELP CENTER, "Enterprise Manager Lifecycle Management Administrator's Guide, 4. Overview of Database Provisioning" (2019) from, https://docs.oracle.com/cd/E24628_01/em.121/e27046/prov_db_overview.htm#EMLCM12206, (accessed 12/17/2019).	
	A7	PATIL, MANOJ E. et al. "Design and Implementation of Graphical User Interface for Relational Database Management System" (2012), International Jounral of Computer Science and Information Technologies (IJCSIT), Volume 3 (3), p. 3871-3874.	

Examiner Signature		Date Considered	

Electronic Patent Application Fee Transmittal

Application Number:	16228728
Filing Date:	20-Dec-2018
Title of Invention:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
First Named Inventor/Applicant Name:	Balasubrahmanyam Kuchibhotla
Filer:	Paul S. Hunter/Walter Lau
Attorney Docket Number:	115539-0215

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	2	100	200
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**200**

Electronic Acknowledgement Receipt	
EFS ID:	38063180
Application Number:	16228728
International Application Number:	
Confirmation Number:	3978
Title of Invention:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
First Named Inventor/Applicant Name:	Balasubrahmanyam Kuchibhotla
Customer Number:	147491
Filer:	Paul S. Hunter/Walter Lau
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	115539-0215
Receipt Date:	17-DEC-2019
Filing Date:	20-DEC-2018
Time Stamp:	20:34:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$200
RAM confirmation Number	E2019BGK35240837
Deposit Account	190741
Authorized User	Walter Lau
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		115539-0215-Preliminary_Amendment.pdf	142557 84b3104000d0b03278af463342654b720eb9c787	yes	8
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Applicant Arguments/Remarks Made in an Amendment		8	8	
	Claims		2	7	
	Preliminary Amendment		1	1	
Warnings:					
Information:					
2	Transmittal Letter	115539-0215-IDS_Transmittal.pdf	112441 22030d6411b66caf9ad6a916046485e85feac1d9	no	2
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	115539-0215-IDS_SB-08.pdf	111146 cc7903c1ea06a2b69ec4e141ca65b0e01586f42e	no	2
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
4	Non Patent Literature	NETAPP_SUPPORT-Cloning_Databases.pdf	162179 b017d51f5d2d02cc22637f6867c1089c2fee6749	no	8
Warnings:					
Information:					

5	Non Patent Literature	NETAPP_SUPPORT-Types_of_SnapManager.pdf	145601 6181c6d0cd04d6d40b9ebbf612b21ab080c47fe0	no	3
Warnings:					
Information:					
6	Non Patent Literature	ORACLE_COMMUNICATIONS-Provisioning_Database_Interface.pdf	1358937 bdfbcdfe42dd895a75d256bf16c37ffddf253e7e	no	174
Warnings:					
Information:					
7	Non Patent Literature	ORACLE_HELP_CENTER-Enterprise_Manager_Lifecycle.pdf	917972 3a408a41d28a32e2ed7b63026d0a398a60274e19	no	30
Warnings:					
Information:					
8	Non Patent Literature	PATIL_et_al-Design_and_Implementation.pdf	477476 4e2d8b295b5e0f721511bdea1b3735035fd8113b	no	4
Warnings:					
Information:					
9	Fee Worksheet (SB06)	fee-info.pdf	30732 8d502f986caab0b9131261dc7be95b77b33f19f0	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3459041		

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.

REMARKS

Applicant respectfully requests that the foregoing amendments be made prior to examination of the present application.

Status of Claims

Claims 1-20 have been amended. Claims 21 and 22 are added. No new matter has been added with either the amendments to the claims or the newly added claims. Support for the amendments can be found in the claims and specification, as originally filed. These amendments are made without prejudice or disclaimer.

After amending the claims as set forth above, Claims 1-22 remain pending in this application. Applicant respectfully requests reconsideration of these claims.

Concluding Remarks

Applicant believes that the application is in condition for allowance. Favorable consideration is respectfully requested. The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance prosecution.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application, or credit any overpayment, to Deposit Account No. 19-0741.

Respectfully submitted,

Date ___December 17, 2019_____ By ___*/Paul S. Hunter/*_____

FOLEY & LARDNER LLP
Customer Number: 147491
Telephone: (858) 847-6733
Facsimile: (858) 792-6773

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A database management system comprising:

a dashboard that receives ~~configured to receive~~ input from and provides ~~provide~~ output to a user, the dashboard comprising a main menu providing a plurality of control functions, wherein upon receiving selection of a first control function ~~configured~~ to provision a source database, the dashboard ~~is configured to~~:

~~present~~ presents an option to select ~~options for~~ a database engine type;

upon receiving selection of the database engine type, presents ~~present~~ for user selection:

a sample profile to create ~~profiles for creating~~ a new source database virtual machine;

at least one level ~~levels~~ of a Service Level Agreement ("SLA"); and

~~frequencies~~ a frequency of capturing snapshots and transactional logs; and

upon receiving the user selection of the sample profile ~~profiles~~, one of the at least one level ~~levels~~ of the SLA, and the frequency ~~frequencies~~ of capturing snapshots and transactional logs, displays ~~displaying~~ a status as the source database is provisioned~~; and~~

~~displaying the source database on the dashboard upon provisioning~~.

2. (Currently Amended) The database management system of claim 1, wherein the dashboard further comprises a [[body]] portion that displays the source database on the dashboard upon provisioning ~~configured to display information based upon the plurality of control functions that are selected from the main menu~~.

3. (Currently Amended) The database management system of claim 1, wherein the dashboard comprises a dynamically changing home page comprising a plurality of cells, wherein

a first cell of the plurality of cells displays ~~is configured to display~~ a list of all source databases associated with the database management system.

4. (Currently Amended) The database management system of claim 1, wherein the dashboard presents ~~is configured to present~~:

a first user interface that displays ~~for displaying~~ the option ~~options~~ for the database engine type; and

a second user interface for displaying the sample profile ~~profiles~~ upon receiving selection of the database engine type~~;~~

~~a third user interface for displaying the levels of the SLA and the frequencies of capturing snapshots and transactional logs upon receiving selection of the sample profiles; and~~

~~a fourth user interface for displaying the status of provisioning the source database~~.

5. (Currently Amended) The database management system of claim 4, wherein the second user interface comprises fields for receiving selection of at least one of a software profile, a compute profile, and a network profile.

6. (Currently Amended) The database management system of claim 4, wherein the second user interface comprises fields for receiving selection of a name and description for the new source database virtual machine.

7. (Currently Amended) The database management system of claim [[4]] 21, wherein the third user interface further comprises fields for receiving selection of a duration ~~durations~~ for designating at least one of a daily snapshot, a weekly snapshot, a monthly snapshot, and a quarterly snapshot.

8. (Currently Amended) The database management system of claim [[4]] 21, further comprising displaying a fifth user interface between the second user interface and the third user

interface, wherein the fifth user interface comprises fields for receiving selection of a name and description for the source database.

9. (Currently Amended) The database management system of claim 1, wherein upon receiving selection of the first control function, the dashboard presents ~~is configured to present~~ a first user interface providing a first option to create a new database and a second option to register an existing database.

10. (Currently Amended) The database management system of claim 9, wherein upon receiving selection of the first option, the database presents the option ~~options~~ for the database engine type.

11. (Currently Amended) A database management system comprising:

a dashboard that receives ~~configured to receive~~ input from and provides ~~provide~~ output to a user, the dashboard comprising a main menu providing a plurality of control functions, wherein upon receiving selection of a first control function ~~configured~~ to create a cloned database from a source database, the dashboard presents ~~is configured to present~~ for user selection:

a calendar highlighting [[days]] at least one day covered by at least one protection parameter;

a time scale highlighting at least one time [[slots]] slot that [[are]] is available for selection; and

a first option for creating a new target database virtual machine and a second option for using an existing target database virtual machine;

wherein upon receiving selection of one day from the calendar, a time slot from the time scale, and selection of either the first option or the second option, the dashboard displays ~~displaying~~ a status as the cloned database is being created~~; and~~

~~displaying the cloned database within the dashboard~~.

12. (Currently Amended) The database management system of claim 11, wherein the at least one protection parameter comprises a continuous protection parameter, a daily protection parameter, a weekly protection parameter, a monthly protection parameter, and a quarterly protection parameter.

13. (Currently Amended) The database management system of claim 12, wherein each of the continuous protection parameter, the daily protection parameter, the weekly protection parameter, the monthly protection parameter, and the quarterly protection parameter is color coded with a different color on the calendar.

14. (Currently Amended) The database management system of claim 11, wherein upon receiving selection of the first control function, the dashboard presents ~~is configured to present~~ a first user interface providing a plurality of additional control functions, and wherein the dashboard presents the calendar in response to receiving selection of a clone database control function from the plurality of additional control functions.

15. (Currently Amended) The database management system of claim 11, wherein the dashboard presents ~~is configured to present~~:

a first user interface that presents ~~for presenting~~ the calendar; and

a second user interface that presents ~~for presenting~~ the time scale upon receiving selection of the one day from the calendar~~;~~

~~a third user interface that presents for presenting the first option and the second option; and~~

~~a fourth user interface that displays for displaying the status~~.

16. (Currently Amended) The database management system of claim [[15]] 22, wherein the dashboard presents ~~is configured to present~~ a fifth user interface between the third user interface and the fourth user interface for receiving selection of a name for the cloned database.

17. (Currently Amended) The database management system of claim 11, wherein the dashboard sends ~~is configured to send~~ the user selections to a database engine via an Application Programming Interface.

18. (Currently Amended) A database management system ~~associated with a plurality of source databases in a virtual computing system, the database system~~ comprising:

a dashboard comprising a main menu for providing a plurality of control functions and a body that dynamically changes based upon the plurality of control functions that are selected;

~~wherein the dashboard comprises a homepage for displaying a plurality of cells in the body, including a first cell for displaying a list of the plurality of source databases;~~

wherein the main menu comprises a first control function, wherein the selection of the first control function [[which]] triggers a database provisioning service by presenting ~~options~~ an option within the body to either create a new source database or register an existing database ~~within the body~~; and

wherein the main menu comprises a second control function, wherein the selection of the second control function [[which]] triggers a copy data management service by presenting an option to create a new cloned database.

19. (Currently Amended) The database management system of claim 18, wherein upon selecting either the option to create the new source database or register the existing database, the dashboard presents a plurality of user interfaces for receiving user selections and creating the new source database or register the existing database.

20. (Currently Amended) The database management system of claim 19, wherein the dashboard displays ~~further comprising displaying~~ the new source database or the registered existing database ~~within the first cell~~ on [[the]] a homepage of the dashboard.

21. (New) The database system of claim 4, wherein the dashboard presents:

a third user interface that displays the at least one level of the SLA and the frequency of capturing snapshots and transactional logs upon receiving selection of the sample profiles; and

a fourth user interface that displays the status of provisioning the source database.

22. (New) The database system of claim 15, wherein the dashboard presents:

a third user interface that presents the first option and the second option; and

a fourth user interface that displays the status.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Inventor Name:	Balasubrahmanyam Kuchibhotla.
Title:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
Appl. No.:	16/228728
Filing Date:	12/20/2018
Examiner:	SONG, DAEHO D
Art Unit:	2141
Confirmation Number:	3978

PRELIMINARY AMENDMENT UNDER 37 C.F.R. 1.115

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

Commissioner:

Prior to examination of the present Application, Applicant respectfully requests that the application be amended as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this document.

Remarks begin on page 8 of this document.

Please amend the application as follows:

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Inventor Name:	Balasubrahmanyam Kuchibhotla
Title:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
Application No.:	16/228,728
Filing Date:	12/20/2018
Examiner:	SONG, DAEHO D
Art Unit:	2141
Confirmation No.:	3978

INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §1.56

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

Commissioner:

Applicant submits herewith documents for the Examiner's consideration in accordance with 37 CFR §§1.56, 1.97 and 1.98.

Applicants respectfully request that each listed document be considered by the Examiner and be made of record in the present application and that an initialed copy of Form PTO/SB/08 be returned in accordance with MPEP §609.

The submission of any document herewith is not an admission that such document constitutes prior art against the claims of the present application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicants do not waive any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference any document submitted herewith.

TIMING OF THE DISCLOSURE

The listed documents are being submitted in compliance with 37 CFR §1.97(b), before the mailing date of the first Office Action on the merits.

Although Applicant believes that no fee is required, the Commissioner is hereby authorized to charge any additional fees which may be due to Deposit Account No. 19-0741.

Respectfully submitted,

Date ___December 17, 2019_____ By ___*/Paul S. Hunter/*_____

FOLEY & LARDNER LLP
Customer Number: 147491
Telephone: (858) 847-6733
Facsimile: (858) 792-6773

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/228,728	Filing Date 12/20/2018	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 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	

APPLICATION AS AMENDED - PART II

AMENDMENT	12/17/2019	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 22	Minus	** 20	= 2		x $0 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $0 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

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

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

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

PTO/SB/08 (modified)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
Date Submitted: November 13, 2019				**Filing Date**	12/20/2018
				First Named Inventor	Balasubrahmanyam Kuchibhotla
(use as many sheets as necessary)				Art Unit	2141
				Examiner Name	SONG, DAEHO D.
Sheet	1	of	1	Attorney Docket Number	115539-0215

2U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number / Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

UNPUBLISHED U.S. PATENT APPLICATION DOCUMENTS

Examiner Initials*	Cite No.[1]	U.S. Patent Application Document / Serial Number-Kind Code[2] (*if known*)	Filing Date of Cited Document MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document / Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	B1	CANO, IGNACIO, et al. "Curator: Self-Managing Storage for Enterprise Clusters" (27 March 2017), from https://www.usenix.org/conference/nsdi17/	

Examiner Signature		Date Considered	

4832-5021-8412.1

Electronic Acknowledgement Receipt

EFS ID:	37744981
Application Number:	16228728
International Application Number:	
Confirmation Number:	3978
Title of Invention:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
First Named Inventor/Applicant Name:	Balasubrahmanyam Kuchibhotla
Customer Number:	147491
Filer:	Paul S. Hunter/Maleeha Syeda
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	115539-0215
Receipt Date:	13-NOV-2019
Filing Date:	20-DEC-2018
Time Stamp:	18:21:28
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	Transmittal Letter	IDS-Transmittal-115539-0215.pdf	117356 c88867f5f6ce5a97892598c0c2a6c9005459a66e	no	2

Warnings:

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	SB08-Form-115539-0215.pdf	108567 16510efc02be7cee904f68cffe9a423cf0d31c5b	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Non Patent Literature	B1--CANO__IGNACIO__et_al____Curator___Self_M.pdf	1426670 c2f90bd860525cec252b94a285c1973d0e7a35c4	no	16
Warnings:					
Information:					
		Total Files Size (in bytes):	1652593		

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<u>National Stage of an International Application under 35 U.S.C. 371</u>
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.
<u>New International Application Filed with the USPTO as a Receiving Office</u>
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

First Inventor Name:	Balasubrahmanyam Kuchibhotla
Title:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
Application No.:	16/228728
Filing Date:	12/20/2018
Examiner:	SONG, DAEHO D.
Art Unit:	2141
Confirmation No.:	3978

INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §1.56

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

Commissioner:

Applicant submits herewith documents for the Examiner's consideration in accordance with 37 CFR §§1.56, 1.97 and 1.98.

Applicants respectfully request that each listed document be considered by the Examiner and be made of record in the present application and that an initialed copy of Form PTO/SB/08 be returned in accordance with MPEP §609.

The submission of any document herewith is not an admission that such document constitutes prior art against the claims of the present application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicants do not waive any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference any document submitted herewith.

TIMING OF THE DISCLOSURE

The listed document is being submitted in compliance with 37 CFR §1.97(b), before the mailing date of the first Office Action on the merits.

Although Applicant believes that no fee is required, the Commissioner is hereby authorized to charge any additional fees which may be due to Deposit Account No. 19-0741.

Respectfully submitted,

Date Nov. 13, 2019

By */Paul S. Hunter/*

FOLEY & LARDNER LLP
Customer Number: 147491
Telephone: (858) 847-6733
Facsimile: (858) 792-6773

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
Date Submitted: August 2, 2019				**Filing Date**	12/20/2018
				First Named Inventor	Balasubrahmanyam Kuchibhotla
(use as many sheets as necessary)				Art Unit	2173
				Examiner Name	VU, KIEU D.
Sheet	1	of	2	Attorney Docket Number	115539-0215

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A1	8,549,518-B2	10-01-2013	ARON ET AL.	
	A2	8,601,473-B2	12-03-2013	ARON ET AL.	
	A3	8,850,130-B2	09-30-2014	ARON ET AL.	
	A4	9,772,866-B2	09-26-2017	ARON ET AL.	

UNPUBLISHED U.S. PATENT APPLICATION DOCUMENTS

Examiner Initials*	Cite No.[1]	U.S. Patent Application Document Serial Number-Kind Code[2] (*if known*)	Filing Date of Cited Document MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	A5	POITRAS, STEVEN. "The Nutanix Bible" (11 January 2014), from http://stevenpoitras.com/the-nutanix-bible/ (Publication date based on indicated capture date by Archive.org; first publication date unknown)	
	A6	POITRAS, STEVEN. "The Nutanix Bible" (12 January 2016), from https://nutanixbible.com/	
	A7	POITRAS, STEVEN. "The Nutanix Bible" (15 October 2013), from http://stevenpoitras.com/the-nutanix-bible/ (Publication date based on indicated capture date by Archive.org; first publication date unknown)	
	A8	POITRAS, STEVEN. "The Nutanix Bible" (20 June 2014), from http://stevenpoitras.com/the-nutanix-bible/ (Publication date based on indicated capture date by Archive.org; first publication date unknown)	
	A9	POITRAS, STEVEN. "The Nutanix Bible" (25 June 2018), from https://nutanixbible.com/	
	A10	POITRAS, STEVEN. "The Nutanix Bible" (3 January 2017), from https://nutanixbible.com/	
	A11	POITRAS, STEVEN. "The Nutanix Bible" (3 January 2018), from https://nutanixbible.com/	
	A12	POITRAS, STEVEN. "The Nutanix Bible" (4 September 2015), from https://nutanixbible.com/	

Examiner Signature		Date Considered	

4810-9183-4014.1

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	16/228728
Date Submitted: August 2, 2019				**Filing Date**	12/20/2018
				First Named Inventor	Balasubrahmanyam Kuchibhotla
(use as many sheets as necessary)				Art Unit	2173
				Examiner Name	VU, KIEU D.
Sheet	2	of	2	Attorney Docket Number	115539-0215

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	A13	POITRAS, STEVEN. "The Nutanix Bible" (7 January 2015), from http://stevenpoitras.com/the-nutanix-bible/ (Publication date based on indicated capture date by Archive.org; first publication date unknown)	
	A14	POITRAS, STEVEN. "The Nutanix Bible" (8 June 2017), from https://nutanixbible.com/	
	A15	POITRAS, STEVEN. "The Nutanix Bible" (9 June 2015), from http://stevenpoitras.com/the-nutanix-bible/ (Publication date based on indicated capture date by Archive.org; first publication date unknown)	
	A16	POITRAS, STEVEN. "The Nutanix Bible" (9 June 2016), from https://nutanixbible.com/	

Examiner Signature		Date Considered	

Electronic Acknowledgement Receipt

EFS ID:	36774877
Application Number:	16228728
International Application Number:	
Confirmation Number:	3978
Title of Invention:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
First Named Inventor/Applicant Name:	Balasubrahmanyam Kuchibhotla
Customer Number:	147491
Filer:	Paul S. Hunter/Marilyn Bynum
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	115539-0215
Receipt Date:	02-AUG-2019
Filing Date:	20-DEC-2018
Time Stamp:	21:09:42
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	Transmittal Letter	115539-0215_IDS.pdf	161201 4e1e1f1c61e234b96dede32c9cb9710be17189f6	no	2

Warnings:

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	115539-0215_SB08.pdf	139285 ad1de8924dc625269a031f2c559261337892f03d	no	2
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Non Patent Literature	Jan_2014_The_Nutanix_Bible.pdf	2061651 c1c30b3bafd7276e8243bfa2ba20def48126825c	no	31
Warnings:					
Information:					
4	Non Patent Literature	Jan_2015_The_Nutanix_Bible.pdf	3275926 e15108c75cf72ceb6ed6850fe33674a49dcd584e	no	65
Warnings:					
Information:					
5	Non Patent Literature	Jan_2016_The_Nutanix_Bible.pdf	25325532 eb7bfd41cee755771e2a916adc96bd3554446e59	no	215
Warnings:					
Information:					
6	Non Patent Literature	Jan_2017_Part_1_of_2_The_Nutanix_Bible.pdf	13478662 af544c12f658d269c221136708fa5ff09a095850	no	150
Warnings:					
Information:					
7	Non Patent Literature	Jan_2017_Part_2_of_2_The_Nutanix_Bible.pdf	17259766 4d25ca24e2beaa8f1b6aebfb6e7feef22a8eba1e	no	148
Warnings:					
Information:					
8	Non Patent Literature	Jan_2018_Part_1_of_2_The_Nutanix_Bible.pdf	14749684 977d908cbaac5729baf1660158863e1479f104ce	no	158
Warnings:					
Information:					

9	Non Patent Literature	Jan_2018_Part_2_of_2_The_Nutanix_Bible.pdf	17116331 2aed2503584ac6075bada764ef37e5d99bc5b7da	no	158
Warnings:					
Information:					
10	Non Patent Literature	Jun_2014_The_Nutanix_Bible.pdf	3059111 ca432e90dcf3fd05d26e775eaad423cdf066babe	no	53
Warnings:					
Information:					
11	Non Patent Literature	Jun_2015_The_Nutanix_Bible.pdf	3745614 66d3b50e8bdb487ca05f2f11262cd2595491eacf	no	78
Warnings:					
Information:					
12	Non Patent Literature	Jun_2016_Part_1_of_2_The_Nutanix_Bible.pdf	12080910 f5f38995fd88f3742316c3b11c7f230d27af9832	no	131
Warnings:					
Information:					
13	Non Patent Literature	Jun_2016_Part_2_of_2_The_Nutanix_Bible.pdf	16836091 b3fe11c9934516c675437c8b5bbb443509deb736	no	130
Warnings:					
Information:					
14	Non Patent Literature	Jun_2017_Part_1_of_2_The_Nutanix_Bible.pdf	14455340 3aec5032fd8264fca4d12d2c07ad280833770806	no	153
Warnings:					
Information:					
15	Non Patent Literature	Jun_2017_Part_2_of_2_The_Nutanix_Bible.pdf	17270072 9d24867cf7d95d68ded0eb2bea6b732c455cfb55	no	153
Warnings:					
Information:					

16	Non Patent Literature	Jun_2018_Part_1_of_2_The_Nutanix_Bible.pdf	14303838 0865b6da9854a06d975eb0a913ab5047d05efd5d	no	157
Warnings:					
Information:					
17	Non Patent Literature	Jun_2018_Part_2_of_2_The_Nutanix_Bible.pdf	17181597 0379eead5cfb3490aecb51e54bd45fc9d07226b9	no	157
Warnings:					
Information:					
18	Non Patent Literature	Oct_2013_The_Nutanix_Bible.pdf	970301 0d2f50c1925fd9bc6b3dd28a96375b17ce3fd6d8	no	22
Warnings:					
Information:					
19	Non Patent Literature	Sept_2015_The_Nutanix_Bible.pdf	22727324 9f436e8e2518baca113df089699c7aed62a2b1de	no	167
Warnings:					
Information:					
		Total Files Size (in bytes):	216198236		

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.

<u>New Applications Under 35 U.S.C. 111</u>
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.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
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.
<u>New International Application Filed with the USPTO as a Receiving Office</u>
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

First Inventor Name:	Balasubrahmanyam Kuchibhotla
Title:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
Application No.:	16/228728
Filing Date:	12/20/2018
Examiner:	VU, KIEU D.
Art Unit:	2173
Confirmation No.:	3978

INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §1.56

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

Commissioner:

Applicant submits herewith documents for the Examiner's consideration in accordance with 37 CFR §§1.56, 1.97 and 1.98.

Applicants respectfully request that each listed document be considered by the Examiner and be made of record in the present application and that an initialed copy of Form PTO/SB/08 be returned in accordance with MPEP §609.

The submission of any document herewith is not an admission that such document constitutes prior art against the claims of the present application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicants do not waive any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference any document submitted herewith.

TIMING OF THE DISCLOSURE

The listed documents are being submitted in compliance with 37 CFR §1.97(b), before the mailing date of the first Office Action on the merits.

Although Applicant believes that no fee is required, the Commissioner is hereby authorized to charge any additional fees which may be due to Deposit Account No. 19-0741.

Respectfully submitted,

Date August 2, 2019

By */Paul S. Hunter/*

FOLEY & LARDNER LLP
Customer Number: 147491
Telephone: (858) 847-6733
Facsimile: (858) 792-6773

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/228,728

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	300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*				x 460 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 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).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1720

APPLICATION AS AMENDED - PART II

		(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 =		OR	x =	
AMENDMENT A	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
AMENDMENT A	Application Size Fee (37 CFR 1.16(s))									
AMENDMENT A	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						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	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
AMENDMENT B	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
AMENDMENT B	Application Size Fee (37 CFR 1.16(s))									
AMENDMENT B	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 found in the appropriate box in column 1.

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
16/228,728	12/20/2018		1720	115539-0215	20	3

CONFIRMATION NO. 3978

FILING RECEIPT

OC000000105841303

147491
FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON, DC 20007-5109

Date Mailed: 02/06/2019

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**

Inventor(s)

Balasubrahmanyam Kuchibhotla, San Ramon, CA;
Bakul Banthia, San ramon, CA;
Paul James Tangen, Enfield, NH;

Applicant(s)

Nutanix, Inc., San Jose, CA;

Assignment For Published Patent Application

Nutanix, Inc., San Jose, CA

Power of Attorney: None

Domestic Applications for which benefit is claimed - None.
A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 02/05/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/228,728**

Projected Publication Date: 06/25/2020

Non-Publication Request: No

Early Publication Request: No
Title

USER INTERFACE FOR DATABASE MANAGEMENT SERVICES

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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.

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.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

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.

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 (1-866-999-4258).

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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 U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

DocCode – SCORE

SCORE Placeholder Sheet for IFW Content

Application Number: 16228728 Document Date: 12/20/2018

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Since this was an electronic submission, there is no physical artifact folder, no artifact folder is recorded in PALM, and no paper documents or physical media exist. The TIFF images in the IFW record were created from the original documents that are stored in SCORE.

- Drawing

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- USPTO employees may access SCORE content via eDAN using the Supplemental Content tab, or via the SCORE web page.
- External customers may access SCORE content via PAIR using the Supplemental Content tab.

Form Revision Date: August 26, 2013

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Inventor Name: Balasubrahmanyam Kuchibhotla

Title: INTERFACE FOR DATABASE MANAGEMENT SERVICES

Application No.: Unknown

Filing Date: Herewith

Examiner: Unknown

Art Unit: Unknown

UTILITY PATENT APPLICATION TRANSMITTAL

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

Commissioner:

Transmitted herewith for filing under 37 C.F.R. § 1.53(b) is the nonprovisional utility patent application of:

Balasubrahmanyam Kuchibhotla
1740 Technology Drive
Suite 150
San Jose, California 95110

Bakul Banthia
1740 Technology Drive
Suite 150
San Jose, California 95110

Paul James Tangen
1740 Technology Drive
Suite 150
San Jose, California 95110

Enclosed are:

[**X**] Description, Claim(s), and Abstract (78 pages).

[**X**] Drawings (31 sheets, Figures 1, 2, 3, 4A, 4B, 4C, 4D, 4E, 4F, 4G, 5A, 5B, 5C, 5D, 5E, 6, 7A, 7B, 7C, 7D, 7E, 7F, 8, 9A, 9B, 9C, 9D, 9E, 9F, 9G, 10).

[**X**] Executed Declaration (3 pages).

[**X**] Power of Attorney (1 pages).

[**X**] 3.73(c) statement.

[**X**] Copy of the Executed Assignment.

[**X**] Application Data Sheet (37 CFR 1.76).

The filing fee is calculated below at the large entity rate:

	Number Filed		Included in Basic Fee		Extra		Rate		Fee Totals
Basic Filing Fee							$300.00	=	$300.00
Search Fee							$660.00		$660.00
Examination Fee							$760.00		$760.00
Sequence Listing fee									$0.00
Size Fee	109 *.75	-	100	=	0	x	$400.00		$0.00
Total Claims:	20	-	20	=	0	x	$100.00	=	$0.00
Independents:	3	-	3	=	0	x	$460.00	=	$0.00
If any Multiple Dependent Claim(s) present:						+	$820.00	=	$0.00
Surcharge under 37 CFR 1.16(f) for late filing of Executed Declaration or late payment of Basic Filing Fee/Search Fee/Examination Fee						+	$160.00	=	$0.00
Non-electronic filing fee						+		=	$0.00
Prioritized Examination fee (Track I) under 37 C.F.R. § 1.17 (c)									$0.00
Processing Fee (Track I) under 37 C.F.R. § 1.17 (i)									$0.00
TOTAL FILING FEE:								=	$1720.00
Assignment Recordation Fee:						+		=	$0.00
Processing Fee under 37 CFR 1.17(i) for Late Filing of English Translation of Application:						+	$140.00	=	
TOTAL FEE								=	$1720.00

The above-identified fees of $1720.00 are being paid by credit card via EFS-Web.

The Commissioner is hereby authorized to charge any fees required to secure a filing date and maintain pendency of this application to Deposit Account No. 19-0741.

Respectfully submitted,

Date ___December 20, 2018_____

By ___*/Paul S. Hunter/*_____

FOLEY & LARDNER LLP
Customer Number: 147491
Telephone: (858) 847-6733
Facsimile: (858) 792-6773

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. 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 contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	115539-0215
	Application Number	
Title of Invention	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Balasubrahmanyam		Kuchibhotla	

Residence Information (Select One) ● US Residency Non US Residency Active US Military Service

City	San Ramon	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	1740 Technology Drive
Address 2	Suite 150
City	San Jose
State/Province	CA
Postal Code	95110
Country i	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Bakul		Banthia	

Residence Information (Select One) ◉ US Residency Non US Residency Active US Military Service

City	San ramon	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	1740 Technology Drive
Address 2	Suite 150
City	San Jose
State/Province	CA
Postal Code	95110
Country i	US

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Paul	James	Tangen	

Residence Information (Select One) ◉ US Residency Non US Residency Active US Military Service

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	115539-0215
	Application Number	
Title of Invention	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES	

City	Enfield	State/Province	NH	Country of Residence i	US

Mailing Address of Inventor:

Address 1	1740 Technology Drive		
Address 2	Suite 150		
City	San Jose	**State/Province**	CA
Postal Code	95110	**Country** i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	147491		
Email Address	IPDocketing@foley.com	Add Email	Remove Email

Application Information:

Title of the Invention	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES		
Attorney Docket Number	115539-0215	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	31	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country i

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and 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.

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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	115539-0215
	Application Number	
Title of Invention	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES	

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	147491		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	115539-0215
	Application Number	
Title of Invention	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES	

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	115539-0215
	Application Number	
Title of Invention	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	115539-0215
	Application Number	
Title of Invention	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section. Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Nutanix, Inc.		
Mailing Address Information For Applicant:			
Address 1	1740 Technology Drive		
Address 2	Suite 150		
City	San Jose	**State/Province**	CA
Country	US	Postal Code	95110
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	115539-0215
	Application Number	
Title of Invention	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

Organization Name	Nutanix, Inc.

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	1740 Technology Drive		
Address 2	Suite 150		
City	San Jose	**State/Province**	CA
Country i	US	Postal Code	95110
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Paul S. Hunter/			Date (YYYY-MM-DD)	2018-12-20
First Name	Paul S.	Last Name	Hunter	Registration Number	44787

Additional Signature may be generated within this form by selecting the Add button. Add

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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	115539-0215
	Application Number	
Title of Invention	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES	

This collection of information is required by 37 CFR 1.76. 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 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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 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 CooperationTreaty.

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.

PTO/AIA/01 (modified)

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)	115539-0215

Title of Invention	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES

As the below named inventor, I hereby declare that:

This declaration is directed to:

☒ The attached application, or

☐ United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: BALASUBRAHMANYAM KUCHIBHOTLA Date (Optional): November 16, 2018

Signature: DocuSigned by: BALASUBRAHMANYAM KUCHIBHOTLA 5046FB798D084DB...

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

PTO/AIA/01 (modified)

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)	115539-0215

Title of Invention	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES

As the below named inventor, I hereby declare that:

This declaration is directed to:

☒ The attached application, or

☐ United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: BAKUL BANTHIA

Date (Optional): November 16, 2018

Signature: DocuSigned by: Banthia 1B738C1DEF544AE...

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

DocuSign Envelope ID: 809F77F2-3770-4EBC-B9B8-D7AA6E46C472

PTO/AIA/01 (modified)

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)	115539-0215

Title of Invention	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES

As the below named inventor, I hereby declare that:

This declaration is directed to:

☒ The attached application, or

☐ United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: PAUL JAMES TANGEN Date (Optional): November 16, 2018

Signature: DocuSigned by: PAUL JAMES TANGEN EF1206D02B83487...

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. 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 displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Nutanix, Inc.

