503975836 08/24/2016

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1 Stylesheet Version v1.2 EPAS ID: PAT4022492

| SUBMISSION TYPE: | NEW ASSIGNMENT |
|-----------------------|----------------|
| NATURE OF CONVEYANCE: | ASSIGNMENT |

CONVEYING PARTY DATA

| Name | Execution Date |
|--------------------|----------------|
| STEFAN ARNDT | 02/25/2016 |
| GOPI K. ATTALURI | 02/23/2016 |
| RONALD J. BARBER | 02/19/2016 |
| GUY M. LOHMAN | 03/03/2016 |
| LIN QIAO | 06/09/2016 |
| VIJAYSHANKAR RAMAN | 03/15/2016 |
| EUGENE J. SHEKITA | 03/01/2016 |
| RICHARD S. SIDLE | 02/26/2016 |

RECEIVING PARTY DATA

| Name: | INTERNATIONAL BUSINESS MACHINES CORPORATION | |
|-----------------|---|--|
| Street Address: | NEW ORCHARD ROAD | |
| City: | ARMONK | |
| State/Country: | NEW YORK | |
| Postal Code: | 10504 | |

PROPERTY NUMBERS Total: 1

| Property Type | Number |
|---------------------|----------|
| Application Number: | 15081242 |

CORRESPONDENCE DATA

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Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent

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Address Line 4: SANTA MONICA, CALIFORNIA 90404

| ATTORNEY DOCKET NUMBER: ARC920120017US3 | | |
|--|-----------------------|--|
| NAME OF SUBMITTER: STEVEN LAUT, REG. NO. 47736 | | |
| SIGNATURE: | NATURE: /Steven Laut/ | |

PATENT 503975836 REEL: 039531 FRAME: 0476

| DATE SIGNED: | TE SIGNED: 08/24/2016 | | | |
|---|--|--|--|--|
| | This document serves as an Oath/Declaration (37 CFR 1.63). | | | |
| Total Attachments: 17 | Total Attachments: 17 | | | |
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| source=ARC920120017US3_DeclarationAssignment#page17.tif | | | | |

PATENT REEL: 039531 FRAME: 0477

Title of Invention: EFFICIENT PARTITIONED JOINS IN A DATABASE WITH COLUMN-MAJOR LAYOUT

| | | | leclare that: |
|--|--|--|---------------|
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This declaration is directed to the attached application, or (if following box is checked):

[x] United States application or PCT international application number 15/081,242 filed on March 25, 2016

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 have reviewed and understand the contents of the application, including the claims.

I am aware of the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in 37 CFR Section 1.56.

Whereas, the undersigned inventor(s) has/have made certain inventions, improvements, and discoveries (herein referred to as the "Invention") disclosed in the above-identified patent application and further identified by the IBM Docket Number provided above in the header of this document;

Whereas, International Business Machines Corporation, a corporation of New York having a place of business at Armonk, New York (herein referred to as "IBM"), desires to acquire, and each undersigned inventor desires to grant to IBM, the entire worldwide right, title, and interest in and to the Invention and in and to any and all patent applications and patents directed thereto;

Now, therefore, for good and valuable consideration, the receipt and sufficiency thereof being hereby acknowledged, each undersigned inventor ("ASSIGNOR") hereby sells or has sold, assigns or has assigned, and otherwise transfers or has transferred to IBM (the "ASSIGNEE"), its successors, legal representatives, and assigns, the entire worldwide right, title, and interest in and to the Invention, the above-identified United States patent application, and any and all other patent applications and patents for the Invention which may be applied for or granted therefor in the United States and in all foreign countries and jurisdictions, including all divisions, continuations, reissues, reexaminations, renewals, extensions, counterparts, substitutes, and extensions thereof, and all rights of priority resulting from the filing of such applications and granting of such patents. In addition, each undersigned inventor hereby authorizes and requests the Director of the United States Patent and Trademark Office to issue any United States Patent, and foreign patent authorities to issue any foreign patent, granted for the Invention, to IBM, its successors, legal representatives, and assigns, the entire worldwide right, title, and interest in and to the same to be held and enjoyed by IBM, its successors, legal representatives, and assigns to the full end of the terms for which any and all such patents may be granted, as fully and entirely as would have been held and enjoyed by the undersigned had this Assignment not been made; and each undersigned inventor agrees to execute any and all documents and instruments and perform all lawful acts reasonably related to recording this Assignment or perfecting title to the Invention and all related patents and applications, in IBM, its successors, legal representatives, and assigns, whenever requested by IBM, its successors, legal representatives, or assigns.

