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UTILITY PATENT APPLICATION TRANSMITTAL <i>(Only for new nonprovisional applications under 37 CFR 1.53(b))</i>	Attorney Docket No.	SCHR 8887
	First Named Inventor	Martin KLENK
	Title	METHOD OF CREATING PROCESS PROTOCOLS
	Express Mail Label No.	

APPLICATION ELEMENTS <i>See MPEP chapter 600 concerning utility patent application contents.</i>	Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450
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1. ☐ Fee Transmittal Form (PTO/SB/17 or equivalent) 2. ☐ Applicant asserts small entity status. See 37 CFR 1.27 3. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent. 4. ☒ Specification [Total Pages <u>33</u>] Both the claims and abstract must start on a new page. (See MPEP § 608.01(a) for information on the preferred arrangement) 5. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets <u>2</u>] 6. Inventor's Oath or Declaration [Total Pages <u> </u>] (including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e)) a. ☐ Newly executed (original or copy) b. ☐ A copy from a prior application (37 CFR 1.63(d)) 7. ☒ Application Data Sheet * See note below. See 37 CFR 1.76 (PTO/AIA/14 or equivalent) 8. CD-ROM or CD-R in duplicate, large table, or Computer Program (Appendix) ☐ Landscape Table on CD 9. Nucleotide and/or Amino Acid Sequence Submission (if applicable, items a. – c. are required) a. ☐ Computer Readable Form (CRF) b. ☐ Specification Sequence Listing on: i. ☐ CD-ROM or CD-R (2 copies); or ii. ☐ Paper c. ☐ Statements verifying identity of above copies	ACCOMPANYING APPLICATION PAPERS 10. ☐ Assignment Papers (cover sheet & document(s)) Name of Assignee _____ 11. ☐ 37 CFR 3.73(c) Statement ☐ Power of Attorney (when there is an assignee) 12. ☐ English Translation Document (if applicable) 13. ☐ Information Disclosure Statement (PTO/SB/08 or PTO-1449) ☐ Copies of citations attached 14. ☐ Preliminary Amendment 15. ☐ Return Receipt Postcard (MPEP § 503) (Should be specifically itemized) 16. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed) 17. ☐ Nonpublication Request Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent. 18. ☒ Other: Authorization for Internet Communications _____ _____ _____ _____
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***Note:** (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS					
☒ The address associated with Customer Number: <u>61650</u> OR ☐ Correspondence address below					
Name					
Address					
City		State		Zip Code	
Country		Telephone		Email	
Signature	/Harris A. Wolin/			Date	January 24, 2019
Name (Print/Type)	Harris A. Wolin			Registration No. (Attorney/Agent)	39432

This collection of information is required by 37 CFR 1.53(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.

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.

Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	METHOD OF CREATING PROCESS PROTOCOLS			
First Named Inventor/Applicant Name:	Martin KLENK			
Filer:	Harris Wolin/Michaelanne Stelling			
Attorney Docket Number:	SCHR 8887			
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:				
LATE FILING FEE FOR OATH OR DECLARATION	1051	1	160	160
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1880

Electronic Acknowledgement Receipt

EFS ID:	34946029
Application Number:	16256380
International Application Number:	
Confirmation Number:	7124
Title of Invention:	METHOD OF CREATING PROCESS PROTOCOLS
First Named Inventor/Applicant Name:	Martin KLENK
Customer Number:	61650
Filer:	Harris Wolin/Michaelanne Stelling
Filer Authorized By:	Harris Wolin
Attorney Docket Number:	SCHR 8887
Receipt Date:	24-JAN-2019
Filing Date:	
Time Stamp:	15:00:30
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1880
RAM confirmation Number	012519INTEFSW15011200
Deposit Account	503894
Authorized User	Michaelanne Stelling

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	Application Data Sheet	schr_8887_20190124_ads.pdf	1792844	no	8
			f88eb00d197f403cdbbee55a6ef6ffe7f0fa2b83		
Warnings:					
Information:					
2	Drawings-only black and white line drawings	schr_8887_20190124_dwgs.pdf	553935	no	2
			2d279a6395367ee80920f9d9646529ddbef36f30		
Warnings:					
Information:					
3		schr_8887_20190124_spec.pdf	182097	yes	33
			bfb2a2a5e89eac4feec8146dea55fa41f50f5f82d		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	27	
	Claims		28	32	
	Abstract		33	33	
Warnings:					
Information:					
4	Internet Communications Authorized	schr_8887_20190124_internet_comm.pdf	92912	no	2
			67309fcbc5381131718a8878779a6382b2ac335c		
Warnings:					
Information:					
5	Transmittal of New Application	schr_8887_20190124_trans.pdf	276671	no	2
			de04402c00c04c403390e444cf72483748777bbb		

Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	36370	no	2
			a1dbe13e41a5629462f752969e8a77c8008d935f		
Warnings:					
Information:					
Total Files Size (in bytes):				2934829	
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.					

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	SCHR 8887
		Application Number	
Title of Invention	METHOD OF CREATING PROCESS PROTOCOLS		
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		
	Martin		KLENK			
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service						
City	München	Country of Residence ⁱ		DE		
Mailing Address of Inventor:						
Address 1		c/o Celonis SE				
Address 2		Theresienstr. 6				
City	München	State/Province				
Postal Code	80333	Country ⁱ	DE			
Inventor	2				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Alexander		RINKE			
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service						
City	München	Country of Residence ⁱ		DE		
Mailing Address of Inventor:						
Address 1		c/o Celonis SE				
Address 2		Theresienstr. 6				
City	München	State/Province				
Postal Code	80333	Country ⁱ	DE			
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button. Add						

Correspondence Information:

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SCHR 8887
		Application Number	
Title of Invention	METHOD OF CREATING PROCESS PROTOCOLS		

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	61650		
Email Address	patent@myerswoln.com	Add Email	Remove Email

Application Information:

Title of the Invention	METHOD OF CREATING PROCESS PROTOCOLS		
Attorney Docket Number	SCHR 8887	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	2	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

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.

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	61650		

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SCHR 8887
		Application Number	
Title of Invention	METHOD OF CREATING PROCESS PROTOCOLS		

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
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).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			Add

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SCHR 8887
		Application Number	
Title of Invention	METHOD OF CREATING PROCESS PROTOCOLS		

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SCHR 8887
		Application Number	
Title of Invention	METHOD OF CREATING PROCESS PROTOCOLS		

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	Celonis SE		
Mailing Address Information For Applicant:			
Address 1	Theresienstr. 6		
Address 2			
City	München	State/Province	
Country	DE	Postal Code	80333
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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SCHR 8887
		Application Number	
Title of Invention	METHOD OF CREATING PROCESS PROTOCOLS		

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.				☐
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country ⁱ		Postal Code		
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:

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	/Harris A. Wolin/		Date (YYYY-MM-DD)	2019-01-24
First Name	Harris	Last Name	Wolin	Registration Number
				39432
Additional Signature may be generated within this form by selecting the Add button.				Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SCHR 8887
		Application Number	
Title of Invention	METHOD OF CREATING PROCESS PROTOCOLS		

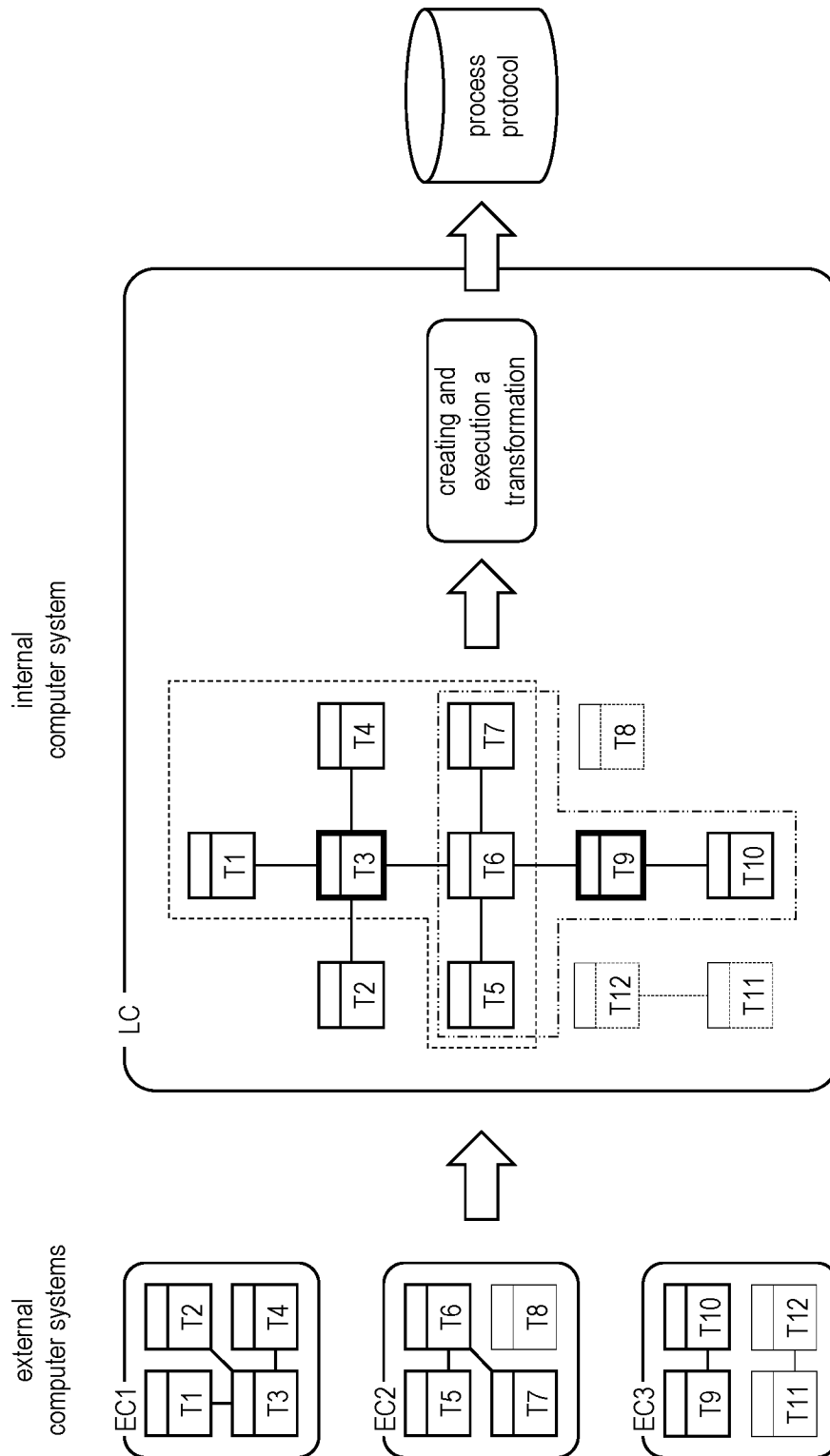
This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes 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.**

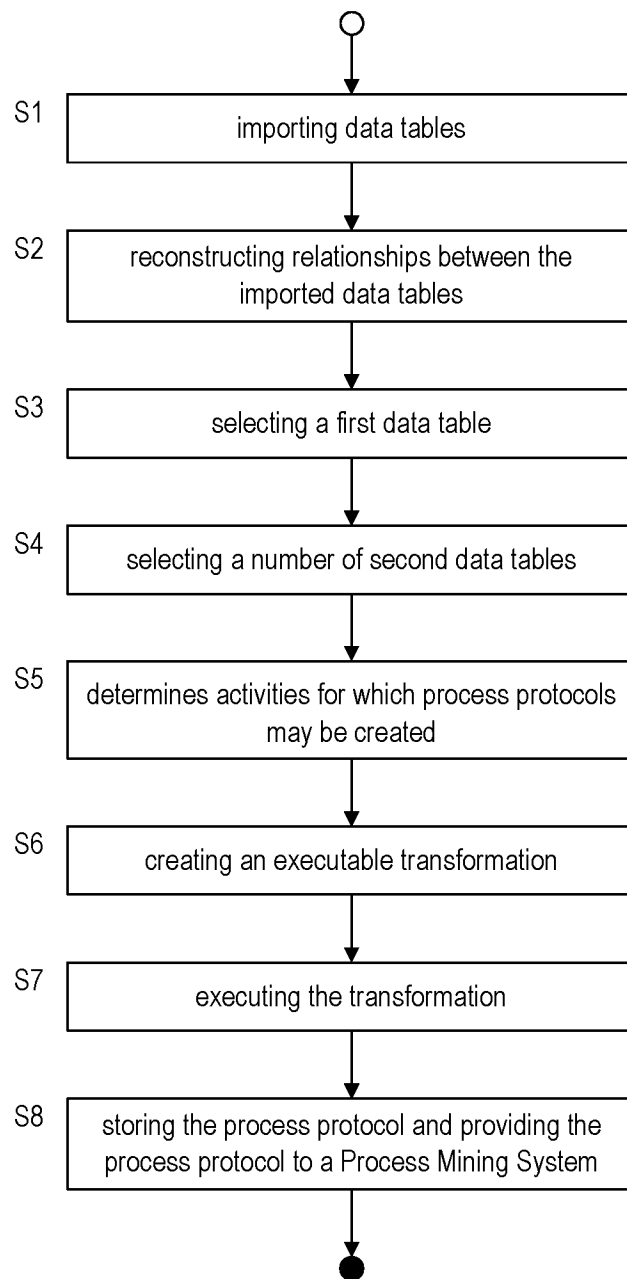
Privacy Act Statement

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).
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- 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.

**Fig. 1**

**Fig. 2**

METHOD OF CREATING PROCESS PROTOCOLS

TECHNICAL FIELD

[0001] The invention relates to a method of creating process protocols, wherein the data for which the process protocols are to be created, is stored in a distributed IT infrastructure, i.e., on different computer systems.

BACKGROUND

[0002] Real processes, as business processes (e.g., an order process) or technical processes (e.g., a coating process) often are executed in a computer system or with the aid of a computer system. Hereby, such a process may comprise several process steps. Each process step may create data during the execution, which is stored in the computer system, in which the process is carried out or with the aid of which the process is carried out.

[0003] It is known to analyze processes, which have been executed in a computer system or with the aid of a computer system. Hereby, information is extracted from the data created by the processes or by the respective process steps, which is relevant for the analysis of the processes. In this way, for example, the transactions carried out in an ERP system or the process steps carried out along a production/processing line can be analyzed in order to identify for example, bottlenecks or other anomalies in the processes. The analysis of the processes is carried out by means of a so-called Process Mining System. For a Process Mining System to be able to carry out such an analysis efficiently, the extracted information has to be available to the Process Mining System in a processed form. In the following, this processed form of the extracted information is referred to as a process protocol.

[0004] In prior art, the analysis of the processes is carried out in the computer system, in which the data has been created and stored. Hereby, it is disadvantageous that

only processes, which have been executed in the respective computer system, can be analyzed.

[0005] In practice, it may happen that partial processes of a process are carried out on different computer systems, and consequently, also create data on different computer systems. Thus, for example, the ordering information for an order process and the history to it may be stored on a first computer system, while the data with respect to the sales and the vendor calls are stored in a second computer system. Hereby, the partial processes relating to the orders are executed in the first computer system, and the partial processes relating to the vendor calls are executed in the second computer system. With respect to technical processes, as production processes, different partial processes may be executed on different production units, whereby the data of the partial processes may be stored in different computer systems. For example, information relating to the assembly process may be stored in a first computer system, and information relating to a subsequent technical test process may be stored in a second computer system.

[0006] The partial processes executed on the first computer system can be analyzed by means of methods known from prior art. Also, partial processes executed on the second computer system can be analyzed, however, only independently of the partial processes executed on the first computer system. An analysis of the overall process, thereby, is not possible.

SUMMARY

[0007] Therefore, it is an object of the present invention to provide solutions, which allow for an efficient and simple analysis of processes, which have been executed in different computer systems and/or by different processing units.

[0008] According to the invention, this object may be solved by a method according to the independent claim. Preferred embodiments and further developments of the invention are defined in the dependent claims.

[0009] Accordingly, a computer-implemented method of creating a process protocol in a local computer system is provided, where the local computer system comprises a processor and a storage device,

- wherein the process protocol is created from raw data, which is stored in part in a first external computer system and in part in a second external computer system,
- wherein the raw data in the external computer systems is stored in a number of data tables,
- wherein the raw data comprises data, which is created during the execution of processes in the first external computer system and in the second external computer system, and
- wherein the method comprises:
 - (a) importing the data tables from the first external computer system and from the second external computer system into the local computer system, and storing the imported data tables in the storing device of the local computer system,
 - (b) in the local computer system, reconstructing the relationships between the imported data tables,
 - (c) in the local computer system, determining and selecting a first data table from the number of imported data tables, which comprises objects for which the process protocol is to be created,
 - (d) in the local computer system, determining and selecting a number of second data tables from the number of imported data tables, which are necessary for the creation of the process protocol, based on the selected first data table and based on the relationships between the imported data tables,
 - (e) in the local computer system, creating an executable transformation, which based on
 - the selected first the data table,
 - the selected second data tables, and

- on the relationships between the selected first data table and the selected second data tables

is adapted to extract data from the first data table and from the second data tables, and to store the extracted data as process protocol, and

(f) in the local computer system, executing the transformation and storing the extracted data as process protocol, and providing the created process protocol to a Process Mining System for analysis and reconstruction of the processes carried out in the first external computer system and in the second external computer system.

[0010] In one embodiment of the invention at least one of the selected data tables may be imported from the first external computer system, and at least one of the selected data tables may be imported from the second external computer system.

[0011] In one embodiment of the invention, during execution of the transformation in the step (f), the data may be extracted from the data tables stored in the external computer systems.

[0012] In one embodiment of the invention, during reconstructing of the relationships between the imported data tables in the step (b), it may be determined via which attributes the data tables are related to each other.

[0013] In one embodiment of the invention two data tables may be related to each other, if an attribute of the one data table is identical or similar to an attribute of the other data table. Examples: attribute "Customer" of a first data table is identical to the attribute "Customer" of a second data table; attribute "Customer Number" of a first data table is similar to the attribute "Customer No." of a second data table.

[0014] In one embodiment of the invention the relationships reconstructed between two imported data tables may be stored, wherein the names of the two data tables, the respective attributes, and an assignment of the attributes of the one data table to the attributes of the other data table are stored.

[0015] In one embodiment of the invention

- a first data model belonging to the data tables imported from the first external computer system may be imported from the first external computer system into the local computer system, wherein the relationships between the data tables imported from the first external computer system are reconstructed based on the first data model,
- a second data model belonging to the data tables imported from the second external computer system may be imported from the second external computer system into the local computer system, wherein the relationships between the data tables imported from the second external computer system are reconstructed based on the second data model,

such that only the relationships between the data tables from the first external computer system and the data tables from the second external computer system have to be reconstructed without the use of a data model.

[0016] In one embodiment of the invention, during determining and selecting of a first data table in the step (c), it may be determined, which data table meets one or more conditions, wherein the conditions are selected from a group, consisting of

- the data table comprises less data sets compared to the other data tables,
- the data table comprises an attribute, in which the time stamps are stored,
- the data table is referenced by a few other data tables,
- and combinations thereof.

[0017] In one embodiment of the invention information with respect to the selected first data table may be stored with the storage device.

[0018] In one embodiment of the invention, during determining and selecting of the number of second data tables in the step (d) those data tables may be selected, which meet one or more conditions, wherein the conditions are selected from the group, consisting of

- the data tables comprise many data sets compared to the first data table,
- the data table is referenced directly or indirectly by the first data table,

- the data tables respectively comprise an attribute, in which the time stamps are stored,
- and combinations thereof.

[0019] In one embodiment of the invention information with respect to the selected second data tables and with respect to the relationships between the selected second data tables and the first data table may be stored with the storage device.

[0020] In one embodiment of the invention, during creating of the executable transformation in the step (e) it may be determined, which attributes of the selected first data table and of the selected second data tables are considered during extracting of the data.

[0021] In one embodiment of the invention, during executing of the transformation in the step (f) data sets may be read out from the first data table and from the second data tables, wherein the data sets, which have been read out, comprise the attribute values of the attributes determined for the respective data table, wherein the data sets, which have been read out, are stored as process protocol, wherein each data set stored in the process protocol represents a process step (a process step represents an event of a process) of a process executed in the first external computer system and in the second external computer system.

[0022] In one embodiment of the invention the data sets, which have been read out, may be stored according to a predetermined data structure in the process protocol, wherein the predetermined data structure comprises at least:

- a first attribute, in which a first unique identifier of the process of the respective process step is stored;
- a second attribute, in which an identifier of the respective process step is stored;
- and
- a third attribute, in which a sequence of the process steps within a process is stored.

[0023] In one embodiment of the invention the attribute values of the attributes of the process protocol may be determined from

- the attribute values of the data sets, which have been read out, and/or
- the table names and/or column names of the selected first data table and/or the selected second data tables.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] Details and features of the invention as well as concrete embodiments of the invention can be derived from the following description in connection with the drawing, in which:

[0025] Fig. 1 shows a block diagram of an IT system with several computer systems, on the basis of which the method of creating process protocols according to the invention is explained; and

[0026] Fig. 2 shows a flow chart of the method of creating process protocols according to the invention.

DETAILED DESCRIPTION

[0027] **Fig. 1** shows a block diagram of an IT system with several computer systems. Here, the IT system exemplarily consists of three external computer systems (EC1, EC2 and EC3) and of an internal computer system. Hereby, the terms “external” and “internal” only indicate that different computer systems are concerned. The computer systems are coupled to each other via a communications connection. In particular, the external computer systems respectively can be or are coupled to the internal computer system. With respect to the computer systems, so-called On Premise systems or cloud systems may be concerned.

[0028] According to an embodiment of the invention, the external computer systems EC1, EC2, EC3 may also be production facilities, processing facilities, or the like, which respectively comprise at least one data processing device. Preferably, the data

processing device is coupled to a storage device, in which the data provided by the production facility, the processing facility, or the like is stored.

[0029] In the external computer systems, partial processes of a higher level process are executed. The higher level process also is referred to as the overall process. Thus, the overall process, exemplarily, may be a purchase process, which is executed or handled by means of the computer systems.

[0030] In the following, examples are described, in which the external computer systems are conventional computer systems. The examples are also applicable correspondingly for external computer systems, which are production facilities, processing facilities, or other technical facilities, wherein these facilities comprise a data processing system, such as a processor having a storage device, or are coupled to such a data processing system.

[0031] For the present invention, external systems EC1, EC2, EC3 may execute partial processes of a higher level overall process and provide data for the respectively executed partial processes, from which process protocols can be created for the higher level overall process according to methods according to the invention.

[0032] Also, more than three or less than three external computer systems may be provided.

[0033] Example:

[0034] With respect to a first partial process of a purchase process, an order process may be concerned, by means of which the orders are handled. The order process, for example, is carried out in the first external computer system EC1. The data of the order process and the associated history are stored in the first computer system EC1.

[0035] With respect to a second partial process, vendor calls or suppliers may be concerned, for which orders have been created in the first computer system EC1. For example, the vendor calls are handled in the second external computer system EC2. The data with respect to the vendor calls and details of the suppliers as well as their vendors are stored in the second computer system EC2.

[0036] A third partial process belonging to the overall process may be carried out on the third external computer system EC3. The data of the third partial process is stored in the third computer system EC3.

[0037] In the example shown in Fig. 1, the overall process is carried out on three computer systems EC1, EC2, and EC3. An overall process, however, may also be carried out on more or less than three computer systems (within the meaning of the present invention, on at least two computer systems).

[0038] The respective data is stored in the respective computer systems in a structured form, for example, in tables T1 to T12 of a relational data base system. Hereby, different data base management systems and different data base technologies (relational, object oriented, hierarchical data base systems, etc.) may be used in each computer system. In the subsequent description, it is assumed that the data in the respective computer system is stored in tables of a relational database system, whereby the invention is not restricted to this.

[0039] The tables or the data of these tables have a distinct relationship to each other. In Fig. 1, these relationships are shown by the connecting lines between the tables T1 to T12 shown between the computer systems EC1 to EC3. In the respective computer systems EC1 to EC3, moreover, structure tables may be provided (not shown in Fig. 1), in which information with respect to the respective tables and their relationships to each other is stored. These structure tables, optionally, may be used for the creation of a process protocol according to the invention, as is explained in further detail below. These structure tables are also referred to as data model.

[0040] For the creation of the process protocol, at first, the data tables T1 to T12 are imported into the internal computer system.

[0041] Subsequently, the relationships between the imported data tables are reconstructed in the internal computer system, whereby, on the one hand, the relationships between the data tables imported from a certain external computer system, and, on the other hand, the relationships between the data tables of a computer system

and the data tables of another computer system are reconstructed. For example, the relationships between the tables T1 to T4 (which have been imported from the computer system EC1) and between the tables T5 to T8 (which have been imported from the computer system EC2) are reconstructed. Moreover, the relationships between the tables T1 to T4 (which have been imported from the computer system EC1) and between the tables T5 to T9 (in Fig. 1, the relationship between the table T3 and the table T6, and the relationship between the table T6 and the table T9) are reconstructed. How these relationships are determined and reconstructed concretely will be described in further detail with reference to Fig. 2.

[0042] The connecting lines between the imported tables in the internal computer system show these reconstructed relationships.

[0043] After the relationships have been reconstructed, a database scheme exists in the internal computer system, which describes the tables and their relationships with respect to each other for all tables T1 to T12 imported from the external computer systems EC1 to EC3.

[0044] After the reconstruction of the relationships between the imported data tables T1 to T12, it is determined, which business objects are suitable for the creation of a process protocol. With reference to the example mentioned above, such business objects, for example, may be “orders” and “vendors”. For example, the orders, here, are stored in the table T3 and the vendors are stored in the table T9. The determination of these business objects is described in further detail with reference to Fig. 2. The tables in the internal computer system, which store these business objects, which have been determined, have a bold print frame in Fig. 1.

[0045] According to a preferred embodiment of the method according to the invention, one of the business objects, which have been determined, is selected automatically, for example, the business object “orders”. That means, that the table T3 is selected automatically. Hereby, the selection may be carried out based on predetermined requirements, as the number of data sets and/or the number of the time stamps stored in

these tables and/or how often a table has been selected in the past (manually or automatically).

[0046] Alternatively, the selection of a business object (as far as several suitable business objects have been determined) may also be carried out by a user. Hereby, the business objects, which have been determined, are offered to the user for selection. The list of business objects may be sorted according to predetermined requirements, as the number of data sets, and/or the number of the time stamps stored in these tables, and/or how often a table has been selected in the past (manually or automatically).

[0047] In the further procedure, the selected business object, i.e., the selected table is used as base table for the creation of a process protocol.

[0048] Based on the base table (selected business object), those tables are selected from the further tables imported into the internal computer system, which are required for the creation of a process protocol or several different process protocols. Several different process protocols, for example, are possible, if, based on the base table, different activities can be analyzed by the means of the process protocols. With respect to the example of the business object “orders”, for example, such activities may be price changes within an order process, or the vendor calls during an order process.