Application No./Patent No.: Unassigned Filed/Issue Date: 12/20/2018

Titled: USER INTERFACE FOR DATABASE MANAGEMENT SERVICES

Nutanix, Inc., a Corporation

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

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

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

2. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

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

This collection of information is required by 37 CFR 3.73(b). 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. 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.

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.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

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

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

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

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

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

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

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

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

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

/Paul S. Hunter/	December 20, 2018
Signature	Date
Paul S. Hunter	44,787
Printed or Typed Name	Title or Registration Number

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Nutanix, Inc.
1740 Technology Drive
Suite 150
San Jose, California 95110

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USER INTERFACE FOR DATABASE MANAGEMENT SERVICES

as set forth in this United States Patent Application

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NAME AND SIGNATURE OF INVENTOR

Name: BALASUBRAHMANYAM KUCHIBHOTLA

SIGNATURE DocuSigned by: BALASUBRAHMANYAM KUCHIBHOTLA 5040FB798D084D8...

DATE November 16, 2018

NAME AND SIGNATURE OF INVENTOR

Name: BAKUL BANTHIA

SIGNATURE DocuSigned by: Banthia 4B738C1DF2F44AF...

DATE November 16, 2018

NAME AND SIGNATURE OF INVENTOR

Name: PAUL JAMES TANGEN

SIGNATURE DocuSigned by: PAUL JAMES TANGEN EE1206D02B83487...

DATE November 16, 2018

ABSTRACT OF THE DISCLOSURE

A database system associated with a plurality of source databases in a virtual computing system includes a dashboard having a main menu for providing a plurality of control functions and a body that dynamically changes based upon the plurality of control functions that are selected. The dashboard includes a homepage for displaying a plurality of cells in the body, including a first cell for displaying a list of the plurality of source databases. The main menu includes a first control function, the selection of which triggers a database provisioning service by presenting options to either create a new source database or register an existing database within the body and a second control function, the selection of which triggers a copy data management service by presenting an option to create a new cloned database.

CLAIMS

What is claimed is:

1. A database system comprising:

a dashboard configured to receive input from and provide output to a user, the dashboard comprising a main menu providing a plurality of control functions, wherein upon receiving selection of a first control function configured to provision a source database, the dashboard is configured to:

present options for a database engine type;

upon receiving selection of the database engine type, present for user selection:

sample profiles for creating a new source database virtual machine;

levels of a Service Level Agreement ("SLA"); and

frequencies of capturing snapshots and transactional logs;

upon receiving the user selection of the sample profiles, one of the levels of the SLA, and the frequencies of capturing snapshots and transactional logs, displaying a status as the source database is provisioned; and

displaying the source database on the dashboard upon provisioning.

2. The database system of claim 1, wherein the dashboard further comprises a body configured to display information based upon the plurality of control functions that are selected from the main menu.

3. The database system of claim 1, wherein the dashboard comprises a dynamically changing home page comprising a plurality of cells, wherein a first cell of the plurality of cells is configured to display a list of all source databases associated with the database system.

4. The database system of claim 1, wherein the dashboard is configured to present:

a first user interface for displaying the options for the database engine type;

a second user interface for displaying the sample profiles upon receiving selection of the database engine type;

a third user interface for displaying the levels of the SLA and the frequencies of capturing snapshots and transactional logs upon receiving selection of the sample profiles; and

a fourth user interface for displaying the status of provisioning the source database.

5. The database system of claim 4, wherein the second user interface comprises fields for receiving selection of at least one of a software profile, a compute profile, and a network profile.

6. The database system of claim 4, wherein the second user interface comprises fields for receiving selection of a name and description for the new source database virtual machine.

7. The database system of claim 4, wherein the third user interface further comprises fields for receiving selection of durations for designating at least one of a daily snapshot, a weekly snapshot, a monthly snapshot, and a quarterly snapshot.

8. The database system of claim 4, further comprising displaying a fifth user interface between the second user interface and the third user interface, wherein the fifth user interface comprises fields for receiving selection of a name and description for the source database.

9. The database system of claim 1, wherein upon receiving selection of the first control function, the dashboard is configured to present a first user interface providing a first option to create a new database and a second option to register an existing database.

10. The database system of claim 9, wherein upon receiving selection of the first option, the database presents the options for the database engine type.

11. A database system comprising:

a dashboard configured to receive input from and provide output to a user, the dashboard comprising a main menu providing a plurality of control functions, wherein upon receiving selection of a first control function configured to create a cloned database from a source database, the dashboard is configured to present for user selection:

a calendar highlighting days covered by at least one protection parameter;

a time scale highlighting time slots that are available for selection;

a first option for creating a new target database virtual machine and a second option for using an existing target database virtual machine;

upon receiving selection of one day from the calendar, a time slot from the time scale, and selection of either the first option or the second option, displaying a status as the cloned database is being created; and

displaying the cloned database within the dashboard.

12. The database system of claim 11, wherein the at least one protection parameter comprises a continuous protection parameter, a daily protection parameter, a weekly protection parameter, a monthly protection parameter, and a quarterly protection parameter.

13. The database system of claim 12, wherein each of the continuous protection parameter, the daily protection parameter, the weekly protection parameter, the monthly protection parameter, and the quarterly protection parameter is color coded with a different color on the calendar.

14. The database system of claim 11, wherein upon receiving selection of the first control function, the dashboard is configured to present a first user interface providing a plurality of additional control functions, and wherein the dashboard presents the calendar in response to receiving selection of a clone database control function from the plurality of additional control functions.

15. The database system of claim 11, wherein the dashboard is configured to present:

a first user interface for presenting the calendar;

a second user interface for presenting the time scale upon receiving selection of the one day from the calendar;

a third user interface for presenting the first option and the second option; and

a fourth user interface for displaying the status.

16. The database system of claim 15, wherein the dashboard is configured to present a fifth user interface between the third user interface and the fourth user interface for receiving selection of a name for the cloned database.

17. The database system of claim 11, wherein the dashboard is configured to send the user selections to a database engine via an Application Programming Interface.

18. A database system associated with a plurality of source databases in a virtual computing system, the database system comprising:

a dashboard comprising a main menu for providing a plurality of control functions and a body that dynamically changes based upon the plurality of control functions that are selected;

wherein the dashboard comprises a homepage for displaying a plurality of cells in the body, including a first cell for displaying a list of the plurality of source databases;

wherein the main menu comprises a first control function, the selection of which triggers a database provisioning service by presenting options to either create a new source database or register an existing database within the body; and

wherein the main menu comprises a second control function, the selection of which triggers a copy data management service by presenting an option to create a new cloned database.

19. The database system of claim 18, wherein upon selecting either the option to create the new source database or register the existing database, the dashboard presents a plurality of user interfaces for receiving user selections and creating the new source database or register the existing database.

20. The database system of claim 19, further comprising displaying the new source database or the registered existing database within the first cell on the homepage.

USER INTERFACE FOR DATABASE MANAGEMENT SERVICES

BACKGROUND

[0001] The following description is provided to assist the understanding of the reader. None of the information provided or references cited is admitted to be prior art.

[0002] Virtual computing systems are widely used in a variety of applications. Virtual computing systems include one or more host machines running one or more virtual machines and other entities (e.g., containers) concurrently. Modern virtual computing systems allow several operating systems and several software applications to be safely run at the same time, thereby increasing resource utilization and performance efficiency. However, the present day virtual computing systems have limitations due to their configuration and the way they operate.

SUMMARY

[0003] In accordance with some aspects of the present disclosure, a database system is disclosed. The database system includes a dashboard configured to receive input from and provide output to a user. The dashboard includes a main menu providing a plurality of control functions such that upon receiving selection of a first control function configured to provision a source database, the dashboard is configured to present options for a database engine type, and upon receiving selection of the database engine type, present for user selection sample profiles for creating a new source database virtual machine, levels of a Service Level Agreement ("SLA"), and frequencies of capturing snapshots and transactional logs. Upon receiving the user selection of the sample profiles, one of the levels of the SLA, and the frequencies of capturing snapshots and transactional logs, the dashboard is also configured for displaying a status as the source database is provisioned and displaying the source database on the dashboard upon provisioning.

[0004] In accordance with some other aspects of the present disclosure, another database system is disclosed. The database system includes a dashboard configured to receive input from and provide output to a user. The dashboard includes a main menu providing a plurality of control functions such that upon receiving selection of a first control function configured to create a cloned database from a source database, the dashboard is configured to present for user selection a calendar highlighting days covered by at least one protection parameter, a time scale highlighting time slots that are available for selection, and a first option for creating a new target database virtual machine and a second option for using an existing target database virtual machine. Upon receiving selection of one day from the calendar, a time slot from the time scale, and selection of either the first option or the second option, the dashboard is configured for displaying a status as the cloned database is being created and displaying the cloned database within the dashboard.

[0005] In accordance with yet other aspects of the present disclosure, a database system associated with a plurality of source databases in a virtual computing system is disclosed. The database system includes a dashboard having a main menu for providing a plurality of control functions and a body that dynamically changes based upon the plurality of control functions that are selected. The dashboard includes a homepage for displaying a plurality of cells in the body, including a first cell for displaying a list of the plurality of source databases. The main menu includes a first control function, the selection of which triggers a database provisioning service by presenting options to either create a new source database or register an existing database within the body. The main menu also includes a second control function, the selection of which triggers a copy data management service by presenting an option to create a new cloned database.

[0006] The foregoing summary is illustrative only and is not intended to be in any way limiting. In addition to the illustrative aspects, embodiments, and features described above, further aspects,

embodiments, and features will become apparent by reference to the following drawings and the detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is an example block diagram of a cluster of a virtual computing system, in accordance with some embodiments of the present disclosure.

[0008] FIG. 2 is an example block diagram of a database system of the virtual computing system of FIG. 1, in accordance with some embodiments of the present disclosure.

[0009] FIG. 3 is an example flowchart outlining operations for provisioning databases by the database system of FIG. 2, in accordance with some embodiments of the present disclosure.

[0010] FIGS. 4A-4G are example screenshots showing the operations of FIG. 3 for creating a new database, in accordance with some embodiments of the present disclosure.

[0011] FIGS. 5A-5E are example screenshots showing the operations of FIG. 3 for registering an existing database, in accordance with some embodiments of the present disclosure.

[0012] FIG. 6 is an example block diagram showing a database protection system of the database system of FIG. 2, in accordance with some embodiments of the present disclosure.

[0013] FIGS. 7A-7F are example screenshots showing creating cloned databases from source databases, in accordance with some embodiments of the present disclosure.

[0014] FIG. 8 is an example flowchart outlining operations for creating cloned databases using the database protection system of FIG. 6, in accordance with some embodiments of the present disclosure.

[0015] FIGS. 9A-9G are example screenshots showing how snapshots and transactional logs are stored within the database system, in accordance with some embodiments of the present disclosure.

[0016] FIG. 10 is an example flowchart outlining operations for protecting an external database, in accordance with some embodiments of the present disclosure.

[0017] The foregoing and other features of the present disclosure will become apparent from the following description and appended claims, taken in conjunction with the accompanying drawings. Understanding that these drawings depict only several embodiments in accordance with the disclosure and are therefore, not to be considered limiting of its scope, the disclosure will be described with additional specificity and detail through use of the accompanying drawings.

DETAILED DESCRIPTION

[0018] In the following detailed description, reference is made to the accompanying drawings, which form a part hereof. In the drawings, similar symbols typically identify similar components, unless context dictates otherwise. The illustrative embodiments described in the detailed description, drawings, and claims are not meant to be limiting. Other embodiments may be utilized, and other changes may be made, without departing from the spirit or scope of the subject matter presented here. It will be readily understood that the aspects of the present disclosure, as generally described herein, and illustrated in the figures, can be arranged, substituted, combined, and designed in a wide variety of different configurations, all of which are explicitly contemplated and made part of this disclosure.

[0019] The present disclosure is generally directed to a virtual computing system having a plurality of clusters, with each of the plurality of clusters having a plurality of nodes. Each of the plurality of nodes includes one or more virtual machines and other entities managed by an instance of a

monitor such as a hypervisor. These and other components may be part of a datacenter, which may be managed by a user (e.g., an administrator or other authorized personnel). A distributed storage system, for providing storage and protection capabilities, is associated with the virtual computing system. The virtual computing system may be configured for providing database management services. For example, at least some of the one or more virtual machines within the virtual computing system may be configured as database virtual machines for storing one or more databases. These databases may be managed by a database system. The database system may provide a plurality of database services. For example, in some embodiments, the database system may provide database provisioning services and copy data management services.

[0020] Database provisioning services involve creating and/or associating databases with the database system for management and use. Creating a new database and associating the database with the database system may be a complex and long drawn process. A user desiring to create a new database with a provider of the database system may make a new database creation request with the database provider. The user request may pass through multiple entities (e.g., people, teams, etc.) of the database provider before a database satisfying the user request may be created. For example, the user may be required to work with a first entity of the database provider to specify the configuration (e.g., database engine type, number of storage disks needed, etc.) of the database that is desired. Upon receiving the database configuration, another entity of the database provider may configure a database virtual machine for hosting the database, while yet another entity may configure the networking settings to facilitate access to the database upon creation. Yet another entity of the database provider may configure database protection services to backup and protect the database. All of these tasks may take a few to several days. Thus, creating the database is a

time intensive process and inconvenient for the user. The user may not have the time or desire to wait for the multiple days to create the database.

[0021] Further, creating the database using the above procedure requires the user to rely on the other entities. If these other entities become unavailable, the user may have no choice but to wait for those entities to become operational again. Additionally, the user may not be fully privy to or even understand the various configurational details of the desired database that the user may be asked to provide to the other entities for creating the database. The present disclosure provides technical solutions to the above problems. Specifically, the database system of the present disclosure greatly simplifies the database provisioning service. The database system of the present disclosure allows the user to quickly and conveniently create a new database and associate the database with the database system without the need for contacting and working with multiple entities. The entire process of creating and associating the database with the database system may be completed by the user within a span of a few minutes instead of the multiple days mentioned above.

[0022] The database system of the present disclosure provides a user friendly, intuitive user interface that solicits information from and conveniently walks the user through the various steps for creating a new database within minutes. The database system may include a catalog of standardized configurations, which the user may select from the user interface for creating the database. The user may modify the standardized configurations or create custom configurations to suit their needs. By virtue of providing standardized configurations, the present disclosure simplifies the database creation process for the user. The user interface also hides the complexity of creating the database from the user. For example, the user need not worry about creating, partitioning, or associating storage space (e.g., storage disk space) with the database that is being

created. The user may simply specify a size of the database that is desired in the user interface and the database system automatically translates that size into storage space. Thus, based upon the needs of the user, the user is able to specifically tailor the database during creation and create the database easily and quickly using the user interface.

[0023] The database system also provides the ability to register an existing database with the database system. Such existing databases may have been created outside of the database system. Users having existing databases may desire to associate their databases with the database system for management. Similar to creating a new database in the database system, registering an existing database with the database system is easy, convenient, and may be completed within a span of a few minutes via the user interface. As with the creation of a new database, the user interface walks the user through the registration process, provides standardized configurations for the user to select from, ability to modify the standardized configurations, and create new configurations. Upon registering the database with the database system, the database may take advantage of other database management services offered by the database system.

[0024] Copy data management services involve protecting a database. Protecting a database means replicating a state of the database for creating a fully functional copy of the database. Replicating the state of the database may involve creating fully functional clones (e.g., back-ups) of the database. Since the clones are fully functional copies of the original or source database, a user may perform operations on the cloned copy that would otherwise be performed on the original database. For example, the user may perform reporting, auditing, testing, data analysis, etc. on the cloned copy of the original database. A cloned database may be created by periodically capturing snapshots of the source database. A snapshot stores the state of the source database at the point in time at which the snapshot is captured. The snapshot is thus a point in time image of the database.

The snapshot may include a complete encapsulation of the virtual machine on which the database is created, including the configuration data of the virtual machine, the data stored within the database, and any metadata associated with the virtual machine. Any of a variety of snapshotting techniques may be used. For example, in some embodiments, copy-on-write, redirect-on-write, near-sync, or other snapshotting methods may be used to capture snapshots. From the snapshot, the source database may be recreated to the state at which the snapshot was captured.

[0025] However, the number of snapshots that are captured in a given day may be limited. Specifically, because capturing a snapshot requires quiescing (e.g., pausing) the source database and entering a safe mode in which user operations are halted, it is desirable to take only a minimum number of snapshots in a day. Thus, choices of state that may recreated from a snapshot may be limited. If a state is desired that falls between the capture of two snapshots, the user is generally out of luck. Thus, the desire to limit the number of snapshots in a day results in a significant technical problem that results in losing changes made to a database since the last snapshot capture or between two snapshot captures. The present disclosure provides technical solutions to this problem.

[0026] Specifically, the present disclosure automatically creates an instance of a database protection system for each database (e.g., source database) that is created within or registered with the database system. The database protection system instance may be configured to protect the source database by automatically capturing snapshots of the source database. Additionally, to avoid losing changes in state between two snapshot captures or since the last snapshot capture, the database system may capture transactional logs. A transactional log may be a text, image, disk, or other type of file that records every transaction or change that occurs on the source database since a last snapshot capture. Thus, by using the snapshots or a combination of snapshots and

transactional logs, any state of the source database down to the last second (or even fractions of seconds or other time granularities) may be recreated. Specifically, states of the source database that fall between the capture of two snapshots may be recreated by using a combination of snapshots and transactional logs.

[0027] The frequency of capturing transactional logs may be higher than the frequency of capturing snapshots in a day. For example, in some embodiments, by default, a transactional log may be captured every 30 minutes. In other embodiments, the user may define the frequency of capturing transactional logs. Further, since the source database is not quiesced (paused) for capturing the transactional log, user operations may continue while the transactional logs are being captured. Further, since the transactional logs only capture the changes in the database since the last snapshot capture, the transactional logs do not consume a lot of space. Thus, clones of the source database can be created to a point in time by using a combination of transactional logs and snapshots (e.g., between two snapshot captures), or based upon available snapshots (e.g., at the point of snapshot capture).

[0028] Further, the frequency with which the snapshots and transactional logs are captured by the database system may depend upon the level of protection desired by the user. The database system may solicit a protection schedule and definition of a Service Level Agreement ("SLA") from the user. For convenience, the database system may include built-in defaults of the protections schedule and SLA levels that the user may select from. The user may modify the defaults or define new parameters for the protection schedule and SLA. Thus, the level of protection accorded to each database associated with the database system may be individually tailored based upon the requirements of the user. The protection schedule may allow the user to define the frequency of

snapshots and transactional logs to be captured each day, and the time-period for capturing daily, weekly, monthly, and/or quarterly snapshots based upon the SLA.

[0029] Thus, the present disclosure provides an easy, convenient, cost effective, and user-friendly mechanism for creating and registering databases, as well as effectively protecting those databases.

[0030] Referring now to FIG. 1, a cluster 100 of a virtual computing system is shown, in accordance with some embodiments of the present disclosure. The cluster 100 includes a plurality of nodes, such as a first node 105, a second node 110, and a third node 115. Each of the first node 105, the second node 110, and the third node 115 may also be referred to as a "host" or "host machine." The first node 105 includes database virtual machines ("database VMs") 120A and 120B (collectively referred to herein as "database VMs 120"), a hypervisor 125 configured to create and run the database VMs, and a controller/service VM 130 configured to manage, route, and otherwise handle workflow requests between the various nodes of the cluster 100. Similarly, the second node 110 includes database VMs 135A and 135B (collectively referred to herein as "database VMs 135"), a hypervisor 140, and a controller/service VM 145, and the third node 115 includes database VMs 150A and 150B (collectively referred to herein as "database VMs 150"), a hypervisor 155, and a controller/service VM 160. The controller/service VM 130, the controller/service VM 145, and the controller/service VM 160 are all connected to a network 165 to facilitate communication between the first node 105, the second node 110, and the third node 115. Although not shown, in some embodiments, the hypervisor 125, the hypervisor 140, and the hypervisor 155 may also be connected to the network 165. Further, although not shown, one or more of the first node 105, the second node 110, and the third node 115 may include one or more containers managed by a monitor (e.g., container engine).

[0031] The cluster 100 also includes and/or is associated with a storage pool 170 (also referred to herein as storage sub-system). The storage pool 170 may include network-attached storage 175 and direct-attached storage 180A, 180B, and 180C. The network-attached storage 175 is accessible via the network 165 and, in some embodiments, may include cloud storage 185, as well as a networked storage 190. In contrast to the network-attached storage 175, which is accessible via the network 165, the direct-attached storage 180A, 180B, and 180C includes storage components that are provided internally within each of the first node 105, the second node 110, and the third node 115, respectively, such that each of the first, second, and third nodes may access its respective direct-attached storage without having to access the network 165.

[0032] It is to be understood that only certain components of the cluster 100 are shown in FIG. 1. Nevertheless, several other components that are needed or desired in the cluster 100 to perform the functions described herein are contemplated and considered within the scope of the present disclosure.

[0033] Although three of the plurality of nodes (e.g., the first node 105, the second node 110, and the third node 115) are shown in the cluster 100, in other embodiments, greater than or fewer than three nodes may be provided within the cluster. Likewise, although only two database VMs (e.g., the database VMs 120, the database VMs 135, the database VMs 150) are shown on each of the first node 105, the second node 110, and the third node 115, in other embodiments, the number of the database VMs on each of the first, second, and third nodes may vary to include other numbers of database VMs. Further, the first node 105, the second node 110, and the third node 115 may have the same number of database VMs (e.g., the database VMs 120, the database VMs 135, the database VMs 150) or different number of database VMs.

[0034] In some embodiments, each of the first node 105, the second node 110, and the third node 115 may be a hardware device, such as a server. For example, in some embodiments, one or more of the first node 105, the second node 110, and the third node 115 may be an NX-1000 server, NX-3000 server, NX-6000 server, NX-8000 server, etc. provided by Nutanix, Inc. or server computers from Dell, Inc., Lenovo Group Ltd. or Lenovo PC International, Cisco Systems, Inc., etc. In other embodiments, one or more of the first node 105, the second node 110, or the third node 115 may be another type of hardware device, such as a personal computer, an input/output or peripheral unit such as a printer, or any type of device that is suitable for use as a node within the cluster 100. In some embodiments, the cluster 100 may be part of a data center. Further, one or more of the first node 105, the second node 110, and the third node 115 may be organized in a variety of network topologies. Each of the first node 105, the second node 110, and the third node 115 may also be configured to communicate and share resources with each other via the network 165. For example, in some embodiments, the first node 105, the second node 110, and the third node 115 may communicate and share resources with each other via the controller/service VM 130, the controller/service VM 145, and the controller/service VM 160, and/or the hypervisor 125, the hypervisor 140, and the hypervisor 155.

[0035] Also, although not shown, one or more of the first node 105, the second node 110, and the third node 115 may include one or more processing units configured to execute instructions. The instructions may be carried out by a special purpose computer, logic circuits, or hardware circuits of the first node 105, the second node 110, and the third node 115. The processing units may be implemented in hardware, firmware, software, or any combination thereof. The term "execution" is, for example, the process of running an application or the carrying out of the operation called for by an instruction. The instructions may be written using one or more programming language,

scripting language, assembly language, etc. The processing units, thus, execute an instruction, meaning that they perform the operations called for by that instruction.

[0036] The processing units may be operably coupled to the storage pool 170, as well as with other elements of the first node 105, the second node 110, and the third node 115 to receive, send, and process information, and to control the operations of the underlying first, second, or third node. The processing units may retrieve a set of instructions from the storage pool 170, such as, from a permanent memory device like a read only memory ("ROM") device and copy the instructions in an executable form to a temporary memory device that is generally some form of random access memory ("RAM"). The ROM and RAM may both be part of the storage pool 170, or in some embodiments, may be separately provisioned from the storage pool. In some embodiments, the processing units may execute instructions without first copying the instructions to the RAM. Further, the processing units may include a single stand-alone processing unit, or a plurality of processing units that use the same or different processing technology.

[0037] With respect to the storage pool 170 and particularly with respect to the direct-attached storage 180A, 180B, and 180C, each of the direct-attached storage may include a variety of types of memory devices that are suitable for a virtual computing system. For example, in some embodiments, one or more of the direct-attached storage 180A, 180B, and 180C may include, but is not limited to, any type of RAM, ROM, flash memory, magnetic storage devices (e.g., hard disk, floppy disk, magnetic strips, etc.), optical disks (e.g., compact disk ("CD"), digital versatile disk ("DVD"), etc.), smart cards, solid state devices, etc. Likewise, the network-attached storage 175 may include any of a variety of network accessible storage (e.g., the cloud storage 185, the networked storage 190, etc.) that is suitable for use within the cluster 100 and accessible via the network 165. The storage pool 170, including the network-attached storage 175 and the direct-

attached storage 180A, 180B, and 180C, together form a distributed storage system configured to be accessed by each of the first node 105, the second node 110, and the third node 115 via the network 165, the controller/service VM 130, the controller/service VM 145, the controller/service VM 160, and/or the hypervisor 125, the hypervisor 140, and the hypervisor 155. In some embodiments, the various storage components in the storage pool 170 may be configured as virtual disks for access by the database VMs 120, the database VMs 135, and the database VMs 150.

[0038] Each of the database VMs 120, the database VMs 135, the database VMs 150 is a software-based implementation of a computing machine. The database VMs 120, the database VMs 135, the database VMs 150 emulate the functionality of a physical computer. Specifically, the hardware resources, such as processing unit, memory, storage, etc., of the underlying computer (e.g., the first node 105, the second node 110, and the third node 115) are virtualized or transformed by the respective hypervisor 125, the hypervisor 140, and the hypervisor 155, into the underlying support for each of the database VMs 120, the database VMs 135, the database VMs 150 that may run its own operating system and applications on the underlying physical resources just like a real computer. By encapsulating an entire machine, including CPU, memory, operating system, storage devices, and network devices, the database VMs 120, the database VMs 135, the database VMs 150 are compatible with most standard operating systems (e.g. Windows, Linux, etc.), applications, and device drivers.

[0039] Thus, each of the hypervisor 125, the hypervisor 140, and the hypervisor 155 is a virtual machine monitor that allows a single physical server computer (e.g., the first node 105, the second node 110, third node 115) to run multiple instances of the database VMs 120, the database VMs 135, and the database VMs 150 with each VM sharing the resources of that one physical server computer, potentially across multiple environments. For example, each of the hypervisor 125, the

hypervisor 140, and the hypervisor 155 may allocate memory and other resources to the underlying VMs (e.g., the database VMs 120, the database VMs 135, the database VM 150A, and the database VM 150B) from the storage pool 170 to perform one or more functions.

[0040] By running the database VMs 120, the database VMs 135, and the database VMs 150 on each of the first node 105, the second node 110, and the third node 115, respectively, multiple workloads and multiple operating systems may be run on a single piece of underlying hardware computer (e.g., the first node, the second node, and the third node) to increase resource utilization and manage workflow. When new database VMs are created (e.g., installed) on the first node 105, the second node 110, and the third node 115, each of the new database VMs may be configured to be associated with certain hardware resources, software resources, storage resources, and other resources within the cluster 100 to allow those virtual VMs to operate as intended.

[0041] The database VMs 120, the database VMs 135, the database VMs 150, and any newly created instances of the database VMs may be controlled and managed by their respective instance of the controller/service VM 130, the controller/service VM 145, and the controller/service VM 160. The controller/service VM 130, the controller/service VM 145, and the controller/service VM 160 are configured to communicate with each other via the network 165 to form a distributed system 195. Each of the controller/service VM 130, the controller/service VM 145, and the controller/service VM 160 may be considered a local management system configured to manage various tasks and operations within the cluster 100. For example, in some embodiments, the local management system may perform various management related tasks on the database VMs 120, the database VMs 135, and the database VMs 150.

[0042] The hypervisor 125, the hypervisor 140, and the hypervisor 155 of the first node 105, the second node 110, and the third node 115, respectively, may be configured to run virtualization

software, such as, ESXi from VMWare, AHV from Nutanix, Inc., XenServer from Citrix Systems, Inc., etc. The virtualization software on the hypervisor 125, the hypervisor 140, and the hypervisor 155 may be configured for running the database VMs 120, the database VMs 135, the database VM 150A, and the database VM 150B, respectively, and for managing the interactions between those VMs and the underlying hardware of the first node 105, the second node 110, and the third node 115. Each of the controller/service VM 130, the controller/service VM 145, the controller/service VM 160, the hypervisor 125, the hypervisor 140, and the hypervisor 155 may be configured as suitable for use within the cluster 100.

[0043] The network 165 may include any of a variety of wired or wireless network channels that may be suitable for use within the cluster 100. For example, in some embodiments, the network 165 may include wired connections, such as an Ethernet connection, one or more twisted pair wires, coaxial cables, fiber optic cables, etc. In other embodiments, the network 165 may include wireless connections, such as microwaves, infrared waves, radio waves, spread spectrum technologies, satellites, etc. The network 165 may also be configured to communicate with another device using cellular networks, local area networks, wide area networks, the Internet, etc. In some embodiments, the network 165 may include a combination of wired and wireless communications. The network 165 may also include or be associated with network interfaces, switches, routers, network cards, and/or other hardware, software, and/or firmware components that may be needed or considered desirable to have in facilitating intercommunication within the cluster 100.

[0044] Referring still to FIG. 1, in some embodiments, one of the first node 105, the second node 110, or the third node 115 may be configured as a leader node. The leader node may be configured to monitor and handle requests from other nodes in the cluster 100. For example, a particular database VM (e.g., the database VMs 120, the database VMs 135, or the database VMs 150) may

direct an input/output request to the controller/service VM (e.g., the controller/service VM 130, the controller/service VM 145, or the controller/service VM 160, respectively) on the underlying node (e.g., the first node 105, the second node 110, or the third node 115, respectively). Upon receiving the input/output request, that controller/service VM may direct the input/output request to the controller/service VM (e.g., one of the controller/service VM 130, the controller/service VM 145, or the controller/service VM 160) of the leader node. In some cases, the controller/service VM that receives the input/output request may itself be on the leader node, in which case, the controller/service VM does not transfer the request, but rather handles the request itself.

[0045] The controller/service VM of the leader node may fulfil the input/output request (and/or request another component within/outside the cluster 100 to fulfil that request). Upon fulfilling the input/output request, the controller/service VM of the leader node may send a response back to the controller/service VM of the node from which the request was received, which in turn may pass the response to the database VM that initiated the request. In a similar manner, the leader node may also be configured to receive and handle requests (e.g., user requests) from outside of the cluster 100. If the leader node fails, another leader node may be designated.

[0046] Additionally, in some embodiments, although not shown, the cluster 100 may be associated with a central management system that is configured to manage and control the operation of multiple clusters in the virtual computing system. In some embodiments, the central management system may be configured to communicate with the local management systems on each of the controller/service VM 130, the controller/service VM 145, the controller/service VM 160 for controlling the various clusters.

[0047] Again, it is to be understood again that only certain components and features of the cluster 100 are shown and described herein. Nevertheless, other components and features that may be

needed or desired to perform the functions described herein are contemplated and considered within the scope of the present disclosure. It is also to be understood that the configuration of the various components of the cluster 100 described above is only an example and is not intended to be limiting in any way. Rather, the configuration of those components may vary to perform the functions described herein.

[0048] Turning now to FIG. 2, an example block diagram of a database system 200 is shown, in accordance with some embodiments of the present disclosure. FIG. 2 is discussed in conjunction with FIG. 1. The database system 200 or portions thereof may be configured as utility software for creating and implementing database management services. The database system 200 is configured to facilitate creation/registration, querying, and/or administration of the databases associated therewith. Thus, the database system 200 includes a database engine 205 that is configured to receive input from and provide output to a user via a dashboard 210. The database engine 205 is also associated with a database storage system 215 that is configured to store one or more databases under management of the database system 200. In association with the dashboard 210 and the database storage system 215, the database engine 205 is configured to implement one or more database management services of the database system 200. For example, the database engine 205 is configured to provide database provisioning services to create new databases and register existing databases with the database system 200 using a database provisioning system 220. The database engine 205 is also configured to protect databases created or registered by the database provisioning system 220 via a database protection system 225. Although the database provisioning system 220. and the database protection system 225 are shown as separate components, in some embodiments, the database provisioning system and the database protection system may be combined and the combined component may perform the operations of the

individual components. The database provisioning system 220 and the database protection system 225 are both discussed in greater detail below.

[0049] The database system 200 may be installed on a database VM (e.g., the database VMs 120, the database VMs 135, the database VMs 150 of FIG. 1). The database system 200 may be installed via the controller/service VM (e.g., the controller/service VM 130, the controller/service VM 145, the controller/service VM 160) of the node (e.g., the first node 105, the second node 110, and the third node 115) on which the database system is to be installed. For example, an administrator desiring to install the database system 200 may download a copy on write image file (e.g., qcow or qcow2 image file) on the controller/service VM to define the content and structure of a disk volume to be associated with the database system 200. In some embodiments, instead of a copy on write image file, another type of disk image file, depending upon the type of underlying hypervisor, may be installed. Further, the administrator may create or one or more new database VMs on which the database system 200 is to reside. As part of creating the database VMs, the administrator may allocate a particular number of virtual central processing units (vCPU) to each of the database VMs, define the number of cores that are desired in each vCPU, designate a specific amount of memory to each of the database VMs, and attach a database storage device (e.g., a virtual disk from the storage pool 170) with each of the database VMs. In some embodiments, at least a portion of the database storage device attached to the database system 200 may form the database storage system 215. The administrator may also create a new network interface (e.g., associate a virtual local area network (VLAN), assign an Internet Protocol ("IP") address to access the database system 200, etc.) with each of the database VMs. The administrator may perform additional and/or other actions to create the database VMs on which the database system 200 resides upon creation and installation of the disk image file.