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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 five (5) years, or both.

| (1) Legai Name of inventor Stefan Arndt | |
|--|----------------|
| Signature: | Date: |
| (2) Legal Name of Inventor: Gopi K. Attaluri | |
| Signature: | Date: |
| (3) Legal Name of Inventor: Ronald J. Barber | |
| Signature / Property / | Date: 2// 9//6 |
| (4) Legal Name of Inventor: Guy M. Lohman | 00 Mart |
| Signature: \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ | One 3 Fet 2016 |

| (5) Legal Name of Inventor: Lin Qiao | |
|--|--------------------------------|
| Signature: | Date: |
| (6) Legal Name of Inventor: Vijayshankar Raman | |
| Signature: 1999 | Date: <u>M Oz. k 1 C</u> Z O F |
| (7) Legal Name of Inventor: Eugene J. Shekita | |
| Signature: | Date: |
| (8) Legal Name of Inventor: Richard S. Sidle | |
| Signature: | Date: |

Title of Invention: EFFICIENT PARTITIONED JOINS IN A DATABASE WITH COLUMN-MAJOR LAYOUT

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| (I) Legal Name of In Signature: | Newton: Stefan Arndt | Date: 2/33/33/3333 |
|------------------------------------|--------------------------|--------------------|
| | | |
| (2) Legal Name of In | ventor: Gopi K. Attaluri | |
| Signature: | | Date: |
| (3) Legal Name of In | ventor: Ronald J. Barber | |
| Signature | | |
| (4) Legal Name of Im | entor: Guy M. Lohman | |
| Signature | | 1Nov. |

Page 2 of 3

| (5) | Legal Name of Inventor: Lin Qiao | | |
|-----|--|-------|---|
| | Signature: | Date: | |
| (6) | Legal Name of Inventor: Vijayshankar Raman | | |
| | Signature: | Date: | |
| (7) | Legal Name of Inventor: Eugene J. Shekita | | |
| | Signature: | Date: | *************************************** |
| (8) | Legal Name of Inventor: Richard S. Sidle | | |
| | Signature: | Date | |

DECLARATION (37 C.F.R. 1.63) FOR UTILITY PATENT APPLICATION USING AN APPLICATION DATA SHEET (37 C.F.R. L.76) AND ASSIGNMENT

Title of Invention: EFFICIENT PARTITIONED JOINS IN A DATABASE WITH COLUMN-MAJOR LAYOUT

As a below named inventor, I hereby declare that:

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I have reviewed and understand the contents of the application, including the claims.

known to me to be material to patentability as defined in 37 CFR Section 1.36.

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Page Lof 3

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| (1) 1 SEN 1/SHIE IN THE CHICA CARETAN LANGUAGE | Date: |
|--|-------|
| Signature: | |
| | |
| | |
| 2) Legal Name of Inventor: Gopi K. Attaluri | |
| | |
| Signature | Date: |
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| ······································ | |
| 3) Legal Name of Inventor: Ronald J. Barber | |
| Signature: | Date: |
| | |
| | |
| (4) Legal Name of Inventor: Guy M. Lohman | |
| | Date: |

| (5) Legal Name of Inventor: Lin Quan | |
|---|-------|
| Signature: | Date |
| (6) Legal Name of Investor: Vijayshnukar Raman | |
| Signature | Date: |
| (7) Legal Name of inventor: Engene J. Shekita | |
| Signature: <u>Ey (420</u>) MMTD | |
| (8) Legal Name of Inventor: Richard S. Sidic | |
| Signature: | Date: |

Title of Invention: EFFICIENT PARTITIONED JOINS IN A DATABASE WITH COLUMN-MAJOR LAYOUT

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| (1) | Legal Name of Inventor: Stefan Arndt | |
|-----|---|-------------------------|
| | Signature: | Date: |
| (2) | Legal Name of Inventor: Gopi K. Attaluri | |
| | Signature: A-CIOP EARWA | Date: <u>2374</u> (e6/6 |
| (3) | Legal Name of inventor: Ronald J. Barber | |
| | Signature: | Date: |
| (4) | Legal Name of Inventor: Guy M. Lohman | |
| | Signature: | Thate- |

Page 2 of 3

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| (1) Legal Name of inventor: Stelan Arnor | | |
|---|-------|--|
| Signature: | Date: | |
| | | |
| | | |
| (2) Legal Name of Inventor: Gopi K. Attaluri | | |
| Signature: | Date: | |
| | | |
| (3) Legal Name of Inventor: Ronald J. Barber | | |
| Signature: | Daté: | |
| | | |
| | | |
| (4) Legal Name of Inventor: Guy M. Lohman | | |
| 99.6 | Data | |

Page 2 of 3

| Date: |
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| Date: |
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| (I) Legal Name of Inventor: Stefan Arndt | |
|--|-------|
| Signature: | Date: |
| | |
| (2) Legal Name of Inventor: Gopi K. Attaluri | |
| Signature: | Date: |
| | |
| (3) Legal Name of Inventor: Ronald J. Barber | |
| Signature: | Date: |
| | |
| (4) Legal Name of Inventor: Guy M. Lohman | |
| Signature: | Date |

| (S) Legal Name of Inventor: Lin Qiao | |
|--|---------------------|
| Signature: Lin | Date: Jnr € 9, 2016 |
| (6) Legal Name of Inventor: Vijayshankar Raman | |
| Signature: | Date: |
| (7) Legal Name of Inventor: Eugene J. Shekita | |
| Signature: | Date: |
| (8) Legal Name of Inventor: Richard S. Sidle | |
| Signature: | Date: |

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PATENT REEL: 039531 FRAME: 0494