[0049] Based on the base table T3, and the (direct or indirect) relationships of the base table T3 to the other imported tables, in the example shown in Fig. 1, the tables T1 and T4 to T7 are selected (in Fig. 1 indicated by the dashed-lined frame). The selection of the further tables is based on whether the tables are suitable for the creation of a process protocol. For example, further tables (together with the base table) are then suitable for the creation of a process protocol, if the further tables, compared to the base table, respectively comprise many data sets, and/or the further table is referenced directly or indirectly by the base table, and/or the further tables comprise at least one attribute, in which a time stamp is stored. Further tables may also be suitable for the creation of process protocols, if they have already been used for the creation of process protocols previously.

[0050] With respect to the example shown in Fig. 1, the table T2, however, is referenced by the base table T3 directly. In this table T2, for example, only the type of the order is stored (e.g., online order, order by fax, order by mail, order by telephone). Accordingly, the table T2 does not have any time stamps and, compared to the base table, only has a few data sets. The table T2, thereby, is not relevant for the creation of process protocols.

[0051] If the table T9, in the example shown in Fig. 1, would be selected as base table (business object “vendor”), the system, for example, selects the further tables T5 to T7 and T10 as further table, which is relevant for the creation of a process protocol (in Fig. 1, indicated by the dot-dashed frame).

[0052] After the selection of the relevant further tables, the system, based on the base table and the associated further tables, determines activities for which a process protocol can be created. Based on the example of the base table T3 (orders) and the selected further tables T1 and T4 to T7, such activities, for example, may be the price changes within an order process, or the vendor calls during an order process.

[0053] Depending on the activity, if needed, different tables of the selected further tables are relevant for the creation of the process protocol.

[0054] If the price changes of an order including the relevant time stamps would be stored in the table T4, then, this table, besides the base table T3, would be relevant for a process protocol for analyzing the price changes of orders. Besides the changes of the price, also, changes of the order amounts including the associated time stamps can be stored in the table T4. For the activity “price changes in orders”, this table would have to be filtered according to price changes, for the activity “change of the order amount”, this table would have to be filtered according to the corresponding changes. For each activity, which has been determined, the system stores the filter criteria necessary for this (as far as required). Whether in table T4, a data set belongs to a price change or to an order amount change may be determined, for example, by means of an attribute, in which the type of the change is stored for each data set.

[0055] Besides these two activities, which are stored in the table T4, also, a common activity “change of the order” may be determined, for which no filter criteria would be necessary.

[0056] If the vendor calls including the relevant time stamps would be stored in the table T6, then, this table would not be relevant for a process protocol for analyzing the price changes of orders. In contrast, for a process protocol for analyzing the calls to the vendor within an order process, this table would be relevant.

[0057] Further activities may be the creation of an order or the confirmation of an order by the vendor. For this, no further table would be necessary, if the date is stored in the table T3, at which the order has been created, and a date at which the order has been confirmed.

[0058] For a process protocol for analyzing price changes of orders based on vendor calls during an order process, on the other hand, both tables T4 and T6 would be relevant.

[0059] The activities, which has been determined, may be part of a higher level process. Such a process, for example, may be the order process itself, which comprises the process steps (activities)

- creation of an order,
- price changes in orders,
- vendor calls, and/or
- confirmation of an order.

[0060] Also for such a process, a process protocol may be created. For this, referring to the example mentioned above, besides the base table T3, also the tables T4 to T6 would be relevant for the creation of a process protocol.

[0061] For each activity, which has been determined, the system stores, besides relevant filter criteria, if needed, also attributes/column names (plus, if needed, the associated table name), the values of which are necessarily required for the creation of a

process protocol. Such a mandatory attribute is, for example, a time stamp, by means of which the sequence of the activities within a process is specified.

[0062] By means of a process protocol, which is created for the order process, a Process Mining System, which is provided with the process protocol, is able to analyze the order processes. For example, by means of a Process Mining System, it may be determined that for x % of the order processes more than y vendor calls have taken place, or that for x % of the order processes, at least y price changes have been made, or that x % of the order processes have been made within a certain time period.

[0063] From the activities, which have been determined, the system now may select one or more activities in order to create corresponding process protocols for these. For each selected activity, an own process protocol may be created. Also, for several determined activities, a common process protocol may be created (thus, for the activities of creating an order, price changes in orders, vendor calls, and confirmation of an order, a common process protocol may be generated for the process orders).

[0064] Alternatively, the user may also select from the activities, which have been determined, those activities, for which a (separate or a common) process protocol is to be created.

[0065] Due to the selected activities and the relationships between the tables, which have been determined, the system now is able to select the tables required for this, and, based thereon, to create at least one process protocol.

[0066] Based on the tables (base table and associated relevant further tables according to the selected activities) required for a process protocol and the relationships between the required tables (which, if needed, may be dependent on the selected activities), a transformation is generated in the internal computer system, which extracts data from the necessary attributes of the tables relevant for a process protocol and under consideration of the relevant relationships between the tables relevant for the process protocol, and stores the extracted data as process protocol. The extraction of the data is carried out by using the necessary filter criteria, if needed.

[0067] The process protocol thus created and stored may now be made available to a Process Mining System, in order to analyze the processes stored in the process protocol.

[0068] Each data set stored in the process protocol represents a process step (activity/event) of a process executed in the external computer systems EC1 to EC3. Process steps of several processes may be stored in the process protocol.

[0069] The data structure of the process protocol, hereby, comprises at least

- a first attribute, in which a unique identifier of the process of the respective process step is stored,
- a second attribute, in which an identifier of the respective process step is stored, and
- a third attribute, in which a sequence of the process steps within a process is stored.

[0070] The sequence of the process steps within a process may be indicated by the time stamp mentioned above, which is read out for each activity (process step) from the corresponding tables.

[0071] The unique identifier of the process, for example, may be read out from the base table. For orders, which are stored in the table T3, for example, the (unique) order number may be read out and may be used as process identifier in the process protocol.

[0072] The identifier of the respective process step (which does not have to be unique) may be determined from the column name and/or table name and/or from the attribute values. Example: in the table T3, there are the columns “created” and “confirmed”, in which for each order, the creation date and (if confirmed) the confirmation date are stored. The table T3 is named “orders”. For the activities (process steps) “creation of an order” and “confirmation of an order” mentioned above, the identifiers “order created” (from the table name “orders” and the column name

“confirmed”) may be created and may be stored for the respective process step in the third attribute of the process protocol.

[0073] It is advantageous, if the process protocol or the data sets stored therein, at first, are sorted according to the first attribute and then according to the third attribute. Thereby, the process steps belonging to a process are present in a grouped form, wherein at the same time, the process steps belonging to a process are sorted chronologically.

[0074] The process protocol may be stored in the main memory completely or partially. Further, it is advantageous, if the process steps belonging to a process are stored in the main memory in adjacent addresses, and in particular, according to the third attribute. Thereby, predecessor/successor relationships of the process steps may be determined within a process in an advantageous manner without the predecessor/successor relationships having to be stored. Namely, in an purely sequential process (without parallel partial processes), the predecessor/successor relationship results directly from the addresses, in which the process steps are stored. Moreover, the Process Mining System may read and process the process protocol as a stream sequentially and in the correct order from the main memory. Thus, for example, in $O(n)$ a complete process graph can be created and visualized, which comprises the process steps of all processes stored in the process protocol. Moreover, in $O(n)$, for processes with parallel partial processes, a complete process hierarchy can be created, which may then be visualized as process graph, too.

[0075] The possibility of the linear processing of the process protocol in the Process Mining System is of fundamental significance, because typical process protocols (e.g., in a company that processes several hundred thousands of orders from the creation of the order up to the payment of the ordered goods annually, wherein each order may comprise up to hundred or more activities) comprise several millions up to several hundred million activities (data sets).

[0076] For the first time creation of the process protocol (by executing the transformation), the data of the tables imported into the internal computer system may be

used. However, for this it is also possible to use the data stored in the external computer systems EC1 to EC3.

[0077] After the first time creation of the process protocol, the transformation may be executed periodically, if needed, or according to certain rules, for example, every 10 minutes. At each execution of the transformation, the activities added into the external computer systems since the last execution of the transformation are extracted and added to the process protocol.

[0078] Above, a method according to the invention has been described with reference to external computer systems EC1 to EC3, which are systems, by means of which business processes may be handled.

[0079] With respect to the external systems EC1 to EC3, however, physical entities, as machines, which, for example, provide data within the scope of processing a product along a production and/or processing line, which we present an activity or a process step of a production process may also be concerned. This data may be stored in a storage device assigned to the machine, for example, in tables of a database system. These tables may then be imported into the internal computer system described above in order to create the process protocols according to the method described above.

[0080] Thus, with respect to the external system EC1, a grinding machine may be concerned. The grinding machine, for example, records the start and the end of a grinding process and stores this data together with a product identifier in the database assigned to it.

[0081] With respect to the external system EC2, a coating unit may be concerned, which is coupled to another database. The coating unit may comprise a sensor for measuring the applied coating thickness in order to repeat a coating process on a product, if needed, as long as the desired coating thickness is reached. The coating unit may record the start and the end of the entire coating process, as well as the start and the end of the respective repetitions together with the coating thicknesses measured respectively, and may store it together with a product identifier in the database assigned to it.

[0082] From the tables assigned to these two machines, the activities (process steps) may be determined according to a method according to the invention

- start of grinding
- end of grinding
- start of coating
- end of coating
- start of repetition of coating (together with the coating thickness measured)
- end of repetition of coating (together with the coating thickness measured).

[0083] By means of the product identifier, the single activities may be assigned to a certain processing process.

[0084] The process protocols created for this may be analyzed by a Process Mining System in order to recognize, for example, which products lead to a delay in a subsequent assembly process, because, for example, the coating process has to be repeated particularly often with respect to certain products.

[0085] **Fig. 2** shows a flowchart of a method of creating process protocols according to the invention.

[0086] In a first step S1, the data tables are imported from different systems into the internal computer system. The different systems, from which the data tables are imported, may be the external computer systems EC1 to EC3 shown in Fig. 1, and/or production facilities, processing facilities, or other technical facilities, which provide data for processes/partial processes, which have been carried out. With respect to these systems, distributed systems (e.g., production facilities at different locations) and/or cloud systems may be concerned.

[0087] As far as the data tables to be imported are data from data base systems, the data tables may be imported into a data base system of the internal computer system directly.

[0088] However, the data tables to be imported do not necessarily have to be tables of a data base system. For example, the data to be imported may also be present as

one or more structured text file/files. In this case, it is advantageous to nevertheless store the data in a data base system of the internal computer system. If needed, the data to be imported may be processed prior to being stored in the database system.

[0089] After the first step S1, all data of the external computer systems, for which the process protocols are to be created, is stored in the internal computer system.

[0090] In the following, four tables with exemplary data, which have been imported from external computer systems, are provided as an example, wherein the tables 1 and 2 have been imported from a first computer system (e.g., an On Premise ERP system), and the tables 3 and 4 have been imported from a second computer system (e.g., a Cloud CRM system) into the internal computer system.

Table T1 – Order Information

Order Number	Creation Date	Vendor	Price	Amount
1	01.01.2018	ABC	100	10
2	24.01.2018	XYZ	2	12
...	...	...	...	...

Table T2 – Order History

Date	Order Number	Field	Old value	New value	Who
01.01.2018	1	Price	99	130	Joe
02.01.2018	1	Amount	9	7	Joe
03.01.2018	1	Amount	7	10	Joe
04.01.2018	1	Price	130	95	Bill
05.01.2018	1	Price	95	100	Joe
...	...	...	...	...	...

Table T3 – Vendor Calls

Vendor	Account Executive	Type	Reference ID	Date
ABC	George	Call	1	02.01.2018
ABC	George	Mail	1	04.01.2018
...	...	...	...	

Table T4 – Vendor Information

Vendor	Create date	Country	State
ABC	02.01.2017	DE	BY
XYZ	08.04.2017	DE	BY
...	...	...	...

[0091] After the data tables have been imported completely, in the second step S2, the relationships (foreign key relationships) between the individual data tables, which have been imported, are reconstructed. With respect to the four tables mentioned above, this would be the following relationships:

- a) T1 (Order Number) $\leftrightarrow$ T2 (Order Number)
- b) T1 (Order Number) $\leftrightarrow$ T3 (Reference ID)
- c) T2 (Order Number) $\leftrightarrow$ T3 (Reference ID)
- d) T3 (Vendor) $\leftrightarrow$ T4 (Vendor)
- e) T3 (Vendor) $\leftrightarrow$ T1 (Vendor)

[0092] Hereby, $T_n(x) \leftrightarrow T_m(y)$ means that the tables T_n and T_m are linked to each other via the attribute x in the table T_n and via the attribute y in the table T_m .

[0093] In order to reconstruct the relationships between the imported data tables, it may be advantageous to also import so-called scheme tables, besides the data tables, from the external computer systems. In the scheme tables, information with respect to the relationships amongst the imported data tables may be stored.

[0094] Thus, scheme tables may be imported for the tables T1 to T4 mentioned above from the first computer system and from the second computer system. In the scheme tables from the first computer system, the relationships between the tables T1 and T2 are stored, in the scheme tables from the second computer system, the relationships between the tables T3 and T4 are stored.

[0095] Then, using the scheme tables, the relationships between the tables T1 and T2 and between the tables T3 and T4, respectively, may be reconstructed automatically.

[0096] Also without using the scheme tables mentioned above, the relationships between the tables T1 and T2 and between the tables T3 and T4, respectively, may be reconstructed automatically. For example, this is possible, if

- an attribute (column name) of the one data table is identical or similar to an attribute (column name) of the other data table, or
- the combination of table name and column name is identical or similar to a column name of another data table (e.g., the table "Vendor" comprises a first column "ID" and the table "Order" comprises a column "VendorID" – in this case, the tables "Vendor" and "Order" would be linked to each other via the attributes "ID" and "VendorID").

[0097] Thus, for the tables mentioned above, the relationships

T1 (Order Number) $\leftrightarrow$ T2 (Order Number)

T3 (Vendor) $\leftrightarrow$ T4 (Vendor)

may also be constructed without scheme tables automatically.

[0098] Moreover, also the relationship

T3 (Vendor) $\leftrightarrow$ T1 (Vendor)

could be recognized automatically, although the tables T1 and T3 have been imported from different external systems.

[0099] For the automatic recognition of the relationships between the tables T1 and T3 and between the tables T2 and T3 (T1 and T2 have been imported from another computer system than the table T3), further heuristics may be used. For example, the column name may be analyzed (e.g., if the column name comprises the text component “ID”, then it may be assumed with a high probability that in this column foreign key values are stored). Alternatively or additionally, also the imported scheme tables may be used in order to determine the primary key attributes and the foreign key attributes for the imported tables.

[00100] For the table T1, for example, the attribute “Order Number” may be determined based on the imported scheme tables as primary key attribute. For the table T3, for example, the attribute “Reference ID” may be determined based on an analysis of the column names as foreign key attribute. Thereby, the relationship

T1 (Order Number) $\leftrightarrow$ T3 (Reference ID)

may be determined automatically.

[00101] Analogously, also the relationship

T2 (Order Number) $\leftrightarrow$ T3 (Reference ID)

may be determined automatically.

[00102] The relationships between the tables T1 to T4 thus determined may be confirmed by a user. Additionally, it may be provided for a user creating/adding additional relationships (as relationships, which have not been determined automatically)

or deleting existing relationships again (as relationships, which have been determined by the system incorrectly).

[00103] After the relationships have been reconstructed, a valid data base scheme exists in the internal computer system, which describes the tables and their relationships to each other for all tables T1 to T4 imported from the external computer systems. If these tables or a subset of these tables are imported into the internal computer system at a later point of time, for example, in order to create other process protocols, then, the internal computer system may use this valid data base scheme in order to determine relationships between the tables. In this respect, the internal computer system is configured so as to be self-learning, i.e., it successively learns relationships between imported data tables such that the computer system may use these relationships learned at a later point of time.

[00104] After the relationships have been determined and, if needed, have been stored, in the subsequent step S3, business objects (also referred to as Case Object) are determined, which are suitable for the creation of a process protocol. Hereby, such data tables are selected, in which such business objects are stored (or, however, are stored with a high probability). Advantageously, this is carried out automatically.

[00105] In the present example, the internal computer system may recognize the tables T1 (orders) and T4 (vendors) as business objects. Namely, the table T1 stores base information with respect to orders, and the table T4 stores base information with respect to vendors. The tables T2 and T3, on the other hand, store change information (table T2: price changes /changes in the amount of an order) and actions (table T3: vendor cards), respectively.

[00106] If the internal system finds several business objects to be suitable for the creation of a process protocol, one of the business objects may be selected by a user. The internal computer system may store information with respect to the selected business object such that the internal computer system may use this information at a later point of time. If a method according to the invention is carried out several times, the internal

system learns successively, which business objects have been determined for how many times, and which business objects have been selected by a user for how many times. The data table belonging to the selected business object is also referred to as first data table (in Fig. 1 above, also referred to as base table).

[00107] In this example, the business object orders (data table T1) is selected.

[00108] In a further step S4, the internal computer system, starting from the selected business object (orders) or starting from the first data table (T1), respectively, then determines further data tables (also referred to as the second data tables), which may be suitable for the creation of process protocols. For the first data table T1, this would be the data tables T2 and T3, which, on the one hand, are related to the first data table T1 directly, and on the other hand, store change information and actions, respectively.

[00109] Based on the first data table T1 and the second data tables T2, T3, and the relationships between these data tables, the internal computer system determines activities, for which process protocols may be created, in the subsequent step S5.

[00110] For the data tables T1, T2, and T3, the internal computer system, in this example, determines the following activities:

Create Order	based on the table T1 and the attribute "Creation Date" of the table T1
Change Price	based on the table T2 and the attribute "Date" of the table T2 as well as the attribute "Field" of the table T2, whereby attribute values of the attribute "Field" are filtered (Field = Price)
Change Amount	based on the table T2 and the attribute "Date" of the table T2 as well as the attribute "Field" of the table T2, whereby attribute values of the attribute "Field" are stored (Field = Amount)
Change Order	based on the table T2 and the attribute "Date" of the table T2
Call Vendor	based on the table T3 and the attribute "Date" of the table T3

[00111] The relationships of the activities may be created by the internal computer system automatically, for example, from the table names and the respective date attribute (e.g. “Create Order” from “Order Information” and “Creation Date”).

[00112] With respect to the activities “Change Price” and “Change Amount” determined above, the internal computer system, moreover, creates a filter based on the attribute “Field” in order to filter certain activities in the table T2. Hereby, the computer system may assume that due to the table name “Order History” and the column “Field” occurring in this table, the table T2 stores changes for various fields (e.g., Price and Amount) of the table T1 (T1 and T2, in fact, are linked to each other via the columns Order Number).

[00113] Subsequently, based on these activities, several process protocols may be created, for example, a process protocol for orders or a process protocol for changes of orders.

[00114] These activities, however, may also be combined, in order to, for example, create process protocols for higher-level processes. Thus, for example, it is possible to create a process protocol, by means of which changes of orders may be analyzed based on vendor calls.

[00115] Now, a user may select one or more activities, for which one or more process protocols are to be created. If the user selects several activities, then the internal computer system may create a process protocol for that activity or a common process protocol for all selected activities upon instruction of the user.

[00116] Alternatively, the computer system may also create a process protocol without user interaction for all activities, which have been respectively determined automatically.

[00117] In the subsequent step S6, the internal computer system creates an executable transformation for every selected activity (or alternatively, for all activities or for combinations of activities) by means of which the data from the external computer systems EC1 to EC3 may be transformed into a process protocol.

[00118] The transformation, when executed, extracts data at least from the necessary attributes of the tables relevant for the respective process protocol, and under consideration of the relevant relationships between the tables relevant for the respective process protocol, and stores the extracted data as process protocol. The extraction of the data is carried out by using the possibly necessary filter criteria, which may be prescribed by the respective activities.

[00119] Then, the transformation thus created is stored and is executed in the step S7.

[00120] The process protocol created by the execution of the transformation is stored and is made available to a Process Mining System for being analyzed.

[00121] The transformation may be carried out a couple of times, for example, periodically, whereby the process protocol may be enriched by new process steps carried out in the external systems or by newly executed processes.

[00122] Each data set of a process protocol, hereby, represents a process step (activity / event) of a process executed in the external computer systems, whereby also process steps of several processes may be stored in the process protocol.

[00123] In any case, the attributes necessary for the creation of the process protocol are

- a unique identifier of the process of the respective process step,
- an identifier of the respective process step, and
- a sequence of the process steps within a process.

[00124] If a process protocol is to be created for the activity Change Order mentioned above, then, for each data set of the process protocol, the attribute values necessary for this would be

- Order Number (= identifier of the process),
- "Name" (= identifier of the process step – is created by the system automatically),
and
- Date (= sequence).

[00125] Based on the tables listed above, for the activity Change Order, the following process protocol is obtained:

Identifier of the process	Identifier of the process step	Sequence
1	Change Price	01.01.2018
1	Change Amount	02.01.2018
1	Change Amount	03.01.2018
1	Change Price	04.01.2018
1	Change Price	05.01.2018

[00126] The system may create the identifier of the respective process step from the values of the column “Field” automatically.

What is claimed is:

1. A computer-implemented method of creating a process protocol in a local computer system (LC), which comprises a processor and a storage device, wherein the process protocol is created from raw data, which is stored in part in a first external computer system (EC1) and in part in a second external computer system (EC2), wherein the raw data in the external computer systems is stored in a number of data tables, wherein the raw data comprises data, which is created during the execution of processes in the first external computer system and in the second external computer system, and wherein the method comprises:
 - (a) importing the data tables from the first external computer system and from the second external computer system into the local computer system, and storing the imported data tables in the storing device of the local computer system,
 - (b) in the local computer system, reconstructing the relationships between the imported data tables,
 - (c) in the local computer system, determining and selecting a first data table from the number of imported data tables, which comprises objects for which the process protocol is to be created,
 - (d) in the local computer system, determining and selecting a number of second data tables from the number of imported data tables, which are necessary for the creation of the process protocol, based on the selected first data table and based on the relationships between the imported data tables,
 - (e) in the local computer system, creating an executable transformation, which based on
 - the selected first the data table,
 - the selected second data tables, and
 - on the relationships between the selected first data table and the selected second data tables

- is adapted to extract data from the first data table and from the second data tables, and to store the extracted data as process protocol, and
- (f) in the local computer system, executing the transformation and storing the extracted data as process protocol, and providing the created process protocol to a Process Mining System for analysis and reconstruction of the processes carried out in the first external computer system and in the second external computer system.
2. The method of claim 1, wherein at least one of the selected data tables is imported from the first external computer system (ES1), and at least one of the selected data tables is imported from the second external computer system (ES2).
 3. The method of claim 1, wherein during execution of the transformation in the step (f), the data is extracted from the data tables stored in the external computer systems (ES1, ES2).
 4. The method of claim 1, wherein during reconstructing of the relationships between the imported data tables in the step (b), it is determined via which attributes the data tables are related to each other.
 5. The method of claim 4, wherein two data tables are related to each other, if an attribute of the one data table is identical or similar to an attribute of the other data table.
 6. The method of claim 1, wherein the relationships reconstructed between two imported data tables are stored, wherein the names of the two data tables, the respective attributes, and an assignment of the attributes of the one data table to the attributes of the other data table are stored.
 7. The method of claim 1, wherein

- a first data model belonging to the data tables imported from the first external computer system (EC1) is imported from the first external computer system into the local computer system, wherein the relationships between the data tables imported from the first external computer system (EC1) are reconstructed based on the first data model,
- a second data model belonging to the data tables imported from the second external computer system (EC2) is imported from the second external computer system into the local computer system, wherein the relationships between the data tables imported from the second external computer system (EC2) are reconstructed based on the second data model,

such that only the relationships between the data tables from the first external computer system and the data tables from the second external computer system have to be reconstructed without the use of a data model.

8. The method of claim 1, wherein during determining and selecting of a first data table in the step (c), it is determined, which data table meets one or more conditions, wherein the conditions are selected from a group, consisting of
 - the data table comprises less data sets compared to the other data tables,
 - the data table comprises an attribute, in which the time stamps are stored,
 - the data table is referenced by a few other data tables,
 - and combinations thereof.
9. The method of claim 8, wherein information with respect to the selected first data table is stored.
10. The method of claim 1, wherein during determining and selecting of the number of second data tables in the step (d) those data tables are selected, which meet one or more conditions, wherein the conditions are selected from the group, consisting of
 - the data tables comprise many data sets compared to the first data table,

- the data table is referenced directly or indirectly by the first data table,
 - the data tables respectively comprise an attribute, in which the time stamps are stored,
 - and combinations thereof.
11. The method of claim 10, wherein information with respect to the selected second data tables and with respect to the relationships between the selected second data tables and the first data table are stored.
12. The method of claim 1, wherein during creating of the executable transformation in the step (e) it is determined, which attributes of the selected first data table and of the selected second data tables are considered during extracting of the data.
13. The method of claim 12, wherein during executing of the transformation in the step (f) data sets are read out from the first data table and from the second data tables, wherein the data sets, which have been read out, comprise the attribute values of the attributes determined for the respective data table, wherein the data sets, which have been read out, are stored as process protocol, wherein each data set stored in the process protocol represents a process step (Event) of a process executed in the first external computer system and in the second external computer system.
14. The method of claim 13, wherein the data sets, which have been read out, are stored according to a predetermined data structure in the process protocol, wherein the predetermined data structure comprises at least:
- a first attribute, in which a first unique identifier of the process of the respective process step is stored;
 - a second attribute, in which an identifier of the respective process step is stored;
 - and

- a third attribute, in which a sequence of the process steps within a process is stored.
15. The method of claim 14, wherein the attribute values of the attributes of the process protocol are determined from
- the attribute values of the data sets, which have been read out, and/or
 - the table names and/or column names of the selected first data table and/or the selected second data tables.

ABSTRACT

A computer-implemented method of creating a process protocol in a local computer system is provided. The local computer system comprises a processor and a storage device, wherein the process protocol is created from raw data, which is stored in part in a first external computer system and in part in a second external computer system, wherein the raw data in the external computer systems is stored in a number of data tables, wherein the raw data comprises data, which is created during the execution of processes in the first external computer system and in the second external computer system.

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.	
Filing Date	
First Named Inventor	Martin KLENK
Art Unit	
Examiner Name	
Practitioner Docket No.	SCHR 8887

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

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☒ 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)

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☐ 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 39432.

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

/Harris A. Wolin/
Signature

January 24, 2019
Date

Harris A. Wolin
Typed or printed name

973-828-1284
Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Juristic entities must be represented by a patent practitioner (see 37 CFR 1.31, which is applicable to any paper filed on or after September 16, 2012, that is presented on behalf of a juristic entity, regardless of application filing date). Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

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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)).
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/256,380	01/24/2019	Martin KLENK	SCHR 8887

CONFIRMATION NO. 7124

INFORMAL NOTICE



61650
MYERS WOLIN, LLC
100 HEADQUARTERS PLAZA
West Tower, Floor 7
MORRISTOWN, NJ 07960-6834

Date Mailed: 02/13/2019

INFORMATIONAL NOTICE TO APPLICANT

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

The item(s) indicated below are also required and should be submitted with any reply to this notice to avoid further processing delays.