[0050] In some embodiments, the database VMs on which the database system 200 resides may all be located on a single node (e.g., one of the first node 105, the second node 110, and the third node 115). In other embodiments, the database VMs on which the database system 200 resides may be spread across multiple nodes within a single cluster, or possibly amongst multiple clusters. When spread across multiple clusters, each of the associated multiple clusters may be configured to at least indirectly communicate with one another to facilitate operation of the database system 200. Upon installing the database system 200, a user (e.g., the administrator or other user authorized to access the database system) may access the dashboard 210. The dashboard 210, thus, forms the front end of the database system 200 and the database engine 205 and the database storage system 215 form the backend of the database system.

[0051] The database system 200 may be accessed via a computing device associated with the virtual computing system 100. In other embodiments, instead of or in addition to being accessible via a particular computing device, the database system 200 may be hosted on a cloud service and may be accessed via the cloud. In some embodiments, the database system 200 may additionally or alternatively be configured as a mobile application suitable for access from a mobile computing device (e.g., a mobile phone). In some embodiments, the database system 200 and particularly the dashboard 210 may be accessed via an Application Programming Interface ("API") 230. To access the dashboard 210 via the API 230, a user may use designated devices such as laptops, desktops, tablets, mobile devices, other handheld or portable devices, and/or other types of computing devices that are configured to access the API. These devices may be different from the computing device on which the database system 200 is installed.

[0052] In some embodiments and when the dashboard 210 is configured for access via the API 230, the user may access the dashboard via a web browser and upon entering a uniform resource

locator ("URL") for the API such as the IP address of the database system 200 or other web address. Using the API 230 and the dashboard 210, the users may then send instructions to the database engine 205 and receive information back from the database engine. In some embodiments, the API 230 may be a representational state transfer ("REST") type of API. In other embodiments, the API 230 may be any other type of web or other type of API (e.g., ASP.NET) built using any of a variety of technologies, such as Java, .Net, etc., that is capable of accessing the database engine 205 and facilitating communication between the users and the database engine. In some embodiments, the API 230 may be configured to facilitate communication via a hypertext transfer protocol ("HTTP") or hypertext transfer protocol secure ("HTTPS") type request. The API 230 may receive an HTTP/HTTPS request and send an HTTP/HTTPS response back. In other embodiments, the API 230 may be configured to facilitate communication using other or additional types of communication protocols. In other embodiments, the database system 200 may be configured for access in other ways.

[0053] The dashboard 210 provides a user interface that facilitates human-computer interaction between the users and the database engine 205. The dashboard 210 is configured to receive user inputs from the users via a graphical user interface ("GUI") and transmit those user inputs to the database engine 205. The dashboard 210 is also configured to receive outputs/information from the database engine 205 and present those outputs/information to the users via the GUI of the management system. The GUI may present a variety of graphical icons, windows, visual indicators, menus, visual widgets, and other indicia to facilitate user interaction. In other embodiments, the dashboard 210 may be configured as other types of user interfaces, including for example, text-based user interfaces and other man-machine interfaces. Thus, the dashboard 210 may be configured in a variety of ways.

[0054] Further, the dashboard 210 may be configured to receive user inputs in a variety of ways. For example, the dashboard 210 may be configured to receive the user inputs using input technologies including, but not limited to, a keyboard, a stylus and/or touch screen, a mouse, a track ball, a keypad, a microphone, voice recognition, motion recognition, remote controllers, input ports, one or more buttons, dials, joysticks, etc. that allow an external source, such as the user, to enter information into the database system 200. The dashboard 210 may also be configured to present outputs/information to the users in a variety of ways. For example, the dashboard 210 may be configured to present information to external systems such as users, memory, printers, speakers, etc. Therefore, although not shown, dashboard 210 may be associated with a variety of hardware, software, firmware components, or combinations thereof. Generally speaking, the dashboard 210 may be associated with any type of hardware, software, and/or firmware component that enables the database engine 205 to perform the functions described herein.

[0055] Thus, the dashboard receives a user request (e.g., an input) from the user and transmits that user request to the database engine 205. In some embodiments, the user request may be to request a database management service. For example, in some embodiments, the user request may be to request a database provisioning service. In response to the user request for a database provisioning service, the database engine 205 may activate the database provisioning system 220. The database provisioning system 220 includes a database creation system 235 for creating new databases within the database system 200 and a database registration system 240 for registering databases that were previously created outside of the database system with the database system. Although the database creation system 235 and the database registration system 240 are shown as separate components, in some embodiments, those components may be combined together and the combined component

may perform the functions of the individual components. The database creation system 235 and the database registration system 240 are discussed in greater detail in FIGS. 3-5E below.

[0056] The database protection system 225 is configured to protect databases associated with the database system 200. Thus, the database protection system 225 implements a copy data management service of the database system 200. During creation or registration of a database, the database provisioning system 220 creates an instance of a database protection system 225 for protecting the associated database. Thus, upon the creation or registration of a database, that database may be protected by the associated instance of the database protection system 225 by capturing snapshots, transactional logs, and creating cloned databases. Each instance of the database protection system 225 may receive a variety of user defined constraints in accordance with which the associated database is protected. The database protection system 225 is discussed in greater detail in FIG. 6 below.

[0057] The database engine 205, including the database provisioning system 220 and the database protection system 225 may be configured as, and/or operate in association with, hardware, software, firmware, or a combination thereof. Specifically, the database engine 205 may include a processing unit 245 configured to execute instructions for implementing the database management services of the database system 200. In some embodiments, each of the database provisioning system 220 and the database protection system 225 may have their own separate instance of the processing unit 245. The processing unit 245 may be implemented in hardware, firmware, software, or any combination thereof. "Executing an instruction" means that the processing unit 245 performs the operations called for by that instruction. The processing unit 245 may retrieve a set of instructions from a memory for execution. For example, in some embodiments, the processing unit 245 may retrieve the instructions from a permanent memory

device like a read only memory (ROM) device and copy the instructions in an executable form to a temporary memory device that is generally some form of random access memory (RAM). The ROM and RAM may both be part of the storage pool 170 and/or provisioned separately from the storage pool. In some embodiments, the processing unit 245 may be configured to execute instructions without first copying those instructions to the RAM. The processing unit 245 may be a special purpose computer, and include logic circuits, hardware circuits, etc. to carry out the instructions. The processing unit 245 may include a single stand-alone processing unit, or a plurality of processing units that use the same or different processing technology. The instructions may be written using one or more programming language, scripting language, assembly language, etc.

[0058] The database engine 205 may also include a memory 250. The memory 250 may be provisioned from or be associated with the storage pool 170. In some embodiments, the memory 250 may be separate from the storage pool 170. The memory 250 may be any of a variety of volatile and/or non-volatile memories that may be considered suitable for use with the database engine 205. In some embodiments, the memory 250 may be configured to store the instructions that are used by the processing unit 245. Further, although not shown, in some embodiments, the database provisioning system 220 and the database protection system 225 may each, additionally or alternatively, have their own dedicated memory.

[0059] Further, the database engine 205 may be configured to handle a variety of types of database engines. For example, in some embodiments, the database engine 205 may be configured to manage PostgreSQL, Oracle, Microsoft SQL server, and MySQL database engines. In other embodiments, the database engine 205 may be configured to manage other or additional database engines. Each database that is created within or registered with the database system 200 may be

of a particular "database engine type." The database engine type may identify the type of database management system (e.g., Oracle, PostgreSQL, etc.) of a particular database. By virtue of creating or registering a database with a particular database engine type, that database is managed in accordance with the rules of that database engine type. Thus, the database engine 205 is configured to be operable with and manage databases associated with a variety of database engine types.

[0060] It is to be understood that only some components of the database engine 205 are shown and discussed herein. In other embodiments, the database engine 205 may also include other components that are considered necessary or desirable in implementing the various database management services discussed herein. Similarly, the database provisioning system 220 and the database protection system 225 may have components that are considered necessary or desirable in implementing the various database management services discussed herein.

[0061] Referring still to FIG. 2, the database storage system 215 is configured to store one or more databases that are either created within the database system 200 or registered with the database system. The database storage system 215 may include a source database storage 255 and a target database storage 260. The source database storage 255 is configured to store the original instances of the databases (also referred to herein as source databases) that are created within or registered with the database system 200. The target database storage 260 is configured to store the clones of the source databases (also referred to herein as cloned databases). In some embodiments, the source database storage 255 and the target database storage 260 may be provisioned from the storage pool 170 and may include virtual disk storage that is associated with the database VMs (e.g., the database VMs 120, the database VMs 135, the database VMs 150) on which the database system 200, the source databases, and the cloned databases reside. For example, in some embodiments, the source database storage 255 may be associated with one or more database VMs

(referred to herein as source database VMs) and the source databases stored within the source database storage may be stored within the virtual disks associated with the source database VMs. Similarly, in some embodiments, the target database storage 260 may be associated with one or more database VMs (referred to herein as target database VMs) and the databases stored within the target database storage may be stored within the virtual disks associated with the target database VMs. In some embodiments, each source database VM may be configured to store one or more source databases and each target database VM may be configured to store one or more target databases. In other embodiments, the source database storage 255 and the target database storage 260 may additionally or alternatively be provisioned from other types of storage associated with the database system 200.

[0062] Further, depending upon the size of a particular database and the size of the virtual disk associated with a particular source database VM, a source database may be stored in its entirety on a single source database VM or may span multiple source database VMs. Further, as the size of that source database increases, the source database may be moved to another source database VM, may be stored onto multiple source database VMs, and/or additional storage may be provisioned to the source database VMs to house the increased size of the source database. Similarly, depending upon the size of a cloned database and the size of the virtual disk associated with a particular target database VM, the cloned database may be stored on a single or multiple target database VMs. Further, as the size of the cloned database increases (e.g., by virtue of updating the cloned database to incorporate any changes in the source database), the cloned database may be moved to another target database VM of appropriate size, may be divided amongst multiple target database VMs, and/or additional virtual disk space may be provisioned to the target

database VM. Thus, the database storage system 215 is structured with the flexibility to expand and adapt to accommodate databases of various sizes.

[0063] The database storage system 215 also includes a database manager 265. In some embodiments, each instance of the source database within the source database storage 255 may include an instance of the database manager 265. In other embodiments, a single instance of the database manager 265 may manage multiple or all source databases. The database manager 265 is configured to work with the database protection system 225 to protect the source databases stored within the source database storage 255. The database manager 265 is discussed in greater detail in FIG. 6 below. Although not shown, the database manager 265 may include a processing unit (e.g., similar to the processing unit 245), a memory (e.g., similar to the memory 250), and other hardware, software, and/or firmware components that are necessary or considered desirable for performing the functions described herein. Further, although the cloned databases in the target database storage 260 are shown as having a database manager, in some embodiments, each cloned database may be associated with a database manager for managing the cloned databases.

[0064] Turning now to FIG. 3, an example flow chart outlining operations of a process 300 is shown, in accordance with some embodiments of the present disclosure. The process 300 may include additional, fewer, or different operations, depending on the particular embodiment. The process 300 may be used to implement the database provisioning service. Thus, the process 300 may be used to create a new database or register an existing database. The process 300 is discussed in conjunction with FIGS. 1 and 2 and is implemented by the database provisioning system 220 of the database engine 205 in conjunction with the dashboard 210. Specifically, the database provisioning system 220 receives inputs from the user via the dashboard 210 and performs operations in response to those inputs for creating a new database or registering an existing

database. Thus, the process 300 starts at operation 305 with the database provisioning system 220 receiving a user request via the dashboard 210 for either creating a new database or registering an existing database. Specifically, once the database system 200 is installed and the user is able to access the dashboard 210, the dashboard may present an option to create a new database or register an existing database. If the user desires to create a new database, the user may select the database creation option from the dashboard 210 and activate the database creation system 235 of the database provisioning system 220. If the user desires to register an existing database, the user may select the database registration option and activate the database registration system 240 of the database provisioning system 220.

[0065] Upon activation, the database creation system 235 or the database registration system 240 may present one or more user interfaces to the user for soliciting parameters for creating a new database or registering an existing database, respectively. For example, at operation 310, the activated one of the database creation system 235 or the database registration system 240 presents, via the dashboard 210, a user interface for requesting the database engine type of the database to be created or registered. The dashboard 210 may present a selection of the database engine types that are supported by the database engine 205. The user may select one of the various database engine types presented on the dashboard 210. As noted above, the database engine type defines the database management system of the database being created or registered. For example, if the user desires to create a database with the database engine type Oracle, and if Oracle is presented as an option on the dashboard at the operation 310, the user may select Oracle on the dashboard. As another example, if the user desires to register an existing database that has been configured with the database engine type Oracle, the user may select Oracle from the dashboards at the operation 310.

[0066] The database creation system 235 or the database registration system 240 receives the user's selection of the database engine type at the operation 310. Additionally, the database creation system 235 or the database registration system 240 configures the remaining user interfaces that are presented to the user on the dashboard 210 based on the database engine type selected by the user at the operation 310. For example, if the user selected Oracle as the database engine type at the operation 315, the database creation system 235 or the database registration system 240 may configure the remaining database creation process or the database registration process in accordance with requirements for Oracle. Thus, at operation 315, the database creation system 235 or the database registration system 240 presents one or more user interfaces to the user, via the dashboard 210, for requesting a selection of parameters for defining the configuration for and creating a new source database VM on which the database being created or registered will ultimately reside.

[0067] For example, in some embodiments, the activated one of the database creation system 235 or the database registration system 240 may request parameters for defining a software profile, a network profile, a compute profile, and a database parameter profile to be associated with the new source database VM. In other embodiments, the database provisioning system 220 may request other or additional types of parameters from the user for creating the source database VM based upon the database engine type selected at the operation 310. The user interface may present one or more standardized profiles for one or more of the software profile, network profile, compute profile, and database parameter profile. The user may select from the standardized profiles in some embodiments. In some embodiments, the database creation system 235 or the database registration system 240 may also allow the user to modify a standardized profile and/or create new profiles from scratch based upon the user's preferences. Each of the profiles is based upon the

database engine type selected at the operation 310. Thus, the standardized profiles that are presented to the user are in compliance with the database engine type. Similarly, the database creation system 235 or the database registration system 240 only allow those changes to the standardized profiles or creation of new profiles that comply with the database engine type.

[0068] The software profile defines the software and operating system parameters for the database engine type that is selected at the operation 310. For example, if at the operation 310, the database engine type is selected as PostgreSQL, the software profile may include one or more software and operations system image profiles associated with PostgreSQL. Each software profile may define the rules that are to be applied in managing the database being created or registered. In some embodiments, one or more sample software profiles may be available for the user to select. In other embodiments, the user may create their own custom software profile or modify an existing software profile to suit their needs. When creating their own custom software profile or modifying an existing software profile, in some embodiments, the user may be required to create/modify the software profile before starting the process 300, while in other embodiments, the user may be able to create the custom software profile as part of the operation 315.

[0069] The network profile identifies the network location of the database being created or registered to facilitate access to the database after creation or registration. In some embodiments, the network profile may be the same profile that is created during installation of the database system 200. In other embodiments, a different network profile may be used. Similar to the software profile, the database creation system 235 or the database registration system 240 may make a sample network profile available for the user to select. Alternatively, the user may create a new network profile or modify an existing network profile either before starting the process 300 or during the operation 315. The compute profile defines the size/configuration of the source

database VM. For example, the compute profile may define the number of vCPUs, number of cores per vCPU, and memory capacity to be associated with the source database VM. In other embodiments, the compute profile may define other or additional configurational parameters. At the operation 315, the database creation system 235 or the database registration system 240 may also request the database parameter profile from the user. The database parameter profile defines the custom parameters that are applied to the database being created or registered. Again, the database creation system 235 or the database registration system 240 may make sample compute profiles and/or a sample database parameter profiles available for the user to select in some embodiments. Alternatively, the user may create custom compute and/or database parameter profiles or modify existing compute and/or database parameter profiles, either before starting the process 300 or during the operation 315.

[0070] In some embodiments, the database creation system 235 or the database registration system 240 may pre-select a default option for the user for one or more of the software profile, compute profile, network profile, and the database parameter profile. The database creation system 235 or the database registration system 240 may allow the user to change the default options by selecting another standardized option, modifying a standardized option, or creating a new profile. Thus, at the operation 315, the database creation system 235 or the database registration system 240 receives selection of the various parameters for creating a new source database VM.

[0071] In some embodiments, based upon the parameters received from the user, the database creation system 235 or the database registration system 240 may create a new source database VM at the operation 315. In other embodiments, the database creation system 235 or the database registration system 240 may wait until other remaining parameters are received before creating the source database VM. In some embodiments, instead of creating a new source VM, the database

creation system 235 or the database registration system 240 may allow the user to use a previously created source database VM. Thus, at the operation 315, the database creation system 235 or the database registration system 240 may first request the user to select one option from either creating a new source database VM or using an existing (e.g., previously created) source database VM. Based on the user's selection, the database creation system 235 or the database registration system 240 may request the various profiles discussed above or request the user to identify the existing source database VM to use. In some embodiments, the database creation system 235 or the database registration system 240 may present a list of existing source database VMs created previously for the database engine type selected at the operation 310 and that have space available to receive the database being created or registered. The user may select one source database VM from the list. The database creation system 235 or the database registration system 240 may facilitate the user selection of an existing source database VM in other manners (e.g., by allowing the user to browse to a location, etc.).

[0072] Upon receiving selection of the various profiles for creating a new source database VM or receiving selection of an existing source database VM, at operation 320, the database creation system 235 or the database registration system 240 presents one or more user interfaces, via the dashboard 210, for requesting parameters (e.g., configurational details) for the database being created/registered. For example, the database creation system 235 or the database registration system 240 may request a database name and a description of the database being created or registered to distinguish that database from other databases within the database system 200. The database creation system 235 or the database registration system 240 may also request a database password to restrict access to the database to only authorized users, a database size to determine how much storage space is needed for storing that base, and/or any additional or other parameters

that may be considered necessary or desirable in creating/registering the database. Further, the parameters that are requested may vary based upon whether a database is being created or whether an existing database is being registered. For example, if an existing database is being registered, the database registration system 240 may automatically determine the size of the database. In some embodiments, certain default values may be pre-selected for the user and the user may be allowed to change those values. Thus, at the operation 320, the database creation system 235 or the database registration system 240 receives selection of parameters from the user, via the dashboard 210, for either creating a new database or registering an existing database.

[0073] At operation 325, the database creation system 235 or the database registration system 240 presents one or more user interfaces, via the dashboard 210, to request selection of parameters for creating an instance of a database protection system (e.g., the database protection system 225) for the database being created or registered by the process 300. The instance of the database protection system is configured to protect the database being created or registered by the process 300. To create the instance of the database protection system, the database creation system 235 or the database registration system 240 may request a name and description for the instance of the database protection system 225, a level of a Service Level Agreement ("SLA"), and a protection schedule to define rules based on which the instance of the database protection system 225 operates.

[0074] An SLA is an agreement between a service provider (e.g., the owner of the database system 200) and the user (e.g., the owner of the database) that outlines, among other things, the protection scope of the database. The protection scope defines for how long data from the database being created or registered is retained. Thus, the protection scope defines the database retention policy. In some embodiments, the SLA may define various protection parameters such as continuous,

daily, weekly, monthly, quarterly, or yearly protection parameters for determining the protection scope of the database being created/registered. In other embodiments, the SLA may define other or additional protection parameters.

[0075] Each database for which an instance of the database protection system 225 is created may be protected by capturing snapshots and/or transactional logs. The number of snapshots and transactional logs to be captured on each day may be defined by the user in the protection schedule. As used herein, a "day" may be any 24-hour period (e.g., from midnight to Noon). In some embodiments, the protection schedule may define default values to define the frequency of capturing snapshots and transactional logs, which the user may modify. Thus, based upon the frequency of capturing snapshots and transactional logs defined in the protection schedule, the instance of the database protection system 225 may be configured to capture one or more snapshots and one or more transactional logs each day. Generally speaking, the number of transactional logs that are captured each day may be higher than the number of snapshots that are captured on that day. Since it is impractical and expensive to indefinitely store the captured snapshots and the transactional logs, the protection parameters in the SLA define the duration for how long those snapshots and transactional logs are stored.

[0076] For example, the continuous protection parameter within the SLA defines the duration in days for which all captured snapshots and transactional logs are retained. For example, if the continuous protection parameter is defined as 30 days, the instance of the database protection system 225 is configured to retain all snapshots and transactional logs that are captured within the last 30 days. By retaining all snapshots and the transactional logs, the user may replicate any or substantially any state of the database (down to a second or even a fraction of a second).

[0077] The SLA may also define a daily protection parameter, which defines the duration in days for which a daily snapshot is stored. For example, if the daily protection parameter is 90 days, the instance of the database protection system 225 is configured to store a daily snapshot for 90 days. The protection schedule may define the time of day to identify the snapshot that is designated as the daily snapshot. For example, if the user specifies that the snapshot captured at 11:00 AM every day is the daily snapshot and the SLA defines the daily protection parameter for 90 days, the instance of the database protection system 225 may be configured to store a daily snapshot that was captured at or closest to 11:00 AM and store the daily snapshot for 90 days.

[0078] Similarly, the SLA may define weekly, monthly, and quarterly protection parameters. A weekly protection parameter in the SLA may define the duration in weeks for which a weekly snapshot is stored. The protection schedule may define the day of the week to identify which snapshot is designated as the weekly snapshot. For example, if the user defines in the protection schedule that the snapshot captured on Monday is to be designated as the weekly snapshot, and the weekly protection parameter in the SLA specifies a duration of 8 weeks, the instance of the database protection system 225 may store the snapshot captured every week on Monday for 8 weeks. If multiple snapshots are captured each day, the protection schedule may also define which snapshot captured on the designated day of the week (e.g., Monday) serves as the weekly snapshot. In some embodiments, the time defined in the protection schedule for capturing a daily snapshot may be used. For example, if the protection schedule defines that the snapshot captured at 11:00 AM is the daily snapshot, and the weekly snapshot is to be captured on Monday, the instance of the database protection system 225 may store the snapshot captured at or closest to 11:00 AM every Monday as the weekly snapshot. In other embodiments, another time period may be used.

[0079] Likewise, a monthly protection parameter in the SLA may define a duration in months for which a monthly snapshot is to be stored. The user may specify the date within the protection schedule for identifying which snapshot corresponds to the monthly snapshot. For example, the user may specify storing the snapshot captured on the 20th of every month as the monthly snapshot in the protection schedule, and the monthly protection parameter may specify a duration of 12 months for storing the monthly snapshot. Thus, the instance of the database protection system 225 stores a monthly snapshot captured on the 20th of every month and stores that monthly snapshot for 12 months. A quarterly protection parameter in the SLA may define a duration in quarters for which a quarterly snapshot is to be stored and the user may specify in the protection schedule which months correspond to the various quarters. For example, the user may specify January, April, July, and October as the quarters and the quarterly protection parameter may specify storing the quarterly snapshots for 20 quarters. Thus, the instance of the database protection system 225 may designate a snapshot captured on the first day of January, April, July, and October (e.g., January 1, April 1, July 1, and October 1) as the quarterly snapshot and store the quarterly snapshot for 20 quarters.

[0080] Thus, for each protection parameter that is defined in the SLA, a corresponding value may be requested from the user in the protection schedule to identify which snapshot corresponds to that protection parameter. It is to be understood that the various protection parameters and their respective schedules mentioned above are only examples and may vary from one embodiment to another as desired. Further, when the duration specified by a protection parameter expires, any snapshots or transactional logs that are expired (e.g., past their duration) may be deleted. As an example, if a snapshot is to be stored for 30 days, on the 31st day, that snapshot may be deleted.

Thus, each snapshot and transactional log is managed based on the SLA and protection schedule independent from other snapshots and transactional logs.

[0081] Additionally, to simplify user selection, in some embodiments, various levels of SLA may be pre-defined within the database provisioning system 220. Each level of the SLA may have default values of the various protection parameters. For example, in some embodiments, the various levels of SLA may be GOLD, SILVER, BRONZE and the various protection parameters for these levels may be as follows:

Name	Continuous	Daily	Weekly	Monthly	Quarterly
GOLD	30 Days	90 Days	16 Weeks	12 Months	75 Quarters
SILVER	14 Days	60 Days	12 Weeks	12 Months	0 Quarters
BRONZE	7 Days	30 Days	8 Weeks	6 Months	0 Quarters

[0082] It is to be understood that the nomenclature of the GOLD, SILVER, BRONZE levels of the SLA is only an example and the levels may be given different names in other embodiments. Further, although three levels of the SLA are described herein, in other embodiments, greater or fewer than three SLA levels may be used. Additionally, the values of the protection parameters in each level of the SLA may vary from one embodiment to another. The database creation system 235 or the database registration system 240 may present the various pre-defined SLA levels to the user at the operation 325 to select from. In some embodiments, the database creation system 235 or the database registration system 240 may allow the user to modify the values of one or more protection parameters in the pre-defined SLA levels. For example, if the user desires to select the GOLD level, but would like continuous protection for 45 days instead of the default value of 30

days shown in the table above, the user may modify the continuous protection parameter of the GOLD level. Thus, the pre-defined SLA levels provide the convenience and flexibility of tailoring the various protection parameters to suit the user's needs. Alternatively, the database creation system 235 or the database registration system 240 may allow the user to create a new SLA at the operation 325.

[0083] To create a new SLA, upon receiving input from the user at the operation 325 indicating creation of a new SLA, the database creation system 235 or the database registration system 240 may present one or more user interfaces to the user requesting certain information. For example, the database creation system 235 or the database registration system 240 may request an SLA name, description, and values for the continuous, daily, weekly, monthly, and quarterly protection parameters. The database creation system 235 or the database registration system 240 may request other or additional details as well. Upon receiving the various inputs from the user for creating the new SLA, the database creation system 235 or the database registration system 240 may create the new SLA and allow the user to select that SLA at the operation 325.

[0084] Therefore, at the operation 325, the database creation system 235 or the database registration system 240 receives selection of the SLA and the protection schedule for creating an instance of the database protection system 225 for the database being created/registered. At operation 330, upon receiving the various user selections at the operations 310-325, the database creation system 235 or the database registration system 240 creates a new database or registers the existing database with the database system 200. To create/register the database, the database creation system 235 or the database registration system 240 initiates a series of operations. For example, the database creation system 235 or the database registration system 240 may create a source database VM (or designate an existing source database VM), convert the database size into

a number of virtual disks that are needed to house the database, create a database profile having a database name, description, network information, etc., attach the software and parameters of the database engine type with the database, create an instance of the database protection system, associate the SLA and schedule with the database protection system, designate storage for storing snapshots and transactional logs, etc. Once the database is created/registered, database management services may be applied to the database.

[0085] In some embodiments, the database creation system 235 or the database registration system 240 may request other or additional information for creating/registering the database. For example, the database creation system 235 or the database registration system 240 may request which cluster or clusters the user desires to create/register the database, which node or nodes on a cluster the user desires to create the source database VM, etc. Thus, the database system 200 provides an easy, convenient, and flexible mechanism to create a new database or register an existing database using a user friendly and intuitive user interface. Instead of requiring multiple days to create/register a database, using the user interface of the present disclosure, the database may be created/registered within minutes. Once created/registered, additional database management services may be implemented on those databases.

[0086] Turning now to FIGS. 4A-5E, example user interfaces for creating and registering a database are shown, in accordance with some embodiments of the present disclosure. FIGS. 4A-4G show example user interfaces for creating a database, while FIGS. 5A-5E show example user interfaces for registering a database. FIGS. 4A-5E are discussed in conjunction with FIGS. 1-3. Referring to FIGS. 4A-4G, FIG. 4A shows an example dashboard 400. The dashboard 400 is similar to the dashboard 210. The dashboard 400 becomes accessible to the user upon installing the database system 200 and allows the user to manage and monitor activities across multiple

databases that are created/registered within the database system. In some embodiments, the user may be required to be authenticated before being able to access the dashboard 400.

[0087] The dashboard 400 may include a toolbar 405 and a body 410. The toolbar 405 is configured to switch between various control functions of the database system 200. In some embodiments, the toolbar 410 includes a main menu 415, an alerts menu 420, and a user view menu 425. The main menu 415 may be configured as a drop-down list that enables the user selected within the user view menu 425 to select and activate a control function. For example, when the control function "dashboard" is selected in the main menu 415, the dashboard 400 may be configured to display a "home page" 430 in the body 410 of the dashboard. As the control function selected in the main menu 415 is changed, the page (or at least portions thereof) that is displayed in the body 410 of the dashboard 400 may change to reflect the control function that is activated. The alerts menu 420 allows the user to view and monitor any alerts that are occurring within the database system. An "alert" may be indicative of an error or issue in the database system that needs user attention. In some embodiments, alerts may be color coded to identify the criticality of the alert. The user view menu 425 determines which features are accessible to a particular user. For example, if the user selected in the user view menu 425 is an administrator, certain features that are generally not available to a non-administrator user may be activated. It is to be understood that the toolbar 405 is only an example and may vary from one embodiment to another.

[0088] The homepage 430 displayed within the body 410 provides a summary or a "quick-glance" view of all the databases (e.g., source databases) that are managed by the database system 200. The homepage 430 may be divided into one or more components or cells. For example, the homepage 430 may include a database list cell 435A that lists all of the source databases stored in the source database VMs of the database system 200 and provides a summary of each of those

source databases (e.g., name of the source database, database engine type, size of the database, name of the instance of the database protection system, number of cloned databases created from the source database, etc.). A summary cell 435B lists the total number of source databases created or registered on the source database VMs combined (e.g., the total number of databases listed in the database list cell 435A), the total number of cloned databases created from those total number of source databases, data usage values of the source and/or the cloned databases, etc. A clone cell 435C provides history on the cloning of the databases (e.g., number of clones created in a given time period, whether the cloning was successful or not, etc.). A version cell 435D provides information on the cluster on which the source databases resides and the version of the software implemented by the database system. An alerts cell 435E provides additional details on the various alerts being generated by the databases listed within the database list cell 4335A.

[0089] It is to be understood that the various components or cells of the homepage 430 shown in FIG. 4A are examples and features thereof may vary from one embodiment to another. For example, the number of components or cells that are shown on the homepage 430 may vary from one embodiment to another. Likewise, the details that are displayed within each component or cell may vary from one embodiment to another. The orientation, placement, size, and other design aspects of each component or cell may vary from one embodiment to another. In some embodiments, the configuration of the homepage 430 and/or the configuration of each component/cell may be defined by the user by using a settings menu option of the dashboard 400. By virtue of the dashboard 400, the user may get a quick glance summary of the various source databases that are managed by the database system 200, as well as a quick summary of the configuration and specifics of each source database. Via the dashboard 400, the user may also decide to perform various database management services on the source databases.

[0090] For example, to initiate a database provisioning service, the user authorized to request the database provisioning service may select a "databases" option from the main menu 415 to display a database page 440 (shown in FIG. 4B) in the body 410 of the dashboard. If the user selected in the user view menu 425 is not permitted to request the database provisioning service, the "databases" option may be inactivated or not shown in the main menu 415. The database page 440 may display a database menu 445A from which the user may view additional information and/or perform additional operations. The database page 440 may also include a database detail component 445B to display additional details corresponding to the option selected from the database menu 445A. For example, as shown in FIG. 4B. upon selecting the "Sources" option from the database menu 445, a list of the source databases associated with the database system 200 may be displayed within the database detail component 445B. The user may select any one of the source databases to view additional details of that source database and/or perform permitted operations on that source database.

[0091] The database page 440 may also allow the user to create a new database or register an existing database. For example, the user may select a create button 445C on the database page 440 to send a user request to the database engine 205 to start the process 300 for creating a new database. Likewise, the user may select a register button 445D to initiate a registration process and sending a user request to the database engine 205.

[0092] Upon selecting the create button 445C, the database engine 205, and particularly the database creation system 235 of the database engine may present a user interface 450, shown in FIG. 4C. The user interface 450 identifies the various steps of creating the new database and highlights the current step. For example, the user interface 450 has the "Engine" step highlighted. By virtue of identifying the various steps of creating the new database, the dashboard 400 keeps

the user informed as to which step the database creation process is on and which steps are coming up next. The user interface 450 may also present one or more database engine types that are supported by the database system 200. The user may select one of the database engine types to highlight the selection. For example, the PostgreSQL database engine type is shown selected in the user interface 450. The user may select the "Next" button to send the selected database engine type selection to the database creation system 235, which in response, presents a user interface 455 of FIG. 4D.

[0093] The user interface 455 identifies that the database creation process is at the "Server" step for creating a new source database VM or identifying an existing source database VM. The user interface 455 may, thus, allow a user to select an option 455A to create a new source database VM or an option 455B to use an existing source database VM. In the user interface 455 of FIG. 4D, the option 455A for creating a new source database VM is shown selected. Thus, the user interface 455 requests user selection of one or more profiles for creating a new source database VM. For example, the user interface 455 may request a name 455C for the source database VM, a software profile 455D, a compute profile 455E, a network profile 455F, a description 455G for the source database VM, and security options 455H for the source database VM. The user interface 455 may also request a parameter profile for the source database VM. In other embodiments, the user interface 455 may request additional or other information for creating a new source database VM.