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
Martin KLENK
Alexander RINKE

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/haberehe/

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 16/256,380				
APPLICATION AS FILED - PART I										
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY				
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	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), (l), 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(j))	15	minus 20 = *			OR	x 100 =	0.00			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1	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)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY		
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	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.										



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/256,380	01/24/2019		1880	SCHR 8887	15	1

CONFIRMATION NO. 7124

FILING RECEIPT



0000000105826237

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MORRISTOWN, NJ 07960-6834

Date Mailed: 02/13/2019

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)

Martin KLENK, München, GERMANY;
Alexander RINKE, München, GERMANY;

Applicant(s)

Celonis SE, Munchen, GERMANY;

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: 02/11/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/256,380**

Projected Publication Date: 07/30/2020

Non-Publication Request: No

Early Publication Request: No

Title

METHOD OF CREATING PROCESS PROTOCOLS

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).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

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.

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

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

☒ Practitioners associated with Customer Number: 61650

OR

☐ Practitioner(s) named below (if more than ten assistant practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

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

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

☒ The address associated with Customer Number: 61650

OR

Firm or individual name			
Address			
City	State	Zip	
Country			
Telephone		Email	

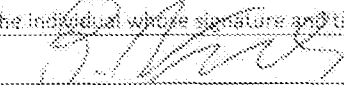
Assignee name and address:

Celonis SE
Theresienstr. 6, 80333 München, GERMANY

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature 	Date January 24, 2019
Name JOM WACKER, OAKTON	Telephone 443/9902893330
Title Co-CEO	

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 302 and 37 CFR 1.11 and 1.14. This collection is estimated to take 15 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 1480, Alexandria, VA 22313-1480. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1480, Alexandria, VA 22313-1480.

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

Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Martin KLENK

Serial No.: 16/256,380

Filing Date: January 24, 2019

Title: METHOD OF CREATING PROCESS
PROTOCOLS

Examiner:

Art Unit:

Confirmation No.: 7124

Attorney Docket No.: SCHR 8887

July 24, 2020

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

**SUBMISSION OF DECLARATION/ASSIGNMENT, POWER OF ATTORNEY
AND STATEMENT UNDER 37 CFR 3.73(c)**

Sir or Madam:

Subsequent to the filing of the above-identified application, applicant submits herewith an executed Declaration/Assignment, Power of Attorney and Statement under 37 CFR 3.73(c).

The surcharge for late filing of the Declaration was paid on January 24, 2019 with the filing of the subject application. However, any fee due with this paper, not already paid through EFS-Web, may be charged to Deposit Account No. 50-3894. Any overpayment may be credited to Deposit Account No. 50-3894.

Respectfully submitted,
MYERS WOLIN, LLC

/Daniel J. Gross/
Daniel J. Gross
Reg. No. 66,449

CUSTOMER NUMBER 61650
PHONE: (973) 828-1284
FAX: (866) 864-3947

Electronic Acknowledgement Receipt

EFS ID:	40095593
Application Number:	16256380
International Application Number:	
Confirmation Number:	7124
Title of Invention:	METHOD OF CREATING PROCESS PROTOCOLS
First Named Inventor/Applicant Name:	Martin KLENK
Customer Number:	61650
Filer:	Daniel Jacob Gross/Michaelanne Stelling
Filer Authorized By:	Daniel Jacob Gross
Attorney Docket Number:	SCHR 8887
Receipt Date:	24-JUL-2020
Filing Date:	24-JAN-2019
Time Stamp:	11:59:48
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73	schr_8887_20200724_stmt_373c.pdf	117540 80ff2c157c8c90387cc4f98ed0f4a246d2172239	no	3

Warnings:

Information:					
2	Oath or Declaration filed	schr_8887_20200724_dec_assi gn_executed.pdf	822790	no	2
			1857a1b684b962fbd07d7f1581a774524b3 8a51c		
Warnings:					
Information:					
3	Power of Attorney	schr_8887_20200724_celonis_s e_poa_executed.pdf	980602	no	2
			b40851f19b581041a3a9f5a415f0699e2a8ff 45f		
Warnings:					
Information:					
4	Transmittal Letter	schr_8887_20200724_trans_let ter.pdf	93587	no	1
			15b722b49247e09680d7ef5af92fa4e54456 f63f		
Warnings:					
Information:					
Total Files Size (in bytes):			2014519		
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.					

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: Celonis SEApplication No./Patent No.: 16/256,380Filed/Issue Date: January 24, 2019Titled: METHOD OF CREATING PROCESS PROTOCOLSCelonis SE, a company

(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.

[Page 1 of 2]

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.

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.

/Daniel J. Gross/

Signature

Daniel J. Gross

Printed or Typed Name

July 24, 2020

Date

66449

Title or Registration 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.

**DECLARATION AND ASSIGNMENT
FOR PATENT APPLICATIONS**

As a below named inventor (designated as "the undersigned"), I hereby declare that:

This declaration is directed to the application attached hereto and entitled **METHOD OF CREATING PROCESS PROTOCOLS**. If the application is not attached hereto, the application is as identified by the attorney docket number as set forth above.

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 above-identified application, including the claims.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

Address all correspondence to **CUSTOMER NUMBER 61650**.

ASSIGNMENT

WHEREAS, **Celonis SE**, having an address at **Theresienstr. 6, 80333 München, GERMANY** (hereinafter "ASSIGNEE"), is desirous of acquiring the entire right, title and interest in, to and under the above identified application and invention, and to any Letters Patent(s) that may be granted therefor.

NOW, THEREFORE, for good and valuable consideration, the receipt of which is hereby acknowledged, the undersigned has sold, assigned, transferred and set over, and by these presents does hereby sell, assign, transfer and set over, unto the said ASSIGNEE, its successors, legal representatives and assigns, the entire right, title and interest in, to and under the said invention, and the said United States application and all divisions, renewals and continuations thereof, and all Patents of the United States which may be granted thereon and all reissues and extensions thereof; and all applications for industrial property protection, including, without limitation, all applications for patents, utility models, and designs which may hereafter be filed for said invention in any country or countries foreign to the United States, together with the right to file such applications and the right to claim for the same the priority rights derived from said United States application under the Patent Laws of the United States, the International Convention for the Protection of Industrial Property, or any other international agreement or the domestic laws of the country in which any such application is filed, as may be applicable; and all forms of industrial property protection, including, without limitation, patents, utility models, inventor's certificates and designs which may be granted for said invention in any country or countries foreign to the United States and all extensions, renewals and reissues thereof;

The undersigned authorizes and requests the Commissioner of Patents and Trademarks of the United States, and any Official of any country or countries foreign to the United States, whose duty it is to issue patents or other evidence or forms of industrial property protection on applications as aforesaid, to issue the same to the said ASSIGNEE, its successors, legal representatives and assigns, in accordance with the terms of this instrument.

The undersigned covenants and agrees that he has full right to convey the entire interest herein assigned, and has not executed, and will not execute, any agreement in conflict herewith.

The undersigned further covenants and agrees that he will communicate to the said ASSIGNEE, its successors, legal representatives and assigns, any facts known respecting said invention, and testify in any legal proceeding, sign all lawful papers, execute all divisional, continuing, reissue and foreign applications, make all rightful oaths, and generally do everything possible to aid the said ASSIGNEE, its successors, legal representatives and assigns, to obtain and enforce proper protection for said invention in all countries.

The undersigned hereby grants the law firm of Myers Wolin, LLC the power to insert any further identification which may be necessary or desirable in order to comply with the rules of the U.S. Patent and Trademark Office.

The undersigned hereby acknowledges 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.

In witness whereof, executed by the undersigned on the date opposite the undersigned name.

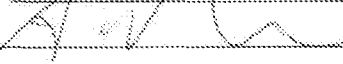
Full name of inventor: Martin KLENK

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16/256,380	01/24/2019	Martin KLENK	SCHR 8887

CONFIRMATION NO. 7124

POA ACCEPTANCE LETTER



61650
MYERS WOLIN, LLC
100 HEADQUARTERS PLAZA
WEST TOWER, FLOOR 7
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Date Mailed: 07/28/2020

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/24/2020.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

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16/256,380	01/24/2019	Martin KLENK	SCHR 8887

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PUBLICATION NOTICE



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61650
MYERS WOLIN, LLC
100 HEADQUARTERS PLAZA
WEST TOWER, FLOOR 7
MORRISTOWN, NJ 07960-6834

Title:METHOD OF CREATING PROCESS PROTOCOLS

Publication No.US-2020-0242114-A1

Publication Date:07/30/2020

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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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	Filing Date		2019-01-24
	First Named Inventor	Martin KLENK	
	Art Unit	2153	
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STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16256380
Filing Date	2019-01-24
First Named Inventor	Martin KLENK
Art Unit	2153
Examiner Name	
Attorney Docket Number	SCHR 8887

1	European partial search report issued for corresponding EP Application Number 20153403.9 mailed on May 6, 2020 with machine generated translation	×
2	van der Aalst, "Process Mining: Getting the Data," Springer-Verlag Berlin Heidelberg, Pages 95-123, January 1, 2011	☐

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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16256380
Filing Date	2019-01-24
First Named Inventor	Martin KLENK
Art Unit	2153
Examiner Name	
Attorney Docket Number	SCHR 8887

CERTIFICATION STATEMENT

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

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

OR

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

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Daniel J. Gross/	Date (YYYY-MM-DD)	2020-10-06
Name/Print	Daniel J. Gross	Registration Number	66449

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(11) **EP 3 139 289 A1**

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(54) **VERFAHREN ZUR ANALYSE VON PROZESSEN**

(57) Bereit gestellt wird ein Verfahren zur Analyse von Prozessdaten, die gemäß einer vorbestimmten Datenstruktur als Prozessprotokoll in einer Speichereinrichtung gespeichert sind, wobei die Prozessdaten eine Anzahl von Prozessinstanzen und jede Prozessinstanz eine Anzahl von Prozessschritten umfassen, wobei die vorbestimmten Datenstruktur zumindest umfasst:

- ein erstes Attribut, in dem eine eindeutige Kennung der Prozessinstanz des jeweiligen Prozessschrittes gespeichert ist;
- ein zweites Attribut, in dem eine Kennung des jeweiligen Prozessschrittes gespeichert ist; und
- ein drittes Attribut, in dem eine Reihenfolge der Prozessschritte innerhalb einer Prozessinstanz gespeichert ist; und

wobei das Verfahren umfasst:

- Entgegennehmen, durch das Computersystem, eines APE-Statements (Advanced Process Algebra Execution), wobei das APE-Statement eine Abfrage von Prozessinstanzen aus der Speichereinrichtung definiert und wobei das APE-Statement zumindest einen Prozessoperator aufweist;
- Ausführen, durch den Prozessor, des APE-Statements und Auslesen der Prozessinstanzen gemäß dem APE-Statement aus der Speichereinrichtung; und
- Bereitstellen des Ergebnisses der Abfrage zur weiteren Verarbeitung.

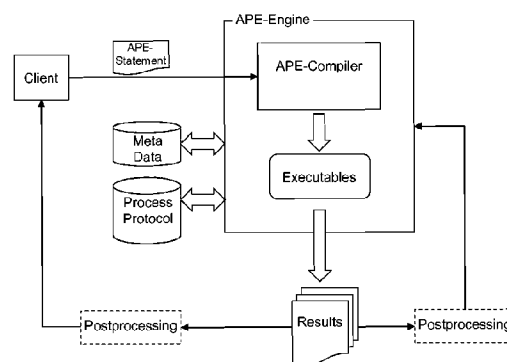


Fig. 4

Beschreibung

Gebiet der Erfindung

- 5 **[0001]** Die Erfindung betrifft ein flexibles Verfahren zur Verarbeitung, Rekonstruktion und Analyse realer Unternehmensprozesse auf Basis von durch Prozessinstanzen erzeugten Eventdaten. Ziel ist es, einen Ist-Zustand einzelner oder mehrere Prozesse überwachen, analysieren und visualisieren zu können.

Stand der Technik und Hintergrund der Erfindung

- 10 **[0002]** Es ist bekannt, Business Prozesse auf Basis digitaler Spuren in IT-Systemen zu analysieren. Die Gesamtheit der in einem IT-System gespeicherten Prozessschritte ergibt einen Prozess, der rekonstruiert werden kann. So können beispielsweise die Transaktionen aus ERP-Systemen dargestellt werden.

- 15 **[0003]** Die Analyse der Daten erfolgt nicht in den Quell-Systemen (z.B. dem ERP-System), sondern in einer von den Quell-Systemen getrennten Datenbasis. Gemäß einem sogenannten ETL-Prozess werden die Daten aus den Quell-Systemen extrahiert, die extrahierten Daten werden transformiert und die transformierten Daten werden in einer Datenbank gespeichert. Die Analyse der Prozesse wird dann auf der in dieser Datenbank gespeicherten Datenbasis durchgeführt.

- 20 **[0004]** Nachteilig bei den aus dem Stand der Technik bekannten Verfahren ist beispielsweise, dass die Analysemöglichkeiten auf Basis der durch die Instanzen des realen Prozesses erzeugten Daten (Prozessinstanzprotokolle) hinsichtlich der Flexibilität, der Performance sowie der Möglichkeit, beliebig komplexe Prozesse zu analysieren stark eingeschränkt sind. Es können nur fest vordefinierte Analysen durchgeführt werden. Die Analyse sehr komplexer, parallel-läufiger Prozesse ist unscharf und die Performance der Algorithmen reicht nicht aus, um sehr große Datensätze mit mehreren hundert Millionen Instanzen zu verarbeiten.

Aufgabe der Erfindung

- 25 **[0005]** Aufgabe der Erfindung ist es, Lösungen bereitzustellen, die eine einfachere, verbesserte, flexiblere und effizientere Analyse potentiell parallel läufiger Prozesse beliebiger Komplexität ermöglichen.

Erfindungsgemäße Lösung

- 30 **[0006]** Diese Aufgabe wird erfindungsgemäß durch ein Verfahren sowie ein System gemäß den unabhängigen Ansprüchen gelöst. Vorteilhafte Ausgestaltungen und Weiterbildungen der Erfindung sind in den jeweiligen abhängigen Ansprüchen angegeben.

- 35 **[0007]** Bereit gestellt wird demnach ein Verfahren zur Analyse von Prozessdaten, die durch Ausführen von realen Prozessen erzeugt werden und gemäß einer vorbestimmten Datenstruktur als Prozessprotokoll in einer Speichereinrichtung eines Computersystems gespeichert sind, wobei die Speichereinrichtung operativ mit einem Prozessor des Computersystems gekoppelt ist, wobei die Prozessdaten eine Anzahl von Prozessinstanzen umfassen, wobei jede Prozessinstanz eine Anzahl von Prozessschritten umfasst, wobei die vorbestimmte Datenstruktur zumindest umfasst:

- 40
- ein erstes Attribut, in dem eine eindeutige Kennung der Prozessinstanz des jeweiligen Prozessschrittes gespeichert ist;
 - ein zweites Attribut, in dem eine Kennung des jeweiligen Prozessschrittes gespeichert ist; und
 - 45 - ein drittes Attribut, in dem eine Reihenfolge der Prozessschritte innerhalb einer Prozessinstanz gespeichert ist; wobei das Verfahren umfasst:
- Entgegennehmen, durch das Computersystem, eines APE-Statements (Advanced Process Algebra Execution), wobei das APE-Statement eine Abfrage von Prozessinstanzen aus der Speichereinrichtung definiert und wobei
 - 50 das APE-Statement zumindest einen Prozessoperator aufweist;
 - Ausführen, durch den Prozessor, des APE-Statements und Auslesen der Prozessinstanzen gemäß dem APE-Statement aus der Speichereinrichtung; und
 - Bereitstellen des Ergebnisses der Abfrage zur weiteren Verarbeitung.

- 55 **[0008]** Vorteilhaft ist es, wenn beim Auslesen der Prozessinstanzen aus der Speichereinrichtung aus den zu den Prozessinstanzen gehörenden Prozessschritten Prozesse rekonstruiert werden.

- [0009]** Hierbei kann es vorteilhaft sein, wenn beim Verarbeiten der Prozessinstanzen gemäß dem Prozessoperator der Prozessoperator auf die rekonstruierten Prozesse angewandt wird.

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[0010] Als Ergebnis der Verarbeitung kann ein Prozessprotokoll, eine Tabelle, ein Wert oder ein Graph bereitgestellt wird.

[0011] Das APE-Statement kann eine Klausel aufweisen, die angibt, in welchem Ausgabeformat das Ergebnis der Abfrage zur weiteren Verarbeitung bereitzustellen ist, wobei das Ausgabeformat zumindest eines aus Tabelle und Graph umfasst.

[0012] Das APE-Statement kann verschachtelte Abfragen umfassen, wobei die Abfragen von dem Prozessor sequentiell ausgeführt werden, und das Ergebnis einer Abfrage als Stream der nachfolgenden Abfrage zur Verfügung gestellt wird.

[0013] Der zumindest eine Prozessoperator kann zumindest eines aus

- Ermitteln einer Durchlaufzeit zwischen zwei vorbestimmten Prozessschritten der Prozessinstanzen,
- Ermitteln zumindest eines Prozessgraphen aus einer Anzahl von Prozessinstanzen,
- Ermitteln von Prozessinstanzen, die einem vorbestimmten Muster entsprechen,
- Ermitteln von Häufigkeiten, insbesondere Häufigkeiten von Prozessschritten in Prozessen,
- Ermitteln von Schleifen in Prozessen,
- Subtrahieren von Prozessgraphen, insbesondere Ermitteln einer Differenz von zwei Prozessgraphen,
- Extrahieren von Teilprozessen aus Prozessen,
- Splitten von Prozessgraphen in zwei oder mehrere Prozessgraphen,
- und Kombinationen hiervon, umfassen.

[0014] Das APE-Statement kann zumindest einen Datenbankoperator aufweisen, wobei der Datenbankoperator zumindest eines aus

- Aggregats-Funktionen,
- analytische Funktionen,
- Konvertierungs-Funktionen,
- kryptographische Funktionen,
- Datums-Funktionen,
- logische Funktionen,
- mathematische Funktionen,
- String-Funktionen,
- Join-Operationen,
- und Kombinationen hiervon,

umfasst.

[0015] Vorteilhaft ist es, wenn das Ausführen des APE-Statements und das Auslesen der Prozessinstanzen umfasst:

- Zuführen des APE-Statements einem Compiler;
- Parsen, durch den Compiler, der von dem Prozessor ausgeführt wird, des APE-Statements und Erzeugen eines abstrakten Syntaxbaums aus dem APE-Statement;
- Erzeugen, durch den Compiler, eines Ausführungsplans aus dem abstrakten Syntaxbaum, wobei der Ausführungsplan den zumindest einen Prozessoperator umfasst; und
- Ausführen, durch den Prozessor, des Ausführungsplans, wobei eine Anzahl von Prozessinstanzen aus der Speichereinrichtung gelesen wird und gemäß dem zumindest einen Prozessoperator verarbeitet wird.

[0016] Hierbei kann es vorteilhaft sein, wenn die Datenstruktur zumindest ein sechstes Attribut umfasst, in dem eine Referenz auf externe Daten gespeichert ist, wobei der Ausführungsplan Informationen zu der Referenz umfasst, und wobei beim Ausführen des Ausführungsplans eine Verknüpfung zwischen den Prozessschritten und den externen Daten gemäß den Informationen aufgelöst wird und die mit dem jeweiligen Prozessschritt verknüpften externen Daten gelesen und von dem Prozessor gemäß dem APE-Statement verarbeitet werden.

[0017] Die externen Daten können eine erste Relation und zumindest eine zweite Relation umfassen, wobei mit dem sechsten Attribut Datensätze der ersten Relation referenziert werden und wobei die erste Relation Attribute aufweist, in denen Referenzen auf Datensätze der zumindest einen zweiten Relation gespeichert sind.

[0018] Vorteilhaft ist es, wenn beim Ausführen des Ausführungsplans die Prozessinstanzen als Stream aus der Speichereinrichtung gelesen werden.

[0019] Das APE-Statement kann zumindest einen Filter aufweisen, der eine Anzahl von Filterkriterien umfasst und der beim Ausführen des Ausführungsplans ausgeführt wird, wobei die aus der Speichereinrichtung gelesenen Prozessinstanzen gemäß den Filterkriterien gefiltert werden.

[0020] Es hat sich als vorteilhaft erwiesen, wenn beim Ausführen des Ausführungsplans zuerst der zumindest eine Prozessoperator ausgeführt wird.

[0021] Beim Ausführen des zumindest einen Prozessoperators kann ein vorbestimmter Programmcode zur Ausführung gebracht werden, wobei der Programmcode dem Prozessor zur Verfügung gestellt wird oder vor der Ausführung des Prozessoperators von dem Prozessor erzeugt wird.

[0022] Der Prozessor kann nach dem Ausführen des zumindest einen Prozessoperators zumindest eine Referenz auf das Ergebnis der Ausführung zur weiteren Verarbeitung des Ergebnisses bereitstellen.

[0023] Vorteilhaft ist es, wenn vor dem Erzeugen des Ausführungsplans der abstrakte Syntaxbaum optimiert wird.

[0024] Nach dem Ausführen des zumindest einen Prozessoperators kann das Ergebnis der Ausführung einem Aggregationsautomaten übergeben werden, der von dem Prozessor ausgeführt wird, wobei der Aggregationsautomat das Ergebnis der Ausführung unter Anwendung zumindest einer Aggregatsfunktion gruppiert, wobei die zumindest eine Aggregatsfunktion zumindest eines aus Anzahl, Minimum, Maximum, Summe, und Mittelwert umfasst.

[0025] Die Speichereinrichtung kann ein Arbeitsspeicher des Computersystems sein.

[0026] Die Kennung des Prozessschrittes kann eine Beschreibung des Prozessschrittes umfassen.

[0027] Bereit gestellt wird des Weiteren ein Computerprogrammprodukt umfassend ein Computer lesbares Speichermedium, auf dem Computer lesbare Instruktionen gespeichert sind, welche, wenn sie von einem Prozessor des Computers ausgeführt werden, den Prozessor des Computers veranlassen ein erfindungsgemäßes Verfahren zur Analyse von Prozessdaten auszuführen, wobei der Prozessor mit der Speichereinrichtung operativ gekoppelt ist, wobei die Prozessdaten eine Anzahl von Prozessinstanzen umfassen und wobei jede Prozessinstanz eine Anzahl von Prozessschritten umfasst.

[0028] Bereit gestellt wird ferner ein computerbasiertes System umfassend:

- einen Prozessor;
- eine Speichereinrichtung, der operativ mit dem Prozessor gekoppelt ist, wobei in der Speichereinrichtung Prozessdaten gemäß einer vorbestimmten Datenstruktur gespeichert sind, wobei die Prozessdaten eine Anzahl von Prozessinstanzen umfassen, wobei jede Prozessinstanz eine Anzahl von Prozessschritten umfasst;
- ein Computer lesbares Speichermedium, das operativ mit dem Prozessor gekoppelt ist, wobei auf dem Computer lesbaren Speichermedium Instruktionen gespeichert sind, welche, wenn sie von dem Prozessor des Systems ausgeführt werden, den Prozessor des Systems veranlassen, ein Verfahren zur Analyse von Prozessdaten, die gemäß einer vorbestimmten Datenstruktur in der Speichereinrichtung des Systems gespeichert sind, auszuführen, wobei die Prozessdaten eine Anzahl von Prozessinstanzen umfassen, wobei jede Prozessinstanz eine Anzahl von Prozessschritten umfasst;
- einen Compiler, der von dem Prozessor ausgeführt wird;

wobei der Prozessor angepasst ist die Schritte des erfindungsgemäßen Verfahrens auszuführen.

Kurzbeschreibung der Figuren

[0029] Einzelheiten und Merkmale der Erfindung sowie konkrete Ausgestaltungen der Erfindung ergeben sich aus der nachfolgenden Beschreibung in Verbindung mit der Zeichnung. Es zeigt:

- Fig. 1 ein Blockdiagramm eines erfindungsgemäßen Systems;
- Fig. 2 eine Datenstruktur eines erfindungsgemäßen Prozessprotokolls;
- Fig. 2 (a) ein beispielhaft partitioniertes Prozessprotokoll;
- Fig. 3 Daten, anhand der das Ermitteln von parallelen Unterprozessen basierend auf dem Prozessprotokoll erläutert wird;
- Fig. 4 ein Blockdiagramm mit einer erfindungsgemäßen APE-Engine; und
- Fig. 5 ein Beispiel eines visualisierten Prozesses.

Detaillierte Beschreibung der Erfindung

[0030] Fig. 1 zeigt ein Blockdiagramm eines erfindungsgemäßen Systems, mit dem reale Prozesse (z.B. Geschäftsprozesse) ad hoc überwacht und gegebenenfalls visualisiert werden können. Änderungen in den Prozessen können ebenfalls ad hoc erfasst werden.

[0031] Nachfolgend wird die Analyse von Prozessprotokollen näher erläutert.

[0032] Werden reale Prozesse, wie Geschäftsprozesse, mit der Hilfe von einem oder mehreren IT Systemen ausgeführt, so hinterlassen die einzelnen Prozessinstanzen Datenspuren in den IT Systemen. Beispielsweise kann ein Produktionsprozess vielfältige Datenspuren in verschiedenen IT Systemen erzeugen (jedes produzierte Produkt, d.h. jede

Prozessinstanz hinterlässt Spuren an unterschiedlichen Maschinen im bestandsführenden System etc.). Betrachten wir in diesem Beispiel die Spuren, die ein vollständiger Durchlauf des Produktionsprozesses (etwa ein fertig produziertes Produkt) in den IT Systemen hinterlässt, so enthalten diese Spuren viele Informationen über den tatsächlichen Verlauf des Prozesses. In jedem Produktionsschritt werden Zeitstempel erzeugt. Damit lässt sich beispielsweise nachvollziehen, zu welchem Zeitpunkt welcher Prozessschritt ausgeführt wurde. Daraus lässt sich unter anderem ableiten, welche Prozessschritte wie häufig und in welcher Reihenfolge ausgeführt wurden und wie viel Zeit zwischen den Produktionsschritten vergangen ist. Betrachten wir nun eine Vielzahl von Durchläufen des Produktionsprozesses und die Gesamtheit der Daten, die jeder Durchlauf in jedem Schritt des Prozesses hinterlassen hat, so erhalten wir das Prozessprotokoll. Bei Prozessen mit vielen Prozessschritten, die in unterschiedlichen IT Systemen ablaufen, kann dieses Prozessprotokoll sehr umfangreich werden und pro Prozessinstanz (d.h. für jeden Durchlauf des Prozesses) eine Vielzahl an Datensätzen enthalten. Auf Basis des Prozessprotokolls lassen sich nun verschiedene Fragestellungen zum tatsächlichen Prozessablauf untersuchen. Es kann zum Beispiel die Frage gestellt werden, wie homogen der Produktionsprozess ist (d.h., wie stark sich die einzelnen Durchläufe des Produktionsprozesses voneinander unterscheiden), wie der Kernprozess aussieht und welche Muster häufig zu Abweichungen vom Kernprozess führen.

[0033] Ein Prozessprotokoll bezeichnet also von den Instanzen eines realen Prozesses erzeugte Daten und liegt in einem oder mehreren IT Systemen verteilt vor.