[0094] Although not shown, if the user selects the option 455B for using an existing source database VM, the user interface 455 may display options for allowing the user to identify an existing source database VM. Upon selecting the "Next" button, the various user selections of the user interface 455 are sent to the database creation system 235, which then presents a user interface 460 of FIG. 4E to the user on the dashboard 400.

[0095] The user interface 460 identifies that the database creation process is at the "Database" step at which various parameters for creating a database on the source database VM are received from the user. The user interface 460 also requests the user to provide a name 460A and description 460B for the database being created, a password 460C and 460D to restrict access to the database, a size 460E of the database to be created, a database parameter profile 460F to be applied to the database and the source database VM, a listener port 460G for the database engine type selected in the user interface 450, and any other details (e.g., details 460H) that may be needed or considered desirable to have in creating the database. When the user is satisfied with the selections on the user interface 460, the user may select a "Next" button to send the selections to the database creation system 235. The database creation system 235 may then present a user interface 465 of FIG. 4F.

[0096] The user interface 465 identifies that the database creation process is at the last step of creating the "Time Machine." The user interface 465 is configured to request selection of SLA and protection schedule from the user for creating an instance of the database protection system 225. The user interface 465, thus, requests a name 465A and description for the instance of the database protection system 225, an SLA level 465C, and a protection schedule 465D. Within the protection schedule 465D, the user interface 465 requests the user to provide a number of snapshots 465E desired each day, a number of transactional logs 465F desired each day, and time periods 465G for identifying which snapshot to designate as the daily snapshot, 465H for identifying which snapshot to designate as the weekly snapshot, 465I for identifying which snapshot to designate as the monthly snapshot, and 465J for identifying which snapshot to designate as the quarterly snapshot. Upon providing the various parameters in the user interface 465, the user may select a "Next" button to send the selections to the database creation system 235 and start the database

creation. The database creation system 235 may display a status of the database creation in a user interface 470 of FIG. 4G.

[0097] Upon creating the database, the newly created database may be displayed within the database list cell 435A, within the database page 440, and anywhere else where source databases are listed. The database creation system 235 may also update the various calculations and numbers in the dashboard 400 that provide some statistic of the source databases (e.g., the summary cell 435B). It is to be understood that the configurations of the various user interfaces of FIGS. 4A-4G may vary from one embodiment to another. For example, the various selections may be displayed as drop-lists, as radio buttons, or in other ways. Similarly, some fields may be pre-filled with default values and allowed to be changed by the user if desired. The placement of the various fields, the size, orientation, and other design aspects of those fields may be varied as well. Additionally, some fields may be considered mandatory, while other fields may be designated as mandatory to be filled in by the user. The dashboard 400 thus provides an easy mechanism for creating a new database in a simple, user friendly, and intuitive user interface.

[0098] Turning now to FIGS. 5A-5E, example user interfaces for registering an existing database are shown, in accordance with some embodiments of the present disclosure. Similar to the database creation process, the database registration process is initiated from a dashboard 500. The dashboard 500 is similar to the dashboards 210 and 400. The dashboard 500 includes a database page 505, which is similar to the database page 440. To register an existing database, the user may select a register button 510 and select "Next." Upon selecting "Next," the database registration system 240 may be activated, which starts the database registration process by displaying a user interface 515 of FIG. 5B. From the user interface 515, the user may select the desired database engine type and select "Next." Upon selecting "Next," the user's selection of the database engine

type is sent to the database registration system 240, which then displays a user interface 520 of FIG. 5C.

[0099] By way of the user interface 520, the database registration system 240 requests the user for creating a new source database VM or selecting an existing source database VM. Likewise, by way of user interface 525 of FIG. 5D, the database registration system 240 requests the user for providing various parameters of the existing database, and by way of user interface 530, the database registration system requests the user to define the SLA and protection schedule. Upon receiving all of the parameters from the user, the database registration system 240 registers the database. Similar to the user interface 470, the database registration system may display the registration status in a user interface. Upon registration, the database becomes a source database that resides on a source database VM and on which other database management services may be applied.

[0100] Referring now to FIG. 6, an example block diagram of a database system 600 is shown, in accordance with some embodiments of the present disclosure. The database system 600 is similar to the database system 200. Therefore, the components of the database system 600 that are already discussed with respect to the database system 200 are not discussed again. The database system 600 includes a database engine 605 that is associated with a dashboard 610 via an API 615. The database engine 605 is also associated with a database storage system 620 for storing one or more databases managed by the database system 600. The database engine 605 is similar to the database engine 205, the dashboard 610 is similar to the dashboard 210, the API 615 is similar to the API 230, and the database storage system 620 is similar to the database storage system 215. The database engine 605 includes a database protection system 625 that is configured to protect databases that are associated with the database system 600. The database protection system 625

is similar to the database protection system 225. Although not shown, the database engine 605 also includes a database provisioning system similar to the database provisioning system 220.

[0101] As discussed above, an instance of the database protection system 625 may be created for each source database when that source database is created or registered within the database system 600. Thus, the database protection system 625 may include multiple instances of the database protection system – one for each source database. For example, the database protection system 625 may include database protection system instance 630A-630N (collectively referred to herein as database protection system instances 630). In other embodiments, each instance of the database protection system (e.g., the database protection system instances 630A-630N) may be configured to protect more than one source database. Each of the database protection system instances 630A-6930N may respectively include a clone management system 635A-635N (collectively referred to herein as clone management systems 635) and a snapshot/log capturing system 640A-640N (collectively referred to herein as snapshot/log capturing systems 640).

[0102] Each of the database protection system instances 630 may be associated with a source database stored within a source database storage 645. The source database storage 645 is similar to the source database storage 255. Thus for example, the database protection system instance 630A may be associated with a source database 650A stored within the source database storage 645, the database protection system instance 630B may be associated with a source database 650B of the source database storage, the database protection system instance 630N may be associated with a source database 650N, and so on. Thus, the clone management system 635A and the snapshot/log capturing system 640A of the database protection system instance 630A may be configured to protect the source database 650A, the clone management system 635B and the snapshot/log capturing system 640B may be configured to protect the source database 650B, the

clone management system 635N and the snapshot/log capturing system 640N may be configured to protect the source database 650N, and so on. By virtue of having the database protection system instances 630 for each of the source databases 650A-650N (collectively referred to herein as the source databases 650), the protection of each of those databases may be customized and tailored to suit the user's needs.

[0103] To protect the source databases 650, the database protection system instances 630 may create a clone of those source databases. The clones of the source databases 650 (e.g., cloned databases) may be stored within a target database storage 655. The target database storage 655 is similar to the target database storage 260. For each source database (e.g., the source databases 650) that is stored within the source database storage 645, one or more clones of that source database may be created and stored within the target database storage 655. For example, when a clone of the source database 650A is created, a cloned database 660A is created and stored within the target database storage 655. Similarly, clones of the source databases 650B and 650N may be created as cloned databases 660B and 660N, respectively, and stored within the target database storage 655. The cloned databases 660A-660N are collectively referred to herein as the cloned databases 660. Although each of the source databases 650 in the source database storage 645 has been shown as having a corresponding instance of the cloned databases 660 in the target database storage 655, it is to be understood that in some embodiments, clones of only some of the source databases stored in the source database storage may be made. The source databases 650 that have not been cloned may not have a cloned database within the target database storage 655.

[0104] Further, similar to the source databases 650, which reside on a database VM (e.g., the source database VMs), the cloned databases 660 also reside on a database VM. The database VMs on which the cloned databases 660 reside are referred to herein as target database VM. Each of

the cloned databases 660 may reside entirely on one target database VM or may span across multiple target database VMs. In some embodiments, the source database VMs and the target database VMs may be created on the same node or different nodes of the same cluster or across multiple clusters.

[0105] Thus, the database protection system instances 630, and particularly the clone management systems 635 of the database protection system instances creates the cloned databases 660 from the source databases 650 stored within the source database storage 645, and stores the cloned databases within the target database storage 655. The cloned databases 660 may be of a variety of types. As discussed above, each of the source databases 650 are created or registered on a source database VM. Thus, each of the cloned databases 660 may include a clone of the source database VM only (e.g., to create the target database VM) or may include the clone of the source database VM plus the database that resides on that source database VM. For example, the cloned database 660A of the source database 650A may include a clone of the source database VM on which the source database 650A resides or a clone of that source database VM plus the database 650A. When both the source database VM and the source database 650A are cloned, the cloned database 660A may include a target database VM created on the target database storage 655 with a similar or different configuration as the source database VM and the clone of the source database stored on the target database VM. When only the source database VM is cloned, a target database VM is created for that source database VM and stored on the target database storage 655. The target database VM may be used at a later point to store the clone of the source database that resides on the associated source database VM. Thus, the cloned databases 660 may include the source database VM only, the source database VM plus the source database, or the source database only (which is to be stored on a previously created target database VM).

[0106] The cloned databases 660 may be considered operationally same (or substantially similar) to the source databases 650. Each of the cloned databases 660 may be refreshed/updated to incorporate any changes that may have occurred in the source databases 650 since the cloned databases were created. In some embodiments, the operations that are performed on the source databases 650 may be performed on the cloned databases 660 as well. Thus, in some embodiments, instead of using the source databases 650, the cloned databases 660 may be used for performing operations (e.g., analyzing data). The cloned databases 660 may be created from snapshots and transactional logs captured from the source databases 650. The cloned databases 660 are generally created upon receiving a user request. The user may request to clone a particular one of the source databases 650 to a point in time or to a specific snapshot. For example, the user may request a cloned database of a particular one of the source databases 650 as that source database existed at 11:00AM on a particular date. Alternatively, the user may specifically identify a snapshot and request a cloned database of the source databases 650 based on that snapshot. Creating a cloned database (e.g., the cloned databases 600) involves replicating a state of the source databases 650. The "state" of the source databases 650 may include the configuration of the source database, the user data stored within the source database, metadata stored within the source database, and any other information associated with the source database. In other words, a cloned database may be an exact or substantially exact copy of the source database.

[0107] Thus, upon receiving a user request to create a cloned database (e.g., the cloned database 660A) from a source database (e.g., the source database 650A), the clone management system (e.g., the clone management system 635A) associated with the source database may retrieve snapshots and transactional logs of the source database from a repository where the snapshots and transactional logs are stored. If the user request is to clone the source database to a point in time,

the clone management system (e.g., the clone management system 635A) may retrieve all snapshots and transactional logs captured of the source database at that point in time and create a cloned database (e.g., the cloned database 660A) from those snapshots and transactional logs. The cloned database (e.g., the cloned database 660A) represents the state of the source database at the requested point in time. If the user request is to clone the source database based on a particular available snapshot, the clone management system (e.g., the clone management system 635A) may retrieve that particular snapshot and create a cloned database (e.g., the cloned database 660A) from that particular snapshot. The cloned database (e.g., the cloned database 660A) represents the state of the source database (e.g., the source database 650A) at the time the requested snapshot was captured. Thus, the clone management systems 635 are configured to create the cloned databases 660. The clone management systems 635 are also configured to refresh the cloned databases 660, as well as manage/perform any operations performed on the cloned databases.

[0108] Referring now to FIGS. 7A-7F in conjunction with FIGS. 6 and 4A, example user screenshots illustrating the cloning of a source database are shown, in accordance with some embodiments of the present disclosure. To clone a source database, the user may start from dashboard 700 of FIG. 7A. The dashboard 700 is similar to the dashboard 400. To create a clone of a source database, the user may select the option “time machines” from main menu 705. Upon selecting the option “time machines” from the main menu 705, the user may select a particular source database to be cloned. Alternatively, in some embodiments, the user may first select the source database to be cloned and then select the option “time machines” from the main menu 705. Upon selecting the source database to be cloned, the database protection system instance associated with the source database is activated. Further, the database protection system instance displays, in a body 710 of the dashboard 700, a summary section 715. The summary section 715

may display one or more configurational features of the source database such as the database engine type (e.g., type in FIG. 7A), how long ago was the source database created (e.g., age), the last time the source database was updated (e.g., last update), the next period for capturing a transactional log (e.g., next log catch up), name of the source database (e.g., name), the number of clones previously made of the source database (e.g., clones), the SLA level of the source database (e.g., SLA), and the protection schedule (e.g., schedule). In other embodiments, other or additional details may be provided in the summary section 715.

[0109] The database protection system instance may also display within the body 410 a menu section 720 that provides options of operations that the user may perform on the source database. For example, the user may select a clone option 725A to create a new clone of the source database. The user may elect to manually capture transactional logs or snapshots by interacting with log catch up option 725B and snapshot option 725C, respectively. Similarly, the user may perform other operations by selecting another one of options 725D. Depending upon the options that the user is authorized to make, some of the options 725A-725D may be inactivated. Further, although specific options are shown in FIG. 7A, the number and types of options may vary from one embodiment to another. The database protection system instance may also display a calendar 730 visually representing the SLA associated with the source database. For example, the calendar 730 may include a color coded legend to represent the duration for the continuous, daily, weekly, monthly, and quarterly protection parameters for a selected number of months. For example, the calendar 730 of FIG. 7A shows five months (May-September) with dates highlighted based upon the protection parameter that applies to that date.

[0110] For example, by looking at the calendar 730, the user may quickly determine that August 20-September 19 fall under the continuous protection parameter, July 21-August 19 fall under the

daily protection parameter, and July 5, 12, and 19 are days when the weekly protection parameter applies. The calendar 730 may also show the dates when manual snapshots and/or transactional logs were captured of the source database (e.g., on June 7, July 13, August 19). Further, upon selecting a particular date, the user may view additional details of available snapshots and transactional logs for that date from which a clone may be created. For example, in FIG. 7A, August 21 is shown as selected. Thus, in a display portion 735, a time scale shows the available snapshots/transactional logs. Since August 21 falls under the continuous protection parameter, the user may select any time on the time scale to create a clone of the source database. If for example July 25 is selected by the user, the display portion 735 may highlight the time on the time scale at which the daily snapshot was captured (as identified from the protection schedule) and which the user may be able to select to create a clone from. Thus, the body 710 of the dashboard 700 provides a user friendly, visual, and intuitive interface for easily and quickly determining how the source database is protected and the level of protection that is available to that source database on any given day.

[0111] To clone the source database, the user may select the clone option 725A. Upon selecting the clone option 725A, the database protection system instance and particularly the clone management system of the source database initiates the cloning process. The cloning process may include three distinct operations: a time operation to identify whether the user desires to create the clone based on an available snapshot or to a point in time, a server operation to either create a new target database VM to house the clone of the source database or select a previously created target database VM, and a database operation to create the clone of the source database on the target database VM. Selecting the clone option 725A triggers the time operation by displaying a user interface 740 shown in FIG. 7B.

[0112] The user interface 740 solicits a clone name 740A, a date from a calendar 740B from which the clone is desired, and one of a point in time option 740C or snapshot option 740D. If the user desires to clone the source database to a point in time, the user may select the point in time option 740C and if the user desires to create the clone from an available snapshot, the user may select the snapshot option 740D. Upon providing the information requested in the user interface 740, the user may interact with (e.g., click on) a next button 740E, which opens user interface 745 of FIG. 7C. The dialog box 745 is shown for a point in time selection. Thus, the user interface 745 may solicit the exact time from which the clone is to be created. The user interface 745 may display the times that are available for the user to select for the point in time option. Specifically, the user interface 745 may display a time scale 745A, which may include an activated slot from which the user may pick a time and an inactivated slot that is unavailable to the user. For example, the time scale 745A shows an activated slot 745B and an inactivated slot 745C. The user may pick (e.g., by interacting with the time scale 745A or by entering the time in box 745D) a time from the activated slot 745B for creating the clone. For example, if the user selects 5:00 from the activated slot 745B, the corresponding clone management system is configured to create a clone based on the state of the source database at 5:00.

[0113] It is to be understood that the activated slot 745B corresponds to the protection parameter of the SLA and the protection schedule. For example, if the date that the user selected on the calendar 740B falls under the daily protection parameter and the protection schedule indicates that the daily snapshot is captured at 11:00AM, in some embodiments, the user may be able to only select 11:00AM for the clone. In other embodiments, the user may still be allowed to select times other than 11:00AM as well. However, since only a daily snapshot is available for that date, the clone may be based on the daily snapshot of 11:00AM.

[0114] If the user selects the snapshot option 740D in FIG. 7B, the user interface 745 may look somewhat different and may present options to allow the user to select one or more available snapshots to create a clone from. Upon selecting the point in time or the available snapshot, the user may interact with a next button 745E to display user interface 750 of FIG. 7D. The user interface 750 allows the user to either create a new target database VM 750A on the target database storage (e.g., the target database storage 655) or select an existing target database VM 750B. To create a new target database VM, the database protection system instance may solicit the target database VM name and one or more profiles (e.g., software profile, compute profile, network profile, database parameter profile), and any other desired or required information from the user. In some embodiments, one or more profiles may be same as that of the source database VM, while in other embodiments, the one or more profiles may vary from those of the source database VM. If the user selects the existing target database VM 750B, the user interface 750 may display a list of previously created target database VMs for the source database. In some embodiments, multiple target database VMs may be created for a particular source database. Upon providing the target database VM information, the user may interact with a next button 750C to display a user interface 755 of FIG. 7E.

[0115] In the user interface 755, the user may specify details of the cloned database. For example, the database protection system instance may solicit a name 755A of the cloned database, a password 755B if desired, and any other information that is desired or needed. Upon interacting with a clone button 755C, the database protection system instance creates the clone of the source database based upon the inputs received from the user in FIGS. 7A-7D. Interacting with the clone button 755C may display a user interface 760 of FIG. 7F, which shows the status of the clone. The database protection system instance may retrieve the snapshot(s) and/or the transactional logs and

create the clone therefrom. For the point in time option, the database protection system instance may use both snapshots and transactional logs to create the cloned database, while for the available snapshot option, the database protection system instance may use only the available snapshot. The database protection system instance may also create a new target database VM (if a new target database VM is selected by the user). Once the cloned database is created, the cloned database may be displayed within the dashboard 700. Thus, the dashboard 700 provides an easy and convenient mechanism to clone source databases.

[0116] Turning now to FIG. 8 and referring to FIG. 8 in conjunction with FIGS. 6 and 7A-7F, an example flowchart outlining operations of a process 800 is shown, in accordance with some embodiments of the present disclosure. The process 800 may include additional, other, or different operations depending upon the embodiment. The process 800 may be used to create a cloned database from a source database. The process 800 may be implemented by the clone management systems 635 of the database protection system instances 630. The process 800 starts at operation 805 with the database protection system instances 630 receiving a user request for creating a clone. As discussed in FIG. 7A, the user may request creation of a clone of a source database via the dashboard 700. Upon receiving the user request, the database protection system instances 630 corresponding to the source database being clones is activated. The activated one of the database protection system instances 630 receives selection from the user of creating the clone from either a point in time or from an available snapshot. If the user selects the point in time option, the process 800 proceeds to operation 810. At the operation 810, the activated one of the database protection system instances 630 presents user interface, via the dashboard 700, to the user to receive selection of a specific time at which the clone is to be created. The clone is created based on the state of the source database at that specific time. At operation 815, the activated one of the

database protection system instances 630 retrieves the snapshot corresponding to that specific time or the snapshot that is available closest to that specific time.

[0117] At operation 820, the activated one of the database protection system instances 630 retrieves any transactional logs that may be needed. For example, if the snapshot that is retrieved at the operation 815 is captured at the specific time selected by the user at the operation 810, then the source database may be cloned from the snapshot of the operation 815. However, if the snapshot of the operation 815 is created before or after the specific time selected by the user, then one or more transactional logs may exist between the time the snapshot is captured and the specific time. For example, if the specific time is 11:00 AM and the closest snapshot to 11:00 AM is from 10:00 AM, the database protection system instance 630 may determine if there are transactional logs available between 10:00 AM and 11:00 AM. The database protection system instance 630 may retrieve any transactional logs that may be available. If no transactional logs are available between 10:00 AM and 11:00 AM, the database protection system instance 630 may create the clone from the snapshot of 10:00 AM. Thus, at the operation 820, the activated one of the database protection system instances 630 determines if a transactional log is needed or exists, and retrieves those transactional log(s).

[0118] Additionally, at operation 825, the activated one of the database protection system instance 630 receives selection for a target database VM from the user. As indicated above, the user may either create a new target database VM or use an existing target database VM for storing the cloned database. If the activated one of the database protection system instances 630 receives selection for creating a new target database VM from the user, the database protection system instance may solicit information (e.g., name, profiles, etc.) from the user to create the target database VM. The target database VM may be associated with the target database storage. Alternatively, if the user

desires to use an existing target database VM, the activated one of the database protection system instance 630 may present a list of existing target database VMs created previously for the source database. The user may select one of the existing target database VMs from the list. At operation 830, the activated one of the database protection system instances 630 creates the cloned database from the snapshot of the operation 815 and any transactional logs of the operation 820. The database protection system instances 630 stores the cloned database, at operation 835, on the target database VM, and the process 800 ends at operation 840.

[0119] If at the operation 805, the user selects the option of creating a clone from an available snapshot, the process 800 proceeds to operation 845. At the operation 845, the activated one of the database protection system instances 630 solicits the user to select the snapshot from which the clone is to be created. Upon receiving the user's selection of the available snapshot, at operation 850, the activated one of the database protection system instance 630 retrieves that snapshot. Before, after, or along with retrieving the snapshot, at the operation 825, the database protection system instance 630 may either create a new target database VM or identify an existing target database VM to use. At the operations 830 and 835, the database protection system instance 630 creates the clone of the source database and stores the cloned database on the target database VM. Again, the process 800 ends at the operation 840.

[0120] Returning back to FIG. 6, the cloned databases 660 of the source databases 650 are created from snapshots and transactional logs. Thus, to be able to create the cloned databases 660, snapshots and transactional logs are needed of the source databases 650. The snapshots and transactional logs may be captured via the snapshot/log capturing systems 640. The snapshot/log capturing systems 640 may be configured with the protection schedule and the SLA that are defined by the user when the source databases 650 are created or registered with the database

system 600. The protection schedule defines, among other things, the frequency of capturing snapshots and transactional logs each day. Thus, based upon the protection schedule, the snapshot/log capturing systems 640 may instruct a data manager of the source databases 650 to capture snapshots and transactional logs automatically. As discussed above, an instance of a data manager may be associated with each source database that is created on the source database storage 645. For example, the source database 650A may be associated with a database manager 665A, the source database 650B may be associated with a data manager 665B, and the source database 650N may be associated with a database manager 665N. The database managers 665A-665N are collectively referred to herein as database managers 665. Although not shown, in some embodiments, the cloned databases 660 may each be associate with a database manager as well.

[0121] The database managers 665 are configured to capture the snapshots and the transactional logs upon instruction from the snapshot/log capturing systems 640. The database managers 665 may include an agent that captures the snapshots and the transactional logs based on the protection schedule received from the snapshot/log capturing systems 640. Thus, the database manager 665A may include an agent 670A, the database manager 665B may include an agent 670B, and the database manager 665N may include an agent 670N. The agents 670A-670N are collectively referred to herein as agents 670. Each of the agents 670 is an autonomous software program that is configured for performing one or more specific and approved operations. For example, each of the agents 670 may be configured to capture snapshots and transactional logs based upon the protection schedule, and store the captured snapshots and transactional logs in a repository associated therewith. The clone management systems 635 may retrieve the snapshots and transactional logs from the repositories when creating a clone of the source databases 650. For example, the agent 670A may be configured to store the captured snapshots and transactional logs

in a repository 675A that is configured for the source database 650A, the agent 670B may be configured to store the captured snapshots and transactional logs in a repository 675B that is configured for the source database 650B, and the agent 670N may be configured to store the captured snapshots and transactional logs in a repository 675N that is configured for the source database 650N. The repositories 675A-675N are collectively referred to herein as repositories 675.

[0122] For example, if the protection schedule specifies capturing 2 snapshot every day and capturing a transactional log every 2 hours for the source database 650A, the agent 670A may capture 2 snapshots of the source database 650A and a transactional log every 2 hours such that in a 24-hour period, the agent captures 2 snapshots and 12 transactional logs. Further, if the continuous protection parameter in the SLA specifies a continuous protection of 30 days, the agent 670A may be configured to save all snapshots and transactional logs captured in the previous 30 days (not including the current day). Thereafter, the agent 670A may purge (e.g., delete) some of the snapshots and transactional logs based upon the protection parameters defined in the SLA level. For example, if the SLA level specifies a daily protection parameter of 30 days after the duration of the continuous protection parameter expires, the agent 670A may be configured to delete all but one snapshot that were captured before the previous 30 days, as well as delete all the transaction logs captured before the previous 30 days. The snapshot that is saved as the daily snapshot may be the snapshot that is closest to the daily snapshot time specified in the protection schedule. For example, if the time specified in the protection schedule is 11:00 AM for the daily snapshot, the snapshot that is captured at 11:00AM or closest to 11:00 AM is saved and all other snapshots captured on that day are deleted. Thus, the agent 670A is configured to capture and manage snapshots and transactional logs.

[0123] Referring to FIGS. 9A-9G in conjunction with FIG. 6, an example flow diagram outlining operations of how an agent (e.g., the agents 670) of a database (e.g., the source databases 650) may capture, store, and purge snapshots and transactional logs based upon the protection schedule and protection parameters defined in the SLA level is shown, in accordance with some embodiments of the present disclosure. Simply for purposes of explanation, FIGS. 9A-9G show the flow for an SLA that requires a continuous protection of 7 days and a daily protection thereafter for 7 days. Thus, the SLA defines the continuous protection parameter as 7 days and the daily protection parameter as 7 days. Further, FIGS. 9A-9G are based on a protection schedule that specifies capturing 1 snapshot every day and 3 transactional logs every day. It is to be understood that the SLA definitions and the protection schedule above is only an example and not intended to be limiting in any way.

[0124] FIG. 9A shows the contents of a database 900 on a first day of the continuous 7 days. Since the protection schedule specifies capturing 1 snapshot every day, on the first day, the agent associated with the database 900 captures a snapshot 905. The time of the day at which the snapshot 905 is captured may either be defined in the protection schedule or may be pre-defined within the agent capturing the snapshot. Additionally, as shown in FIG. 9B, on the first day, the agent associated with the database 900 also captures 3 transactional logs (e.g., one transactional log every 8 hours) 910. On the second day, as shown in FIG. 9C, the agent associated with the database 900 captures another snapshot 915 and 3 transactional logs 920 shown in FIG. 9D. The agent associated with the database 900 continues to capture snapshots and transactional logs for 7 days to satisfy the continuous protection parameter and provide continuous protection for 7 days as defined in the SLA level. Thus, as shown in FIG. 9D, by the end of the seventh day, the agent associated with the database 900 has captured the snapshots 900, 915, snapshots 925A-925E, the

transactional logs 910, 920, and 930A-930E. On the eighth and following days, the agent associated with the database 900 continues to capture snapshots (e.g., snapshot 935) and 3 transactional logs 940 shown in FIG. 9E.

[0125] However, since the SLA requires 7 days of continuous protection, after the 7 days, the continuous protection is not required and the agent may purge some of the captured snapshots and transactional logs, again based on the definitions in the SLA. As indicated above, the SLA of FIGS. 9A-9G defines a daily protection parameter of 7 days for daily protection after the expiration of the 7 days of continuous protection. Thus, on the ninth day, the snapshot 905 captured on the first day is greater than 7 days old. Since only one snapshot is captured every day, the agent associated with the database 900 maintains the snapshot as the daily snapshot. If multiple snapshots are captured each day, the agent associated with the database 900 may delete all snapshots except one. Further, since the daily protection parameter provides guarantee of a daily snapshot, the agent may delete all of the transactional logs that were captured that day. Therefore, as shown in FIGS. 9E and 9F, on the ninth day, the snapshot 905 may continue to be stored as the daily snapshot but the transactional logs 910 may be deleted. Further, on the ninth day, the agent associated with the database 900 captures another snapshot 945 to continue to provide a continuous protection for the past 7 days.

[0126] Similarly, on each day, from days 10-14, the agent associated with the database 900 continues to delete the transactional logs that are older than 7 days, and capture a new snapshot and 3 transactional logs (e.g., snapshots 950A-950E and transactional logs 955A-955E shown in FIG. 9G). Thus, the agent associated with the database 900 continues to capture snapshots and transactional logs based upon the SLA level and the protection schedule, and deletes some of the snapshots and transactional logs that are no longer required to satisfy the SLA level.

[0127] Snapshots of a source database may be captured by creating a snapshot of the source database VM and a snapshot of the source database itself. Specifically, a snapshot may be an image/copy of the location of the storage files associated with the virtual disks of the source database and an image/copy of the location of the configuration files associated with the source database VM. The virtual disk(s) on which the source database is stored may be composed of or divided into one or more memory blocks. The snapshot/log capturing systems 640 may capture images or copies of the memory blocks for capturing snapshots. A copy of the memory blocks may be made by identifying the memory pointer (e.g., location) assigned to each memory block and copying the memory pointer to a repository (e.g., the repositories 675). During a first snapshot of the memory blocks, the contents of all the memory blocks may be copied to the repositories 675. After the first snapshot is captured, transactional logs may be captured based upon the protection schedule to record all transactions or changes in the source database after the capture of the first snapshot. Capturing a transactional log may be referred to herein as a log catch up operation.

[0128] For example, say the protection schedule defines capturing 2 snapshots each day and 2 transactional logs between the 2 snapshot captures. If the source database includes 1000 memory blocks, the first snapshot creates copies of all the 1000 memory blocks. Capturing a snapshot involves pausing the source database such that no user operations are performed while the source database is being snapshotted, creating copies of the memory blocks (and other information such as the configuration file of the source database VM, etc.), and unpausing the source database. Since snapshots temporarily halt operation of the source database, taking frequent snapshots of the source database is not practical or desirable. However, to accurately capture the state of the source database in between two snapshot captures and allow creation of cloned databases to satisfy the

SLA (e.g., the continuous protection parameter), transactional logs may be captured between two snapshot captures. The frequency of capturing transactional logs may be higher than the frequency of capturing the snapshots. Thus, for example and continuing the example above, if after capturing the first snapshot, 4 out of the 1000 memory blocks of the source database have changed (e.g., due to data being updated, new data being added, etc.), the agents 670 create a first transactional log based upon the protection schedule. The first transactional log may reflect that the 4 blocks have changed since the last snapshot capture. Specifically, the first transactional log may include memory pointers to the 4 memory blocks that have changed. Thus, instead of copying all of the 1000 memory blocks, the first transactional log only copies the changes since the last snapshot capture, thereby saving space and time. Similarly, based upon the protection schedule, the agents 670 may capture a second transactional log after the first transactional log. The second transactional log may determine which memory blocks have changes since the first snapshot capture.

[0129] For example, if the agents 670 determine that 6 memory blocks have changed since the first snapshot capture, the second transactional log may include memory pointers back to the first snapshot indicating which 6 of the memory blocks have changed. The 6 memory blocks that changed at the time of capturing the second transactional log may or may not include the 4 memory blocks that changed at the time of capturing the first transactional log. Thus, each transactional log that is captured identifies the memory blocks that have changed since the previous snapshot capture and include memory pointers to those changed memory blocks. When the source database is cloned, say to a state when the second transactional log is captured, the associated one of the clone management systems 635 may recreate the source database from the first snapshot and the second transactional log. Specifically, the associated one of the clone management systems 635

may determine (e.g., from the memory pointers in the second transactional log) which particular memory blocks have changed from the first snapshot. In the example above, the second transactional log includes memory pointers of the 6 memory blocks that have changed since the first snapshot capture. Thus, the agents 670 may create the cloned based on the 994 memory blocks from the first snapshot that have not changed plus the 6 memory blocks in the second transactional log that have changed. Thus, the cloned database reflects an accurate state of the source database at the time of the second transactional log capture.

[0130] Further, and continuing with the example above of capturing 2 snapshots and 2 transactional logs each day, the agents 670 may capture a second snapshot based upon the protection schedule. In some embodiments, the second snapshot may be a copy of all the memory blocks (e.g., all 1000 memory blocks in the example above) again and transactional logs that are captured after the second snapshot may identify changes in the memory blocks relative to the second snapshot. Thus, any changes made between the capture of the first snapshot and the capture of the second snapshot are reflected in the second snapshot. In other embodiments, the second snapshot may also be an incremental snapshot that reflects only which memory blocks have changed since the first snapshot capture. Thus, the second snapshot in such cases may take less time to create, as well as less space to store. The subsequent transactional logs may continue to make pointers to the first snapshot to reflect the memory blocks that change.

[0131] Advantageously, the snapshot and transactional log capturing efficiently only copies changes in the memory blocks. Furthermore, all transactions are recorded using transaction logs such that when a clone is created, the source database may be recovered based on both the snapshots and the transaction logs to any desired state. Further, since capturing a transactional log does not require pausing the source database, the transactional logs may be captured in background

while the source database is operating, and the transactional logs may be captured at a greater frequency than the snapshots. To capture a transactional log, the agents 670 maintain a small staging disk. The staging disk may be part of the repositories 675 or may be separately provisioned from those repositories. The staging disk may be dedicated or shared amongst the various source databases 650 and may be used to temporarily store the transactional logs. The agents 670 may sweep (e.g., collects) the transactional logs from the source database to the staging disk based upon the protection schedule. From the staging disk, the agents 670 may start the log catch up operation to move the transactional logs from the staging disk to the repositories 675. Thus, based upon a combination of snapshots and transactional logs, the state of the source database may be effectively and accurately replicated. While the snapshots and transactional logs may be automatically captured based upon the protection schedule, in some embodiments, the database engine 605 may allow the users to manually capture snapshots and transactional logs. Such an operation may be particularly useful if the user desires a state that falls between the capture of two snapshots and transactional logs.

[0132] Referring still to FIG. 6, the database storage system 620 may also include an external database manager 680. The source databases 650 that are created within the database system 600 are already configured to be snapshotted. However, databases that were created outside of the database system 600 and registered with the database system may not have been configured to be snapshotted. Thus, such databases need to be reconfigured to be able be snapshotted and protected by the database system 600. The reconfiguration may be part of the registration process or performed after those databases have been registered. To reconfigure the externally created databases, a process 1000 of FIG. 10 may be used. Referring to FIG. 10 in conjunction with FIG. 6, a flowchart outlining the operations of the process 100 is shown, in accordance with some

embodiments of the present disclosure. The process 1000 may include other, additional, or fewer operations depending upon the particular embodiment. The process 1000 may be implemented by the database engine 605.

[0133] The process 1000 starts at operation 1005 and at operation 1010, a complete back up of the external database is made by the external database manager 680. The complete backup includes a complete copy of the external database. In other words, the actual data of the database is copied when creating a back-up. Knowledge about the structure of the underlying storage (e.g., the virtual disks) of a database is not needed when a back-up is created. In contrast, snapshotting requires knowledge of the underlying storage (e.g., virtual disks) since no actual copy of the data is made. Rather, when a snapshot is captured, a copy of the location of the virtual disk where the data is stored is made. Thus, to configure the external database for capturing snapshots and transactional logs, the external database is backed up to a storage disk (e.g., virtual disk), the structure of which is known to the database engine 605. The back-up copy may be considered the source database for purposes of protection and may be part of the source database storage 645. Further, an instance of a database manager may be associated with the back-up copy to create clones from the back-up copy.

[0134] In some embodiments, the operation 1010 may be performed as part of the registration process when the external database is registered with the database system 600. In other embodiments, the operation 1010 may be performed after the registration process. Since the back-up of the external database is to a known structure of the storage disk, snapshots and transactional logs may be created from the back-up copy. Thus, at operation 1015, snapshots and transactional logs may be captured of the external database from the back-up copy. The process of capturing snapshots and transactional logs from the back-up copy is the same as that of a database created

internally within the database system 600. The snapshots and transactional logs may be stored within the repositories 675 and clones may be created from those snapshots or a combination of snapshots and transactional logs.

[0135] Thus, at operation 1020, upon receiving a user request to create a clone of the external database, the database manager associated with the back-up copy of the external database may create a cloned database from the back-up copy. The clone creation process is same as discussed above. The cloned database may be stored within the target database storage 655. In some embodiments, the user may desire to store the external database outside of the database system 600 or on a system that is not compatible with the database system. Thus, at operation 1025, a user may request storing the cloned database to an external location. The database engine 605 and particularly the external database manager 680 may reconfigure the cloned database to a form that is compatible with the external location and at operation 1030, send the reconfigured database to the external location. The database engine 605 may continue to make snapshots and transactional logs of the back-up copy of the operation 1010 based upon the SLA and protection schedule defined for the external database during the registration process. When the user request of the operation 1020 is received, the database engine 605 may create the clone of the external database, reconfigure the cloned database, and send it to the external location. The process 1000 ends at operation 1035.

[0136] Thus, the database system of the present disclosure is a versatile system for creating and managing databases. A variety of operations may be performed on the databases associated with the database system using a user friendly and intuitive user interface.

[0137] It is to be understood that any examples used herein are simply for purposes of explanation and are not intended to be limiting in any way. It is also to be understood that any examples used

herein are simply for purposes of explanation and are not intended to be limiting in any way. Further, although the present disclosure has been discussed with respect to memory usage, in other embodiments, the teachings of the present disclosure may be applied to adjust other resources, such as power, processing capacity, etc.

[0138] The herein described subject matter sometimes illustrates different components contained within, or connected with, different other components. It is to be understood that such depicted architectures are merely exemplary, and that in fact many other architectures can be implemented which achieve the same functionality. In a conceptual sense, any arrangement of components to achieve the same functionality is effectively "associated" such that the desired functionality is achieved. Hence, any two components herein combined to achieve a particular functionality can be seen as "associated with" each other such that the desired functionality is achieved, irrespective of architectures or intermedial components. Likewise, any two components so associated can also be viewed as being "operably connected," or "operably coupled," to each other to achieve the desired functionality, and any two components capable of being so associated can also be viewed as being "operably couplable," to each other to achieve the desired functionality. Specific examples of operably couplable include but are not limited to physically mateable and/or physically interacting components and/or wirelessly interactable and/or wirelessly interacting components and/or logically interacting and/or logically interactable components.

[0139] With respect to the use of substantially any plural and/or singular terms herein, those having skill in the art can translate from the plural to the singular and/or from the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity.

[0140] It will be understood by those within the art that, in general, terms used herein, and especially in the appended claims (e.g., bodies of the appended claims) are generally intended as "open" terms (e.g., the term "including" should be interpreted as "including but not limited to," the term "having" should be interpreted as "having at least," the term "includes" should be interpreted as "includes but is not limited to," etc.). It will be further understood by those within the art that if a specific number of an introduced claim recitation is intended, such an intent will be explicitly recited in the claim, and in the absence of such recitation no such intent is present. For example, as an aid to understanding, the following appended claims may contain usage of the introductory phrases "at least one" and "one or more" to introduce claim recitations. However, the use of such phrases should not be construed to imply that the introduction of a claim recitation by the indefinite articles "a" or "an" limits any particular claim containing such introduced claim recitation to inventions containing only one such recitation, even when the same claim includes the introductory phrases "one or more" or "at least one" and indefinite articles such as "a" or "an" (e.g., "a" and/or "an" should typically be interpreted to mean "at least one" or "one or more"); the same holds true for the use of definite articles used to introduce claim recitations. In addition, even if a specific number of an introduced claim recitation is explicitly recited, those skilled in the art will recognize that such recitation should typically be interpreted to mean at least the recited number (e.g., the bare recitation of "two recitations," without other modifiers, typically means at least two recitations, or two or more recitations). Furthermore, in those instances where a convention analogous to "at least one of A, B, and C, etc." is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., "a system having at least one of A, B, and C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.).

In those instances where a convention analogous to "at least one of A, B, or C, etc." is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., "a system having at least one of A, B, or C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). It will be further understood by those within the art that virtually any disjunctive word and/or phrase presenting two or more alternative terms, whether in the description, claims, or drawings, should be understood to contemplate the possibilities of including one of the terms, either of the terms, or both terms. For example, the phrase "A or B" will be understood to include the possibilities of "A" or "B" or "A and B." Further, unless otherwise noted, the use of the words “approximate,” “about,” “around,” “substantially,” etc., mean plus or minus ten percent.

[0141] The foregoing description of illustrative embodiments has been presented for purposes of illustration and of description. It is not intended to be exhaustive or limiting with respect to the precise form disclosed, and modifications and variations are possible in light of the above teachings or may be acquired from practice of the disclosed embodiments. It is intended that the scope of the invention be defined by the claims appended hereto and their equivalents.

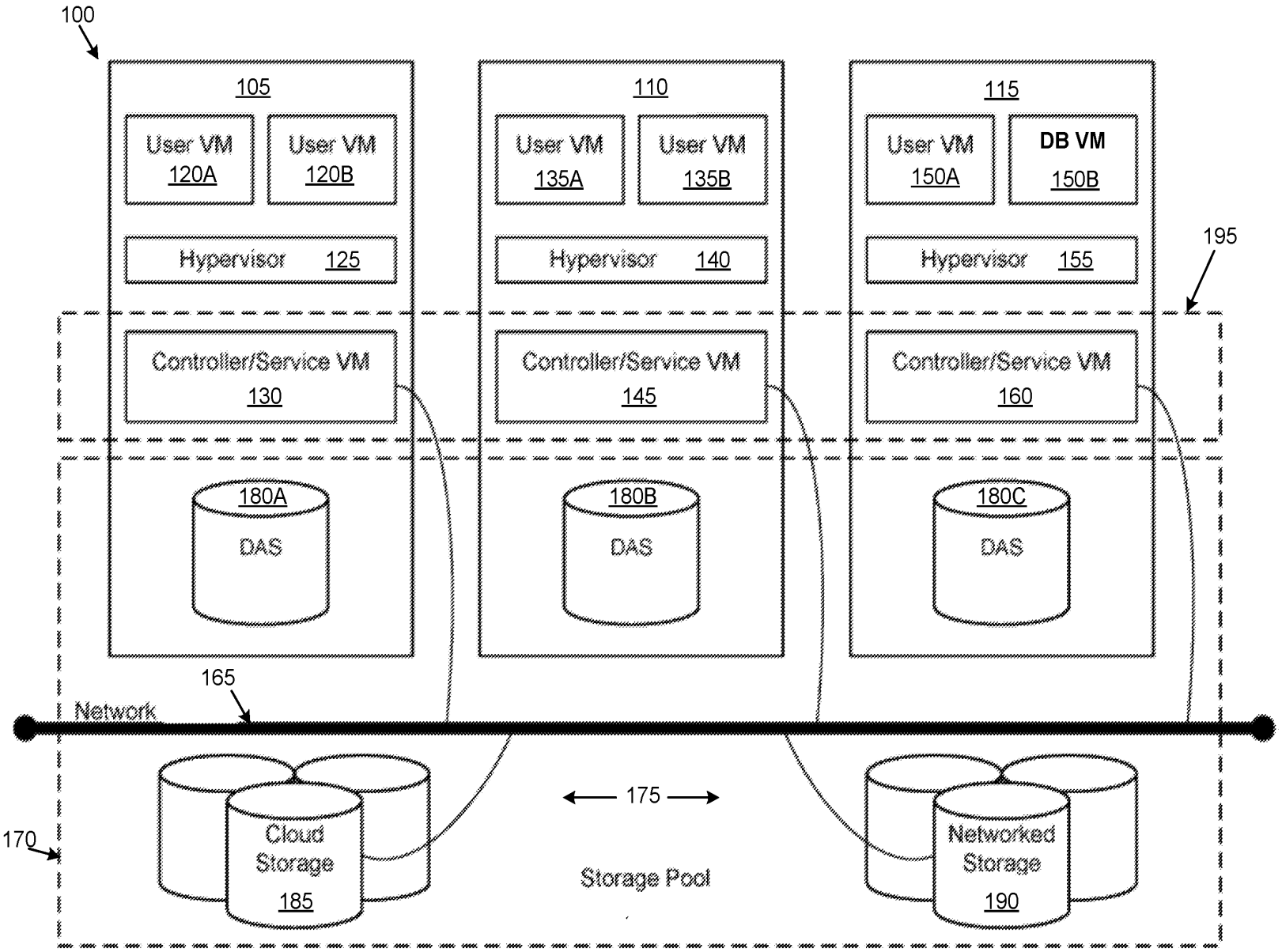
100
105
User VM
120A
User VM
120B
Hypervisor 125
110
User VM
135A
User VM
135B
Hypervisor 140
115
User VM
150A
DB VM
150B
Hypervisor 155
195
Controller/Service VM
130
Controller/Service VM
145
Controller/Service VM
160
180A
DAS
180B
DAS
180C
DAS
165
Network
175
170
Cloud
Storage
185
Storage Pool
Networked
Storage
190

FIG. 1

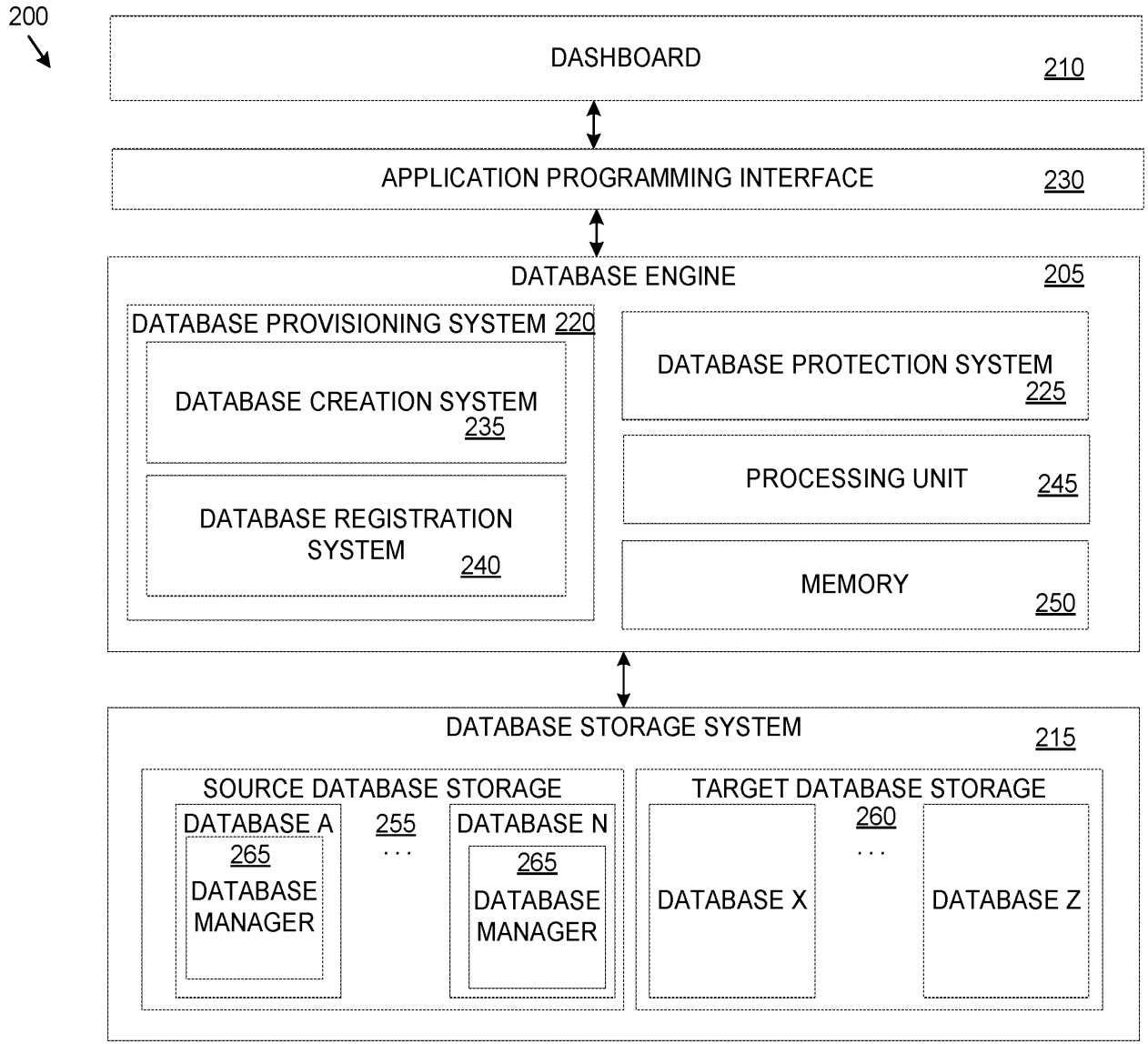
200
DASHBOARD
210
APPLICATION PROGRAMMING INTERFACE
230
DATABASE ENGINE
205
DATABASE PROVISIONING SYSTEM 220
DATABASE CREATION SYSTEM
235
DATABASE REGISTRATION SYSTEM
240
DATABASE PROTECTION SYSTEM
225
PROCESSING UNIT
245
MEMORY
250
DATABASE STORAGE SYSTEM
215
SOURCE DATABASE STORAGE
DATABASE A
265
DATABASE MANAGER
255
DATABASE N
265
DATABASE MANAGER
TARGET DATABASE STORAGE
260
DATABASE X
DATABASE Z

FIG. 2

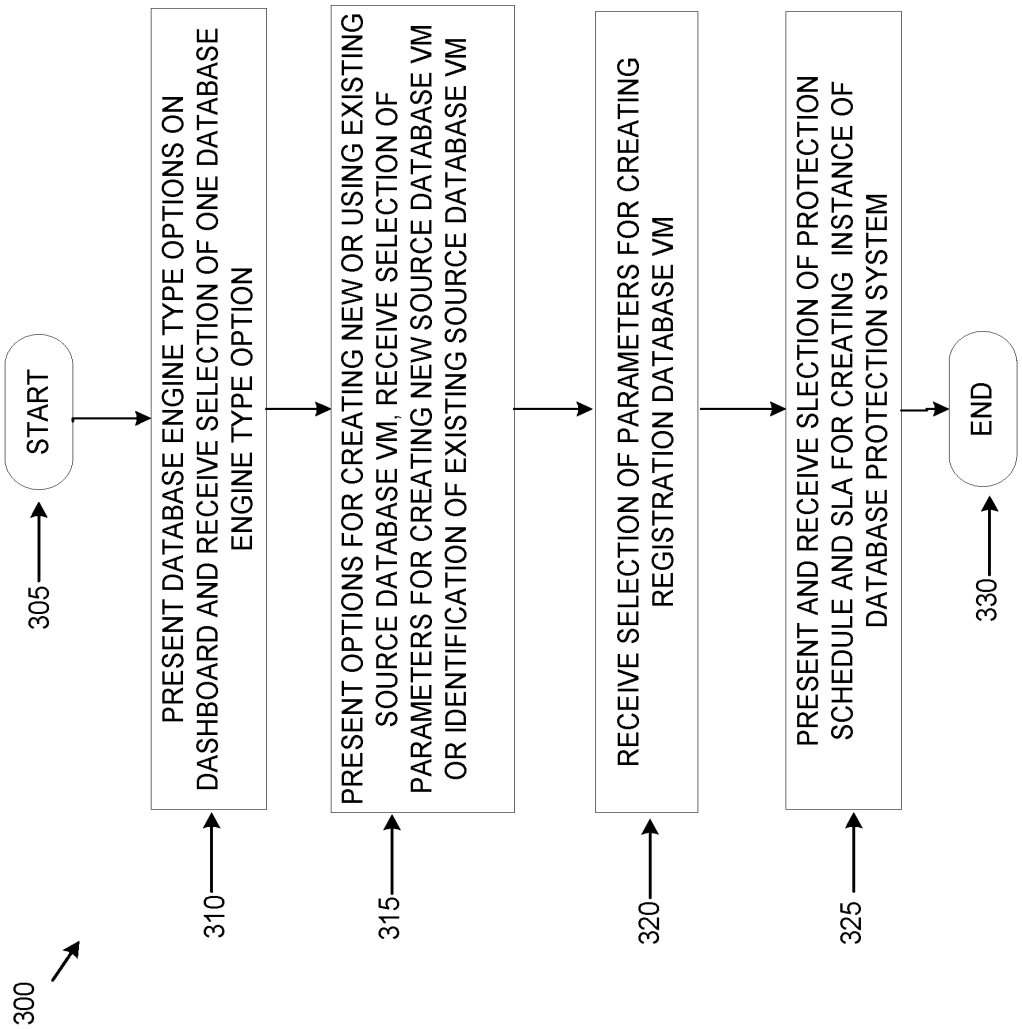
300
305
START
310
PRESENT DATABASE ENGINE TYPE OPTIONS ON DASHBOARD AND RECEIVE SELECTION OF ONE DATABASE ENGINE TYPE OPTION
315
PRESENT OPTIONS FOR CREATING NEW OR USING EXISTING SOURCE DATABASE VM, RECEIVE SELECTION OF PARAMETERS FOR CREATING NEW SOURCE DATABASE VM OR IDENTIFICATION OF EXISTING SOURCE DATABASE VM
320
RECEIVE SELECTION OF PARAMETERS FOR CREATING REGISTRATION DATABASE VM
325
PRESENT AND RECEIVE SLECTION OF PROTECTION SCHEDULE AND SLA FOR CREATING INSTANCE OF DATABASE PROTECTION SYSTEM
330
END

FIG. 3

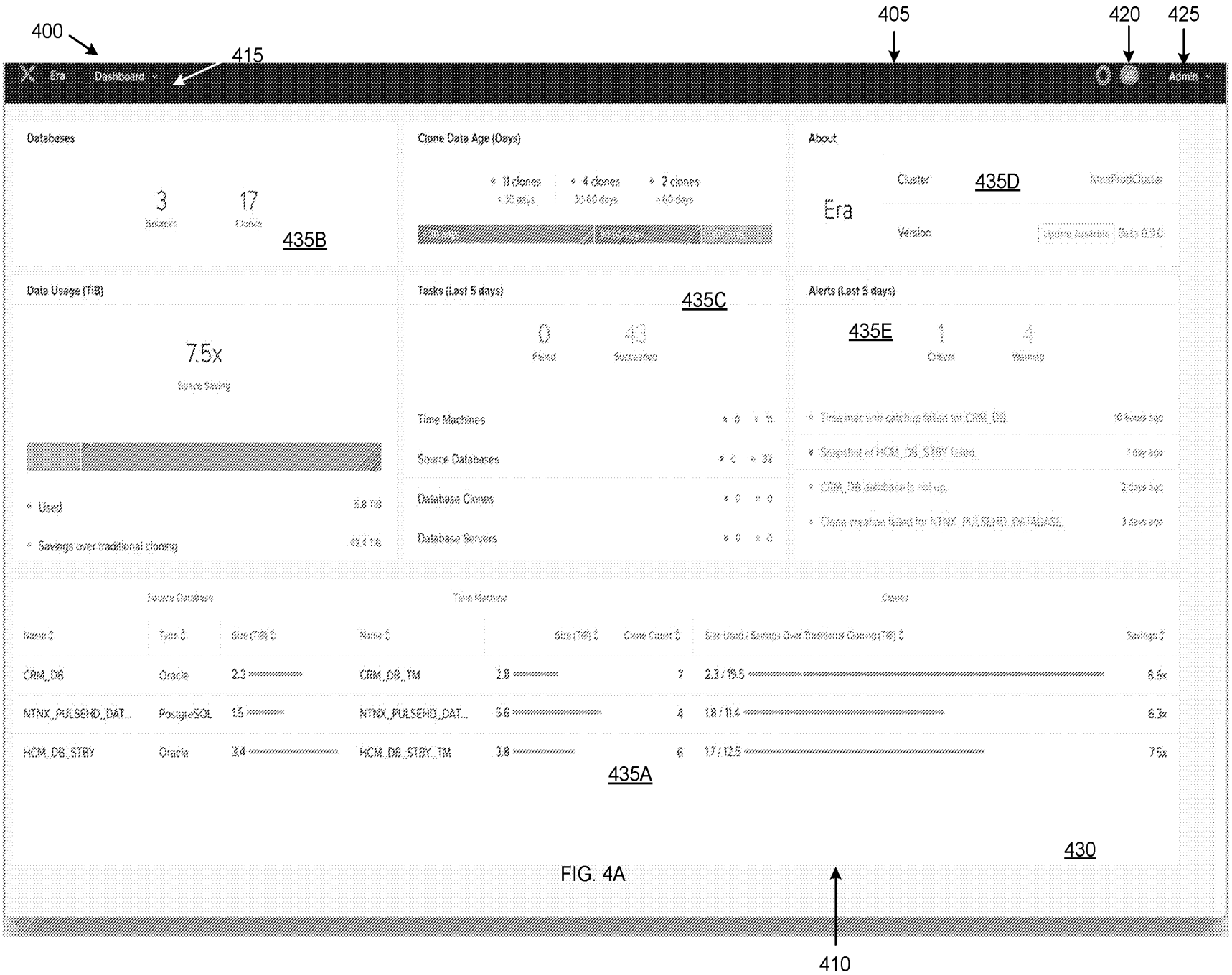
400
415
405
420
425
Era
Dashboard
Admin
Databases
3
17
435B
Clone Data Age (Days)
11 clones
4 clones
2 clones
About
Era
Cluster
435D
Version
Data Usage (TiB)
7.5x
Space Saving
Used
Savings over traditional cloning
Tasks (Last 5 days)
435C
0
43
Failed
Succeeded
Time Machines
Source Databases
Database Clones
Database Servers
Alerts (Last 5 days)
435E
1
4
Critical
Warning
Source Database
Time Machine
Clones
Name
Type
Size (TiB)
Clone Count
Size Used / Savings Over Traditional Cloning (TiB)
Savings
CRM_DB
Oracle
2.3
CRM_DB_TM
2.8
7
2.3 / 19.5
8.5x
NTNX_PULSEHD_DAT...
PostgreSQL
1.5
NTNX_PULSEHD_DAT...
5.6
4
1.8 / 11.4
6.3x
HCM_DB_STBY
Oracle
3.4
HCM_DB_STBY_TM
3.8
6
1.7 / 12.5
7.5x
435A
430
410

FIG. 4A

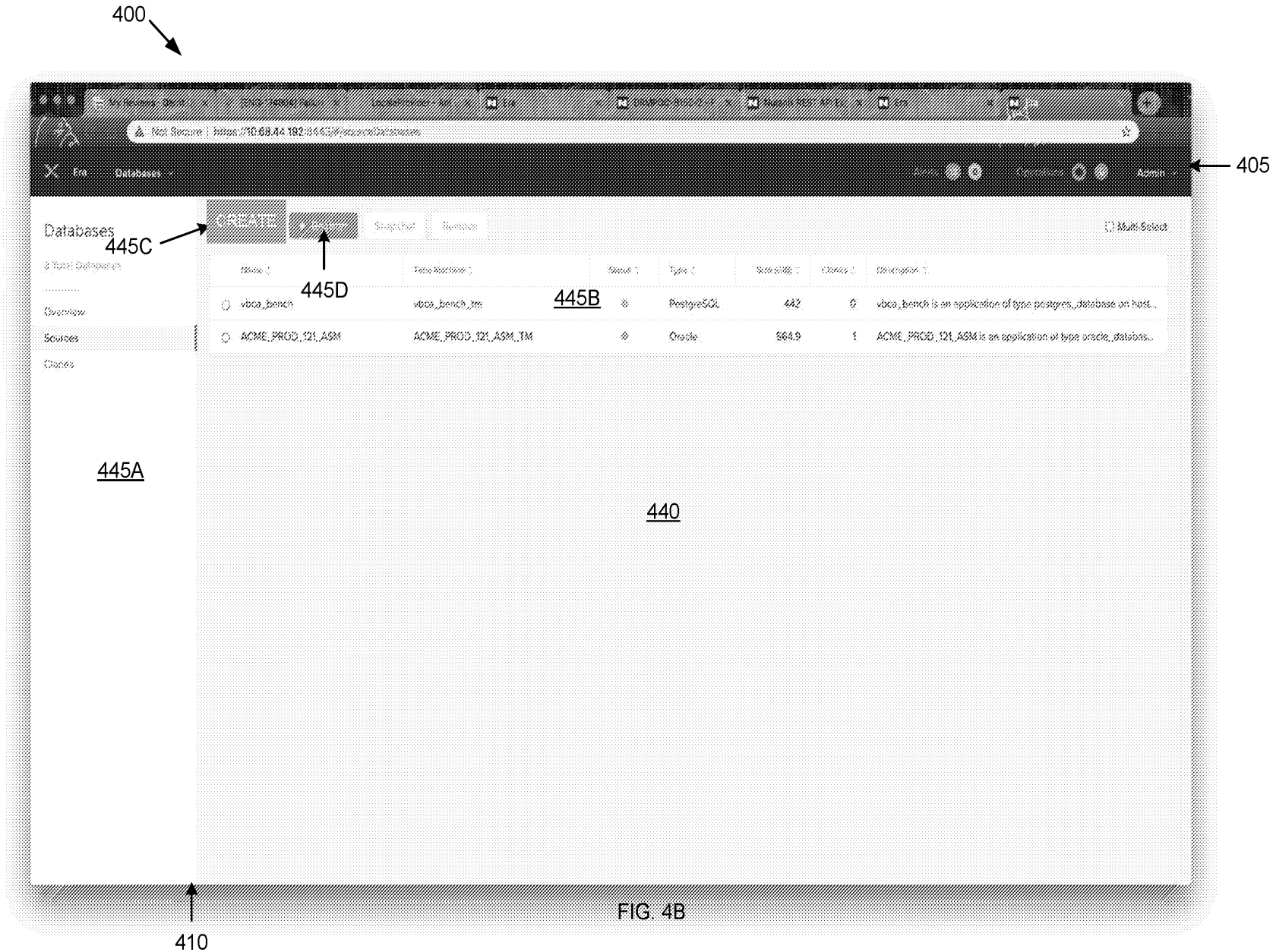

FIG. 4B

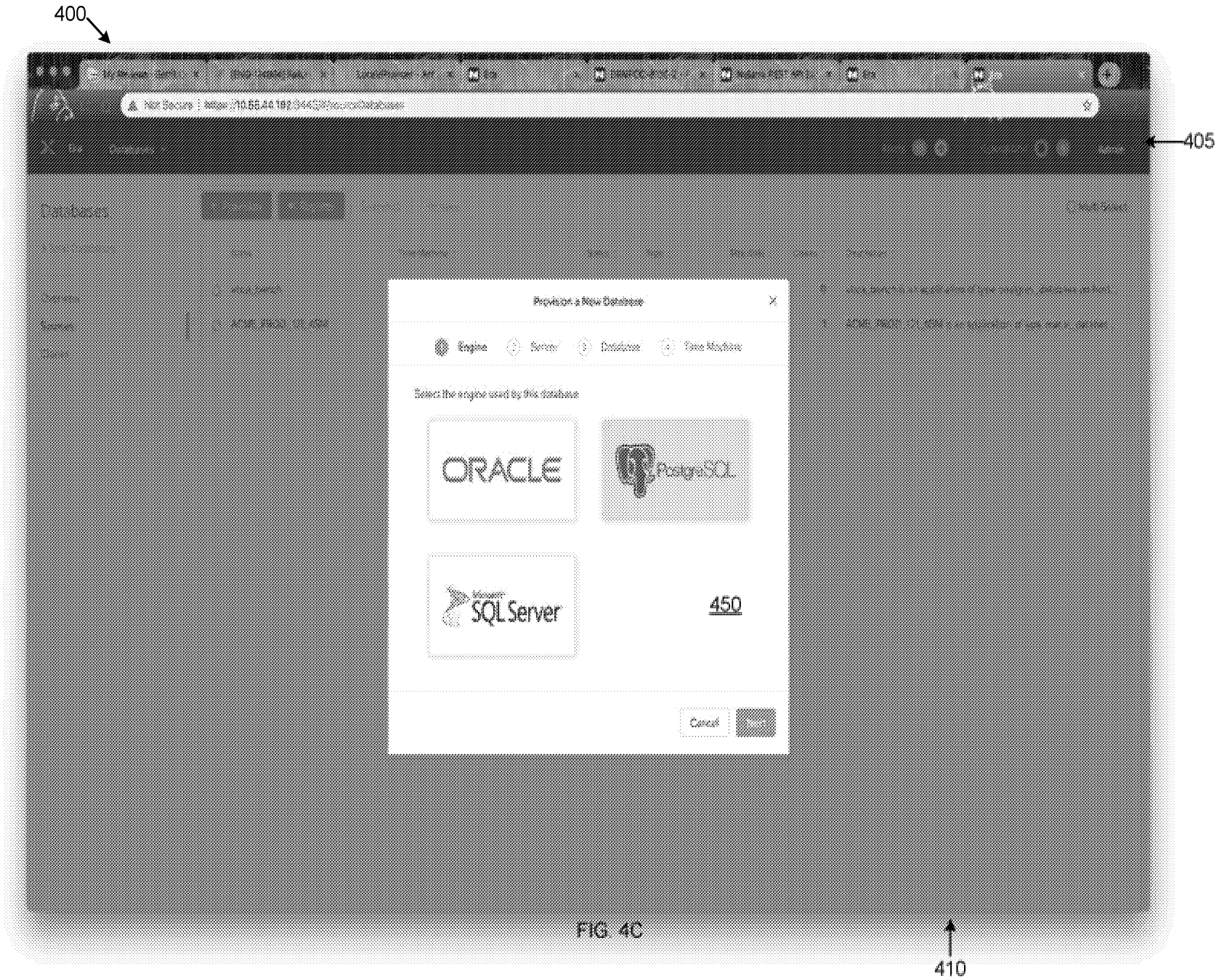
400
405
Provision a New Database
Engine
Server
Database
Time Machine
Select the engine used by this database
ORACLE
PostgreSQL
SQL Server
450
Cancel
410