[0034] Das Prozessprotokoll kann zusammengeführt und in einer Speichereinrichtung des Servers gespeichert sein. Alternativ kann das Prozessprotokoll auch in einer Speichereinrichtung gespeichert sein, die physikalisch vom Server getrennt ist. In beiden Fällen ist es erfindungsgemäß vorteilhaft, wenn das Prozessprotokoll In-Memory (im Arbeitsspeicher) gespeichert ist. Ferner ist es vorteilhaft, wenn das Prozessprotokoll spaltenorientiert in dem Arbeitsspeicher gespeichert wird.

[0035] Ziel der Erfindung ist es, beliebige Fragestellungen an das Prozessprotokoll zu beantworten, um sehr flexible Analysen für die tatsächlichen Unternehmensprozesse bereitzustellen.

[0036] Das erfindungsgemäße System umfasst eine Servereinrichtung (Server), die mit einer Anzahl von Clients koppelbar ist. Die Servereinrichtung ist ferner angepasst, auf ein Prozessprotokoll zuzugreifen.

[0037] Die Clients sind angepasst, Anfragen an den Server zu stellen und Antworten von dem Server zu empfangen. Die vom Client empfangenen Daten können aufbereitet und an einer Anzeigeeinrichtung zur Anzeige gebracht werden.

[0038] In einer vorteilhaften Ausgestaltung der Erfindung sind die Clients angepasst, die Anfragen an den Server in einer APE-Notation (APE-Anfragen) zu stellen (APE = Advanced Process Algebra Execution). Die Advanced Process Algebra Execution APE ist eine durch die Erfindung bereitgestellte Abfragesprache.

[0039] Im Folgenden wird die APE näher erläutert.

[0040] Das Prozessprotokoll hat die Eigenschaft, dass für jede Prozessinstanz eine unbestimmte Menge an (potentiell unterschiedlich strukturierten) Datensätzen aus den einzelnen Prozessschritten vorliegt. Für jede Instanz können also unterschiedlich viele Datensätze vorliegen (je nachdem, wie viele Prozessschritte die Instanz wie häufig durchlaufen hat).

[0041] Die APE ist angepasst, besonders einfach und effizient das Prozessprotokoll abzufragen, beispielsweise die in dem Prozessprotokoll gespeicherten Prozesse zu filtern, zu vergleichen oder zu rekonstruieren. Zudem stellt die APE die Möglichkeit zur Verfügung unterschiedlichste Abfragen flexibel zu definieren und dabei die Vorteile von sogenannten Prozessoperatoren und herkömmlichen Datenbankfunktionen flexibel miteinander zu kombinieren.

[0042] Die herkömmlichen Datenbankfunktionen (auch Datenbankoperatoren genannt) können umfassen: Aggregats-Funktionen (Average, Sum, etc.), häufig in Kombination mit Gruppierung; analytische Funktionen (Median, Quantile, etc.); Konvertierungs-Funktionen (String nach Datum, etc.); kryptographische Funktionen (Hashwert berechnen, Ver- und Entschlüsseln, etc.); Datums-Funktionen (Zeitdifferenzen berechnen, etc.); logische Funktionen; mathematische Funktionen; String-Funktionen (Left, Substring, etc.); Join-Operationen (Verknüpfung mehrerer Tabellen).

[0043] Erfindungsgemäß wird für die Analyse der Prozesse direkt auf das Prozessprotokoll zugegriffen. Aufgrund der erfindungsgemäßen Datenstruktur des Prozessprotokolls (vgl. Beschreibung zu Fig. 2) und der erfindungsgemäßen Abfragesprache APE werden unterschiedlichste ad hoc Analysen der Prozesse auch bei sehr großen Datenmengen effizient möglich.

[0044] Ein Prozessoperator ist ein Operator bzw. eine Funktion, die auf aus dem Prozessprotokoll rekonstruierte Prozesse angewandt wird und als Ergebnis ein Prozessprotokoll, eine Tabelle, einen Wert oder einen Graphen bereitstellen.

[0045] Beispiele für Prozessoperatoren sind:

- Matching (Ermitteln von Prozessinstanzen, die einem bestimmten Muster entsprechen);
- Rework (beispielsweise das Ermitteln von Häufigkeiten von bestimmten Aktivitäten in Prozessen);
- Loop Indicator (beispielsweise das Ermitteln von Häufigkeiten von Schleifen in Prozessen);
- Ermitteln von Prozessgraphen aus einer Anzahl von Prozessinstanzen;
- Prozessgraphen subtrahieren (beispielsweise das Ermitteln einer Differenz von zwei Prozessgraphen);
- Ermitteln von Durchlaufzeiten (beispielsweise die Durchlaufzeiten zwischen zwei vorbestimmten Prozessschritten)

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- in einer Anzahl von Prozessinstanzen);
- Extrahieren von Teilprozessen; und/oder
 - Splitten von Prozessgraphen (beispielsweise anhand vorbestimmter Kriterien).
 - Grouping, (beispielsweise Ermittlung eines Prozessgraphen nach einer Zusammenfassung bestimmter Prozessschritte)

[0046] Zunächst soll die Abfragesprache APE (Advanced Process Algebra Execution) formal definiert werden:

Die von APE unterstützten Prozessoperatoren implementieren eine Erweiterung zur relationalen Algebra. Grundlage der relationalen Algebra, die hier als bekannt vorausgesetzt wird, ist

$$\text{relation } R = \{(r_{1,1}, r_{1,2}, \dots, r_{1,m}), \dots, (r_{n,1}, r_{n,2}, \dots, r_{n,m})\}$$

$$(r_{1,1}, \dots, r_{1,m}) \dots (r_{n,1}, r_{n,2}, \dots, r_{n,m}) \text{ tupel}$$

$$r_{1,1}, \dots, r_{n,m} \text{ attributes}$$

[0047] Eine relationale Algebra benötigt als minimales System folgende Operationen:

- Projektion
- Selektion
- Kreuzprodukt
- Vereinigung
- Differenz und Umbenennung

[0048] Die relationale Algebra ist die Grundlage für relationale Datenbanksysteme und entsprechende Abfragesprachen (wie SQL). Da Prozessprotokoll und Prozessoperatoren nur mit großen Einschränkungen in einer relationalen Algebra abgebildet werden können, wird diese Algebra für die APE erfindungsgemäß erweitert.

[0049] Das Prozessprotokoll wird dabei wie folgt beschrieben:

Sei

$$R = \{(r_{1,1}, r_{1,2}, \dots), \dots (r_{n,1}, r_{n,2}, \dots)\}$$

eine Relation.

[0050] Ein Prozessprotokoll sei dann definiert als Prozess-Relation

$$\{E_1, E_2, \dots, E_k\}, E_i \subset R$$

$$\forall i, j | i \neq j : E_i \cap E_j = \emptyset$$

$$\bigcup_i E_i = R$$

[0051] Außerdem existiert für jedes Teil-Prozessprotokoll eine Ordnungsrelation:

$$O_i = (E_i, Q_i)$$

mit

O_i ... geordnete Menge sowie
 Q_i ... Ordnungsrelation über E_i .

[0052] Damit ist das Prozessprotokoll definiert als

$$E := \bigcup_i O_i$$

[0053] Die Mengen E_i werden auch Fall oder Prozessinstanz genannt.

[0054] Die Prozessinstanzen sind selbst Relationen und als solche mit allen relationalen Operatoren kompatibel.

[0055] Als Basisprozessoperatoren sind nun folgende drei Operatoren definiert:

1) Case Selektion

[0056]

Prädicate $\phi: E \rightarrow \{0,1\}$

Case Selection: $CS_\phi: E \rightarrow E'$

$$E' := \left\{ \bigcup_i O_i \mid O_i \in E \wedge \phi(O_i) = 1 \right\}$$

[0057] Beispiele für Case Selektions-Operatoren sind zum Beispiel der Matching Operator zur Filterung von Prozessinstanzen, die einem bestimmten Prozessmuster entsprechen.

2) Crop Selection

[0058]

Startprädikat $\rho_s: R \rightarrow \{0,1\}$

Endprädikat $\rho_e: R \rightarrow \{0,1\}$

Crop-Case $CC_{\rho_s, \rho_e}: O_i \rightarrow O'_i$

$$O'_i = (\{e \mid e \in E_i \wedge \exists e_s \in E_i: \rho_s(e_s) = 1 \wedge \exists e_e \in E_i: \rho_e(e_e) = 1 \wedge e_s \leq e \leq e_e\}, Q_i)$$

Crop-Selection $CS_{\rho_s, \rho_e}: E \rightarrow E'$

$$E' = \{ CC_{\rho_s, \rho_e}(O_i) \mid O_i \in E \}$$

[0059] Ein Beispiel hierfür ist, den Ausschnitt eines Prozessprotokolls zwischen einer definierten Start- und einer definierten Endaktivität auszuschneiden, um hieraus ein neues Teil-Prozessprotokoll zu erhalten.

[0060] Erweiterungen hierbei sind jeweils, dass das Prädikat zum ersten Mal erfüllt wird und zum letzten Mal erfüllt wird. Es können außerdem mehrere Teil-Streams durch CROP extrahiert werden sowie dass lediglich die ersten und letzten Aktivitäten in der Ergebnismenge enthalten sein sollen.

[0061] Die Ordnungsrelation bleibt bei diesem Prädikat erhalten. Es entsteht also durch die Anwendung dieses Operators ein neues Prozessprotokoll.

3) Event Projektion

[0062]5 Projektion $\delta: R \rightarrow R \cdot R$

$$\delta(r) = r \circ r_n | r \in E_i \wedge r_n \in E_i \wedge r < r_n \wedge \nexists r_z: r < r_z$$

$$< r_n \text{ auf Ordnungsrelation } Q_i$$

$$\gamma(O_i) = (\{\delta(e) | e \in E_i\}, \{\delta(q_s, q_e) | (q_s, q_e) \in Q_i\})$$

15 Event-Projektion $\Omega: E \rightarrow E'$

$$\Omega(E) = \{\gamma(O) | O \in E\}$$

20 **[0063]** Diese Projektion erstellt aus einem Prozessprotokoll ein neues Prozessprotokoll, indem benachbarte Einträge miteinander verkettet werden. Ein Anwendungsbeispiel hierfür ist die Verwendung zur Berechnung von Durchlaufzeiten.

[0064] Auf Basis der erfindungsgemäßen Erweiterung der relationalen Algebra zur Prozessalgebra können in der APE mit Hilfe einer Kombination von Basisprozessoperatoren eine Vielzahl von Prozessoperatoren abgebildet werden. Darüber hinaus stehen alle Operatoren, die auf der relationalen Algebra definiert sind, weiter zur Verfügung. Prozessoperatoren und herkömmliche Datenbankoperatoren können dadurch frei kombiniert werden.

25 **[0065]** Die APE-Engine ist angepasst, von einem Client APE-Statements entgegenzunehmen, die entgegengenommenen APE-Statements zu verarbeiten und Ergebnisse der Verarbeitung zur Verfügung stellen. Die Ergebnisse können gegebenenfalls einer Nachverarbeitung unterzogen werden, bevor sie an den Client zurückgegeben werden.

30 **[0066]** Alternativ oder zusätzlich können die Ergebnisse der APE-Engine zur Verfügung gestellt werden, um beispielsweise basierend auf den Ergebnissen weitere Analysen durchzuführen (z.B. die Ergebnisse weiter einzuschränken). Auch in diesem Fall können die Ergebnisse einer Nachverarbeitung unterzogen werden, bevor sie der APE-Engine zur Verfügung gestellt werden.

[0067] Beispielhaft betrachten wir ein Prozessprotokoll aus einem Beschaffungsprozess mit folgender Struktur:

Order ID	Event	Timestamp	Vendor
1	Create Purchase Order	06.01.2012 11:01	ABC Machine Inc
1	Approve Purchase Order	07.03.2012 14:07	ABC Machine Inc
1	Enter Goods Receipt	01.04.2012 16:05	ABC Machine Inc
1	Enter Invoice Receipt	01.04.2012 17:02	ABC Machine Inc
1	Payment	03.05.2012 11:17	ABC Machine Inc
2	Create Purchase Order	14.02.2012 04:48	CDF Manufacturing
2	Rework Purchase Order	20.03.2012 07:26	CDF Manufacturing
2	Reject Purchase Order	24.04.2012 01:26	CDF Manufacturing
3	Create Purchase Order	29.04.2012 15:21	HIJ Insurance Corp
3	Approve Purchase Order	30.04.2012 17:16	HIJ Insurance Corp
3	Enter Invoice Receipt	30.04.2012 23:31	HIJ Insurance Corp
3	Payment	01.05.2012 08:38	HIJ Insurance Corp
4	Create Purchase Order	06.02.2012 17:16	ABC Machine Inc
4	Approve Purchase Order	28.03.2012 07:12	ABC Machine Inc
4	Enter Goods Receipt	31.03.2012 08:52	ABC Machine Inc

(fortgesetzt)

Order ID	Event	Timestamp	Vendor
4	Enter Invoice Receipt	05.04.2012 19:55	ABC Machine Inc
4	Payment	10.04.2012 14:52	ABC Machine Inc
4	Enter Invoice Receipt	20.04.2012 23:02	ABC Machine Inc
4	Payment	29.04.2012 21:07	ABC Machine Inc

[0068] Die Prozessschritte bzw. Aktivitäten der Prozesse sind in dem Prozessprotokoll gespeichert, auf das die APE-Engine Zugriff hat. In dem Prozessprotokoll können zu jedem Prozessschritt auch Informationen zu dem jeweiligen Lieferanten gespeichert sein. Vorteilhaft ist es jedoch, wenn das Prozessprotokoll lediglich Referenzen zur den Lieferanteninformationen enthält, wobei die Lieferanteninformationen in einer externen Datenquelle gespeichert sein können (vgl. Fig. 2).

Nachfolgend ist ein Beispiel für ein APE-Statement (Statement in APE-Notation) wiedergegeben, mit dem für alle Lieferanten eine mittlere Durchlaufzeit der Prozesse zwischen den Aktivitäten "Create Purchase Order" und "Payment" berechnet werden kann, wobei zwischen diesen beiden Aktivitäten beliebig viele andere Aktivitäten vorkommen können. Da die Aktivitäten in einer Prozessinstanz potentiell mehrfach vorkommen können, betrachten wir jeweils das erste Vorkommen der Aktivität "Create Purchase Order" und berücksichtigen alle Durchlaufzeiten zu einem beliebigen Vorkommen der Aktivität "Payment".

```
TABLE ("VENDOR",
      MEDIAN (
        CALC_THROUGHPUT (
          REMAP_TIMESTAMPS ("TIMESTAMP", DAYS),
          FIRST_OCCURRENCE ['Create Purchase Order'],
          TO_ANY_OCCURRENCE ['Payment']
        )
      )
)
```

[0069] Der Prozessoperator "Durchlaufzeiten" kann in der APE-Engine durch eine Kombination mehrerer Prozess-Basis-Operatoren implementiert werden:

- (Prozessoperator) Es wird das Prozessprotokoll durch eine CROP-Selektion auf die erste Aktivität "Create Purchase Order" sowie die letzte Aktivität "Payment" reduziert. Als Startprädikat wird hierbei "Activity" = 'Create Purchase Order', als Endprädikat wird hierbei "Activity" = 'Payment' verwendet.
- (DB-Operator) Es wird das Attribut "TIMESTAMP" auf einen tagesbasierten Zeitstempel umgerechnet.
- (Prozessoperator) Es wird eine Event Projektion ausgeführt. Im Ergebnis wird dadurch eine neue Relation gebildet, in der jeweils auf das Vorgänger- und Nachfolger-Event als Tupel der Ergebnisrelation zugegriffen werden kann.
- (DB-Operator) Es wird der tagesbasierte Zeitstempel des Nachfolger-Events vom Zeitstempel des Vorgängerevents subtrahiert.
- (DB-Operator) Es wird eine Gruppierung der berechneten Durchlaufzeiten nach dem Attribut "VENDOR" mit dem Aggregator "MEDIAN" ausgeführt.

[0070] Erfindungsgemäß ist es also möglich, Operatoren, die auf Prozessprotokolle angewandt werden, mit Operatoren, die auf herkömmlichen Tabellen angewandt werden, zu kombinieren.

[0071] Das Ergebnis der vorstehenden Abfrage wird in diesem Beispiel in Tabellenform zurückgegeben, um es beispielsweise als Tabelle am Client anzuzeigen. Das Ergebnis kann erfindungsgemäß auch in einem anderen Format zurückgegeben werden, z.B. als Graph, als Diagramm, als Prozess-Stream, etc.

[0072] In diesem Fall wäre das Ergebnis also:

Vendor	Median
ABC Machine Inc	83

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(fortgesetzt)

Vendor	Median
HIJ Insurance Corp	2

[0073] Wir betrachten einige weitere Beispiele für APE Abfragen.

[0074] Fig. 5 zeigt ein Beispiel eines visualisierten Prozesses. In dem Prozessprotokoll sind beispielsweise 50 Mio. Aktivitäten gespeichert, die jeweils einem Prozess zugeordnet sind.

[0075] Mit Hilfe einer ersten APE-Abfrage werden nun die durchschnittlichen Durchlaufzeiten aller Prozesse ermittelt, die mit der Aktivität "Create Purchase Order" beginnen und mit der Aktivität "Payment" enden und die eine Abdeckung von 20% aufweisen. D.h. es werden jene Prozessvarianten in dem Prozessprotokoll abgefragt, die zusammen 20% aller Prozesse in dem Prozessprotokoll ausmachen. Folgende APE-Abfrage kann verwendet werden, um diese Berechnung auszuführen:

```

15  FILTER
      MATCH_PROCESS (
          STARTING["Create Purchase Order"] AS "Start",
          ENDING["Payment"] AS "End"
          CONNECTED BY EVENTUALLY ["Start", "End"]
20  ) = 1;
      VARIANT_TABLE =
      TABLE (
          VARIANT () AS V,
          CUME_DIST () AS R
25  ) ;
      FILTER
      VARIANT_TABLE.R
      < 0.2;
      GRAPH ( ) ;
30

```

[0076] In diesem Beispiel wird zunächst das Prozessprotokoll auf Fälle eingeschränkt, die mit der Aktivität "Create Purchase Order" beginnen und mit der Aktivität "Payment" enden.

[0077] Hierzu wird der Prozessoperator "MATCH_PROCESS" verwendet.

[0078] Im zweiten Schritt wird eine temporäre Liste der Prozessvarianten sowie der kumulierten Verteilung für jede Prozessvariante bestimmt. Hierzu wird der Prozessoperator VARIANT() sowie der DB-Operator CUME_DIST() verwendet.

[0079] Erfindungsgemäß ist es möglich, Analyseergebnisse zur weiteren Filterung zu verwenden. Die APE-Engine erhält hierzu eine Referenz zwischen den Quellrelationen und den jeweiligen Ergebnissen. Im Beispiel wird die Verknüpfung zwischen der auf Varianten-Ebene aggregierten Tabelle VARIANT_TABLE sowie dem ursprünglichen Prozessprotokoll erzeugt. Hierdurch ist es möglich, im nächsten Schritt das Prozessprotokoll auf jene Fälle einzuschränken, deren Variante zu den häufigsten 20% gehören (Kumulierte Verteilung < 0.2).

[0080] Um den Prozessgraphen zur Anzeige zu bringen wird nun mit dem Prozessoperator GRAPH() ein Graph auf Basis des gefilterten Prozessprotokolls berechnet und zurück geliefert.

[0081] Der Prozessgraph für das Ergebnis dieser ersten Abfrage ist in Fig. 5 (a) gezeigt. In dem Prozessgraph wird zudem die Frequenz der Kantendurchläufe berechnet und angezeigt. Mit Hilfe der aus dem Stand der Technik bekannten Möglichkeiten kann diese Information nicht abgeleitet werden.

[0082] Der Benutzer ändert nun den Grad der Abdeckung auf 40%. Mit Hilfe einer zweiten APE-Abfrage wird nun die Frequenz der Kantendurchläufe aller Prozessinstanzen ermittelt, die mit der Aktivität "Create Purchase Order" beginnen und mit der Aktivität "Payment" enden und die eine Abdeckung von 40% aufweisen. Aufgrund der erfindungsgemäßen Datenstruktur (Prozessprotokoll das als Prozess-Stream verfügbar gemacht wird) und der erfindungsgemäßen Abfragegesprache APE wird das Ergebnis in Echtzeit an der Anzeigeeinrichtung des Benutzers visualisiert. Der Prozessgraph für das Ergebnis dieser zweiten Abfrage ist in Fig. 5 (b) gezeigt. 40% aller Prozesse in dem Prozessprotokoll entsprechen dieser Prozessvariante. Die häufigste Prozessvariante wird hier durch fette Pfeile gekennzeichnet, wobei die Dicke der Pfeile im Verhältnis zur Anzahl der konkreten Prozesse steht.

[0083] Wird die Abdeckung auf 100% erhöht, dann werden alle verschiedenen Prozessvarianten der in dem Prozessprotokoll gespeicherten Prozesse angezeigt.

[0084] Erfindungsgemäß hat der Benutzer die Möglichkeit, z.B. bestimmte Filter auf die visualisierten Prozessvarianten anzuwenden. So kann er beispielsweise eine Aktivität (z.B. "Shipping") auswählen und alle Prozessvarianten aus dem

Prozessprotokoll selektieren, die über die ausgewählte Aktivität laufen. Die vorangegangene APE-Abfrage müsste damit um folgenden Filter erweitert werden:

5 `FILTER MATCH_PROCESS ( NODE ["Shipping"] ) = 1`

[0085] Nachfolgend werden die erfindungsgemäße Architektur und die Datenstruktur näher beschrieben.

[0086] Bezug nehmend auf Fig. 1 kann der Zugriff der Clients auf den Server beispielsweise über das Internet oder ein Intranet erfolgen. Ein Client kann beispielsweise ein Computer mit einem Internet-Client sein. Alternativ kann als Client auch ein Anwendungsprogramm, beispielsweise eine Tabellenkalkulation vorgesehen sein, das über eine Schnittstelle auf den Server Zugriff hat. Ein Client kann auch als mobiles Endgerät ausgestaltet sein.

[0087] Der Server kann einen WEB-Server (z.B. Apache HTTP Server oder Microsoft Internet Information Server) aufweisen, der für die Abwicklung der Datenübertragung zwischen einem Internet-Client und dem Server vorgesehen ist.

[0088] Der Server umfasst des Weiteren die oben beschriebene APE-Engine. Die APE-Engine ist angepasst, APE-Anfragen entgegenzunehmen und diese in eine ausführbare Form umzuwandeln bzw. zu transformieren. Die ausführbare Form einer APE-Anfrage kann ein ausführbares Programm oder ein Skript sein. Dem Server oder der APE-Engine kann ein Cache-Speicher zugeordnet sein, um Zwischenergebnisse oder Teilergebnisse beim Ausführen des ausführbaren Programms oder des Skripts effizient speichern zu können.

[0089] Die für das Prozessprotokoll benötigten Daten können im Rahmen eines ETL-Prozesses aus einem oder mehreren Quellsystemen (CRM 1 bis CRM n) geladen und gemäß einer erfindungsgemäßen Datenstruktur als Prozessprotokoll gespeichert werden. Die Datenstruktur wird weiter unten näher beschrieben.

[0090] Vorzugsweise werden die Daten bzw. das Prozessprotokoll im Arbeitsspeicher (z.B. als In-Memory-Datenbank) gespeichert. Dadurch wird die Performance beim Auswerten der Prozesse nochmals deutlich verbessert. Die Quellsysteme können beispielsweise standardisierte ERP-Systeme (z.B. von SAP AG, Walldorf, Germany) oder proprietäre Systeme umfassen, die Prozessinstanzen eines oder mehrerer Geschäftsprozesse speichern.

[0091] Vorteilhaft ist es, wenn das Prozessprotokoll in mehrere annähernd gleich große Teile geteilt wird, wobei Prozesse immer vollständig in einem Teil gespeichert sind. Dadurch wird eine Partitionierung des Prozessprotokolls erreicht, wobei die Partitionen parallel verarbeitet werden können.

[0092] Eine beispielhafte Partitionierung ist in Fig. 2 (a) gezeigt. Das Prozessprotokoll ist hier in drei annähernd gleich große Partitionen geteilt worden, die jeweils im Arbeitsspeicher gehalten werden.

[0093] Beim Laden aus den Quellsystemen werden alle für das Prozessprotokoll benötigten Daten geladen. Alternativ können die Daten auch inkrementell geladen werden. Das heißt, es werden nur jene Daten geladen, die sich in den Quellsystemen seit dem letzten Laden geändert haben oder neu hinzugekommen sind.

[0094] Ist ein direkter Zugriff auf eines oder mehrere Quellsysteme nicht möglich, kann eine Schnittstelle IF für den Zugriff auf die entsprechenden Quellsysteme vorgesehen werden.

[0095] Fig. 2 zeigt eine Datenstruktur eines erfindungsgemäßen Prozessprotokolls.

[0096] In der einfachsten Ausgestaltung weist die Datenstruktur des Prozessprotokolls drei Attribute (Felder) auf, nämlich "CaseID", "Activity" und "Order".

[0097] Das Attribut "CaseID" ist eine eindeutige Kennung einer Prozessinstanz (z.B. eines konkreten Geschäftsprozesses). Das Attribut "Activity" beschreibt einen Prozessschritt einer Prozessinstanz. Das Attribut "Order" gibt die Reihenfolge der Prozessschritte innerhalb einer Prozessinstanz an.

[0098] Mit dem Attribut "CaseID" werden alle Prozessschritte einer konkreten Prozessinstanz zugeordnet. In einer Ausgestaltung der Erfindung kann das Attribut "CaseID" eine zusammengesetzte eindeutige Kennung (zusammengesetzter Schlüssel) sein.

[0099] Das Attribut "Activity" kann eine Kennung des Prozessschrittes speichern. Die Kennung kann beispielsweise eine Beschreibung des Prozessschrittes sein.

[0100] Die Attributswerte können komprimiert gespeichert werden, beispielsweise mit Hilfe eines Dictionary-Encoding Verfahrens.

[0101] Allgemein gibt das Attribut "Order" die Reihenfolge der Prozessschritte innerhalb einer Prozessinstanz an. In einer Ausgestaltung der Erfindung kann in dem Attribut "Order" ein Zeitpunkt (Datum/Uhrzeit) gespeichert sein, der angibt, zu welchem Zeitpunkt der entsprechende Prozessschritt ausgeführt wurde. Die Verwendung von Zeitpunkten (z.B. Timestamps) hat den Vorteil, dass damit Durchlaufzeiten der Prozesse berechnet werden können.

[0102] Erfindungsgemäß ist es vorgesehen, das Prozessprotokoll bzw. die darin gespeicherten Datensätze zunächst nach dem Attribut "CaseID" und dann nach dem Attribut "Order" zu sortieren.

[0103] Die Quelldaten (External Process Data), die ebenfalls Prozessdaten umfassen und in einer Datenbank oder auf sonstige Weise in einem externen System (Source Systems) gespeichert sein können, werden in den Arbeitsspeicher geladen und dann physikalisch im Arbeitsspeicher wie vorstehend erläutert sortiert. Das heißt, die zu einem Prozess

gehörenden Prozessschritte sind im Arbeitsspeicher an benachbarten Adressen gespeichert.

[0104] Unter "Prozessprotokoll" ist nachfolgend immer das sortierte und im Arbeitsspeicher gespeicherte Prozessprotokoll gemeint. Dieses Prozessprotokoll wird nachfolgend auch als Prozess-Stream bezeichnet.

[0105] Die Sortierung der Prozessschritte innerhalb einer Prozessinstanz hat den Vorteil, dass die Prozessinstanzen in gruppierter Form vorliegen. Hierdurch können die Prozessschritte in einem Stream sequenziell und in der richtigen Reihenfolge verarbeitet werden. Zudem kann in vorteilhafter Weise eine Vorgänger/Nachfolger-Beziehung der Prozessschritte innerhalb einer Prozessinstanz berechnet werden.

[0106] Nachfolgend ist ein Beispiel eines Prozessprotokolls angegeben.

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CaseID	Activity	Order
1	Create PO	08:00
1	Shipping	10:00
1	Payment	11:00
2	Create PO	08:00
2	Approve PO	08:15
2	Shipping	08:30
2	Payment	09:00

[0107] Das Prozessprotokoll wird erfindungsgemäß spaltenorientiert in dem Arbeitsspeicher gespeichert, d.h. der Inhalt des Prozessprotokolls wird spaltenweise gespeichert.

[0108] Die erfindungsgemäße Datenstruktur des Prozessprotokolls und die erfindungsgemäße Sortierung der Datensätze haben den Vorteil, dass mit der erfindungsgemäßen vorhergehend beschriebenen APE-Engine sowie der nachfolgend mit Bezug auf Fig. 4 näher beschriebenen Abfragesprache APE die Rekonstruktion von Prozessen und darauf angewandte Operationen in linearer Zeit ausgeführt werden können.

[0109] Zusätzlich oder alternativ kann die Datenstruktur des Prozessprotokolls eine oder mehrere Referenzen (Fremdschlüssel) zu externen Daten aufweisen. Diese Referenzen können in einem oder mehreren Attributen "FK" gespeichert werden. Damit ist es möglich, das Ergebnis einer Prozessanalyse mit zusätzlichen Daten anzureichern. Alternativ oder zusätzlich können Prozesse auch anhand der externen Daten gefiltert werden.

[0110] Externe Daten sind Daten, die nicht im Prozessprotokoll gespeichert sind. Diese Daten können im selben System gespeichert sein, wie das Prozessprotokoll. In einer Ausgestaltung der Erfindung können die externen Daten ebenfalls im Arbeitsspeicher gespeichert sein. Ein Beispiel für externe Daten sind die Stammdaten der an den Prozessen beteiligten Kunden.

[0111] Fig. 4 zeigt ein Blockdiagramm mit einer erfindungsgemäßen APE-Engine. Anhand dieses Blockdiagramms wird eine mögliche Ausgestaltung der erfindungsgemäßen Abfragesprache APE näher beschrieben.

[0112] In einem ersten Schritt wird das entgegengenommene APE-Statement einem Parser des APE-Compilers übergeben. Der Parser parst das APE-Statement und erzeugt daraus einen abstrakten Syntaxbaum (AST), der nachfolgend für das vorstehende APE-Statement in vereinfachter Form wiedergegeben ist.

```

TABLE <CalculationType>
  VENDOR <Column>
  MEDIAN <Aggregate>
  CALC_THROUGHPUT (ANY ...) <ThroughputCalculation>

```

[0113] Der abstrakte Syntaxbaum stellt eine logische Abfolge der einzelnen Operationen bzw. Operatoren des APE-Statements dar.

[0114] Der abstrakte Syntaxbaum wird anschließend in einer In-Memory Ausführungsumgebung ausgeführt bzw. verarbeitet. Es kann vorteilhaft sein, den abstrakten Syntaxbaum vor der Ausführung in ein für die In-Memory Ausführungsumgebung brauchbares Format umzuwandeln. Ferner kann es vorteilhaft sein, den abstrakten Syntaxbaum vor der Ausführung zu optimieren, um beispielsweise die Ausführungszeit zu reduzieren.

[0115] Bei der Ausführung des abstrakten Syntaxbaums in der In-Memory Ausführungsumgebung wird zunächst anhand des abstrakten Syntaxbaums ein Ausführungsplan erzeugt, der anschließend zur Ausführung gebracht wird.

[0116] Nachfolgend wird beispielhaft das Erzeugen des Ausführungsplans beschrieben.

[0117] Der Ausführungsplan gibt die Schritte und die Reihenfolge an, in welcher die Operationen bzw. Operatoren von der APE Engine ausgeführt werden.

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[0118] Beim Erzeugen des Ausführungsplans werden zunächst sämtliche Operatoren aus dem Syntaxbaum extrahiert und in dem Ausführungsplan als Referenzen zur Verfügung gestellt.

[0119] Der Ausführungsplan zu dem vorstehend genannten Syntaxbaum umfasst folgende Bestandteile:

5 1. Operatoren

OP 1:

10 Operator Type: COLUMN
Operator Ref. ID: 1
Column Name: VENDOR

OP 2:

15 Operator Type: Throughput Calculation
Operator Ref. ID: 2
Start: ANY ...
End: ANY ...
Time Units: Days

20 2. Aggregate (Ausführungsplan)

GROUPERS: OP_REF 1
AGGREGATORS:

25 Aggregation Function: MEDIAN
Aggregation Function Operator: OP_REF 2

[0120] "Operator Ref. ID" ist hierbei eine eindeutige Kennung des jeweiligen Operators, mit dem der Operator in dem Ausführungsplan referenziert werden kann (mittels "OP_REF").

[0121] In dem vorstehende Beispiel gibt der Operator "OP 1" in dem Ausführungsplan an, dass die Ergebnisse nach Lieferanten (Column Name: VENDOR) gruppiert werden sollen (GROUPERS: OP_REF 1). Der Operator "OP 2" gibt in dem Ausführungsplan an, dass eine Durchlaufzeit (Throughput Calculation) zwischen zwei Prozessschritten (Start / End) berechnet werden soll.

[0122] Wichtig ist hierbei, dass der Operator "OP 2" als normale Spalte einer Tabelle betrachtet wird, obwohl er unter Verwendung des Prozess-Streams berechnet wird.

[0123] Das Ausführen des Ausführungsplans wird anhand des nachfolgenden Beispiels beschrieben:

40 Beim Ausführen des Ausführungsplans werden zunächst alle Operatoren ausgeführt (in dem vorstehenden Beispiel die Operatoren "OP 1" und "OP 2").

[0124] Für den Operator "OP 1" wird einfach eine Referenz auf die Spalte "VENDOR" zurückgegeben. In der Spalte "VENDOR" sind Informationen zu den jeweiligen Lieferanten gespeichert.

45 **[0125]** Für den Operator "OP 2", der hier als "Throughput Operator" bezeichnet wird, wird ein Programmcode (Executable) erzeugt und zur Ausführung gebracht. Alternativ wird ein bereits bestehender Programmcode zur Ausführung gebracht. Für das vorliegende Beispiel ist der Programmcode angepasst, für die in dem Prozessprotokoll gespeicherten Prozesse die Durchlaufzeiten zwischen den Aktivitäten "Create Purchase Order" und "Payment" zu berechnen.

[0126] Nachdem beide Operatoren "OP 1" und "OP 2" ausgeführt wurden, stehen zwei Referenzen auf Spalten zur Verfügung, nämlich eine Referenz auf die Spalte "VENDOR" und eine Referenz auf die berechneten Durchlaufzeiten.

50 **[0127]** Im Anschluss daran können in einem optionalen Schritt Filter auf den Spalten angewandt werden, um beispielsweise in weiteren Berechnungsschritten nur solche Datensätze zu berücksichtigen, die ein bestimmtes Filterkriterium erfüllen. Nachdem die Operatoren ausgeführt wurden, werden in einem nächsten Schritt die beiden Referenzen auf die erzeugten Spalten einem sogenannten Aggregationsautomaten übergeben. Der Aggregationsautomat ist angepasst, die berechneten Durchlaufzeiten nach Lieferanten zu gruppieren und für jeden Lieferanten eine mittlere Durchlaufzeit zu ermitteln.

55 **[0128]** Nachdem auch dieser letzte Schritt von der APE-Engine ausgeführt wurde, wird das Ergebnis des APE-Statements bzw. der APE-Abfrage dem Client zurückgegeben.

[0129] Alternativ oder zusätzlich kann das Ergebnis der APE-Engine als Eingabe für weitere APE-Abfragen zur Ver-

fügung gestellt werden. Damit können verschachtelte Abfragen durchgeführt werden. Vorteilhaft ist es hierbei, wenn das Ergebnis der APE-Engine als Prozess-Stream bereitgestellt wird.

[0130] Vorstehend ist ein Beispiel einer APE-Abfrage beschrieben worden, bei der als Prozessoperator die Durchlaufzeit verwendet wurde. Erfindungsgemäß können auch andere Prozessoperatoren verwendet werden, die gegebenenfalls miteinander kombiniert werden können. Beispiele für solche Prozessoperatoren sind mit Bezug auf Fig. 1 angegeben.

[0131] Wie aus dem vorstehenden Beispiel einer APE-Abfrage ersichtlich ist, können in einer APE-Abfrage Prozessoperatoren auch mit Operatoren, die auf herkömmlichen Tabellen angewandt werden, und/oder mit herkömmlichen DB-Operatoren (z.B. Aggregationen, Joins, etc.) kombiniert werden.

[0132] Der Client nimmt das Ergebnis der APE-Abfrage entgegen und kann dieses an einer Anzeigeeinrichtung visualisieren. Wird das Ergebnis beispielsweise als Graph zurückgegeben, kann dieses als Prozessgraph zur Anzeige gebracht werden.

[0133] Die Berechnung von Durchlaufzeiten kann erfindungsgemäß auf Basis eines oder mehrerer Kalender durchgeführt werden, wie nachfolgend näher erläutert wird.

[0134] Die Berechnung von Durchlaufzeiten, insbesondere von Netto-Durchlaufzeiten, ist für eine explorative Analyse von Prozessprotokollen von hoher Bedeutung. Im Stand der Technik werden Durchlaufzeiten immer als Brutto-Durchlaufzeiten berechnet, was den Nachteil hat, dass die berechnete Durchlaufzeit nicht der geschäftsrelevanten Durchlaufzeit (zum Beispiel Servicezeiten, Lieferzeiten in Wochentagen, etc.) entspricht.

[0135] Im Folgenden wird ein beispielhaftes Verfahren zur Ad-Hoc Berechnung beliebiger Netto-Durchlaufzeiten angegeben:

Bei der Berechnung von Durchlaufzeiten auf Basis eines oder mehrerer Kalender ist es erfindungsgemäß möglich beispielsweise Feiertage, Wochenenden oder bestimmte Tageszeiten unberücksichtigt zu lassen.

[0136] Zur Bestimmung von Netto-Durchlaufzeiten zwischen Prozessschritten ist erfindungsgemäß das nachfolgend beschriebene Verfahren vorgesehen.

[0137] Das erfindungsgemäße Verfahren zur Berechnung von Netto-Durchlaufzeiten umfasst im wesentlichen zwei Schritte, wobei in dem ersten Schritt die zu den Prozessschritten in dem Prozessprotokoll gespeicherten Zeitangaben relativ zu einer Basis transformiert (normiert) werden, und wobei in dem zweiten Schritt eine Differenz zwischen den den Prozessschritten zugeordneten transformierten Zeitangaben ermittelt wird. Bei den Zeitangaben kann es sich um Zeitstempel handeln.

[0138] Um die Zeitstempel zu transformieren bzw. zu normieren werden zunächst alle, vorzugsweise alle distinkten Zeitstempel, im Prozessprotokoll aufsteigend sortiert. Dieser Vektor (nachfolgend auch Zeitstempel-Vektor genannt) der aufsteigend sortierten Zeitstempel bildet die Ausgangsbasis für das Ermitteln eines Offsets für jeden (distinkten) Zeitstempel im Prozessprotokoll.

[0139] Jeder Zeitstempel kann aus einem Datum (z.B. 31.05.2014) und einer Zeitinformation (z.B. 13:37:00) mit einer gegebenen Präzision (beispielsweise in Sekunden) bestehen.

[0140] Die Zeitstempel werden nun so transformiert bzw. normiert, dass die Differenz zwischen jeweils zwei aufeinanderfolgenden transformierten Zeitstempel deren Netto-Differenz ihres Zeitunterschieds in der Zieleinheit (beispielsweise Tage, Stunden, ...) ist.

[0141] Für das Transformieren der Zeitstempel kann Folgendes festgelegt werden:

- Für jeden Tag (Datum) existiert eine Definition, ob dieser berücksichtigt wird oder nicht. Diese Definition kann beispielsweise durch Angabe von Wochentagen (z.B. Montag) oder durch eine explizite Angabe von Datumswerten mittels eines Kalenders (z.B. 24.05.2016) erfolgen. Eine solche Definition kann auch für Wochen, Monate, Quartale, etc. vorgesehen sein.
- Für jeden Tag existiert eine Definition, welche Stunden des Tags zu berücksichtigen sind oder nicht. Dies kann beispielsweise durch Angabe der Stunden eines Wochentages (z.B. Montag: 08:00 bis 17:00) oder durch die explizite Angabe der Stunden zu einem bestimmten Datum mittels eines Kalenders (z.B. 24.05.2016: 08:00 bis 17:00) erfolgen. Eine solche Definition kann auch für Wochen, Monate, Quartale, etc. vorgesehen sein. Beispielsweise kann auf Wochenbasis definiert werden, welche Wochentage zu berücksichtigen sind, oder auf Monatsbasis, welche Tage zu berücksichtigen sind.
- Die Maximale Netto-Dauer eines Tages ist die Summe der aktiven Tagesintervalle dieses Tages.

[0142] Es können auch mehrere Kalender vorgesehen sein, die gleichzeitig berücksichtigt werden können. Beispielsweise kann mittels eines ersten Kalenders angegeben werden, welche Wochen eines Jahres zu berücksichtigen sind, während mittels eines zweiten Kalenders angegeben werden kann, welche Tage dieses Jahres nicht zu berücksichtigen sind. So können etwa Ausnahmen auf Tagesbasis für die in dem ersten Kalender angegebenen Wochen definiert werden.

[0143] Zur einfacheren Verarbeitung kann für jeden Zeitstempel das Datum als fortlaufende Zahl (beispielsweise als Julianisches Datum) und die Uhrzeit als Zeitangabe ausreichender Präzision (beispielsweise Millisekunden seit 00:00 Uhr) verwendet werden.

5 **[0144]** Wird die Differenz in Tagen berechnet, dann kann die Uhrzeit-Komponente des Zeitstempels ignoriert werden und die Berechnung lediglich auf der Datums-Komponente ausgeführt werden.

[0145] Für das Transformieren des Zeitstempels wird außerdem die Netto-Dauer der Zeitangabe in einer vorbestimmten Einheit (z.B. Stunden, Minuten oder Sekunden) benötigt. Die Netto-Dauer entspricht beispielsweise den Netto-Stunden (bzw. Netto-Minuten bzw. Netto-Sekunden) des Zeitstempels seit 00:00 Uhr.

10 **[0146]** Hierzu ein Beispiel: Ist für einen Tag ein zu berücksichtigendes Zeitintervall von 08:00 bis 17:00 Uhr festgelegt, so ist die Netto-Dauer auf Minutenbasis von 03:00 Uhr ebenso wie die Netto-Dauer von 07:00 Uhr jeweils 0 Minuten. Die Netto-Dauer von 09:00 Uhr ist 60 Minuten. Die Netto-Dauer von 17:00 Uhr ist 540 Minuten. Die Netto-Dauer von 23:00 Uhr ist 540 Minuten und entspricht damit der maximalen Netto-Dauer dieses Tages, weil das Intervall 17:00 bis 23:00 Uhr unberücksichtigt bleibt.

[0147] Die Tages-Gesamt-Nettozeit ist die Nettozeit eines gesamten Tages.

15 **[0148]** Die Transformation der Zeitstempel wird nun nach folgendem Verfahren durchgeführt:

In einem ersten Schritt wird eine Initialisierung durchgeführt, die umfasst

- 20 - der Ergebnisvektor wird als Null-Vektor mit gleicher Dimension wie der Zeitstempel-Vektor initialisiert;
- der aktuelle Tages-Offset wird mit dem Tages-Offset des ersten Zeitstempels initialisiert;
- der aktuelle Uhrzeit-Offset wird mit der Netto-Dauer des ersten Zeitstempels initialisiert;
- der aktuelle Offset-Wert wird mit 0 initialisiert; und
- dem Ergebnisvektor wird der aktuelle Offset-Wert zugewiesen.

25 **[0149]** In einem zweiten Schritt wird für alle Zeitstempel im Zeitstempel-Vektor iterativ folgendes Verfahren durchgeführt:

- solange der Tages-Offset des nächsten Zeitstempels größer als der aktuelle Tages-Offset ist:
 - 30 - erhöhe den Offset-Wert um die Netto-Dauer des aktuellen Tages (wenn der Tag nicht berücksichtigt wird, dann ist dies 0) abzüglich dem aktuellen Uhrzeit-Offset;
 - erhöhe den aktuellen Tages-Offset um 1; und
 - setze den aktuellen Uhrzeit-Offset auf 0;
- 35 - ist der Tages-Offset des nächsten Zeitstempels gleich dem aktuellen Tages-Offset:
 - erhöhe den aktuellen Offset-Wert um die Differenz zwischen aktuellem Uhrzeit-Offset und der Netto-Dauer des nächsten Zeitstempels;
 - weise dem Ergebnisvektor an der Position des nächsten Zeitstempels den aktuellen Offset-Wert zu; und
 - 40 - beginne mit dem nächsten Zeitstempel.

[0150] Im Ergebnis können anhand der so transformierten Zeitstempel Netto-Zeiten zwischen zwei beliebigen Zeitstempeln aus der Menge aller Zeitstempel berechnet werden.

45 **[0151]** In einer vorteilhaften Ausgestaltung der Erfindung werden die Zeitangaben der Prozessschritte des Prozessprotokolls in einem Dictionary Encoding gespeichert. Das Verfahren zur Bestimmung der Netto-Dauer kann direkt auf dem Dictionary Encodierten Zeitangaben und damit auf den komprimierten Daten durchgeführt werden.

[0152] In einer weiteren vorteilhaften Ausgestaltung der Erfindung sind die Werte im Dictionary in aufsteigender Form sortiert. Damit entfällt das vorherige Sortieren zur Bestimmung der Netto-Dauer.

50 **[0153]** Im einfachsten Fall kann die Durchlaufzeit, d.h. die Netto-Durchlaufzeit einer kompletten Prozessinstanz zwischen dem ersten Prozessschritt und dem letzten Prozessschritt der Prozessinstanz berechnet werden. Es ist aber auch möglich die Netto-Durchlaufzeit eines Teilprozesses der Prozessinstanz zu berechnen, d.h. die Netto-Durchlaufzeit zwischen Prozessschritten der Prozessinstanz die verschieden von dem ersten Prozessschritt bzw. verschieden von dem letzten Prozessschritt sind.

55 **[0154]** Die Auswahl der Prozessschritte, zwischen denen die Netto-Durchlaufzeit berechnet werden soll, kann durch den Benutzer an einer Benutzerschnittstelle vorgenommen werden.

[0155] Alternativ oder zusätzlich kann die Auswahl der Prozessschritte, zwischen denen die Netto-Durchlaufzeit berechnet werden soll, auch regelbasiert erfolgen. Beispiele hierfür sind:

- Erstes Auftreten eines bestimmten Prozessschrittes innerhalb einer Prozessinstanz;
- Letztes Auftreten eines bestimmten Prozessschrittes innerhalb einer Prozessinstanz;
- Beliebiges Auftreten eines bestimmten Prozessschrittes innerhalb einer Prozessinstanz;
- Erstes Auftreten eines beliebigen Prozessschrittes innerhalb einer Prozessinstanz;
- Letztes Auftreten eines beliebigen Prozessschrittes innerhalb einer Prozessinstanz;
- Prozessschritt mit einer vorbestimmten Kennung.

[0156] Diese Liste der Beispiele für die regelbasierte Auswahl von Prozessschritten ist nicht abschließend. Es können auch andere Regeln zur Auswahl von Prozessschritten vorgesehen sein.

[0157] Für mehrere Prozessinstanzen können solche Netto-Durchlaufzeiten berechnet werden. Insbesondere können für alle in dem Prozessprotokoll enthaltenen Prozessinstanzen solche Netto-Durchlaufzeiten berechnet werden. Aus den berechneten Netto-Durchlaufzeiten kann dann beispielsweise eine mittlere Netto-Durchlaufzeit für mehrere oder alle Prozessinstanzen eines Prozessprotokolls berechnet werden. In einem weiteren Beispiel können auch jene Prozessinstanzen aus dem Prozessprotokoll selektiert werden, deren Netto-Durchlaufzeit ein vorbestimmtes Kriterium erfüllt (z.B. deren Netto-Durchlaufzeit kleiner als 5 Tage ist).

[0158] Nachfolgend wird erläutert, wie parallel laufende Unterprozesse von Prozessinstanzen erkannt werden können.

[0159] Ein Prozess kann aus mehreren Unterprozessen bestehen, wobei die Unterprozesse parallel ausgeführt worden sein können. Unterprozesse können ihrerseits ebenfalls wieder aus Unterprozessen bestehen, die ebenfalls parallel ausgeführt worden sein können. Das Erkennen von parallel laufenden Unterprozessen alleine anhand des Attributes "Order" ist in den meisten Fällen nicht möglich. Das Erkennen von parallel laufenden Unterprozessen ist allerdings für das korrekte Ermitteln von Prozessgraphen oder Prozesshierarchien mittels Prozessoperatoren erforderlich, was mit aus dem Stand der Technik bekannten Verfahren nicht gewährleistet werden kann.

[0160] Hierfür ist erfindungsgemäß eine erweiterte Form der Datenstruktur des Prozessprotokolls vorgesehen, die ebenfalls in Fig. 2 gezeigt ist. Diese erweiterte Form der Datenstruktur weist lediglich zwei zusätzliche Attribute auf, nämlich "ParentID" und "SubProcessID".

[0161] Das Attribut "SubProcessID" speichert hierbei eine eindeutige Kennung für einen Unterprozess eines Prozesses oder für einen Unterprozess eines Unterprozesses. Das Attribut "ParentID" gibt an, zu welchem übergeordneten Prozess ein Unterprozess gehört. Mit diesen beiden Attributen wird erfindungsgemäß eine Hierarchie von Prozessen beschrieben, wobei Unterprozesse innerhalb der Hierarchie parallel ausgeführt worden sein können. Diese Parallelität wird in jedem Fall erkannt und zwar unabhängig von der Hierarchietiefe.

[0162] Erfindungsgemäß ist es darüber hinaus möglich, die Werte der Attribute "ParentID" und "SubProcessID" auf Basis anderer, in den Daten enthaltener Merkmale zu bestimmen. Die in den Attributen "ParentID" und "SubProcessID" enthaltenen Informationen können auch in anderer Form oder in einer anderen Struktur gespeichert werden.

[0163] Mit der erweiterten Form der Datenstruktur wird es erfindungsgemäß möglich, ein Aufteilen eines Prozesses in parallele Unterprozesse und ein Zusammenführen paralleler Unterprozesse in linearer Zeit zu berechnen. Dadurch können auch parallel laufende Unterprozesse effizient und insbesondere korrekt analysiert werden. Versuche haben gezeigt, dass damit alle Punkte innerhalb eines Prozesses, an denen sich der Prozess in parallele Unterprozesse aufteilt oder an denen parallele Unterprozesse zusammenlaufen, für Prozessprotokolle mit mehreren Millionen Datensätzen in einem Bruchteil einer Sekunde berechnet werden können. Die Berechnung der Hierarchie von Prozessen bzw. das Ermitteln von parallel laufenden Prozessen wird nachfolgend mit Bezug auf Fig. 3 näher beschrieben.

[0164] Sofern die Hierarchietiefe maximal 1 ist (d.h. wenn ein Prozess zwar Unterprozesse aufweist, diese Unterprozesse ihrerseits aber keine Unterprozesse aufweisen), kann auf das Attribut "ParentID" verzichtet werden.

[0165] Fig. 3 zeigt ein Beispiel eines Prozessprotokolls (Fig. 3(a)), einer daraus ermittelten Zustandshierarchie (Fig. 3(b)) und eines entsprechenden Graphen (Fig. 3(c)).

[0166] Anhand von Fig. 3 wird das Ermitteln von parallelen Unterprozessen und das Ermitteln der Prozesshierarchie basierend auf dem Prozessprotokoll näher beschrieben.

[0167] Fig. 3 (a) zeigt ein Prozessprotokoll, in dem sechs Aktivitäten (Prozessschritte) A bis F zu dem Prozess mit der CaseID = 1 gespeichert sind. Dieser Prozess umfasst zwei Teilprozesse, die parallel zur Ausführung gekommen sind. Die beiden Teilprozesse umfassen keine weiteren Teilprozesse, sodass das Attribut "ParentID" nicht unbedingt notwendig ist. Die zu den jeweiligen Teilprozessen gehörenden Aktivitäten werden durch die Werte des Attributes "SubProcID" identifiziert.

[0168] In einem ersten Schritt wird aus dem Prozessprotokoll eine Zustandshierarchie ermittelt. Die ermittelte Zustandshierarchie ist in Fig. 3 (b) gezeigt. Der Aufbau der Zustandshierarchie erfolgt vorteilhafter Weise im Arbeitsspeicher, wobei das Prozessprotokoll in einem Iterationsschritt sequentiell verarbeitet wird. Die Zustandshierarchie kann erfindungsgemäß also mit einer Zeitkomplexität von $O(n)$ ermittelt werden.

[0169] Anhand von Fig. 3 (b) wird erläutert, wie die Zustandshierarchie erzeugt wird.

[0170] In einem ersten Schritt (Step 1) wird der erste Datensatz (Order = 1) des Prozessprotokolls verarbeitet. Dieser erste Datensatz entspricht dem ersten Schritt des Prozesses. Der Wert des Attributes "SubProcID" ordnet diesen ersten

Datensatz einem Teilprozess zu. In dem vorliegenden Fall ist der Teilprozess der Hauptprozess selbst. Der übergeordnete Prozess ist daher nicht gesetzt.

[0171] In dem ersten Schritt (Step 1) wird der Teilprozess "Main" der Zustandshierarchie hinzugefügt. Ferner wird dem Teilprozess "Main", der gleichzeitig der Hauptprozess ist, ein Zeiger auf den ersten Datensatz zugeordnet. Das heißt, in der Zustandshierarchie wird dem Teilprozess "Main" der Datensatz "1" zugeordnet.

[0172] In einem zweiten Schritt (Step 2) wird der zweite Datensatz (Order = 2) des Prozessprotokolls verarbeitet. Dieser zweite Datensatz entspricht dem zweiten Schritt des Prozesses und ist ebenfalls dem Teilprozess "Main" (= Hauptprozess) zugeordnet. In der Zustandshierarchie wird daher dem Teilprozess "Main" der Datensatz "2" zugeordnet.