FIG. 4C

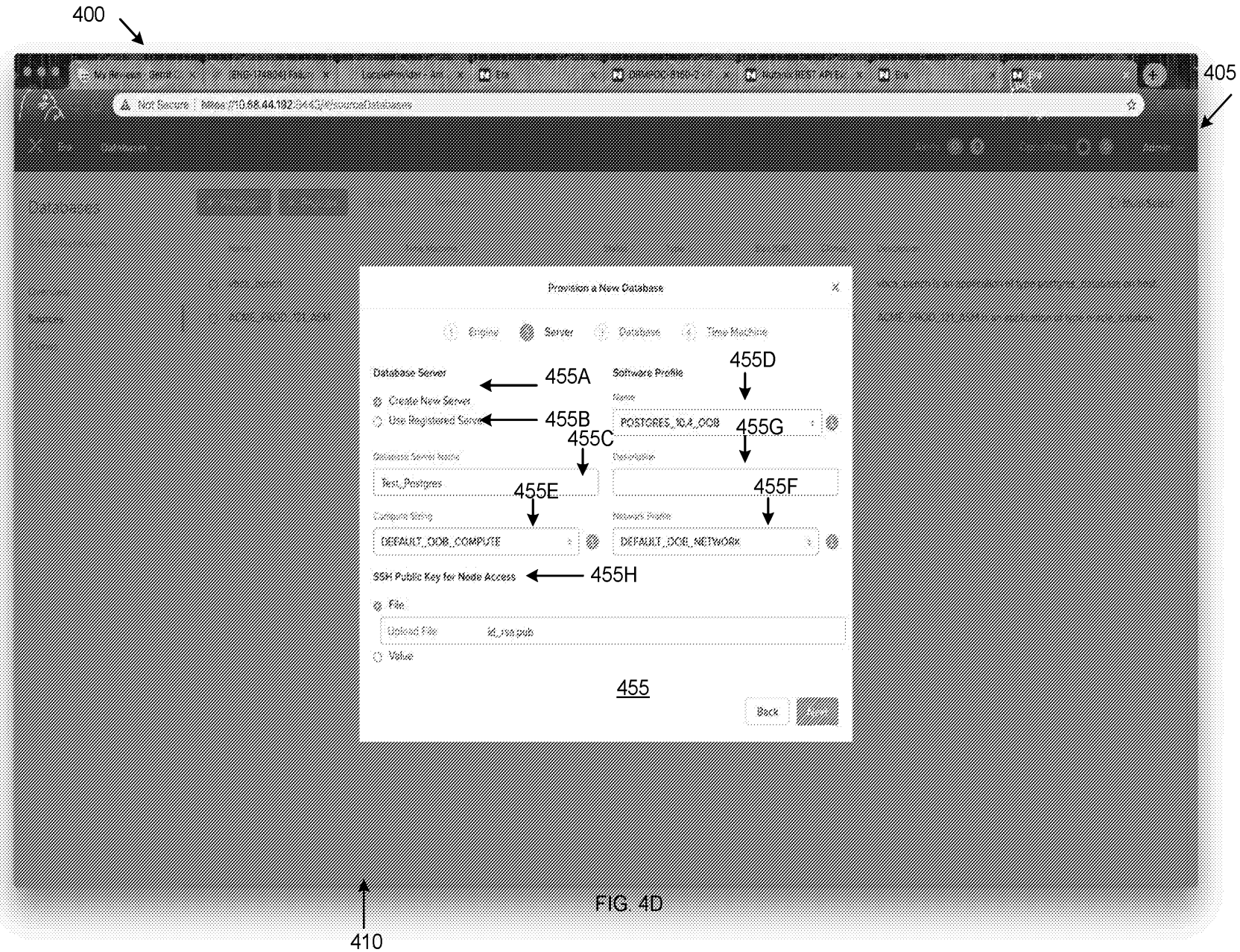
400
405
410
Provision a New Database
Engine
Server
Database
Time Machine
Database Server
455A
Create New Server
Use Registered Server
455B
455C
Test_Postgres
455E
DEFAULT_OOB_COMPUTE
Software Profile
455D
POSTGRES_10.4_OOB
455G
455F
DEFAULT_OOB_NETWORK
SSH Public Key for Node Access
455H
File
Upload File
id_rsa.pub
Value
455
Back

FIG. 4D

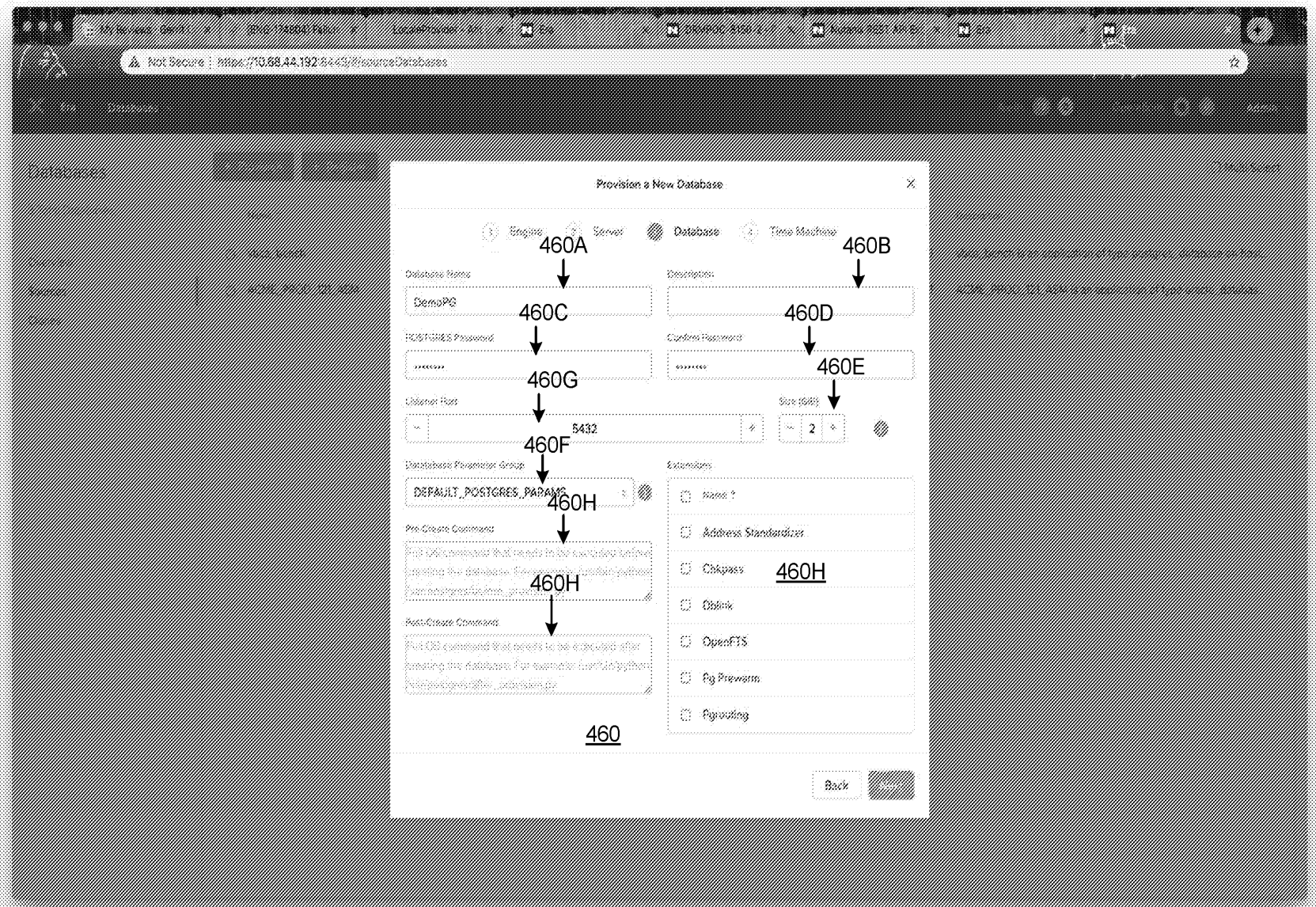
Provision a New Database
Engine
Server
Database
Time Machine
460A
460B
Database Name
Description
DemoPG
460C
460D
HOSTUSER Password
Confirm Password
460E
460G
Listener Port
Size (GiB)
5432
2
460F
Database Parameter Group
Extensions
DEFAULT_POSTGRES_PARAMS
460H
Name ?
Pre-Create Command
Address Standardizer
Chkpass
460H
460H
Dblink
Post-Create Command
OpenFTS
Pg Prewarm
Pgrouting
460
Back

FIG. 4E

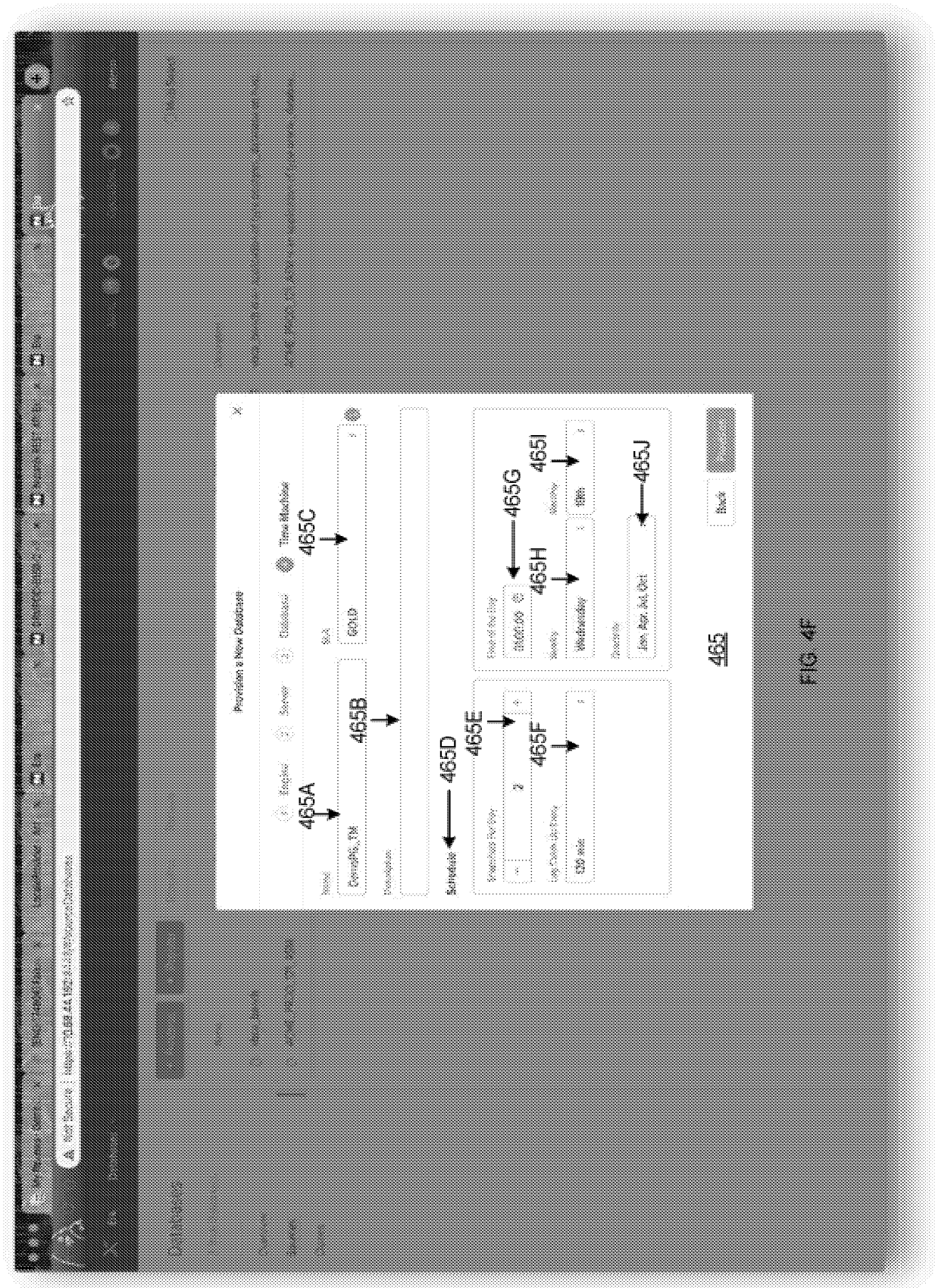
Provision a New Database
465A
465B
465C
465D
465E
465F
465G
465H
465I
465J
465

FIG. 4F

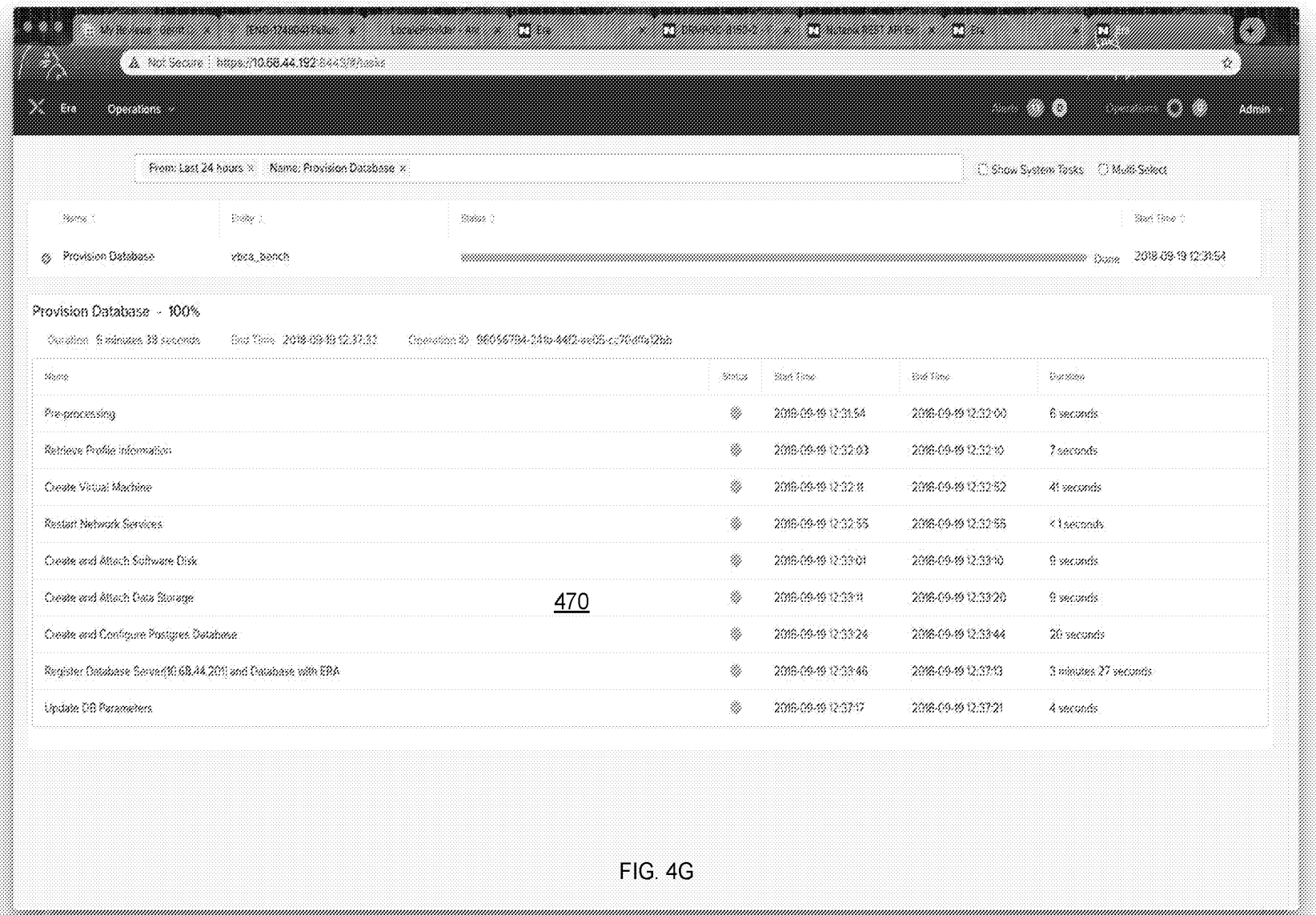
Era
Operations
Admin
From: Last 24 hours
Name: Provision Database
Show System Tasks
Multi Select
Provision Database
xbca_bench
Done
2018-09-19 12:31:54
Provision Database - 100%
Pre-processing
2018-09-19 12:31:54
2018-09-19 12:32:00
6 seconds
Retrieve Profile Information
2018-09-19 12:32:03
2018-09-19 12:32:10
7 seconds
Create Virtual Machine
2018-09-19 12:32:11
2018-09-19 12:32:52
41 seconds
Restart Network Services
2018-09-19 12:32:55
2018-09-19 12:32:55
< 1 seconds
Create and Attach Software Disk
2018-09-19 12:33:01
2018-09-19 12:33:10
9 seconds
Create and Attach Data Storage
2018-09-19 12:33:11
2018-09-19 12:33:20
9 seconds
Create and Configure Postgres Database
2018-09-19 12:33:24
2018-09-19 12:33:44
20 seconds
Register Database Server(10.68.44.201) and Database with EPA
2018-09-19 12:33:46
2018-09-19 12:37:13
3 minutes 27 seconds
Update DB Parameters
2018-09-19 12:37:17
2018-09-19 12:37:21
4 seconds
470

FIG. 4G

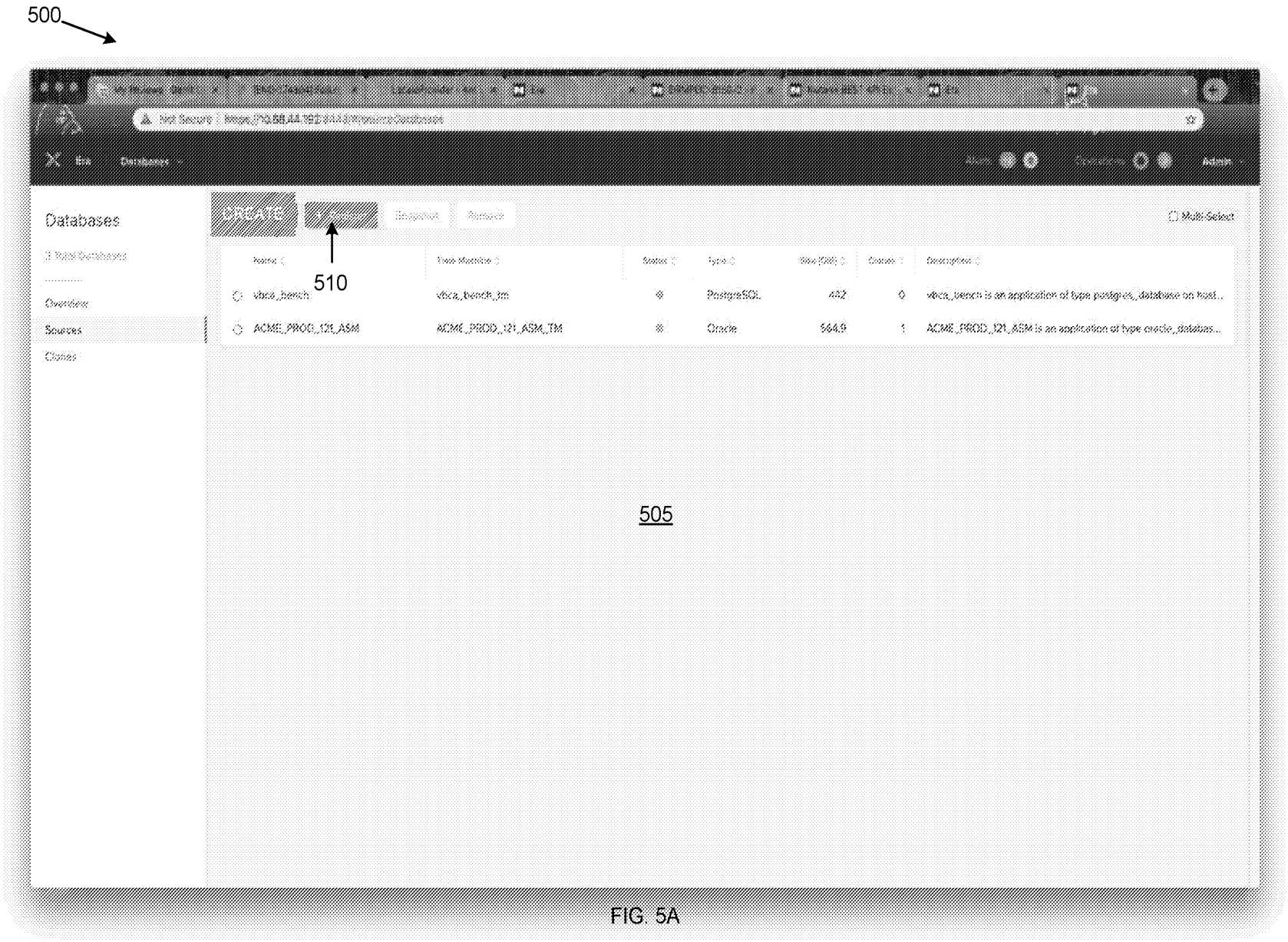
500
Databases
CREATE
510
Multi-Select
Overview
Sources
Clones
vbca_bench
vbca_bench_jm
PostgreSQL
482
0
vbca_bench is an application of type postgres_database on host...
ACME_PROD_121_ASM
ACME_PROD_121_ASM_TM
Oracle
564.9
1
ACME_PROD_121_ASM is an application of type oracle_databa...
505

FIG. 5A

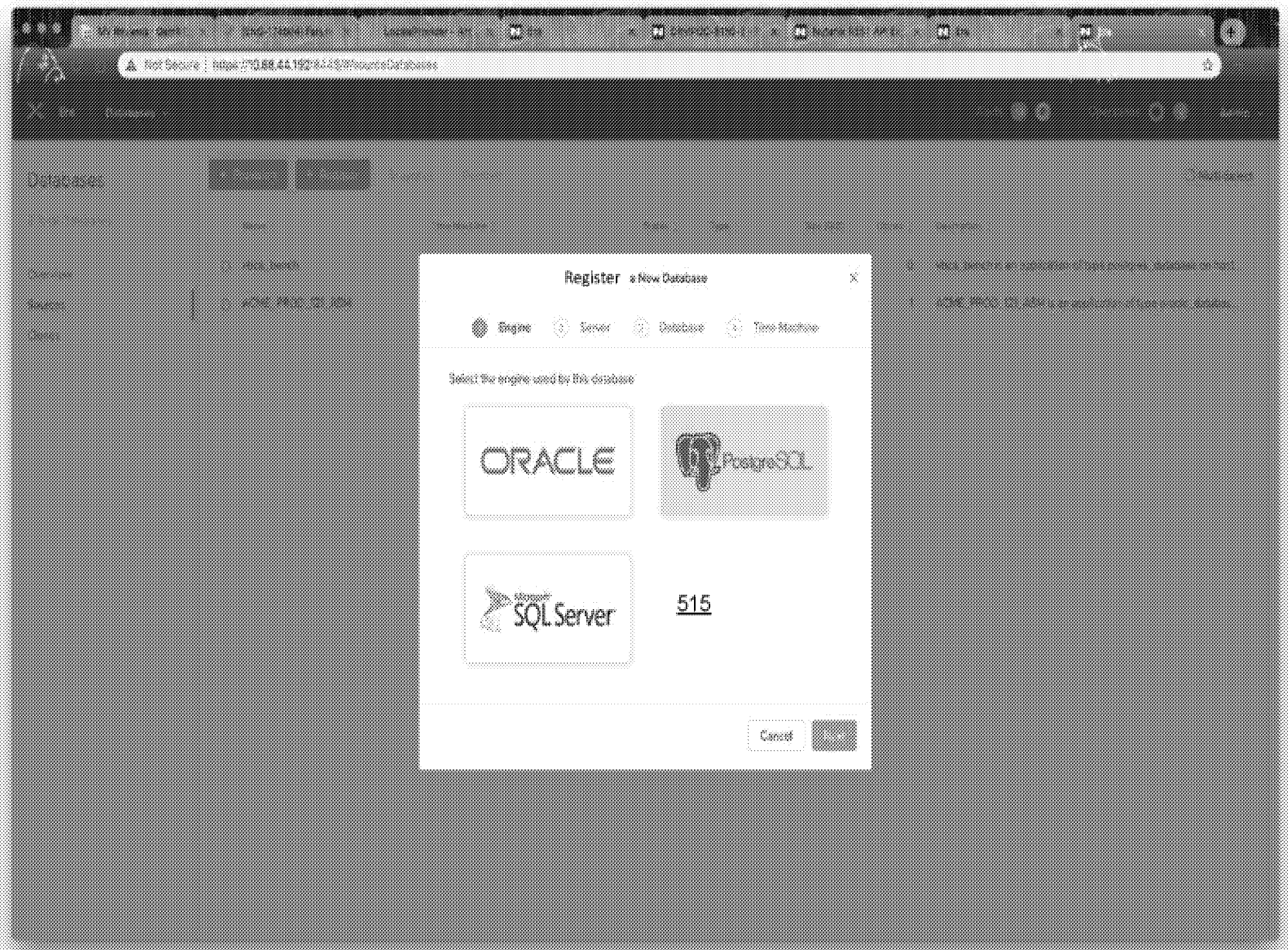
Register a New Database
Engine
Server
Database
Time Machine
Select the engine used by this database
ORACLE
PostgreSQL
SQL Server
515
Cancel

FIG. 5B

Register a Source Database

1 Engine 2 Server 3 Database 4 Time Machine

Database Server

520

Already Registered, Choose Existing

Register New

IP Address or Name of VM

10.19.16.187

Don't see your VM? Click here to refresh.

Oracle Home

oracle_base/product/11.2.0/dbhome_1

Grid Home

/u01/app/12.1.0/grid

Era Drive User (with sudo access)

user1

Provide Credentials By

Password

User Password

****

Back Next

FIG. 5C

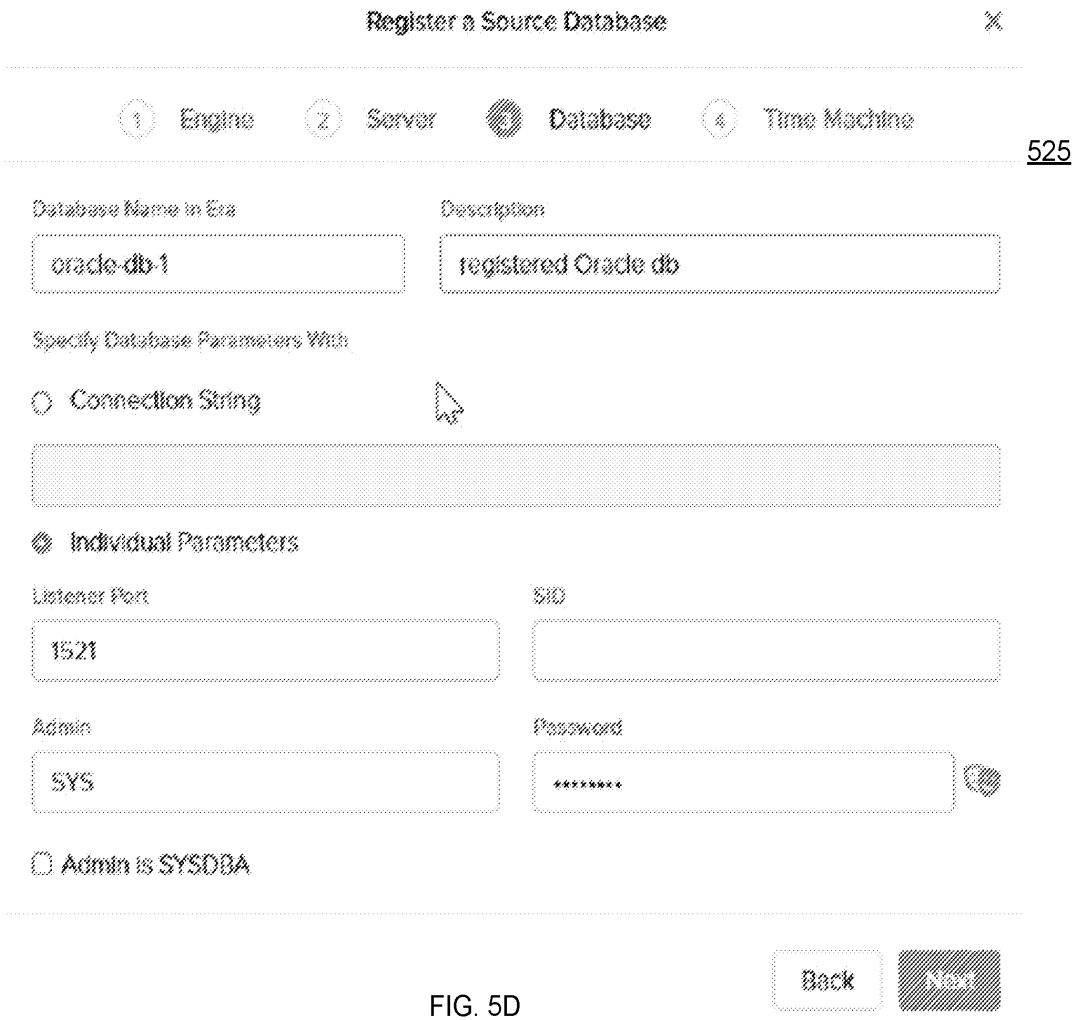
Register a Source Database
1 Engine
2 Server
3 Database
4 Time Machine
525
Database Name in Era
oracle-db-1
Description
registered Oracle db
Specify Database Parameters With
Connection String
Individual Parameters
Listener Port
1521
SID
Admin
SYS
Password
****
Admin is SYSDBA
Back
Next

FIG. 5D

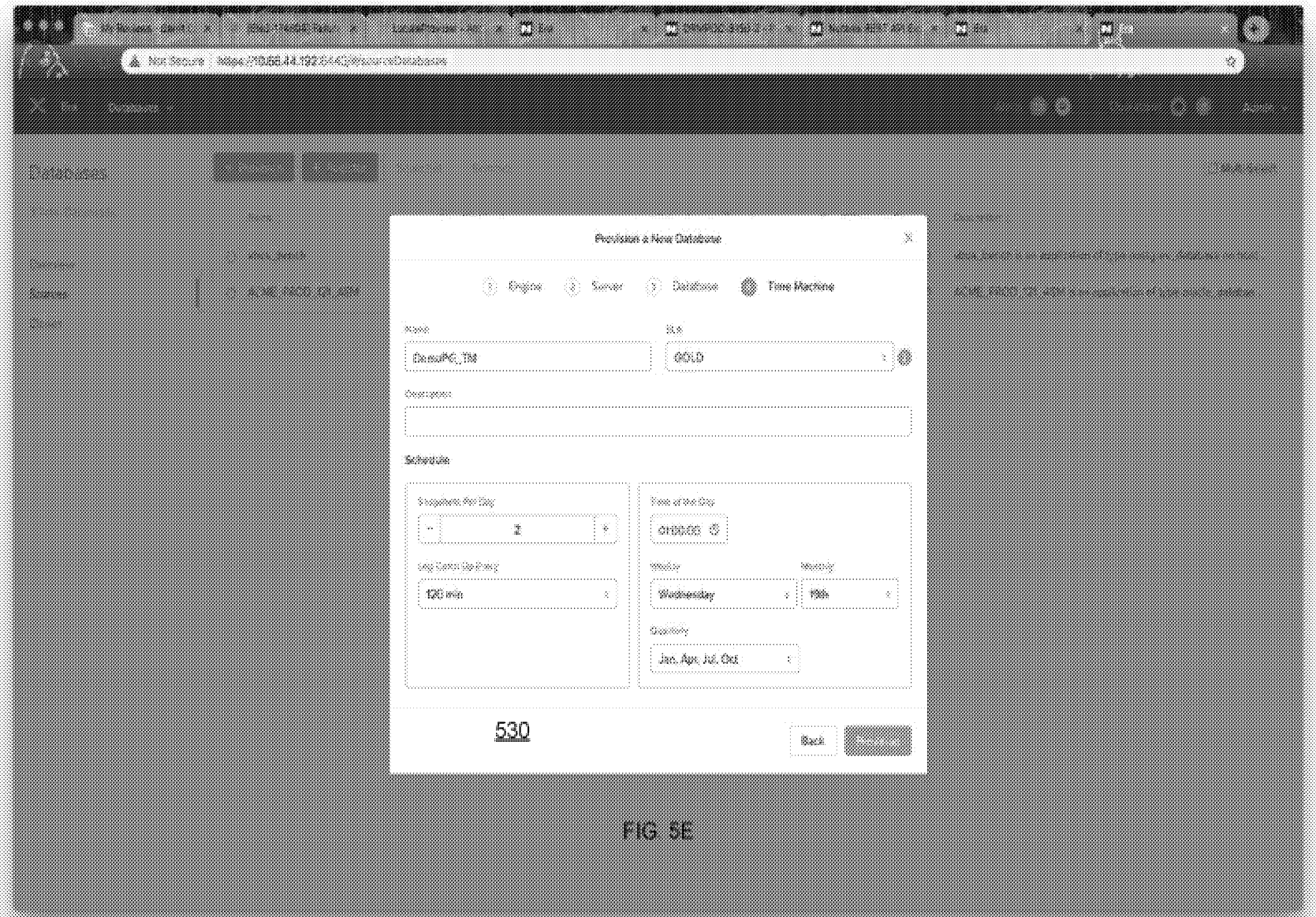
Provision a New Database
Origins
Server
Database
Time Machine
Name
DemoPG_TM
SLA
GOLD
Description
Schedule
Snapshots Per Day
2
Log Catch Up Every
120 min
Time of the Day
01:00:00
Weekday
Wednesday
Monthly
15th
Quarterly
Jan, Apr, Jul, Oct
530
Back
Create