[0173] Nach dem zweiten Schritt (Step 2) sind in der Zustandshierarchie dem Teilprozess "Main" zwei Werte zugeordnet. Weil sich der zweite hinzugefügte Wert (2) von dem ersten hinzugefügten Wert (1) unterscheidet, wird in dem zweiten Schritt zusätzlich eine Kante "1→2" der Zustandshierarchie hinzugefügt. Die in diesem Schritt und in den nachfolgenden Schritten hinzugefügten Kanten "x→y" geben eine Vorgänger-/Nachfolger-Beziehung an, nämlich "y" ist Nachfolger von "x".

[0174] In einem dritten Schritt (Step 3) wird der dritte Datensatz (Order = 3) des Prozessprotokolls verarbeitet. Dieser dritte Datensatz entspricht dem dritten Schritt des Prozesses. Im Unterschied zu den beiden ersten Datensätzen ist dieser dritte Datensatz dem Teilprozess "SP1" zugeordnet. Das Attribut "ParentID" des dritten Datensatzes gibt an, dass dieser dem übergeordneten Teilprozess "Main" (= Hauptprozess) zugeordnet ist, d.h. der dritte Datensatz gehört zu dem Prozess "SP1", der ein Teilprozess des Prozesses "Main" ist.

[0175] Der Zustandshierarchie wird in dem dritten Schritt (Step 3) der Teilprozess "SP1" hinzugefügt. Ferner wird dem Teilprozess "SP1" in der Zustandshierarchie der Datensatz "3" zugeordnet. Der dem Teilprozess "Main" in dem zweiten Schritt (Step 2) zugeordnete Datensatz "2" hat sich nicht geändert und bleibt damit dem Teilprozess "Main" zugeordnet.

[0176] Weil der Wert "SP1" des Attributes "SubProcID" verschieden von dem Wert "Main" des Attributes "ParentID" ist und weil dem Teilprozess "SP1" in dem zweiten Schritt (Step 2) kein Wert zugeordnet wurde, handelt es sich bei dem dritten Datensatz um den ersten Prozessschritt des Teilprozesses "SP1". Der Vorgänger des dritten Prozessschrittes ist demnach jener Prozessschritt des übergeordneten Prozesses, der zuletzt der Zustandshierarchie hinzugefügt wurde. Im vorliegenden Beispiel ist dies der zweite Prozessschritt, der im zweiten Schritt (Step 2) hinzugefügt wurde. In dem dritten Schritt wird daher zusätzlich eine Kante "2→3" der Zustandshierarchie hinzugefügt.

[0177] In einem vierten Schritt (Step 4) wird der vierte Datensatz (Order = 4) des Prozessprotokolls verarbeitet. Dieser vierte Datensatz entspricht dem vierten Schritt des Prozesses. Im Unterschied zu dem dritten Datensatz ist dieser vierte Datensatz dem Teilprozess "SP2" zugeordnet, der dem übergeordneten Teilprozess "Main" (= Hauptprozess) zugeordnet ist, d.h. der vierte Datensatz gehört zu dem Prozess "SP2", der ein Teilprozess des Prozesses "Main" ist.

[0178] Weil sowohl der Teilprozess "SP1" als auch der Teilprozess "SP2" dem selben Prozess "Main" zugeordnet sind, handelt es sich bei den beiden Teilprozessen "SP1" und "SP2" um Prozesse, die parallel ausgeführt wurden.

[0179] In dem vierten Schritt wird der Teilprozess "SP2" der Zustandshierarchie hinzugefügt. Ferner wird dem Teilprozess "SP2" in der Zustandshierarchie der Datensatz "4" zugeordnet. Der dem Teilprozess "Main" in dem dritten Schritt (Step 3) zugeordnete Datensatz "2" ändert sich nicht und bleibt damit dem Teilprozess "Main" zugeordnet. Der dem Teilprozess "SP1" in dem dritten Schritt (Step 3) zugeordnete Datensatz "3" wird ebenfalls nicht geändert und bleibt damit dem Teilprozess "SP1" zugeordnet.

[0180] Weil der Wert "SP2" des Attributes "SubProcID" verschieden von dem Wert "Main" des Attributes "ParentID" ist und weil dem Teilprozess "SP2" in dem dritten Schritt (Step 3) kein Wert zugeordnet wurde, handelt es sich bei dem vierten Datensatz um den ersten Prozessschritt des Teilprozesses "SP2". Der Vorgänger des vierten Prozessschrittes ist demnach jener Prozessschritt des übergeordneten Prozesses, der zuletzt der Zustandshierarchie hinzugefügt wurde. Im vorliegenden Beispiel ist dies der zweite Prozessschritt, der im zweiten Schritt (Step 2) hinzugefügt wurde. In dem dritten Schritt wird daher zusätzlich eine Kante "2→4" der Zustandshierarchie hinzugefügt.

[0181] In einem fünften Schritt (Step 5) wird der fünfte Datensatz (Order = 5) des Prozessprotokolls verarbeitet. Dieser fünfte Datensatz ist dem Teilprozess "SP1" zugeordnet, der dem übergeordneten Teilprozess "Main" (= Hauptprozess) zugeordnet ist, d.h. der fünfte Datensatz gehört zu dem Prozess "SP1", der ein Teilprozess des Prozesses "Main" ist. Ferner wird dem Teilprozess "SP1" in der Zustandshierarchie der Datensatz "5" zugeordnet. Der dem Teilprozess "Main" in dem vierten Schritt (Step 4) zugeordnete Datensatz "2" ändert sich nicht und bleibt damit dem Teilprozess "Main" zugeordnet. Der dem Teilprozess "SP2" in dem vierten Schritt (Step 3) zugeordnete Datensatz "4" wird ebenfalls nicht geändert und bleibt damit dem Teilprozess "SP2" zugeordnet.

[0182] Weil der Teilprozess "SP1" bereits der Zustandshierarchie hinzugefügt wurde (in dem dritten Schritt (Step 3)), handelt es sich bei dem fünften Datensatz um einen Prozessschritt des Teilprozesses "SP1", der nicht der erste Prozessschritt des Teilprozesses "SP1" ist.

[0183] Der Vorgänger des fünften Prozessschrittes ist demnach jener Prozessschritt des Teilprozesses "SP1", der zuletzt der Zustandshierarchie hinzugefügt wurde. Im vorliegenden Beispiel ist dies der dritte Prozessschritt, der im dritten Schritt (Step 3) hinzugefügt wurde. In dem fünften Schritt wird daher zusätzlich eine Kante "3→5" der Zustandshierarchie hinzugefügt.

[0184] In einem sechsten Schritt (Step 6) wird der sechste Datensatz (Order = 6) des Prozessprotokolls verarbeitet. Dieser sechste Datensatz ist dem Teilprozess "Main" zugeordnet, der gleichzeitig der Hauptprozess ist (ParentID = Main).

[0185] Dem Teilprozess "Main" wird der Datensatz "6" zugeordnet. Aus der Zustandshierarchie ergibt sich nun, dass der aktuelle Datensatz (= 6) des Teilprozesses "Main" verschieden von dem Wert (= 2) ist, der in dem fünften Schritt (Step 5) dem Teilprozesses "Main" zugeordnet wurde. Zudem ist bekannt, dass der Teilprozesses "Main" mehrere Teilprozesse (im vorliegenden Beispiel SP1 und SP2) umfasst. Der sechste Prozessschritt ist damit ein Prozessschritt, bei dem die untergeordneten Prozesse (= Teilprozesse SP1 und SP2) zusammengeführt werden. Der sechste Prozessschritt bildet damit einen sogenannten "join point". Daher wird in der Zustandshierarchie auch den untergeordneten Prozessen jeweils der aktuelle Wert (= 6) des Teilprozesses "Main" zugeordnet.

[0186] Der sechste Prozessschritt hat demnach zwei Vorgänger, nämlich die jeweils zuletzt hinzugefügten Prozessschritte der Teilprozesse "SP1" und "SP2". In dem sechsten Schritt werden daher zusätzliche die Kanten, "5→6" und "4→6" der Zustandshierarchie hinzugefügt.

[0187] Optional kann eine weitere Kante "2→6" vom vorherigen Zustand des Teilprozesses "Main" eingefügt werden.

[0188] Aus der so erzeugten Zustandshierarchie bzw. aus den Kanten der Zustandshierarchie ergibt sich nun eine Prozesshierarchie, die parallel ausgeführte Teilprozesse umfassen kann und die beispielsweise als Baumstruktur oder als Graph dargestellt werden kann.

[0189] Fig. 3 (c) zeigt einen aus der Zustandshierarchie gemäß Fig. 3 (b) erzeugten Graphen. Erkennbar sind hier die parallel laufenden Teilprozesse "SP1" und "SP2" als Teile des Hauptprozesses "Main". Die Kante "2→6" ist hier als gestrichelter Pfeil dargestellt.

[0190] Dieses Verfahren hat den Vorteil, dass die Hierarchie eines Prozesses, der parallel ausgeführte Prozesspfade umfasst, mit einer Zeitkomplexität von $O(n)$ ermittelt werden kann, und zwar unabhängig von der Hierarchietiefe des Prozesses.

[0191] Weil auch parallele Pfade innerhalb eines Prozesses korrekt ermittelt werden können, liefert auch eine Prozessanalyse von Prozessen mit parallelen Prozesspfaden immer ein korrektes Ergebnis. So kann beispielsweise eine mittlere Durchlaufzeit für Prozesse ermittelt werden, die mit dem Prozessschritt "A" beginnen und bei denen die Prozessschritte "C" und "D" parallel ausgeführt werden. Bei den aus dem Stand der Technik bekannten Verfahren kann nicht in jedem Fall gewährleistet werden, dass eigentlich parallel ausgeführte Prozessschritte tatsächlich auch als solche erkannt werden. So kann es beispielsweise vorkommen, dass beim Ermitteln einer mittleren Durchlaufzeit für Prozesse, die mit dem Prozessschritt "A" beginnen und bei denen die Prozessschritte "C" und "D" parallel ausgeführt werden, nicht alle ausgeführten Prozesse berücksichtigt werden, obwohl sie eigentlich dem Filterkriterium entsprechen würden. Das führt zwangsläufig zu einer falschen mittleren Durchlaufzeit.

[0192] Der Wesentliche Vorteil der Erfindung liegt darin, dass eine Prozessanalyse direkt auf dem Prozessprotokoll durchgeführt wird, und zwar unabhängig davon, ob die in dem Prozessprotokoll gespeicherten Daten "einfache" Prozesse oder "komplexe" Prozesse, die verschachtelte und parallel ausgeführte Teilprozesse umfassen können, beschreiben.

Patentansprüche

1. Computer-implementiertes Verfahren zur Analyse von Prozessdaten, die durch Ausführen von realen Prozessen erzeugt werden und gemäß einer vorbestimmten Datenstruktur als Prozessprotokoll in einer Speichereinrichtung eines Computersystems gespeichert sind, wobei die Speichereinrichtung operativ mit einem Prozessor des Computersystems gekoppelt ist, wobei die Prozessdaten eine Anzahl von Prozessinstanzen umfassen, wobei jede Prozessinstanz eine Anzahl von Prozessschritten umfasst, wobei die vorbestimmten Datenstruktur zumindest umfasst:

- ein erstes Attribut, in dem eine eindeutige Kennung der Prozessinstanz des jeweiligen Prozessschrittes gespeichert ist;
- ein zweites Attribut, in dem eine Kennung des jeweiligen Prozessschrittes gespeichert ist; und
- ein drittes Attribut, in dem eine Reihenfolge der Prozessschritte innerhalb einer Prozessinstanz gespeichert ist; wobei das Verfahren umfasst:

- Entgegennehmen, durch das Computersystem, eines APE-Statements (Advanced Process Algebra Execution), wobei das APE-Statement eine Abfrage von Prozessinstanzen aus der Speichereinrichtung definiert und wobei das APE-Statement zumindest einen Prozessoperator aufweist;
- Ausführen, durch den Prozessor, des APE-Statements und Auslesen der Prozessinstanzen gemäß dem APE-Statement aus der Speichereinrichtung; und
- Bereitstellen des Ergebnisses der Abfrage zur weiteren Verarbeitung.

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2. Verfahren nach Anspruch 1, wobei beim Auslesen der Prozessinstanzen aus der Speichereinrichtung aus den zu den Prozessinstanzen gehörenden Prozessschritten Prozesse rekonstruiert werden.
- 5 3. Verfahren nach Anspruch 2, wobei beim Verarbeiten der Prozessinstanzen gemäß dem Prozessoperator der Prozessoperator auf die rekonstruierten Prozesse angewandt wird, wobei als Ergebnis der Verarbeitung vorzugsweise ein Prozessprotokoll, eine Tabelle, ein Wert oder ein Graph bereitgestellt wird.
- 10 4. Verfahren nach Anspruch 1, wobei das APE-Statement eine Klausel aufweist, die angibt, in welchem Ausgabeformat das Ergebnis der Abfrage zur weiteren Verarbeitung bereitzustellen ist, wobei das Ausgabeformat zumindest eines aus Tabelle und Graph umfasst.
- 15 5. Verfahren nach Anspruch 1, wobei das APE-Statement verschachtelte Abfragen umfasst, wobei die Abfragen von dem Prozessor sequentiell ausgeführt werden, und das Ergebnis einer Abfrage als Stream der nachfolgenden Abfrage zur Verfügung gestellt wird.
- 20 6. Verfahren nach Anspruch 1, wobei der zumindest eine Prozessoperator zumindest eines aus
- Ermitteln einer Durchlaufzeit zwischen zwei vorbestimmten Prozessschritten der Prozessinstanzen,
 - Ermitteln zumindest eines Prozessgraphen aus einer Anzahl von Prozessinstanzen,
 - Ermitteln von Prozessinstanzen, die einem vorbestimmten Muster entsprechen,
 - Ermitteln von Häufigkeiten, insbesondere Häufigkeiten von Prozessschritten in Prozessen,
 - Ermitteln von Schleifen in Prozessen,
 - Subtrahieren von Prozessgraphen, insbesondere Ermitteln einer Differenz von zwei Prozessgraphen,
 - Extrahieren von Teilprozessen aus Prozessen,
 - 25 - Splitten von Prozessgraphen in zwei oder mehrere Prozessgraphen,
 - und Kombinationen hiervon,
- umfasst.
- 30 7. Verfahren nach Anspruch 1, wobei das APE-Statement zumindest einen Datenbankoperator aufweist, wobei der Datenbankoperator zumindest eines aus
- Aggregats-Funktionen,
 - analytische Funktionen,
 - Konvertierungs-Funktionen,
 - 35 - kryptographische Funktionen,
 - Datums-Funktionen,
 - logische Funktionen,
 - mathematische Funktionen,
 - String-Funktionen,
 - 40 - Join-Operationen,
 - und Kombinationen hiervon,
- umfasst.
- 45 8. Verfahren nach Anspruch 1, wobei das Ausführen des APE-Statements und das Auslesen der Prozessinstanzen umfasst:
- Zuführen des APE-Statements einem Compiler;
 - Parsen, durch den Compiler, der von dem Prozessor ausgeführt wird, des APE-Statements und Erzeugen eines abstrakten Syntaxbaums aus dem APE-Statement;
 - 50 - Erzeugen, durch den Compiler, eines Ausführungsplans aus dem abstrakten Syntaxbaum, wobei der Ausführungsplan den zumindest einen Prozessoperator umfasst; und
 - Ausführen, durch den Prozessor, des Ausführungsplans, wobei eine Anzahl von Prozessinstanzen aus der Speichereinrichtung gelesen wird und gemäß dem zumindest einen Prozessoperator verarbeitet wird.
- 55 9. Verfahren nach Anspruch 8, wobei die Datenstruktur zumindest ein sechstes Attribut umfasst, in dem eine Referenz auf externe Daten gespeichert ist, wobei der Ausführungsplan Informationen zu der Referenz umfasst, und wobei beim Ausführen des Ausführungsplans eine Verknüpfung zwischen den Prozessschritten und den externen Daten gemäß den Informationen aufgelöst wird und die mit dem jeweiligen Prozessschritt verknüpften externen Daten

gelesen und von dem Prozessor gemäß dem APE-Statement verarbeitet werden.

- 5 10. Verfahren nach Anspruch 9, wobei die externen Daten eine erste Relation und zumindest eine zweite Relation umfassen, wobei mit dem sechsten Attribut Datensätze der ersten Relation referenziert werden und wobei die erste Relation Attribute aufweist, in denen Referenzen auf Datensätze der zumindest einen zweiten Relation gespeichert sind.
- 10 11. Verfahren nach Anspruch 8, wobei beim Ausführen des Ausführungsplans die Prozessinstanzen als Stream aus der Speichereinrichtung gelesen werden, wobei das APE-Statement vorzugsweise zumindest einen Filter aufweist, der eine Anzahl von Filterkriterien umfasst und der beim Ausführen des Ausführungsplans ausgeführt wird, wobei die aus der Speichereinrichtung gelesenen Prozessinstanzen gemäß den Filterkriterien gefiltert werden und/oder wobei beim Ausführen des Ausführungsplans zuerst der zumindest eine Prozessoperator ausgeführt wird.
- 15 12. Verfahren nach Anspruch 11, wobei beim Ausführen des zumindest einen Prozessoperators ein vorbestimmter Programmcode zur Ausführung gebracht wird, wobei der Programmcode dem Prozessor zur Verfügung gestellt wird oder vor der Ausführung des Prozessoperators von dem Prozessor erzeugt wird und/oder wobei der Prozessor nach dem Ausführen des zumindest einen Prozessoperators zumindest eine Referenz auf das Ergebnis der Ausführung zur weiteren Verarbeitung des Ergebnisses bereitstellt.
- 20 13. Verfahren nach Anspruch 8, wobei vor dem Erzeugen des Ausführungsplans der abstrakte Syntaxbaum optimiert wird, wobei die Speichereinrichtung vorzugsweise ein Arbeitsspeicher des Computersystems ist und/oder wobei die Kennung des Prozessschrittes vorzugsweise eine Beschreibung des Prozessschrittes umfasst.
- 25 14. Verfahren nach Anspruch 11, wobei nach dem Ausführen des zumindest einen Prozessoperators das Ergebnis der Ausführung einem Aggregationsautomaten übergeben wird, der von dem Prozessor ausgeführt wird, wobei der Aggregationsautomat das Ergebnis der Ausführung unter Anwendung zumindest einer Aggregatsfunktion gruppiert, wobei die zumindest eine Aggregatsfunktion zumindest eines aus Anzahl, Minimum, Maximum, Summe, und Mittelwert umfasst.
- 30 15. Ein computerbasiertes System umfassend:
 - einen Prozessor;
 - eine Speichereinrichtung, der operativ mit dem Prozessor gekoppelt ist, wobei in der Speichereinrichtung Prozessdaten gemäß einer vorbestimmten Datenstruktur gespeichert sind, wobei die Prozessdaten eine Anzahl
 - 35 von Prozessinstanzen umfassen, wobei jede Prozessinstanz eine Anzahl von Prozessschritten umfasst;
 - ein Computer lesbares Speichermedium, das operativ mit dem Prozessor gekoppelt ist, wobei auf dem Computer lesbaren Speichermedium Instruktionen gespeichert sind, welche, wenn sie von dem Prozessor des Systems ausgeführt werden, den Prozessor des Systems veranlassen, ein Verfahren zur Analyse von Prozessdaten, die gemäß einer vorbestimmten Datenstruktur in der Speichereinrichtung des Systems gespeichert sind, auszuführen, wobei die Prozessdaten eine Anzahl von Prozessinstanzen umfassen, wobei jede Prozessinstanz
 - 40 eine Anzahl von Prozessschritten umfasst;
 - einen Compiler, der von dem Prozessor ausgeführt wird;
 - wobei der Prozessor angepasst ist die Schritte des Verfahrens gemäß einem der vorhergehenden Ansprüche auszuführen.
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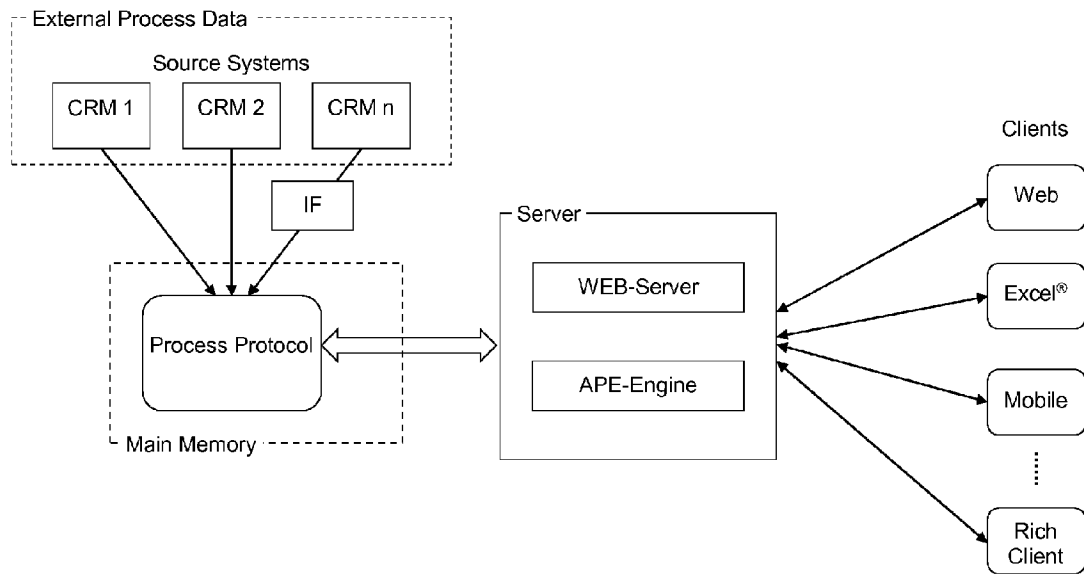


Fig. 1

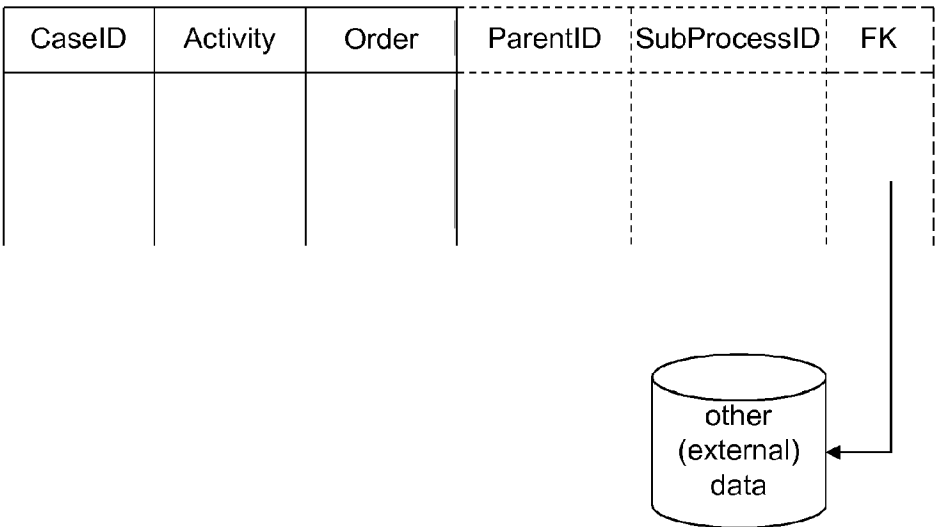


Fig. 2

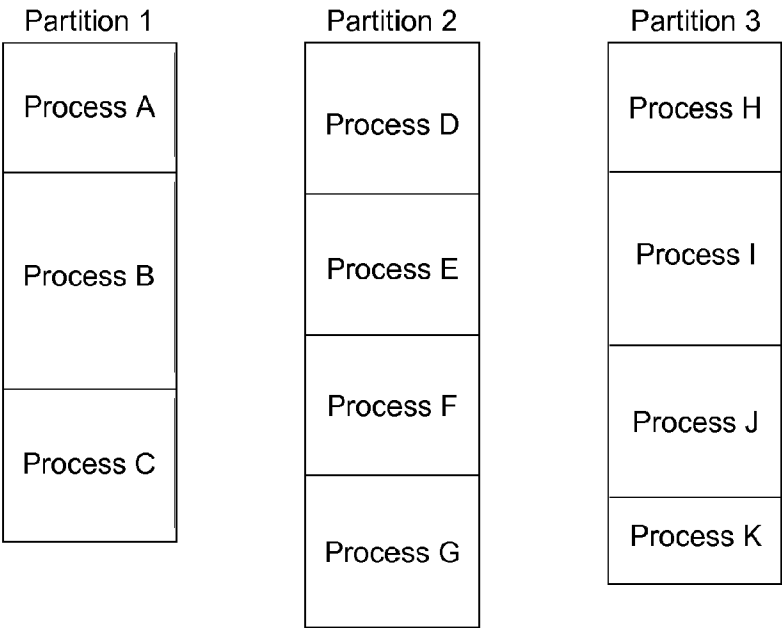
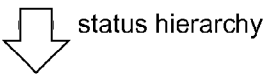


Fig. 2 (a)

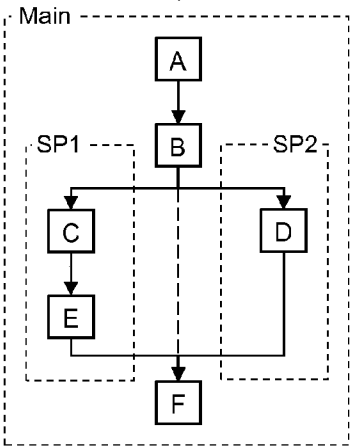
CaseID	Activity	Order	ParentID	SubProcID
1	A	1		Main
1	B	2		Main
1	C	3	Main	SP1
1	D	4	Main	SP2
1	E	5	Main	SP1
1	F	6		Main

(a)



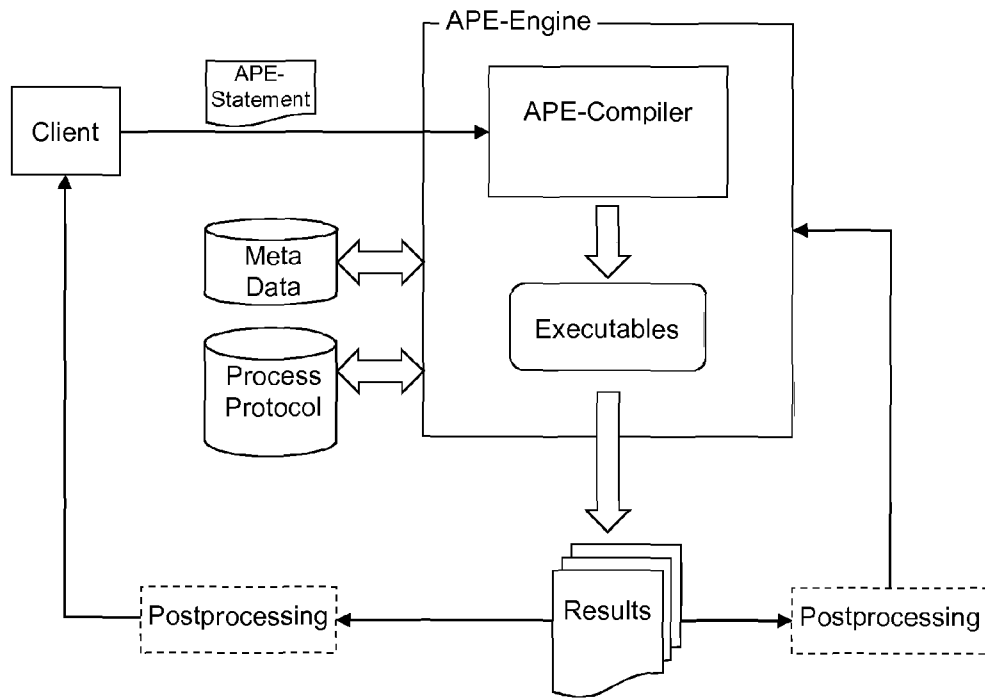
	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Main	1	2	2	2	2	6
SP1	1	2	3	3	5	6
SP2	1	2	2	4	4	6
edges		1→2	2→3	2→4	3→5	2→6 5→6 4→6

(b)



(c)

Fig. 3

**Fig. 4**

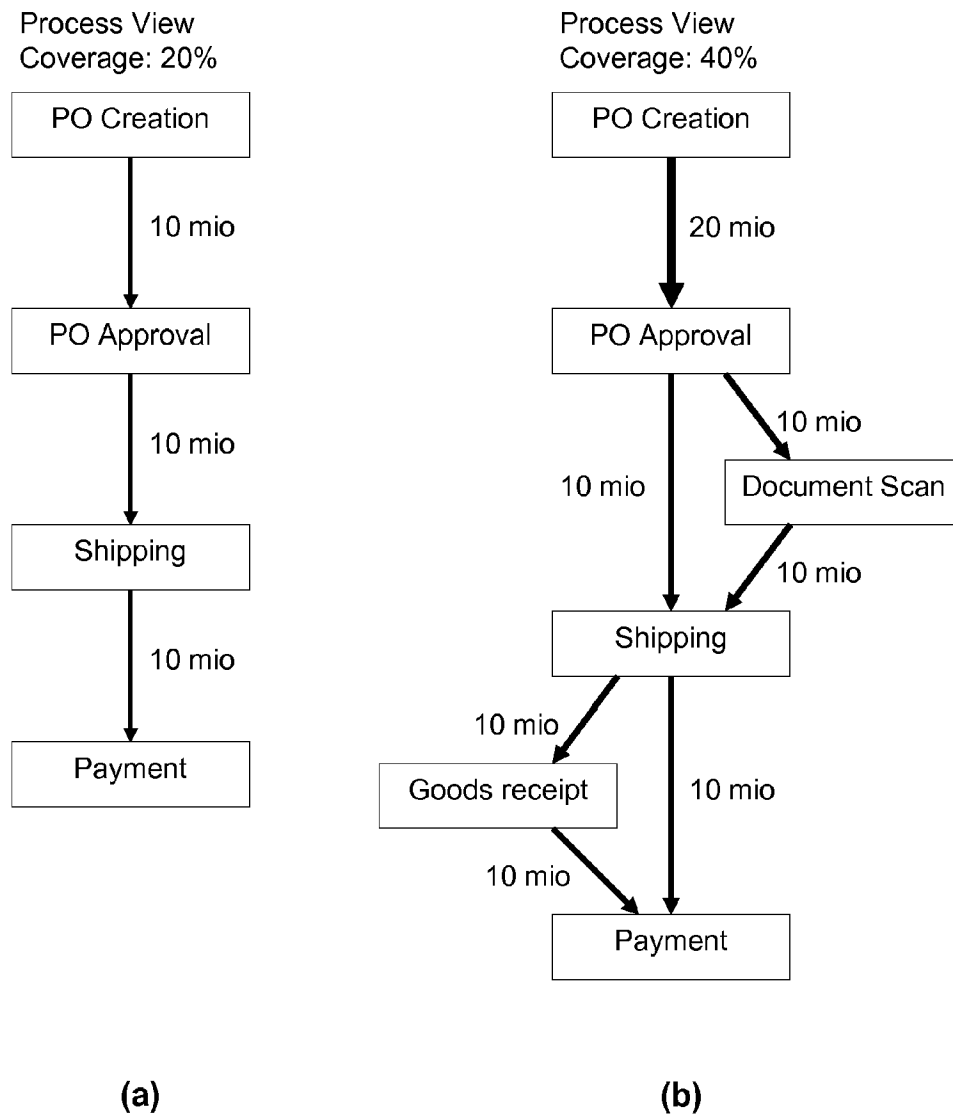


Fig. 5



EUROPÄISCHER RECHERCHENBERICHT

 Nummer der Anmeldung
EP 16 18 6720

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EINSCHLÄGIGE DOKUMENTE			
Kategorie	Kennzeichnung des Dokuments mit Angabe, soweit erforderlich, der maßgeblichen Teile	Betrifft Anspruch	KLASSIFIKATION DER ANMELDUNG (IPC)
Y	"CHAPTER 2: Database System Concepts and Architecture ED - Elmasri R; Navathe S B (Eds)", 1. Januar 2011 (2011-01-01), FUNDAMENTALS OF DATABASE SYSTEMS (SIXTH EDITION),, PAGE(S) 29 - 55, XP009171284, ISBN: 978-0-13-608620-8 * Seite 42 - Seite 43 *	1-15	INV. G06F17/30 G06F9/50 G06Q10/10
Y	"CHAPTER 19: Algorithms for Query Processing and Optimization ED - Ramez Elmasri; Shamkant B Navathe (eds)", 1. Januar 2011 (2011-01-01), FUNDAMENTALS OF DATABASE SYSTEMS (SIXTH EDITION), ADDISON-WESLEY, PAGE(S) 679 - 725, XP009171423, ISBN: 978-0-13-608620-8 * Seite 679 - Seite 680 *	1-15	
			RECHERCHIERTE SACHGEBIETE (IPC)
			G06F G06Q
Der vorliegende Recherchenbericht wurde für alle Patentansprüche erstellt			
Recherchenort Den Haag		Abschlußdatum der Recherche 18. Januar 2017	Prüfer Mühlenbrock, Martin
KATEGORIE DER GENANNTEN DOKUMENTE X : von besonderer Bedeutung allein betrachtet Y : von besonderer Bedeutung in Verbindung mit einer anderen Veröffentlichung derselben Kategorie A : technologischer Hintergrund O : mündliche Offenbarung P : Zwischenliteratur		T : der Erfindung zugrunde liegende Theorien oder Grundsätze E : älteres Patentedokument, das jedoch erst am oder nach dem Anmeldedatum veröffentlicht worden ist D : in der Anmeldung angeführtes Dokument L : aus anderen Gründen angeführtes Dokument & : Mitglied der gleichen Patentfamilie, übereinstimmendes Dokument	

EPO FORM 1533 03 82 (P04003)

Electronic Acknowledgement Receipt

EFS ID:	40773071
Application Number:	16256380
International Application Number:	
Confirmation Number:	7124
Title of Invention:	METHOD OF CREATING PROCESS PROTOCOLS
First Named Inventor/Applicant Name:	Martin KLENK
Customer Number:	61650
Filer:	Daniel Jacob Gross/Michaelanne Stelling
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Application Type:	Utility under 35 USC 111(a)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	schr_8887_20201006_ids.pdf	1034573	no	4
			d5029a07b19b65aae45d42f20e71eb2ca981ed13		

Warnings:

Information:					
2	Foreign Reference	schr_8887_20201006_ids_fr1.pdf	1394031	no	26
			a0af8c5eb31c37b2e1678962201c70401b8c502a		
Warnings:					
Information:					
3	Non Patent Literature	schr_8887_20201006_ids_npl1.pdf	271051	no	16
			cc1328de63d7431ec766acd4cbc1c3cb162d3190		
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4	Non Patent Literature	schr_8887_20201006_ids_npl2.pdf	2930914	no	30
			bbb6cde919cbeefec6b33511d2613327f58dc59		
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/256,380	01/24/2019	Martin KLENK	SCHR 8887	7124
61650	7590	02/05/2021	EXAMINER	
MYERS WOLIN, LLC			CHOI, YUK TING	
100 SOUTH JEFFERSON ROAD			ART UNIT	PAPER NUMBER
SUITE 202			2153	
WHIPPANY, NJ 07981-1009			NOTIFICATION DATE	DELIVERY MODE
			02/05/2021	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):

patent@myerswolyn.com

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application 16/256,380, filed on 01/24/2019, is being examined under the first inventor to file provisions of the AIA. Claims 1-15 are pending in this application.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 10/06/2020 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Objections

3. Claims 1, 7, 8, 10 are objected to because of the following informalities:

In claims 1, 7, 8 and 10, the “—” symbols are ambiguous. It is unclear what the dashes represented.

Appropriate correction is required.

Review under 35 USC § 101

4. Claims 1-15 are directed a method has been reviewed. Claims 1-15 appeared to be in one of the statutory categories [e.g. process], the process is a method for generating a process protocol. Claims 1-15 do not seem to fall in one of the grouping of abstract ideas enumerated in the 2019 PEG. Therefore claims 1-15 are qualified as eligible subject Matter under 35 USC 101.

Claim Rejections - 35 USC § 103

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, 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.

5. Claims 1-5, 8-10 and 12-15 are rejected under 35 U.S.C. 103 as being unpatentable over Rinke et al. (US 2017/0068705 A1), hereinafter Rinke'705 and in view of Rinke et al. (US 2017/0213167 A1), hereinafter Rinke '167.

Referring to claim 1, Rinke '705 discloses a computer-implemented method of creating a process protocol in a local computer system (LC) (***See para. [0018], para. [0065], para. [0066] a server creates a new process protocol***), which comprises a processor and a storage device (***See para. [0018] and Figure 1 , the server has a memory and a storage, the created/merged process protocol can be stored in the storage means of the server***), wherein the process protocol is created from raw data, which is stored in part in a first external computer system (EC1) and in part in a second external computer system (EC2) (***See para. [0103] and Figure 1, data required for the process protocol are obtained from one or more source systems e.g., CRM 1 to CRM n***), wherein the raw data in the external computer systems is stored in a number of data tables, wherein the raw data comprises data, which is created during the execution of processes in the first external computer system and in the second external computer system (***See para. [0071] para. [0103], para. [0107], para. [0109], para. [0117] and Figures 1 and 2A, the data obtained from the one or more sources systems are loaded during execution of ETL processes, the data are stored according a data structure according to process protocol, the data structure [table(s)] of the process protocol is shown in Figure 2A***) and wherein the method comprises:

(a) importing the data tables from the first external computer system and from the second external computer system into the local computer system (***See para. [0103], para. [0104], para. [0107] and para. [0117], loading the required data for the process protocol***

from the one or more source systems [e.g. CRM 1 to CRM n], the required data is stored according to the data structure [e.g. Figure 2A] required for the process protocol to main memory of the server and then is sorted physically in the main memory); and storing the imported data tables in the storing device of the local computer system (See para. [0018], para. [0117] and Figure 1, storing the source data comprises process data in a database),****

(b) in the local computer system, reconstructing [...] (**See para. [0025], para [0028]-para. [0038], the server is adapted to reconstruct processes to analyze the data from the one or more source systems);**

(c) in the local computer system, determining and selecting a first data table from the number of imported data tables, which comprises objects for which the process protocol is to be created (**See para. [0027]-para.[0046], para. [0060]-para.[0068] and para. [0071], the server is adapted to receive an APE request includes selection operators, which filters process instances to a certain process pattern and make results of the processing available, for example, a purchasing process having vendor table information),**

(d) in the local computer system, determining and selecting a number of second data tables from the number of imported data tables, which are necessary for the creation of the process protocol, based on the selected first data table and based on the relationships between the imported data tables (**See para. [0027]-para.[0046], para. [0060]-para.[0068] and para. [0071], the server is adapted to receive an APE request includes selection operators, which filters process instances to a certain process pattern and make results of the processing available, for example, a purchasing process having order table information),**

(e) in the local computer system, creating an executable transformation, which based on the selected first the data table, the selected second data tables [...] is adapted to extract data from the first data table and from the second data tables (**See para. [0102] and para. [0103],**

in response to the APE request [e.g. the APE request includes selection operators], the server is adaptor to convert and transform the APE request into an executable form, the data required for the process protocol loaded within an ETL process from one or more source systems and stored according to a data structured according to the invention as process protocol) and to store the extracted data as process protocol (See para. [0018], para. [0117] and Figure 1, storing the source data comprises process data in a database),

(f) in the local computer system, executing the transformation and storing the extracted data as process protocol (*See para. [0121] and para. [0122], the process protocol is stored in the main memory in a column orientated manner and executing the reconstruction of processes and operation in linear time*).

Rinke'705 does not explicitly disclose reconstructing the relationships between the imported data tables and providing the created process protocol to a Process Mining System for analysis and reconstruction of the processes carried out in external computer systems.

However, Rinke '167 discloses reconstructing the relationships between the imported data tables (*See para. [0018] and para. [0100]-para. [0108], providing a data model describing relationships between the tables*), creating an executable transformation, which based on the selected first the data table, the selected second data tables and based on relationship between the selected first data table and the selected second data tables from the first data table and from the second data tables (*See para. [0017]-para. [0021], creating, based on the data model comprising executable program modules for creating and displaying at least one graphical analysis of the process data stored within the event log and/or of the auxiliary data stored with the set of tables, the data model including indicating relationships between the tables*), and providing the created process protocol to a Process Mining System for analysis and reconstruction of the processes (*See para. [0008] and para.[0090], providing business process to process mining systems*) carried out in

external computer systems (***See para. [0193]-para. [0201], the created process in the event log and analytical packages for the user's process mining application can be distribute other computer users***).

Therefore, it would have been obvious to a person of ordinary skill in the computer art before the effective filing date of the claimed invention to incorporate the Rinke'167 teachings in the Rinke'705 system. Skilled artisan would have been motivated to reconstruct the relationships between the imported data tables and providing the created process protocol to a Process Mining System for analysis and reconstruction taught by Rinke'167 in order to simplify the process of monitoring and analyzes processes and checking for irregularities (See Rinke '167). In addition, both of the references (Rinke '167 and Rinke '705) teach features that are directed to analogous art and they are directed to the same field of endeavor, such as providing business process analysis. This close relation between both of the references highly suggests an expectation of success.

As to claim 2, Rinke '705 discloses wherein at least one of the selected data tables is imported from the first external computer system (ES1), and at least one of the selected data tables is imported from the second external computer system (ES2) (***See para. [0103], para. [0104], para. [0107] and para. [0117], loading the required data for the process protocol from the one or more source systems [e.g. CRM 1 to CRM n], the required data is stored according to the data structure [e.g. Figure 2A] required for the process protocol to main memory of the server and then is sorted physically in the main memory***).

As to claim 3, Rinke '705 discloses wherein during execution of the transformation in the step (f), the data is extracted from the data tables stored in the external computer systems (ES1, ES2) (***See para. [0103], para. [0104], para. [0107] and para. [0117], the***

required data for the process protocol is loaded within an ETL “Extraction-Transformation-Loading” from the one or more source systems [e.g. CRM 1 to CRM n].

As to claim 4, Rinke’705 in view of Rinke ‘167 discloses wherein during reconstructing of the relationships between the imported data tables, it is determined via which attributes the data tables are related to each other (***See Rinke ‘167, para. [0100-0106], determining which attribute [identifier] can consist of any transformation of the fields [attributes] contained in the consecutive join over multiple tables***).

Therefore, it would have been obvious to a person of ordinary skill in the computer art before the effective filing date of the claimed invention to incorporate the Rinke’167 teachings in the Rinke’705 system. Skilled artisan would have been motivated to reconstruct the relationships between the imported data tables taught by Rinke’167 in order to identify relations between different tables since data fields which are stored in a database system are often scattered among different tables (See Rinke’167, para. [0100]). In addition, both of the references (Rinke ‘167 and Rinke ‘705) teach features that are directed to analogous art and they are directed to the same field of endeavor, such as providing business process analysis. This close relation between both of the references highly suggests an expectation of success.

As to claim 5, Rinke’167 also discloses wherein two data tables are related to each other, if an attribute of the one data table is identical or similar to an attribute of the other data table (***See para. [0100]-0106], relating or joining tables when the unique attribute [identifier] of a first table is identical to the attribute field [unique identifier] of another table***).

As to claim 8, Rinke' 705 discloses wherein during determining and selecting of a first data table in the step (c), it is determined, which data table meets one or more conditions, wherein the conditions are selected from a group, consisting of the data table comprises less data sets compared to the other data tables, the data table comprises an attribute, in which the time stamps are stored, the data table is referenced by a few other data tables, and combinations thereof (***See para. [0027]-para.[0046], para. [0060]-para.[0068] and para. [0071], the server is adapted to receive an APE request includes selection operators, which filters process instances to a certain process pattern and make results of the processing available, for example, the purchasing order table meets the APE request, the purchasing order table also referenced vendor information table)***)

As to claim 9, Rinke'705 disclose wherein information with respect to the selected first data table is stored (***See para. [0071], the information on respective vendor is stored for each process step).***

As to claim 10, Rinke'705 discloses wherein during determining and selecting of the number of second data tables in the step (d) those data tables are selected, which meet one or more conditions, wherein the conditions are selected from the group, consisting of the data tables comprise many data sets compared to the first data table, the data table is referenced directly or indirectly by the first data table, the data tables respectively comprise an attribute, in which the time stamps are stored, and combinations thereof (***See para. [0027]-para.[0046], para. [0060]-para.[0068] and para. [0071], para. [0122] and para. [0123], the server is adapted to receive an APE request includes selection operators and relational algebra, which filters process instances to a***

certain process pattern and make results of the processing available, note the data structure [e.g. second table] of the process protocol may comprise one or more reference foreign keys indirectly referenced by the first table).

As to claim 12, Rinke'705 discloses wherein during creating of the executable transformation in the step (e) it is determined, which attributes of the selected first data table and of the selected second data tables are considered during extracting of the data (***See para. [0027]-para.[0046], para. [0060]-para.[0068] and para. [0071], the server is adapted to receive an APE request includes selection operators, which filters process instances to a certain process pattern and make results of the processing available, for example, the purchasing order table meets the APE request, the purchasing order table also referenced vendor information table.***

As to claim 13, Rinke'705 discloses wherein during executing of the transformation in the step (f) data sets are read out from the first data table and from the second data tables, wherein the data sets, which have been read out, comprise the attribute values of the attributes determined for the respective data table, wherein the data sets, which have been read out, are stored as process protocol, wherein each data set stored in the process protocol represents a process step (Event) of a process executed in the first external computer system and in the second external computer system (***see para. [0103, para. [0109]-para. [0122]. All data required for the process protocol is loaded and stored as process protocol, figure 2A shows the data structure of the process protocol has three attributes: Case ID, Activity and Order, the attribute "Activity" describes a process step of a process instance, the attribute "order" indicates the sequence of the process steps within a process***

instance, the data for processes steps are obtained from one or more source systems CRM1 to CRM2).

As to claim 14, Rinke'705 discloses wherein the data sets, which have been read out, are stored according to a predetermined data structure in the process protocol, wherein the predetermined data structure comprises at least: a first attribute, in which a first unique identifier of the process of the respective process step is stored; a second attribute, in which an identifier of the respective process step is stored; and a third attribute, in which a sequence of the process steps within a process is stored (***see para. [0103], para. [0109]-para. [0122]. All data required for the process protocol is loaded and stored as process protocol, figure 2A shows the data structure of the process protocol has three attributes: Case ID, Activity and Order, the attribute "Case ID" is a unique identification of a process instance, the attribute "Activity" describes a process step of a process instance, the attribute "order" indicates the sequence of the process steps within a process instance, the data for processes steps are obtained from one or more source systems CRM1 to CRM2).***

As to claim 15, Rinke' 705 discloses wherein the attribute values of the attributes of the process protocol are determined from the attribute values of the data sets, which have been read out, and/or the table names and/or column names of the selected first data table and/or the selected second data tables (***See para. [0114], para. [0120] , the example of the process protocol with data columns and attributes values).***

7. Claims 6, 7 and 11 are rejected under 35 U.S.C. 103 as being unpatentable over Rinke '705 (US 2017/0068705 A1) and in view of Rinke '167 (US 2017/0213167 A1) and further in view of Sayal et al. (US 2011/0178974), hereinafter Sayal.

As to claim 6, Rinke' 705 in view of Rinke ' 167 do not explicitly teach the relationships reconstructed between two imported data tables are stored, wherein the names of the two data tables, the respective attributes, and an assignment of the attributes of the one data table to the attributes of the other data table are stored .

However, Sayal discloses wherein the relationships reconstructed between two imported data tables are stored, wherein the names of the two data tables, the respective attributes, and an assignment of the attributes of the one data table to the attributes of the other data table are stored (***See para. [0031] and Figures 2 and 9, comparing the stored tables in a database to reconstruct relationships by comparing names in the two tables, for example, determining the names of attributes 906, 908 of the first table are identical with the names of the second table***).

Therefore, it would have been obvious to a person of ordinary skill in the computer art before the effective filing date of the claimed invention to incorporate the Sayal teachings in the Rinke'705/Rinke'167 system. Skilled artisan would have been motivated to reconstruct the relationships between two imported data tables are stored, wherein the names of the two data tables, the respective attributes, and an assignment of the attributes of the one data table to the attributes of the other data table are stored, as taught by Sayal in the Rinke'705/Rinke'167 system in order to facilitate extracting and reconstructing, the

logic, meaning and understanding of the data stored in electronic database since obtaining the various different levels of knowledge and understanding of the data stored in an electronic database can be complex, tedious, time-consuming and often intractable (See Sayal, para. [0004]). In addition, all of the references (Sayal, Rinke '167 and Rinke '705) teach features that are directed to analogous art and they are directed to the same field of endeavor, such as data analysis. This close relation between both of the references highly suggests an expectation of success.

As to claim 7, Rinke' 705 in view of Rinke'167 discloses wherein a first data model belonging to the data tables imported from the first external computer system (EC1) is imported from the first external computer system into the local computer system (***See Rinke'167, para. [0012]-para. [0019], providing a data model to the local processor, the model describing the predetermined data structure, the set of tables and the relations with the tables, the data model is associated with the process data derived from raw data stored in a source system, the process data is stored in a predetermined data structure [tables]***), wherein the relationships between the data tables imported from the first external computer system (EC1) are reconstructed based on the first data model (***See Rinke '167, See para. [0018] and para. [0100]-para. [0108], providing a data model to reconstruct relationships between the tables***), a second data model belonging to the data tables imported from the second external computer system (EC2) is imported from the second external computer system into the local computer system (***See Rinke '167, para. [0093], para. [0134], raw data stored in more than one source system and each process sensor is configured according to different source systems, also see Rinke'167, para. [0012]-para.***

[0019], providing a data model to the local processor, the model describing the predetermined data structure, the set of tables and the relations with the tables, the data model is associated with the process data derived from raw data stored in a source system, the process data is stored in a predetermined data structure [tables]), wherein the relationships between the data tables imported from the second external computer system (EC2) are reconstructed based on the second data model (See Rinke '167, See para. [0018] and para. [0100]-para. [0108], providing a data model to reconstruct relationships between the tables).

Rinke' 705 in view of Rinke'167 does not explicitly disclose the relationships between the data tables from the first external computer system and the data tables from the second external computer system have to be reconstructed without the use of a data model.

However, Sayal discloses the relationships between the data tables from the first external computer system and the data tables from the second external computer ***(See para. [0021], relational database databases are distributed in more than one storage devices)*** have to be reconstructed without the use of a data model ***(See para. [0031] and Figures 2 and 9, comparing the stored tables in a database to reconstruct relationships by comparing names in the two tables, for example, determining the names of attributes 906, 908 of the first table are identical with the names of the second table).***

Therefore, it would have been obvious to a person of ordinary skill in the computer art before the effective filing date of the claimed invention to incorporate the Sayal teachings in the

Rinke'705/Rinke'167 system. Skilled artisan would have been motivated *to* reconstruct the relationships between two imported data tables are stored, as taught by Sayal in the Rinke'705/Rinke'167 system in order to facilitate extracting and reconstructing, the logic, meaning and understanding of the data stored in electronic database since obtaining the various different levels of knowledge and understanding of the data stored in an electronic database can be complex, tedious, time-consuming and often intractable (See Sayal, para. [0004]). In addition, all of the references (Sayal, Rinke '167 and Rinke '705) teach features that are directed to analogous art and they are directed to the same field of endeavor, such as data analysis. This close relation between both of the references highly suggests an expectation of success.

As to claim 11, Rinke' 705 in view of Rinke'167 does not explicitly disclose wherein information with respect to the relationships between the selected second data tables and the first data table are stored.

Sayal discloses wherein information with respect to the relationships between the selected second data tables and the first data table are stored (***See para. [0035] and para. [0037] storing information describing the relationships between the two tables in memory for subsequent use***).

Therefore, it would have been obvious to a person of ordinary skill in the computer art before the effective filing date of the claimed invention to incorporate the Sayal teachings in the Rinke'705/Rinke'167 system. Skilled artisan would have been motivated *to* reconstruct the relationships between two imported data tables are stored, as taught by Sayal in the Rinke'705/Rinke'167 system in order to facilitate extracting and reconstructing, the logic, meaning and understanding of the data stored in electronic database since obtaining the

various different levels of knowledge and understanding of the data stored in an electronic database can be complex, tedious, time-consuming and often intractable (See Sayal, para. [0004]). In addition, all of the references (Sayal, Rinke '167 and Rinke '705) teach features that are directed to analogous art and they are directed to the same field of endeavor, such as data analysis. This close relation between both of the references highly suggests an expectation of success.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Jost et al. (US 2005/0171833A1), Computerized methods and systems are provided for acquiring time-dependent data for business process analysis. In such methods and systems, information may be imported from a plurality of source systems using a generic interface. Further, process fragments may defined from the imported information and the process fragments may be merged to generate process instances. The process instances may then be merged to generate a process model, which may represent a business process. Further, configurable performance indicators may be calculated in order to analyze a business process. The performance indicators may be calculated based on the process model and information imported from the plurality of source systems. As a result, users may investigate specific processes and indicators in detail, as well as overall business process performance on an aggregated basis.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YUK TING CHOI whose telephone number is (571)270-1637. The examiner can normally be reached on Monday-Friday 9am-6pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is

encouraged to use the USPTO Automated Interview Request (AIR) at
<http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alford W Kindred can be reached on 5712724037. 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 <https://ppair-my.uspto.gov/pair/PrivatePair>. 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.