FIG. 5E

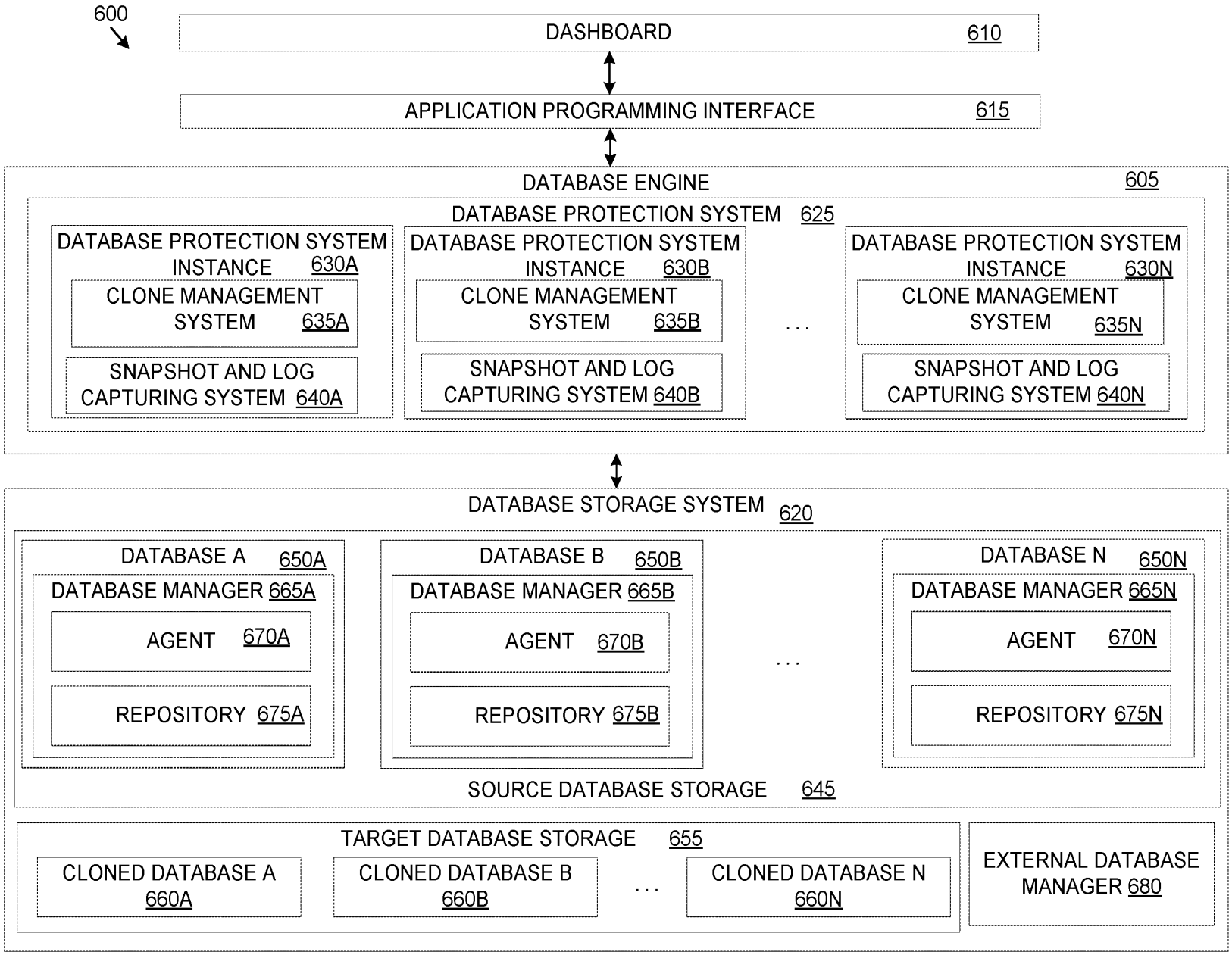
600
DASHBOARD 610
APPLICATION PROGRAMMING INTERFACE 615
DATABASE ENGINE 605
DATABASE PROTECTION SYSTEM 625
DATABASE PROTECTION SYSTEM INSTANCE 630A
CLONE MANAGEMENT SYSTEM 635A
SNAPSHOT AND LOG CAPTURING SYSTEM 640A
DATABASE PROTECTION SYSTEM INSTANCE 630B
CLONE MANAGEMENT SYSTEM 635B
SNAPSHOT AND LOG CAPTURING SYSTEM 640B
. . .
DATABASE PROTECTION SYSTEM INSTANCE 630N
CLONE MANAGEMENT SYSTEM 635N
SNAPSHOT AND LOG CAPTURING SYSTEM 640N
DATABASE STORAGE SYSTEM 620
DATABASE A 650A
DATABASE MANAGER 665A
AGENT 670A
REPOSITORY 675A
DATABASE B 650B
DATABASE MANAGER 665B
AGENT 670B
REPOSITORY 675B
. . .
DATABASE N 650N
DATABASE MANAGER 665N
AGENT 670N
REPOSITORY 675N
SOURCE DATABASE STORAGE 645
TARGET DATABASE STORAGE 655
CLONED DATABASE A 660A
CLONED DATABASE B 660B
. . .
CLONED DATABASE N 660N
EXTERNAL DATABASE MANAGER 680

FIG. 6

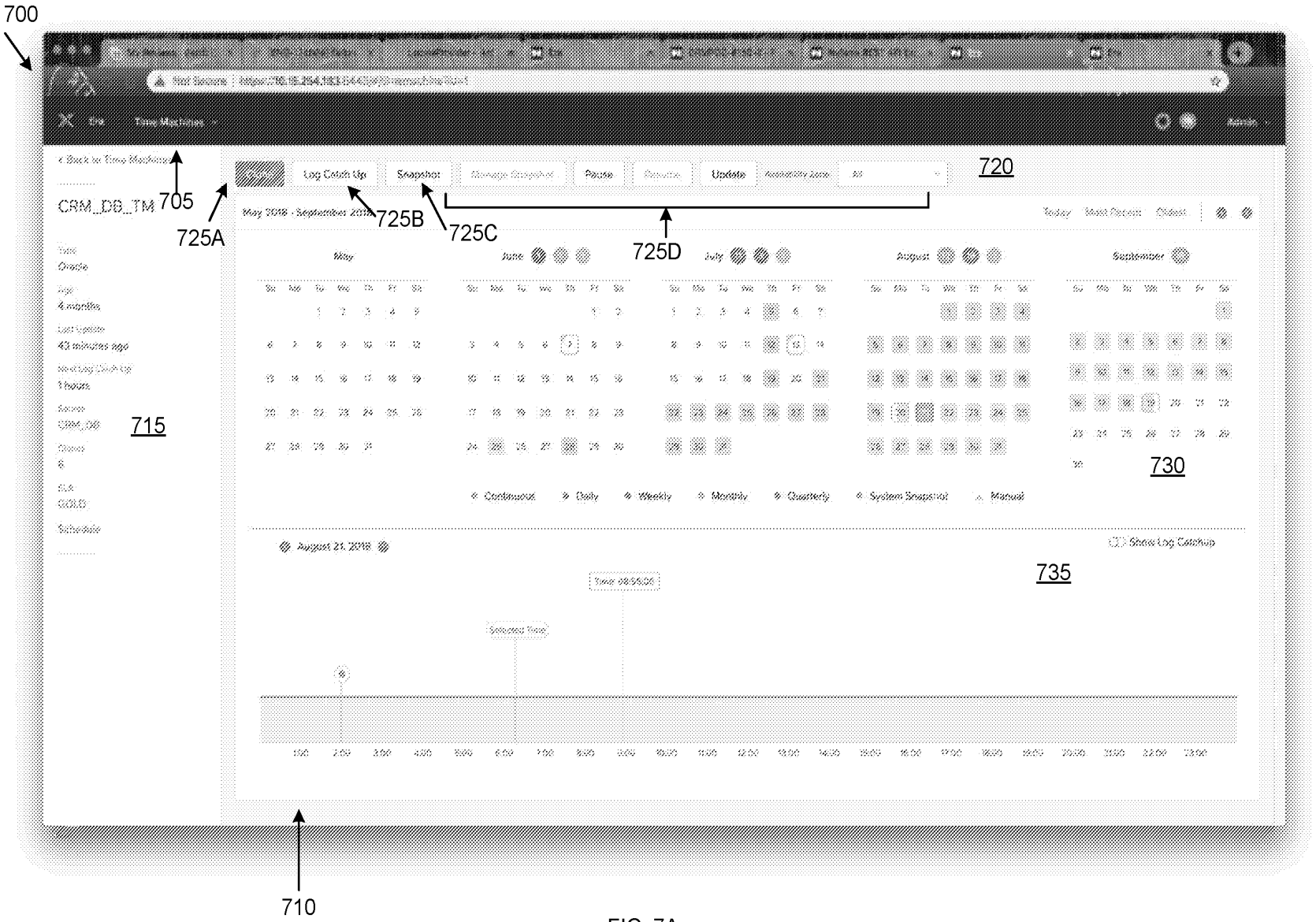
700
705
725A
725B
725C
725D
720
715
730
735
710
CRM_DB_TM
Log Catch Up
Snapshot
Pause
Update
May
June
July
August
September
Continuous
Daily
Weekly
Monthly
Quarterly
System Snapshot
Manual
Show Log Catchup

FIG. 7A

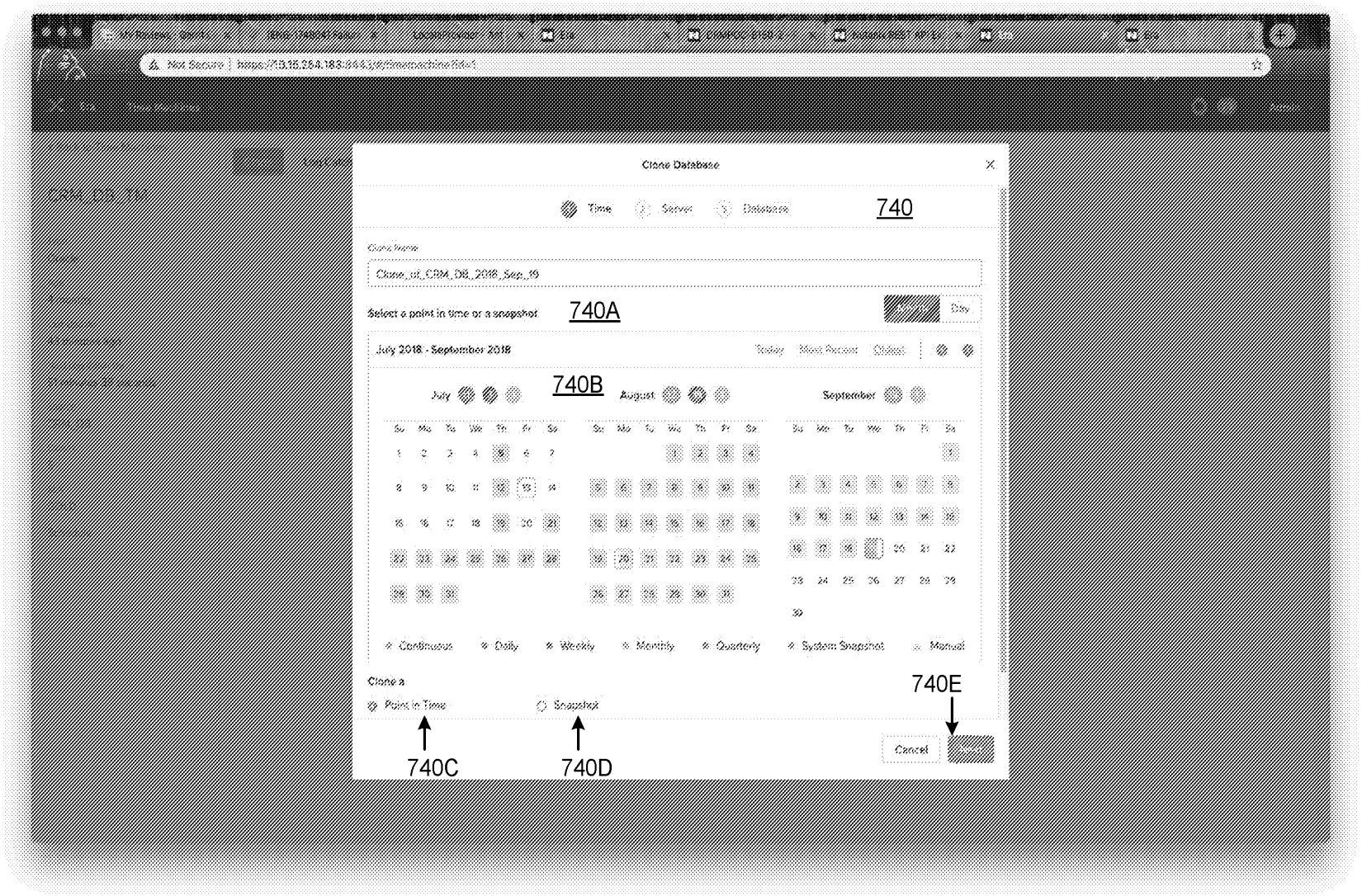
Clone Database
Time
Server
Database
740
Clone_of_CRM_DB_2018_Sep_19
Select a point in time or a snapshot
740A
Day
July 2018 - September 2018
Today
740B
July
August
September
Continuous
Daily
Weekly
Monthly
Quarterly
System Snapshot
Manual
Clone a
Point in Time
Snapshot
740E
740C
740D
Cancel

FIG. 7B

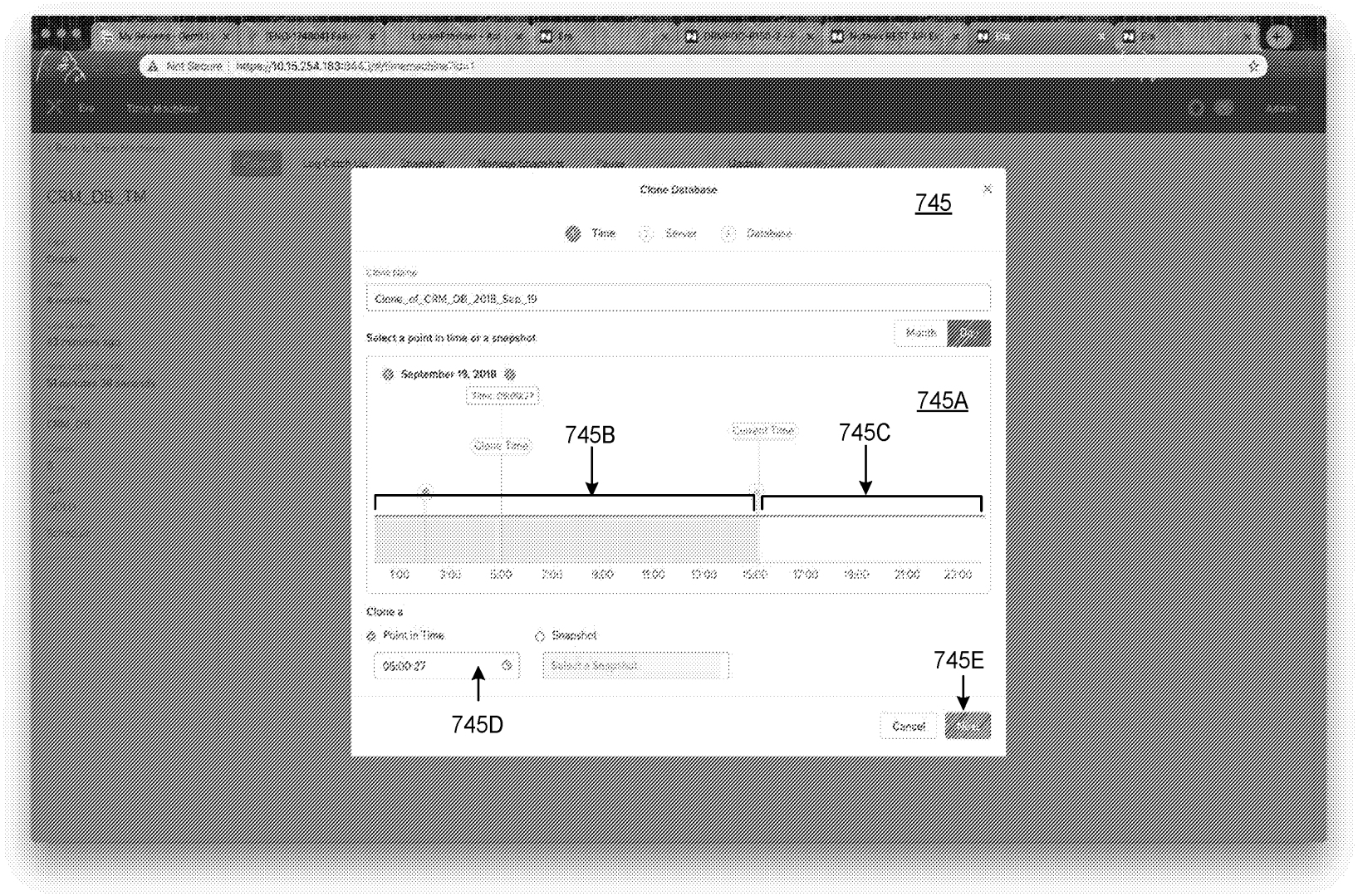
Clone Database
745
Time
Server
Database
Clone_of_CRM_DB_2018_Sep_19
Select a point in time or a snapshot
Month
September 19, 2018
745A
745B
745C
Clone Time
Current Time
Clone a
Point in Time
Snapshot
05:00:27
745D
745E
Cancel

FIG. 7C

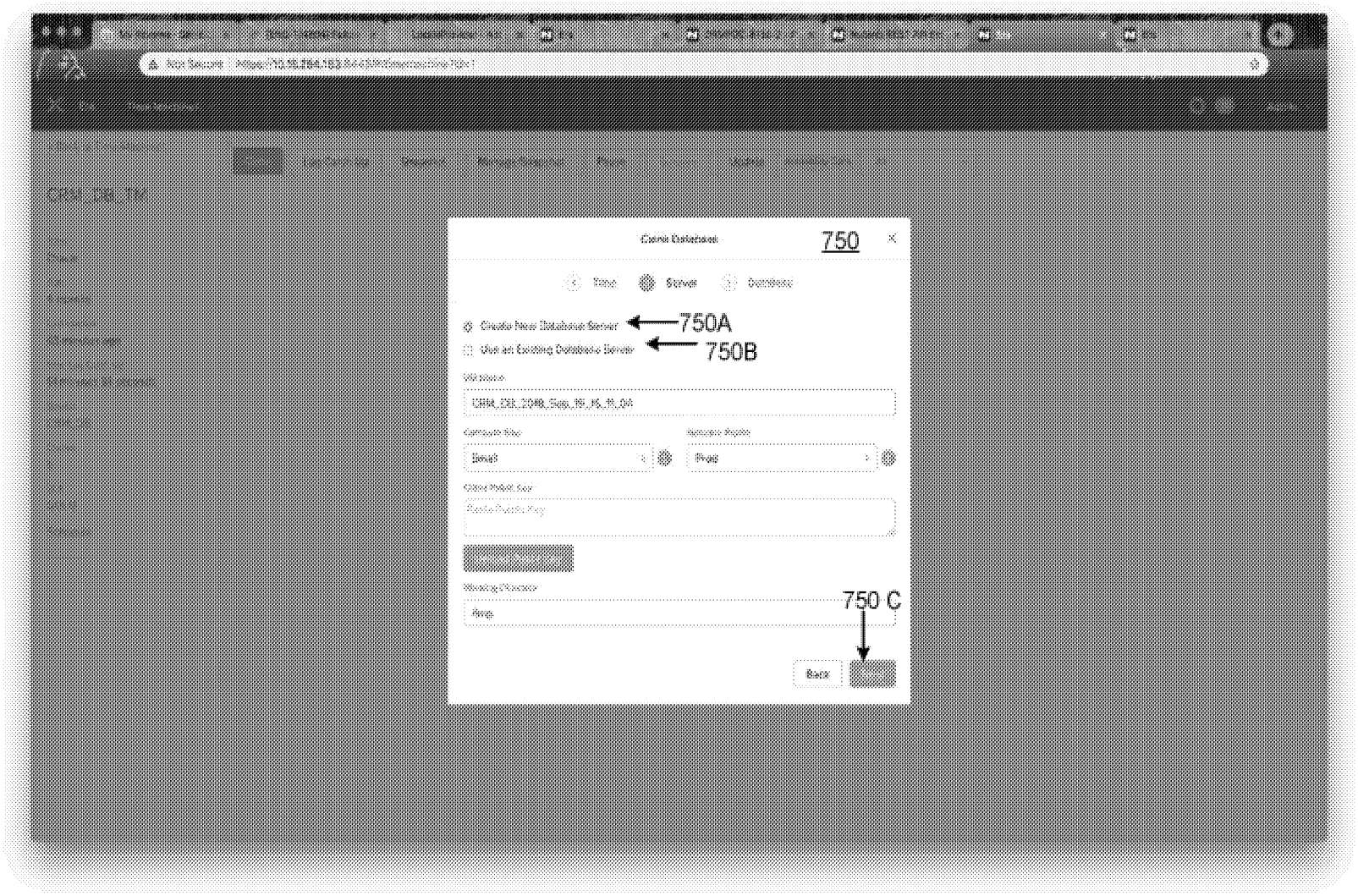

FIG. 7D

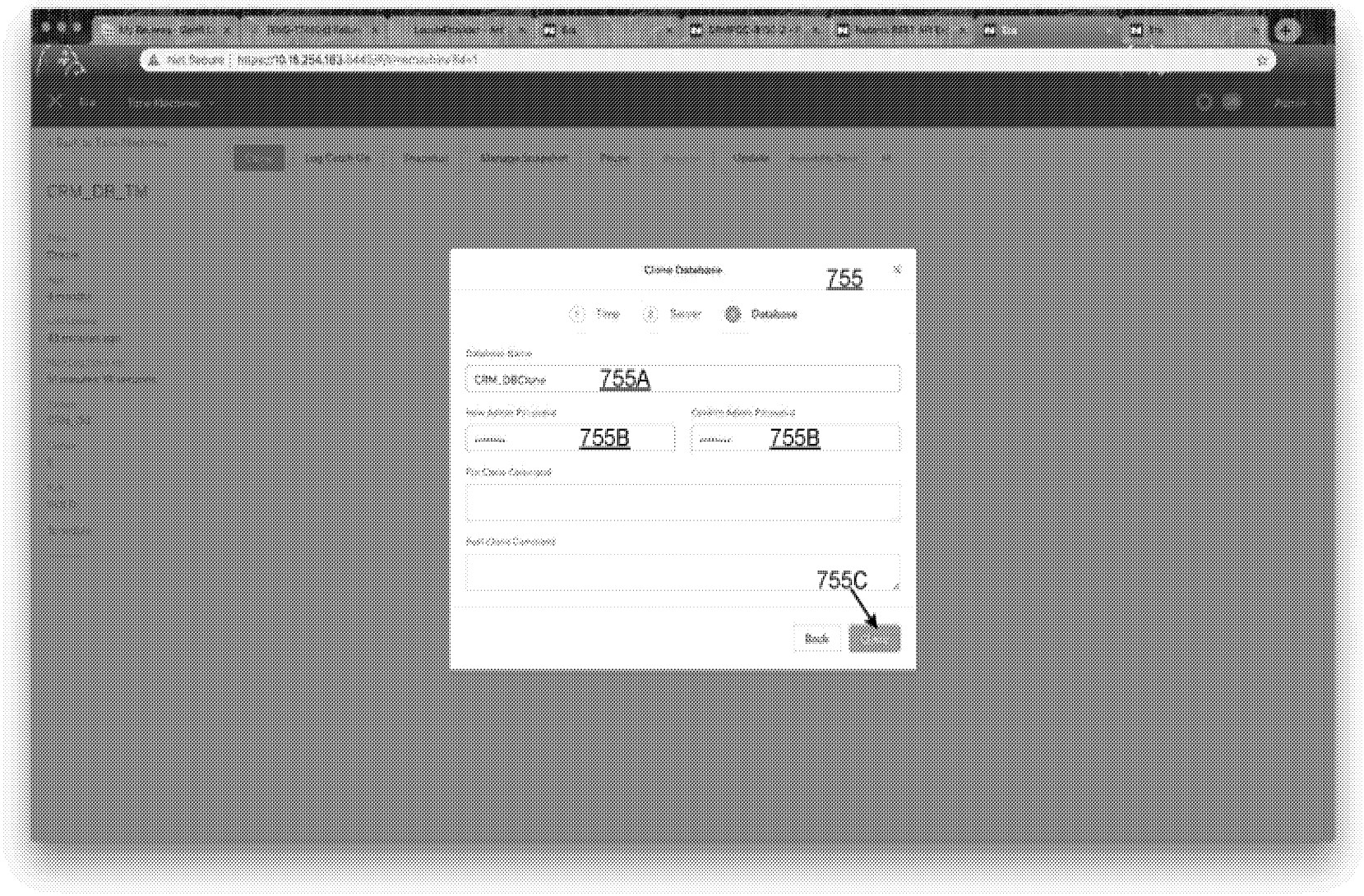
755
Time
Server
Database
CRM_DBCore
755A
755B
755B
755C
Back

FIG. 7E

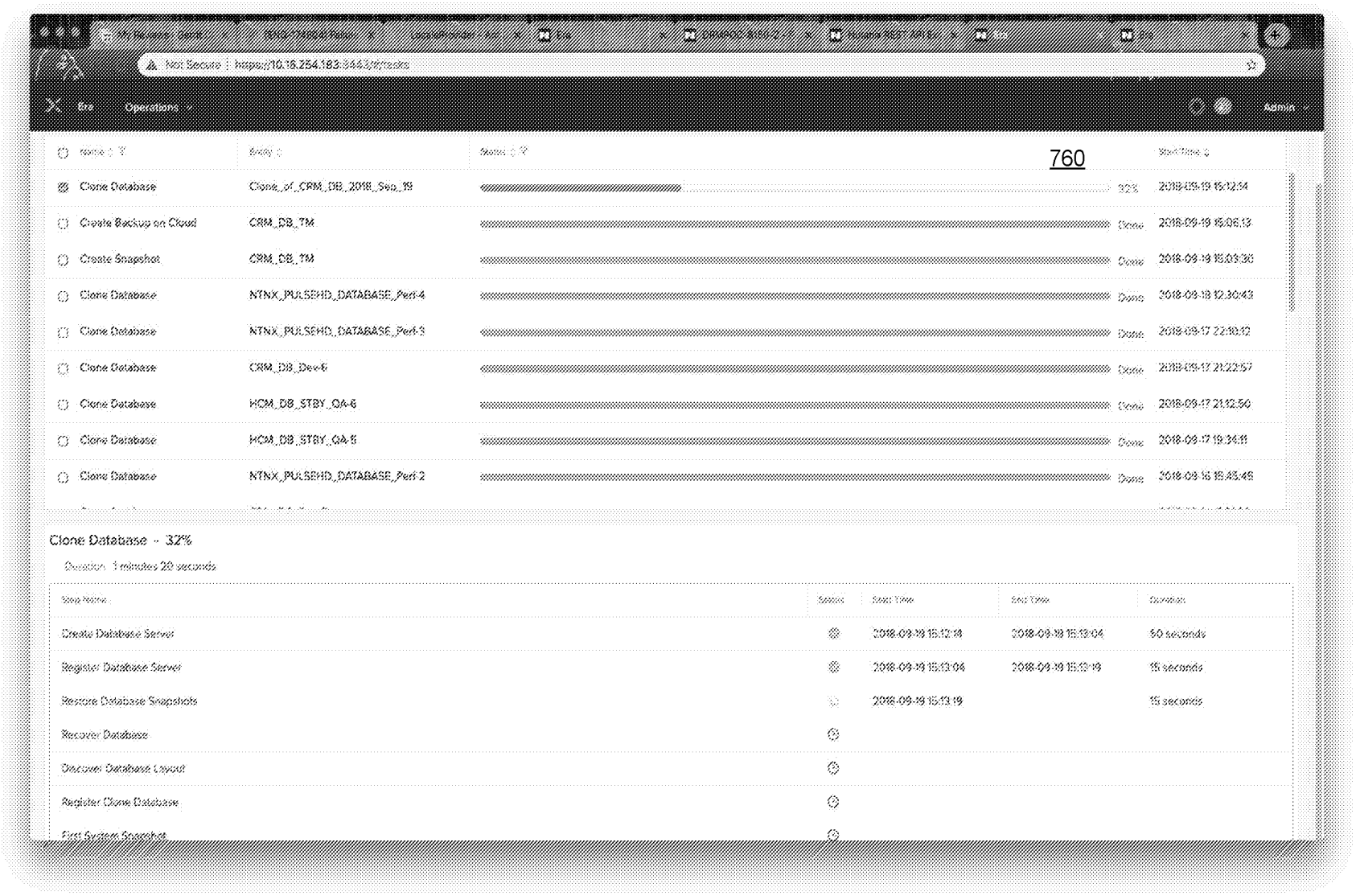
Not Secure
Era
Operations
Admin
760
Clone Database
Clone_of_CRM_DB_2018_Sep_19
32%
Create Backup on Cloud
CRM_DB_TM
Done
Create Snapshot
CRM_DB_TM
Done
Clone Database
NTNX_PULSEHD_DATABASE_Perf-4
Done
Clone Database
NTNX_PULSEHD_DATABASE_Perf-3
Done
Clone Database
CRM_DB_Dev-6
Done
Clone Database
HCM_DB_STBY_QA-6
Done
Clone Database
HCM_DB_STBY_QA-5
Done
Clone Database
NTNX_PULSEHD_DATABASE_Perf-2
Done
Clone Database - 32%
Duration: 1 minutes 20 seconds
Create Database Server
2018-09-19 15:12:19
2018-09-19 15:13:04
50 seconds
Register Database Server
2018-09-19 15:13:04
2018-09-19 15:13:19
15 seconds
Restore Database Snapshots
2018-09-19 15:13:19
15 seconds
Recover Database
Discover Database Layout
Register Clone Database
First System Snapshot

FIG. 7F

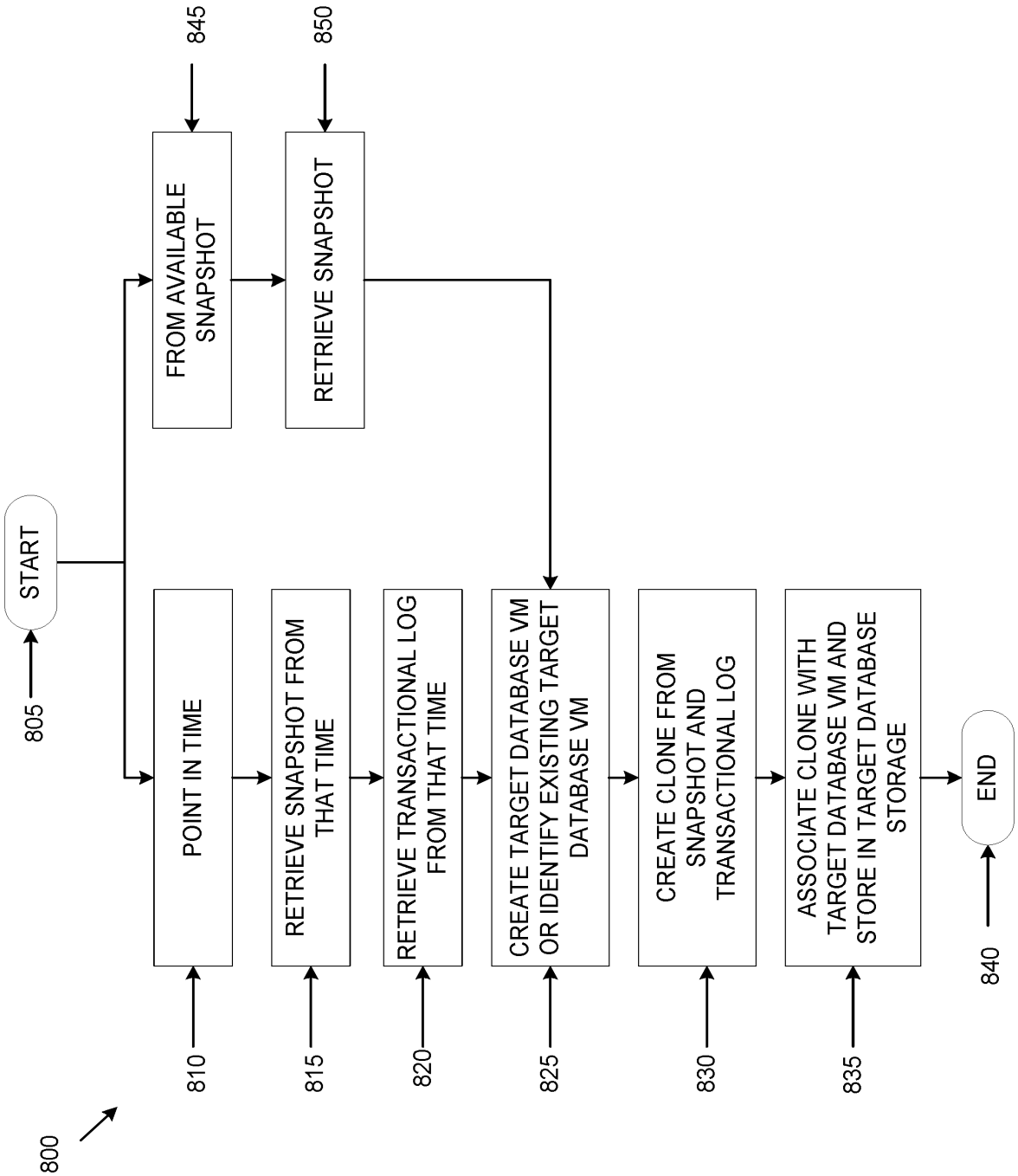
800
805
START
810
POINT IN TIME
815
RETRIEVE SNAPSHOT FROM THAT TIME
820
RETRIEVE TRANSACTIONAL LOG FROM THAT TIME
825
CREATE TARGET DATABASE VM OR IDENTIFY EXISTING TARGET DATABASE VM
830
CREATE CLONE FROM SNAPSHOT AND TRANSACTIONAL LOG
835
ASSOCIATE CLONE WITH TARGET DATABASE VM AND STORE IN TARGET DATABASE STORAGE
840
END
845
FROM AVAILABLE SNAPSHOT
850
RETRIEVE SNAPSHOT

FIG. 8

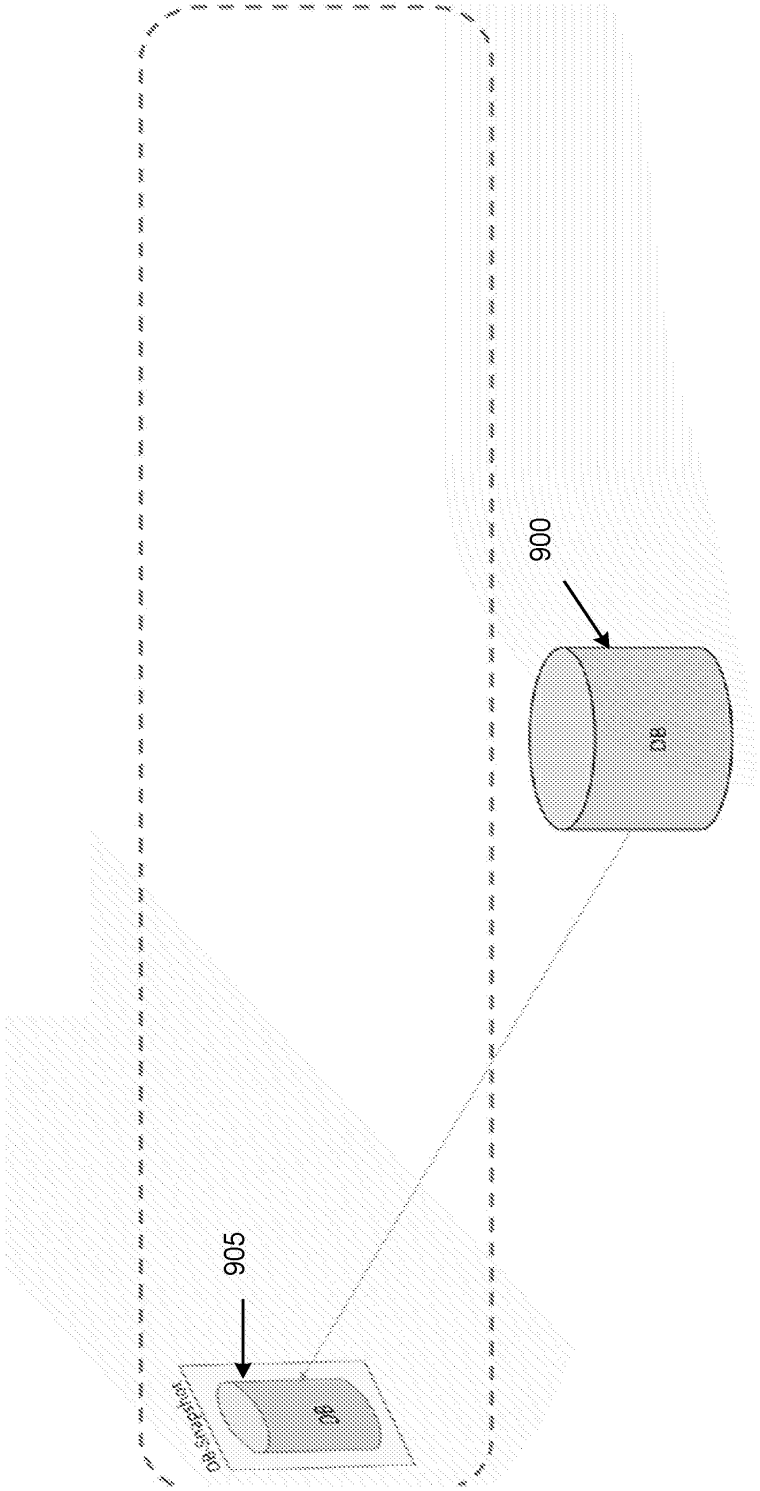

FIG. 9A

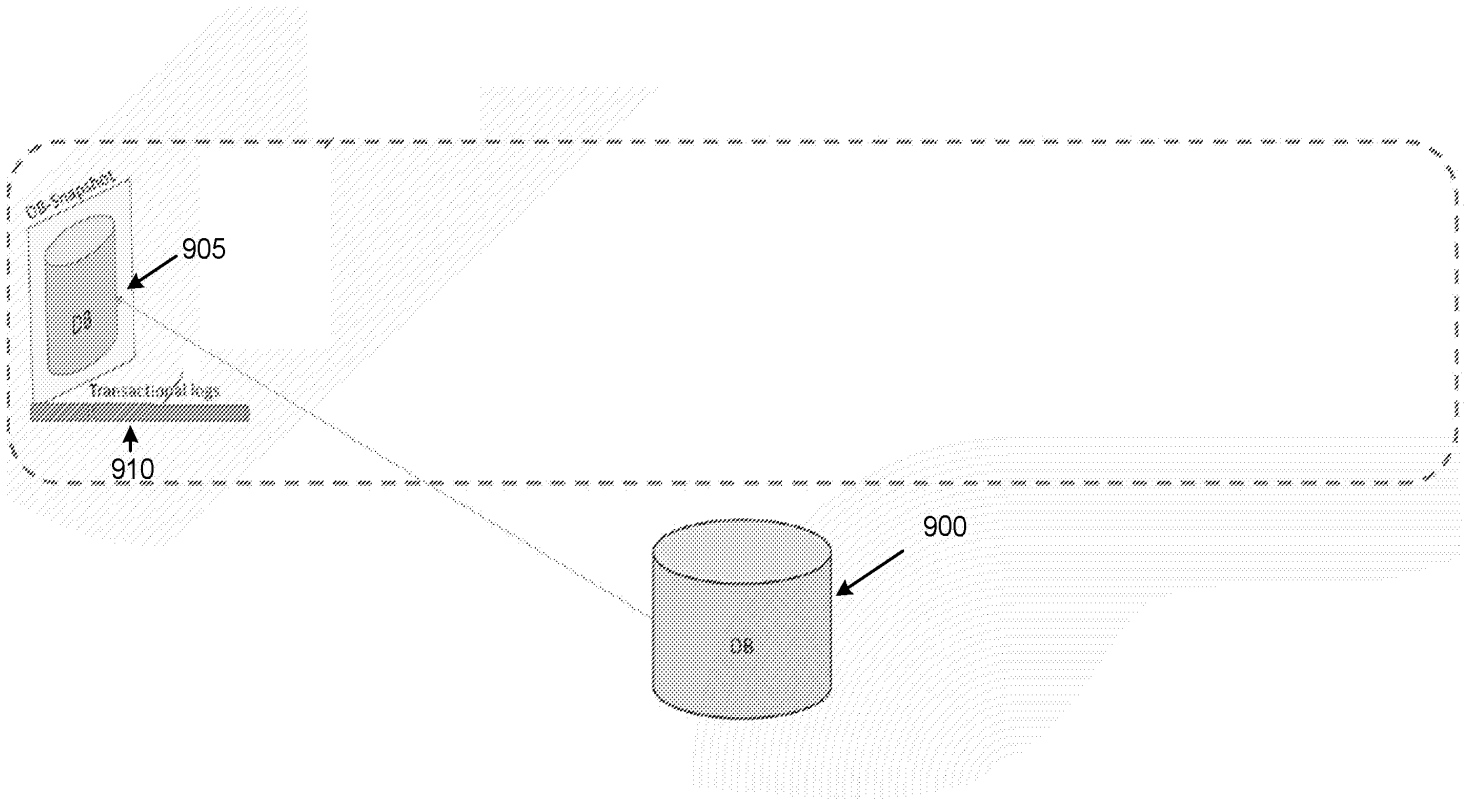

FIG. 9B

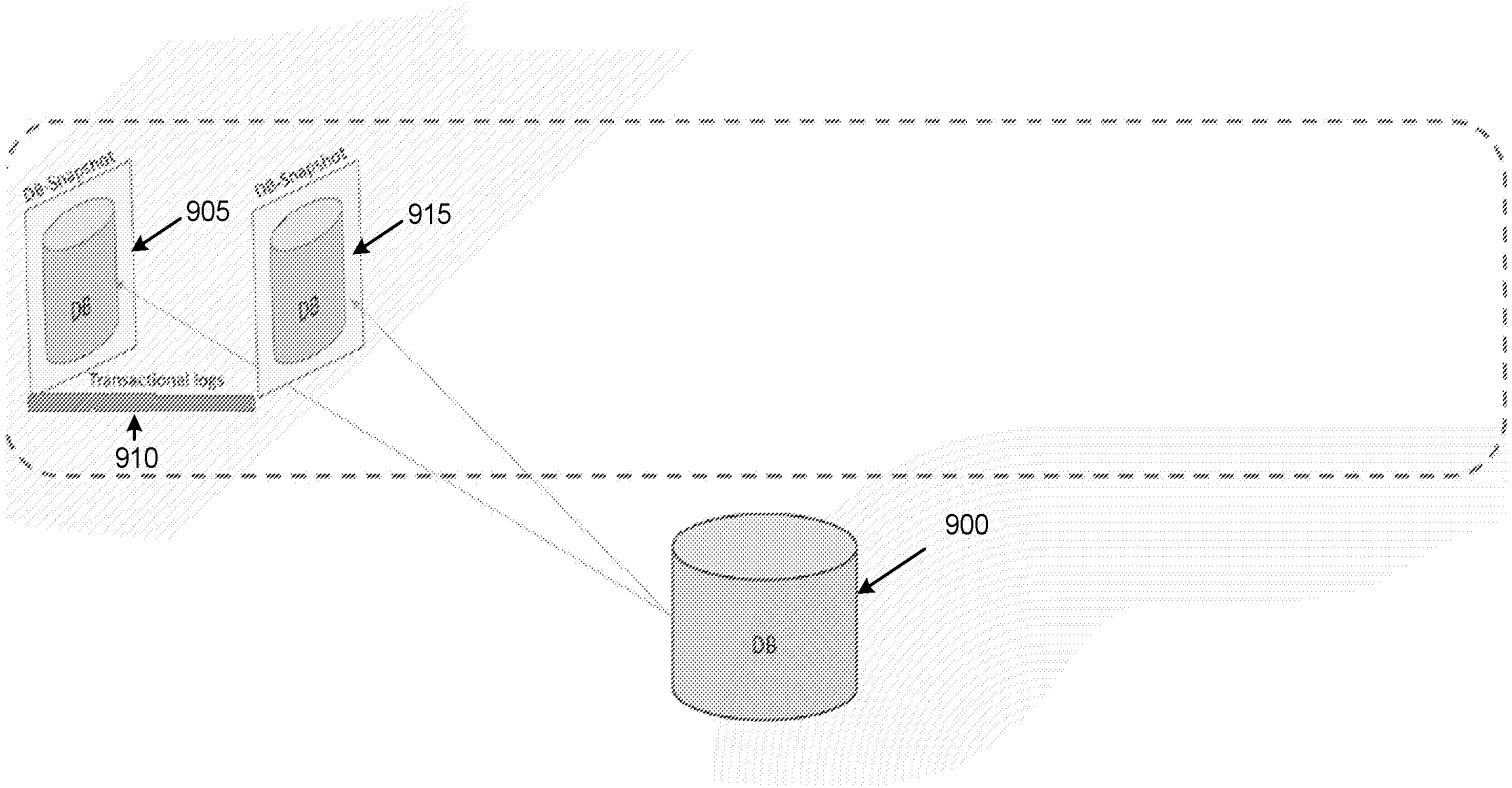
DB Snapshot
DB Snapshot
905
915
DB
DB
Transactional logs
910
900
DB

FIG. 9C

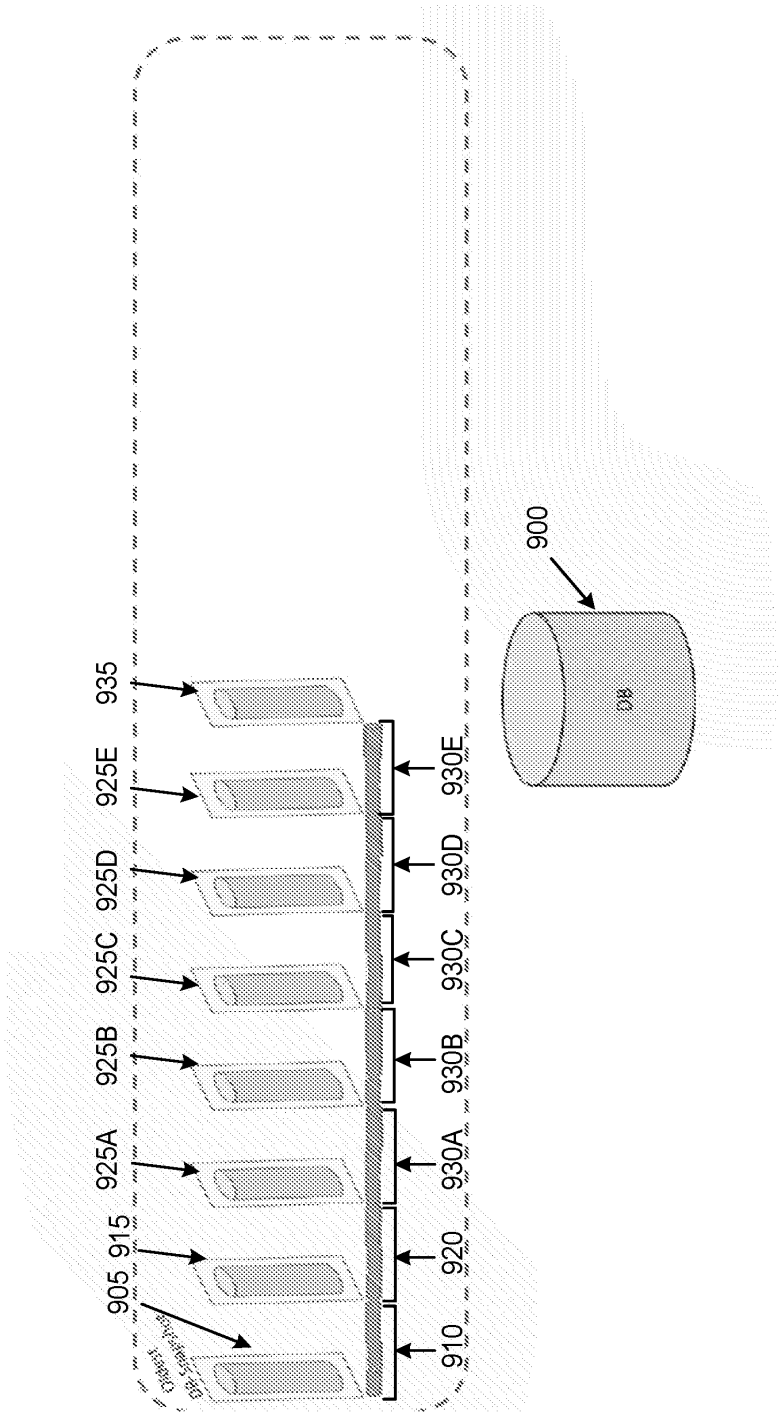
905
915
925A
925B
925C
925D
925E
935
910
920
930A
930B
930C
930D
930E
900

FIG. 9D

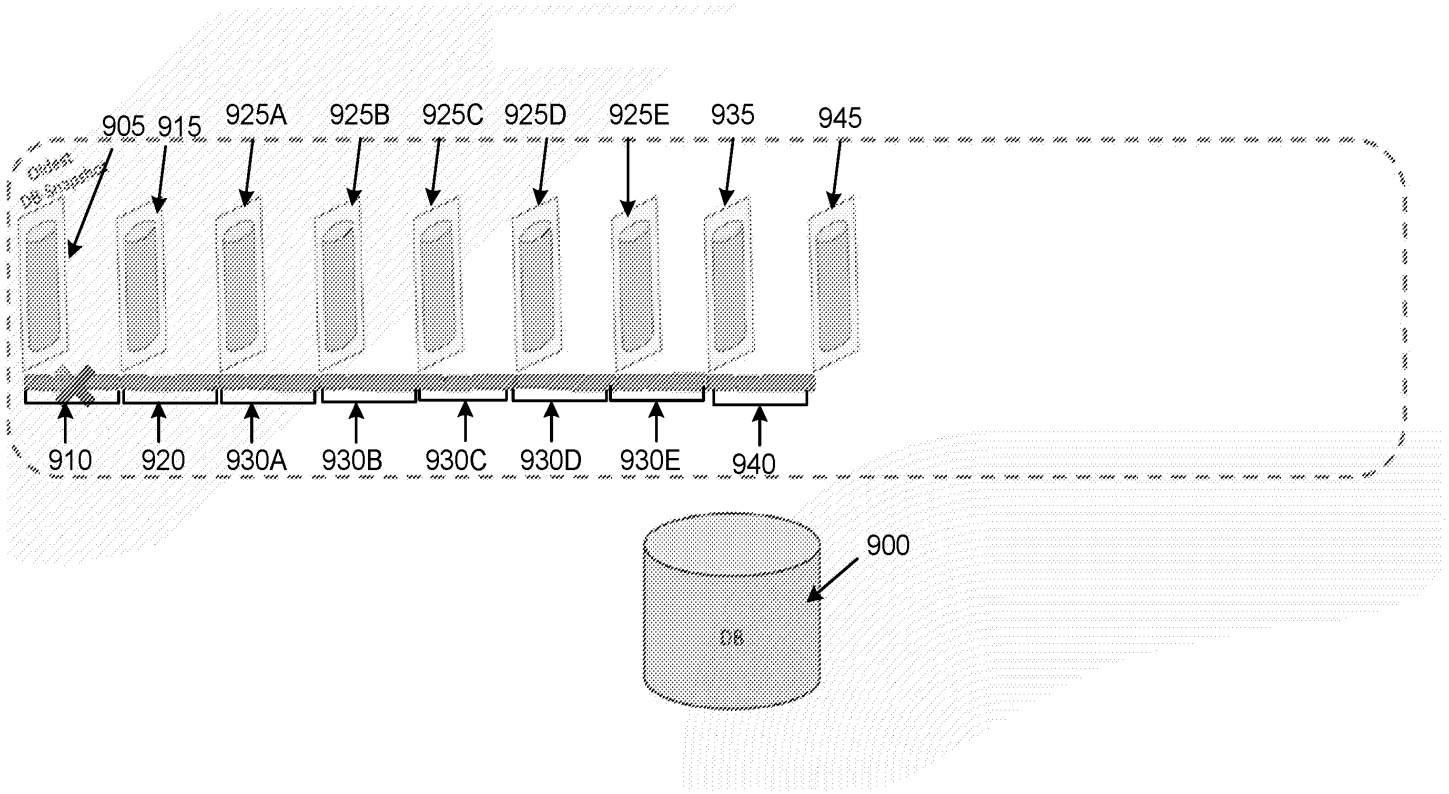
905
915
925A
925B
925C
925D
925E
935
945
Oldest
DB Snapshot
910
920
930A
930B
930C
930D
930E
940
900
DB

FIG. 9E

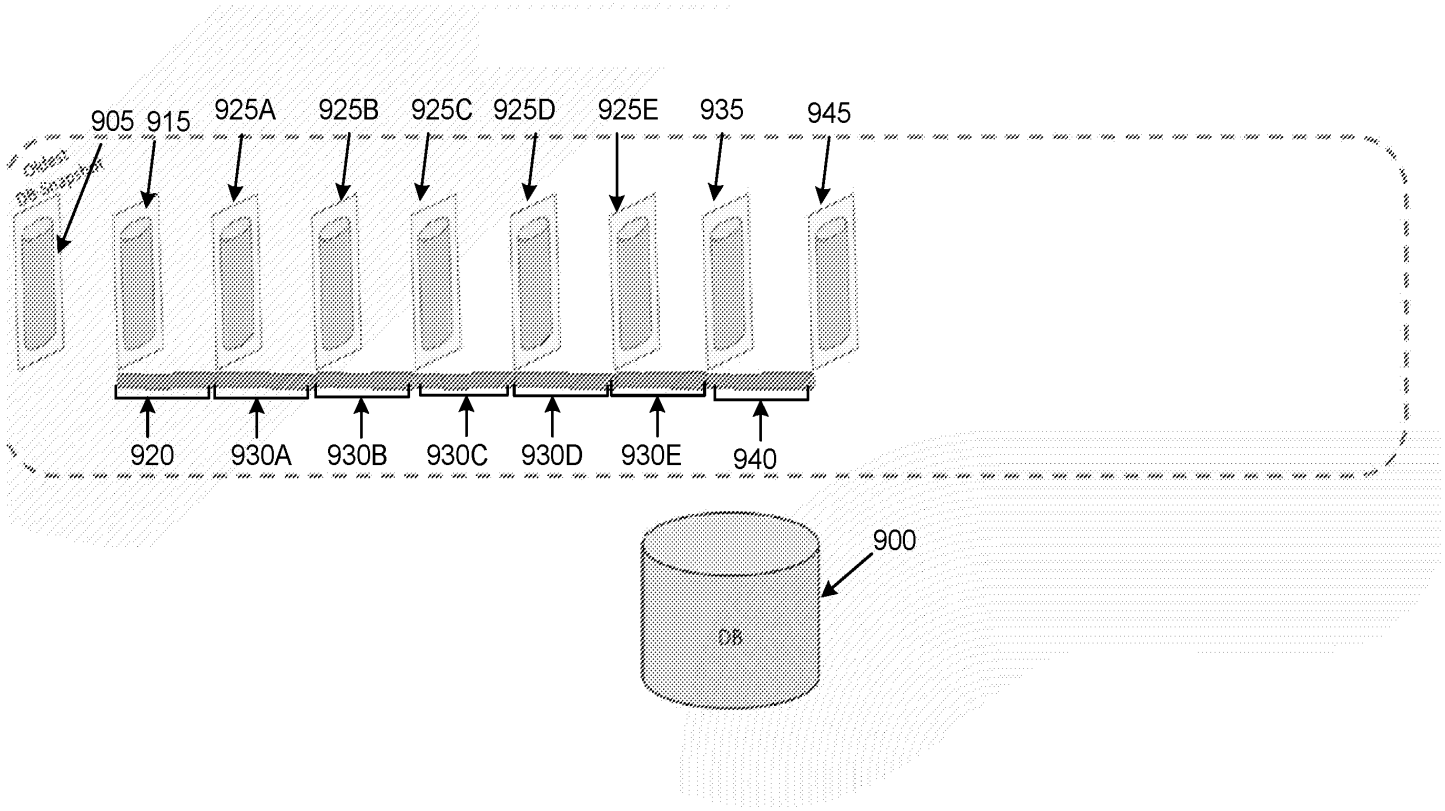
905
915
925A
925B
925C
925D
925E
935
945
Oldest DB Snapshot
920
930A
930B
930C
930D
930E
940
900
DB

FIG. 9F

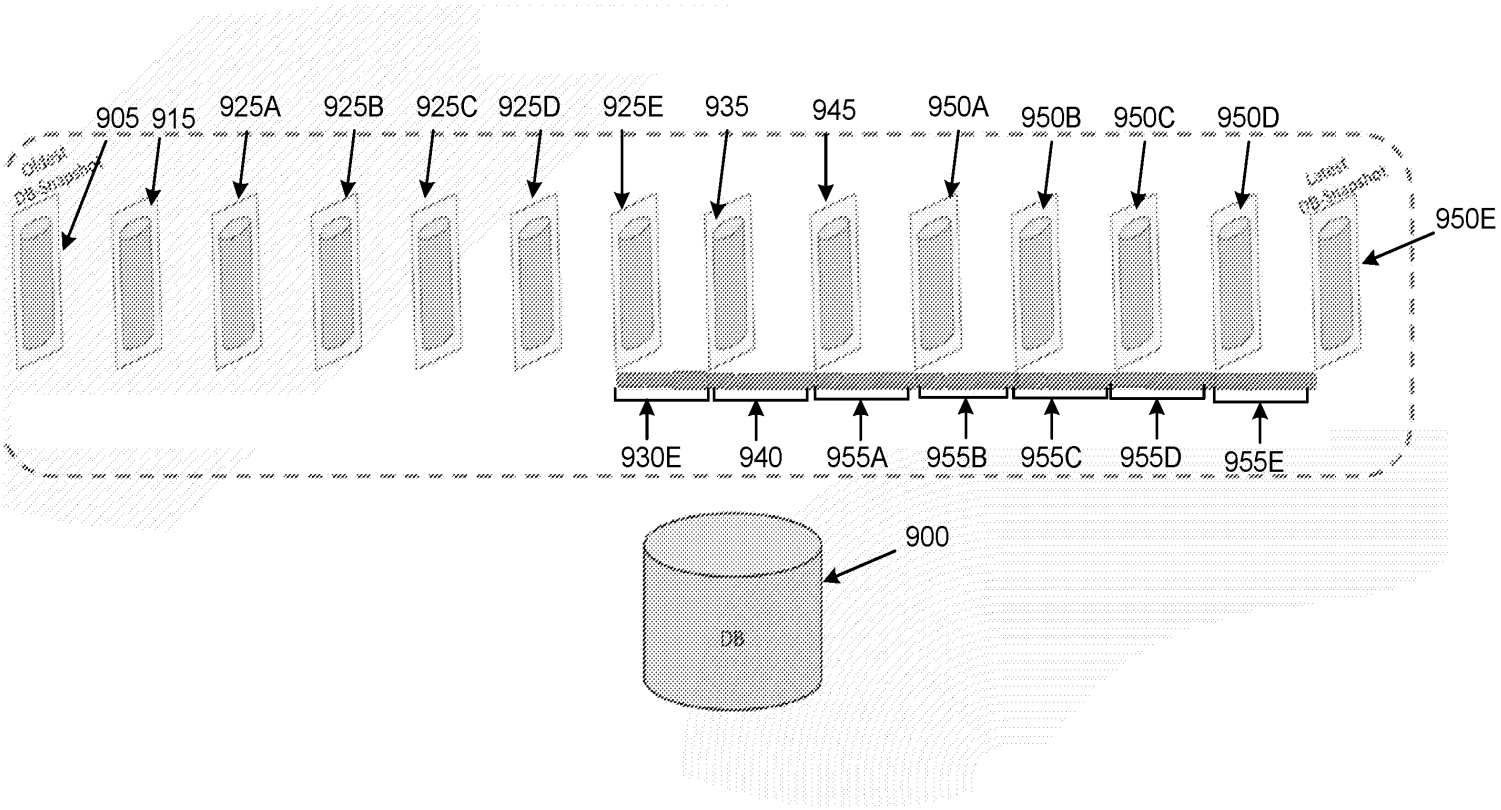
905
915
925A
925B
925C
925D
925E
935
945
950A
950B
950C
950D
950E
930E
940
955A
955B
955C
955D
955E
900
DB

FIG. 9G

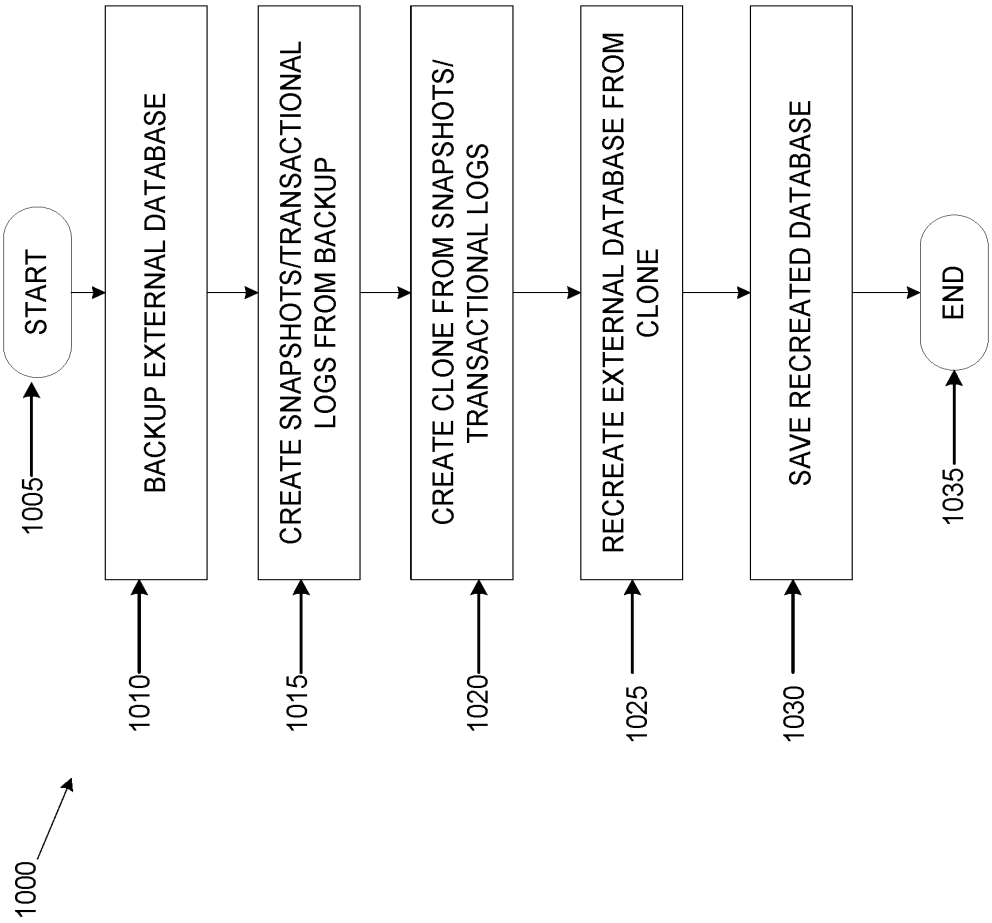
1000
1005
START
1010
BACKUP EXTERNAL DATABASE
1015
CREATE SNAPSHOTS/TRANSACTIONAL LOGS FROM BACKUP
1020
CREATE CLONE FROM SNAPSHOTS/ TRANSACTIONAL LOGS
1025
RECREATE EXTERNAL DATABASE FROM CLONE
1030
SAVE RECREATED DATABASE
1035
END

FIG. 10

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
First Named Inventor/Applicant Name:	Balasubrahmanyam Kuchibhotla
Filer:	Paul S. Hunter/Walter Lau
Attorney Docket Number:	115539-0215

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	300	300
UTILITY SEARCH FEE	1111	1	660	660
UTILITY EXAMINATION FEE	1311	1	760	760
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1720**

Electronic Acknowledgement Receipt	
EFS ID:	34646657
Application Number:	16228728
International Application Number:	
Confirmation Number:	3978
Title of Invention:	USER INTERFACE FOR DATABASE MANAGEMENT SERVICES
First Named Inventor/Applicant Name:	Balasubrahmanyam Kuchibhotla
Customer Number:	147491
Filer:	Paul S. Hunter/Walter Lau
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	115539-0215
Receipt Date:	20-DEC-2018
Filing Date:	
Time Stamp:	22:59:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
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Payment was successfully received in RAM	$1720
RAM confirmation Number	122118INTEFSW23012500
Deposit Account	190741
Authorized User	Walter Lau
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37 CFR 1.19 (Document supply fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	115539-0215-Application_Transmittal.pdf	144250 84688313f8c07fc71fa7c6418183163df8f39306	no	4
Warnings:					
Information:					
2	Application Data Sheet	115539-0215-ADS.pdf	1846008 64328ff5a178bae776a2416e58bf2ee89826c0f6	no	9
Warnings:					
Information:					
3	Oath or Declaration filed	115539-0215-Executed_Declaration.pdf	697120 f15fd1c6cc71066b3b86b536ba97c0e23e84d784	no	3
Warnings:					
Information:					
4	Assignee showing of ownership per 37 CFR 3.73	115539-0215-373C_Statement.pdf	568498 f7921d2b9b33fb78f3e680298a2127c0019f2495	no	3
Warnings:					
Information:					
5	Assignee showing of ownership per 37 CFR 3.73	115539-0215-Executed_Assignment.pdf	2145406 d4398fc47f684f0f27c413cea2ad4ea80c5b3809	no	3
Warnings:					
Information:					
6		115539-0215-Application.pdf	357845 e716b0af0b8490ad8b0794055efb2497aa2423d0	yes	78
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	

	Abstract		78	78	
	Claims		72	77	
	Specification		1	71	
Warnings:					
Information:					
7	Drawings-other than black and white line drawings	115539-0215-Drawings.pdf	5071102 1b388efe737e9e8ce7148f85f792c62fea03fb4f	no	31
Warnings:					
Information:					
8	Fee Worksheet (SB06)	fee-info.pdf	35236 6a0789422482e0fad22917200f5c42a27d0fcaac	no	2
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Information:					
		Total Files Size (in bytes):	10865465		

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<u>National Stage of an International Application under 35 U.S.C. 371</u>
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.
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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.