YUK TING CHOI
Examiner
Art Unit 2153

/YUK TING CHOI/
Primary Examiner, Art Unit 2153

<i>Notice of References Cited</i>	Application/Control No. 16/256,380		Applicant(s)/Patent Under Reexamination KLENK et al.	
	Examiner YUK TING CHOI		Art Unit 2153	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-20050171833-A1	08-2005	Jost, Wolfram	G06Q10/06	705/7.38
*	B	US-20110178974-A1	07-2011	Sayal; Mehmet Oguz	G06N5/022	706/50
*	C	US-20170213167-A1	07-2017	Rinke; Alexander	G06F16/2465	707/999.003
*	D	US-20170068705-A1	03-2017	RINKE; Alexander	G06F9/50	707/999.003
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
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<i>Search Notes</i> 	Application/Control No. 16/256,380	Applicant(s)/Patent Under Reexamination KLENK et al.
	Examiner YUK TING CHOI	Art Unit 2153

CPC - Searched*		
Symbol	Date	Examiner
G06F16/258 OR G06F2216/03 OR G06F40/177 OR G06F16/254 OR G06N20/00		

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Search Notes		
Search Notes	Date	Examiner
G06F16/258 OR G06F2216/03 OR G06F40/177 OR G06F16/254 OR G06N20/00		
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Interference Search			
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<i>Search Notes</i> 	Application/Control No. 16/256,380	Applicant(s)/Patent Under Reexamination KLENK et al.
	Examiner YUK TING CHOI	Art Unit 2153

/YUK TING CHOI/ Primary Examiner, Art Unit 2153	
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Bibliographic Data

Application No: 16/256,380

Foreign Priority claimed: ☐ Yes ☒ No

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

Verified and Acknowledged: /YUK TING CHOI/

Examiner's Signature

Initials

Title: METHOD OF CREATING PROCESS PROTOCOLS

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
01/24/2019	707	2153	SCHR 8887
RULE			

APPLICANTS

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Alexander RINKE, München, GERMANY

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EAST Search History

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Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	63	(import\$3 select\$3) near20 (table\$3) and (build\$3 construct\$3 creat\$3) near20 (relationship\$3) near20 (tables) and (discover\$3 mining) near5 process\$3 and (rebuild\$3 reform\$3 rearrang\$3 regnerat\$3 remodel\$3 rebuild\$3 reorganiz\$3 reconstruct\$3) near20 (process\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/11 17:54
L3	13	2 AND ((G06F16/258 OR G06F2216/03 OR G06F40/177 OR G06F16/254 OR G06N20/00).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/11 17:56
S1	18	celonis.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/09 12:45
S2	3	"20170213167"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/09 12:57
S3	4	"20170068705"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/09 13:00
S4	3	"20170213167"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/09 13:04
S5	1	(import\$3) near20 (table\$3) near20 (systems machines computers) and (build\$3 construct\$3 creat\$3) near20 (relationship\$3) near20 (imported) and creat\$3 near20 (process\$3) near20	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2020/12/09 13:09

		(select\$3) near20 tables and process near5 (mine mining)	DERWENT; IBM_TDB			
S6	1	(import\$3) near20 (table\$3) near20 (systems machines computers) and (build\$3 construct\$3 creat\$3) near20 (relationship\$3) near20 (imported) and creat\$3 near20 (process\$3) near20 (select\$3) near20 tables	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/09 13:09
S7	1	(import\$3) near20 (table\$3) near20 (systems machines computers) and (build\$3 construct\$3 creat\$3) near20 (relationship\$3) near20 (imported) and (mining generat\$3 creat\$3) near20 (process\$3) near20 (select\$3) near20 tables	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/09 13:09
S8	1	(table\$3) near20 (systems machines computers) and (build\$3 construct\$3 creat\$3) near20 (relationship\$3) near20 (imported) and creat\$3 near20 (process\$3) near20 (select\$3) near20 tables	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/09 13:10
S9	18	(table\$3) near20 (systems machines computers) and (build\$3 construct\$3 creat\$3) near20 (relationship\$3) near20 (table\$3) and creat\$3 near20 (process\$3) near20 (select\$3) near20 tables	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/09 13:10
S10	25	(table\$3) near20 (systems machines computers) and (build\$3 construct\$3 discover\$3 learn\$5 mining creat\$3) near20 (relationship\$3) near20 (table\$3) and (generat\$3 mining creat\$3) near20 (process\$3) near20 (select\$3) near20 tables	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/09 13:13
S11	1	process near5 mining near5 (machine system) and (reconstruct\$3 construct\$3 build\$3 creat\$3) near20 (processes) near20 (machines computers servers systems nodes) and (import\$3 load\$3) near20 (table\$3) and (discover\$3 generat\$3 mining creat\$3 identif\$3 extract\$3) near20 relationship\$3 near20 (table\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/09 13:17
S12	1	process near5 mining near5 (machine node server system) and (reconstruct\$3 construct\$3 build\$3 creat\$3) near20 (processes) near20 (machines computers servers systems nodes) and (import\$3 load\$3) near20 (table\$3) and (discover\$3 generat\$3 mining creat\$3 identif\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/09 13:17

		extract\$3) near20 relationship\$3 near20 (table\$3)				
S13	3	process near5 mining and (reconstruct\$3 construct\$3 build\$3 creat\$3) near20 (processes) near20 (machines computers servers systems nodes) and (import\$3 load\$3) near20 (table\$3) and (discover\$3 generat\$3 mining creat\$3 identif\$3 extract\$3) near20 relationship\$3 near20 (table\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/09 13:18
S14	15	process near5 mining and (reconstruct\$3 construct\$3 build\$3 creat\$3) near20 (process\$5) near20 (machines computers servers systems nodes) and (import\$3 load\$3) near20 (table\$3) and (discover\$3 generat\$3 mining creat\$3 identif\$3 extract\$3) near20 relationship\$3 near20 (table\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/09 13:18
S15	2	"15006732" and table\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/09 15:18
S16	4	"16256380"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 14:04
S17	37	process near5 protocol and reconstruct\$3 near20 (process\$3) near20 (systems computers nodes servers)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 14:19
S18	24	mining near5 process\$3 and reconstruct\$3 near20 (process\$3) near20 (systems computers nodes servers)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 14:21
S19	17	mining near5 process\$3 and reconstruct\$3 near20 (process\$3) near20 (systems computers nodes servers) and tables	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 14:27

S21	1	"16256380" and external near20 protocol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 14:34
S22	1	"14846651" and external	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 14:36
S23	3	"14846451" and external	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 14:37
S24	1	"16256380" and reconstruction\$3 same external	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 14:39
S25	3	"14846451" and relation\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 14:41
S26	3	"14846451" and relationship\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 14:41
S27	24	mining near5 process\$3 and reconstruct\$3 near20 (process\$3) near20 (systems machines computers nodes servers)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 14:43
S28	36	mining near5 process\$3 and (rebuild\$3 reform\$3 regnerat\$3 remodel\$3 rebuild\$3 reorganiz\$3 reconstruct\$3) near20 (process\$3) near20 (systems machines computers nodes servers)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 14:44

S29	47	mining near5 process\$3 and (rebuild\$3 reform\$3 rearrang\$3 regnerat\$3 remodel\$3 rebuild\$3 reorganiz\$3 reconstruct\$3) near20 (process\$3) near20 (systems machines computers nodes servers)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 14:46
S30	1	"14846451" and mining	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 14:52
S31	2	"15006732" and relationship	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 15:08
S32	33	"6836773" and mining and protocol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 15:12
S33	3	"14846451" and creat\$3 near10 Process\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 16:57
S34	3	"14846451" and creat\$3 near10 Process\$3 and main near5 memory	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 16:58
S38	3	"14846451" and table\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 17:10
S39	3	"14846451" and reconstruc\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 17:43

S40	3	"14846451" and select\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 18:11
S44	3	"14846451" and select\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 18:25
S45	2	"15006732" and select\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 18:26
S46	14	mining near5 process\$5 and select\$3 near20 table\$3 same reconstruct\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 18:26
S47	10	mining near5 process\$5 and select\$3 near20 table\$3 same reconstruct\$3 and relationship\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 18:28
S48	1	mining near5 process\$5 and select\$3 near20 table\$3 and reconstruct\$3 near20 relationship\$3 same tables	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 18:29
S49	8	mining near5 process\$5 and select\$3 near20 table\$3 and reconstruct\$3 near20 relationship\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 18:30
S50	19	"6629095" and select\$3 near10 table\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 18:31

S51	1	"20050171833" and select\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 18:34
S55	2	select\$3 near10 (table\$3) and (discover\$3 learn\$3 mining) near20 relationship\$3 near20 table\$3 and reconstruct\$3 near20 (process\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 18:37
S56	1	import\$3 near10 (table\$3) and (discover\$3 learn\$3 mining) near20 relationship\$3 near20 table\$3 and reconstruct\$3 near20 (process\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 18:38
S57	3	"14846451" and creat\$3 near10 process\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 18:39
S58	3	"14846451" and creat\$3 near10 process\$3 and tables	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 18:40
S59	3	"14846451" and relation\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 19:06
S60	5	(import\$3) near20 (table\$3) and (build\$3 construct\$3 creat\$3) near20 (relationship\$3) near20 (tables) and (discover\$3 mining) near5 process\$3 and (rebuild\$3 reform\$3 rearrang\$3 regnerat\$3 remodel\$3 rebuild\$3 reorganiz\$3 reconstruct\$3) near20 (process\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 19:10
S62	1	(import\$3 select\$3) near20 (table\$3) and (rebuild\$3 mining reogranz\$3 rearrang\$3 discover\$3 reconstruct\$3 recreat\$3) near20 (relationship\$3) near20 (tables) and (discover\$3 mining) near5 process\$3 and (rebuild\$3 reform\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 19:17

		rearrang\$3 regnerat\$3 remodel\$3 rebuild\$3 reorganiz\$3 reconstruct\$3) near20 (process\$3)				
S63	332	((rinke near5 alexander)(martin near5 klenk)(bastian near5 nominacher)(raimar near5 wagner))"in."	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 19:19
S64	10	((rinke near5 alexander)(martin near5 klenk)(bastian near5 nominacher)(raimar near5 wagner)).in. and creat\$3 near20 process and process near5 mining	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 19:20
S65	35	process near4 mining near5 system and reconstruc\$5 near10 process\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 19:27
S66	2	"15006732" and select\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 19:32
S67	2	"15006732" and tables	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 19:32
S68	3	"14846451" and tables	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 20:19
S70	3	"14846451" and creat\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 20:22
S71	3	"14846451" and stor\$3 near10 protocol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2020/12/10 20:47

			DERWENT; IBM_TDB			
S73	3	"14846451" and protocol same systems	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 20:51
S74	2	"15006732" and relation\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 20:57
S75	2	"15006732" and mining	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 21:02
S77	2	"15006732" and mining same reconstruc\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 21:02
S78	2	"15006732" and distribut\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 21:17
S79	2	"15006732" and tables	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 21:30
S80	2	"15006732" and source	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/10 21:39
S81	3	"14846451" and etl	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2020/12/11 14:47

			DERWENT; IBM_TDB			
S82	2	"15006732" and attribut\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/11 14:49
S83	1	"15006732" and attribut\$3 same relationship\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/11 14:50
S85	3	reconstruct\$3 near20 relation\$5 near20 (tables) same table near5 name\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/11 15:09
S86	3	reconstruct\$3 near20 relation\$5 near20 (tables) same (table near5 name\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/11 15:09
S87	2	"15006732" and data near5 model	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/11 15:51
S88	2	"15006732" and data near5 model and source near10 systems	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/11 15:52
S90	3	reconstruct\$3 near20 relation\$5 near20 (tables) same table near5 name\$3 and import\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/11 16:15
S91	3	"20110178974" and (import\$3 import\$3 creat\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2020/12/11 16:16

			DERWENT; IBM_TDB			
S92	3	"20110178974" and (import\$3 import\$3 load\$3 consolidat\$3 integrat\$3 creat\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/11 16:16
S93	3	"20110178974" and (load\$3 consolidat\$3 integrat\$3 creat\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/11 16:16
S94	2	"20110178974" and (load\$3 consolidat\$3 integrat\$3 distribut\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/11 16:17
S95	3	"20110178974" and (load\$3 consolidat\$3 integrat\$3 creat\$3) and stor\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/11 16:41
S96	3	"20110178974" and (load\$3 consolidat\$3 integrat\$3 creat\$3) and stor\$3 near20 relation\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/11 16:46

12/11/2020 5:58:21 PM

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Enterprise web mining system and method

P. Tamayo, J. Myczkowski, M. Campos - US Patent 6,836,773, 2004 - Google Patents

... 0 abstract claims description title 71; 238000007418 data **mining** Methods 0 ... 238000007761 pre-**processing** Methods 0 claims description 34; 238000015654 memory Effects 0 ... 6; 238000004140 cleaning Methods 0 description 5; 238000005516 engineering **processes** Methods ...

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System for protecting the transmission of live data streams, and upon reception, for reconstructing the live data streams and recording them into files

HL Wolfgang, W Fang - US Patent 7,024,609, 2006 - Google Patents

... During the **processing** of the ... US20040231001A1 (en) *, 2003-01-14, 2004-11-18, Canon Kabushiki Kaisha, **Process** and format for reliable storage of ... US20080304483A1 (en) *, 2004-08-06, 2006-12-11, Ipeak Networks Incorporated, **System** and method for achieving accelerated ...

Cited by 1173 Related articles All 4 versions

[PDF] googleapis.com

Systems and methods for acquiring time-dependent data for business process analysis

W Jost, H Hess, T Blickle, M Driesch - US Patent App. 10/975,069, 2005 - Google Patents

... 238000005516 engineering **processes** Methods 0 description 2; 239000000284 extracts ... Substances 0 description 1; 238000004519 manufacturing **process** Methods 0 ... G06—COMPUTING; CALCULATING; COUNTING; G06Q—DATA **PROCESSING** SYSTEMS OR METHODS ...

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System and method for rapid completion of data processing tasks distributed on a network

J. Carrasco, S Dolgov, FB Ehrentfried - US Patent 6,775,631, 2004 - Google Patents

... whose processor is tied up with a non germane task, such as a word **processing** task ... If the control file indicates that a **process** must finish before one or more other **processes** must begin, the ... This detail is attended to at the beginning of the **process**, in the initial control file which a ...

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[PDF] googleapis.com

Information infrastructure management tools with extractor, secure storage, content analysis and classification and method therefor

RM Redlich, MA Nemzow - US Patent 9,015,301, 2015 - Google Patents

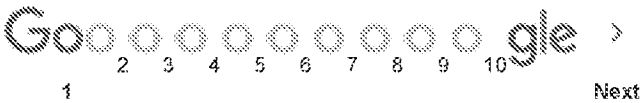
... 238000010168 coupling **process** Methods 0 claims 3; 238000005859 coupling reaction Methods 0 claims ... visual effect Effects 0 description 12; 238000005516 engineering **processes** Methods 0 ... 230000035611 feeding Effects 0 description 11; 238000005065 **mining** Methods 0 ...
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System and method of detecting anomaly malicious code by using process behavior prediction technique [PDF] googleapis.com

OH HyungGeun, P Seung-Hyun, LEE Cheolho... - US Patent ..., 2012 - Google Patents
... 238000001914 filtration Methods 0 claims description 16; 238000005516 engineering **processes** Methods 0 ... This information again passes through behavior prediction information **processing** in operation S130 to ... This record is classified by each generation **process** to create an ...
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System and method for capture of user actions and use of capture data in business processes [PDF] googleapis.com

S Ramamurthy, C Beall, H Shah, R Saxena... - US Patent App. 11 ..., 2006 - Google Patents
System and method for capture of user actions and use of capture data in business **processes**.
Download PDF Info ... A US30607405 A US 30607405A US 2006184410 A1 US2006184410 A1
US 2006184410A1 Authority US United States Prior art keywords **process** gt ll data ...
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	16256380
	Filing Date	2019-01-24
	First Named Inventor	Martin KLENK
	Art Unit	2153
	Examiner Name	/YUK TING CHOI/
	Attorney Docket Number	SCHR 8887

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/Y.C/	1	20170068705	A1	2017-03-09	RINKE et al.	

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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16256380
Filing Date	2019-01-24
First Named Inventor	Martin KLENK
Art Unit	2153
Examiner Name	
Attorney Docket Number	SCHR 8887

/Y.C/	1	European partial search report issued for corresponding EP Application Number 20153403.9 mailed on May 6, 2020 with machine generated translation	×
/Y.C/	2	van der Aalst, "Process Mining: Getting the Data," Springer-Verlag Berlin Heidelberg, Pages 95-123, January 1, 2011	☐

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EXAMINER SIGNATURE

Examiner Signature	/YUK TING CHOI/	Date Considered	12/09/2020
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16256380
Filing Date	2019-01-24
First Named Inventor	Martin KLENK
Art Unit	2153
Examiner Name	
Attorney Docket Number	SCHR 8887

CERTIFICATION STATEMENT

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

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

OR

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

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Daniel J. Gross/	Date (YYYY-MM-DD)	2020-10-06
Name/Print	Daniel J. Gross	Registration Number	66449

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 16/256,380		Filing Date 01/24/2019		☐ To be Mailed			
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO											
APPLICATION AS FILED - PART I											
		(Column 1)		(Column 2)							
FOR		NUMBER FILED		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											
		(Column 1)		(Column 2)		(Column 3)					
AMENDMENT	04/30/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	* 15	Minus	** 20	= 0			x \$100 =		0	
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0			x \$480 =		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	
		(Column 1)		(Column 2)		(Column 3)					
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		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.								SLIE			
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Application Number: 16/256,380
Attorney Docket: SCHR 8887
Response to Non-Final Office Action of February 5, 2021

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Celonis SE	Examiner: Yuk Ting Choi
Serial No.: 16/256,380	Art Unit: 2153
Filing Date: January 24, 2019	Confirmation No.: 7124
For: METHOD OF CREATING PROCESS PROTOCOLS	Attorney Docket No.: SCHR 8887

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

April 30, 2021

RESPONSE TO NON-FINAL OFFICE ACTION

Sir:

In response to the Non-Final Office Action dated February 5, 2021, please amend the subject application as follows:

Amendments to the **Claims** begin on page 2 of this paper.

Remarks begin on page 6 of this paper.

AMENDMENTS TO THE CLAIMS

1. (Currently amended) A computer-implemented method of creating a process protocol in a local computer system (LC), which comprises a processor and a storage device, wherein the process protocol is created from raw data, which is stored in part in a first external computer system (EC1) and in part in a second external computer system (EC2), wherein the raw data in the external computer systems is stored in a number of data tables, wherein the raw data comprises data, which is created during the execution of processes in the first external computer system and in the second external computer system, and wherein the method comprises:
 - (a) importing the data tables from the first external computer system and from the second external computer system into the local computer system, and storing the imported data tables in the storing device of the local computer system,
 - (b) in the local computer system, ~~determining and~~ reconstructing the relationships between the imported data tables,
 - (c) in the local computer system, determining and selecting a first data table from the number of imported data tables, which comprises objects for which the process protocol is to be created,
 - (d) in the local computer system, determining and selecting a number of second data tables from the number of imported data tables, which are necessary for the creation of the process protocol, based on the selected first data table and based on the relationships between the imported data tables,
 - (e) in the local computer system, creating an executable transformation, which based on
 - [[1]] the selected first the data table,
 - [[1]] the selected second data tables, and
 - [[1]] on the relationships between the selected first data table and the selected second data tables

is adapted to extract data from the first data table and from the second data tables, and to store the extracted data as process protocol, and

(f) in the local computer system, executing the transformation and storing the extracted data as process protocol, and providing the created process protocol to a Process Mining System for analysis and reconstruction of the processes carried out in the first external computer system and in the second external computer system.

2. (Original) The method of claim 1, wherein at least one of the selected data tables is imported from the first external computer system (ES1), and at least one of the selected data tables is imported from the second external computer system (ES2).
3. (Original) The method of claim 1, wherein during execution of the transformation in the step (f), the data is extracted from the data tables stored in the external computer systems (ES1, ES2).
4. (Original) The method of claim 1, wherein during reconstructing of the relationships between the imported data tables in the step (b), it is determined via which attributes the data tables are related to each other.
5. (Original) The method of claim 4, wherein two data tables are related to each other, if an attribute of the one data table is identical or similar to an attribute of the other data table.
6. (Original) The method of claim 1, wherein the relationships reconstructed between two imported data tables are stored, wherein the names of the two data tables, the respective attributes, and an assignment of the attributes of the one data table to the attributes of the other data table are stored.
7. (Currently amended) The method of claim 1, wherein
a first data model belonging to the data tables imported from the first external computer system (EC1) is imported from the first external computer system into the local

computer system, wherein the relationships between the data tables imported from the first external computer system (EC1) are reconstructed based on the first data model,

[[1]] a second data model belonging to the data tables imported from the second external computer system (EC2) is imported from the second external computer system into the local computer system, wherein the relationships between the data tables imported from the second external computer system (EC2) are reconstructed based on the second data model,

such that only the relationships between the data tables from the first external computer system and the data tables from the second external computer system have to be reconstructed without the use of a data model.

8. (Currently amended) The method of claim 1, wherein during determining and selecting of a first data table in the step (c), it is determined, which data table meets one or more conditions, wherein the conditions are selected from a group, consisting of
 - [[1]] the data table comprises less data sets compared to the other data tables,
 - [[1]] the data table comprises an attribute, in which the time stamps are stored,
 - [[1]] the data table is referenced by a few other data tables,
 - [[1]] and combinations thereof.
9. (Original) The method of claim 8, wherein information with respect to the selected first data table is stored.
10. (Currently amended) The method of claim 1, wherein during determining and selecting of the number of second data tables in the step (d) those data tables are selected, which meet one or more conditions, wherein the conditions are selected from the group, consisting of
 - [[1]] the data tables comprise many data sets compared to the first data table,
 - [[1]] the data table is referenced directly or indirectly by the first data table,
 - [[1]] the data tables respectively comprise an attribute, in which the time stamps are stored,
 - [[1]] and combinations thereof.

11. (Original) The method of claim 10, wherein information with respect to the selected second data tables and with respect to the relationships between the selected second data tables and the first data table are stored.
12. (Original) The method of claim 1, wherein during creating of the executable transformation in the step (e) it is determined, which attributes of the selected first data table and of the selected second data tables are considered during extracting of the data.
13. (Original) The method of claim 12, wherein during executing of the transformation in the step (f) data sets are read out from the first data table and from the second data tables, wherein the data sets, which have been read out, comprise the attribute values of the attributes determined for the respective data table, wherein the data sets, which have been read out, are stored as process protocol, wherein each data set stored in the process protocol represents a process step (Event) of a process executed in the first external computer system and in the second external computer system.
14. (Currently amended) The method of claim 13, wherein the data sets, which have been read out, are stored according to a predetermined data structure in the process protocol, wherein the predetermined data structure comprises at least:
 - (i) a first attribute, in which a first unique identifier of the process of the respective process step is stored;
 - (ii) a second attribute, in which an identifier of the respective process step is stored; and
 - (iii) a third attribute, in which a sequence of the process steps within a process is stored.
15. (Currently amended) The method of claim 14, wherein the attribute values of the attributes of the process protocol are determined from
 - (i) the attribute values of the data sets, which have been read out, and/or
 - (ii) the table names and/or column names of the selected first data table and/or the selected second data tables.

REMARKS

A Non-Final Office Action was mailed on February 5, 2021. Claims 1-15 are pending. In this response, claims 1, 7, 8, 10, 14, and 15 are amended for clarity. No new matter is added.

OBJECTIONS TO THE CLAIMS

Claims 1, 7, 8, and 10 are objected to for containing hyphens (“—”) delineating clauses of the claims. Applicant respectfully disagrees that such hyphens were ambiguous, as they were intended to clarify the nature of lists within the claims. However, in the interest of advancing prosecution, all such hyphens have now been cancelled from the claims. Similar lists were included in claims 14 and 15, and the hyphens have been removed from those claims as well.

In view of the amendments submitted herewith, it is respectfully submitted that all objections have been addressed. It is therefore respectfully requested that the objections to claims 1, 7, 8, and 10 be withdrawn.

REJECTIONS UNDER 35 U.S.C. §103

Claims 1-5, 8-10, and 12-15 are rejected under 35 U.S.C. §103 as being unpatentable over *Rinke et al.* (US 2017/0068705) in view of *Rinke et al.* (US 2017/0213167); claims 6, 7, and 11 are rejected under 35 U.S.C. §103 as being unpatentable over *Rink ‘705* in view of *Rinke ‘167* and further in view of *Sayal et al.* (US 2011/0178974).

Applicant respectfully submits that the prior art, whether taken alone or in combination, does not teach or suggest the claimed invention. For instance, claim 1 as amended provides a computer-implemented method of creating a process protocol in a local computer system from raw data stored in at least two external computer systems (EC1 and EC2). The raw data is stored in data tables in each of the external computer systems, and *the method comprises:*

- (a) *importing the data tables from the first external computer system and from the second external computer system into the local computer system, and storing the imported data tables in the storing device of the local computer system,*

- (b) in the local computer system, determining and reconstructing the relationships between the imported data tables,
- (c) in the local computer system, determining and selecting a first data table from the number of imported data tables, which comprises objects for which the process protocol is to be created,
- (d) in the local computer system, determining and selecting a number of second data tables from the number of imported data tables, which are necessary for the creation of the process protocol, based on the selected first data table and based on the relationships between the imported data tables,
- (e) in the local computer system, creating an executable transformation, which based on
the selected first the data table,
the selected second data tables, and
on the relationships between the selected first data table and the selected second data tables
is adapted to extract data from the first data table and from the second data tables, and to store the extracted data as process protocol, and
- (f) in the local computer system, executing the transformation and storing the extracted data as process protocol, and providing the created process protocol to a Process Mining System for analysis and reconstruction of the processes carried out in the first external computer system and in the second external computer system. (Emphasis added)

Traditional process mining systems typically analyze processes that take place on computer systems based on data in processed form. Such data is referred to as a process protocol. In process mining systems that execute on computers on which the underlying raw data has been created and stored, the processing of data into process protocols is known. Existing methods may also retrieve data from a single external computer system for analysis.

However, in practice, processes that require analysis occur on multiple external computer systems. The data required to create an accurate process protocol may then comprise separate data created on multiple external computer systems. For example, data related to ordering information for an order process and associated history may be stored on a first external computer system while data related to sales and vendor calls for such an order may be stored on a second computer system.

In such a scenario, methods exist in the prior art for analyzing the partial processes executed on the first computer system as well as the partial processes executed on the second computer system. However, such methods cannot generate an analysis of the overall process. The claimed method therefore allows for preparation of data for efficient and flexible analysis of processes which have been partially executed in different computer systems or by different processing units.

Accordingly, in the claimed method, the local computer system first imports data tables from both a first and second external computer system and stores the imported data tables locally. The method then determines relationships between the imported data tables and reconstructs such relationships accordingly.

The method then proceeds to select a first data table from the imported data tables which comprises “objects” for which a process protocol is to be created and then selects additional tables necessary for such a process protocol. The system then creates a transformation that can extract data from both tables and store the extracted data as a process protocol.

This allows “objects” to be identified for analysis in a first data table, at step (c), and then based on determined relationships, fill in gaps in data available in the first data table from secondary data tables. Without first *determining and reconstructing the relationships between the imported data tables*, such an approach would not be possible. Prior to this step, relationships between imported data tables may not be known, as they are sourced from different computer systems. The claim has been amended to clarify the unknown nature of such relationships, and that such relationships must be *determin[ed]* prior to *reconstructing*.

No such approach is shown in the prior art, and the prior art generally does not relate to the preparation of data for analysis. The Office points to *Rinke* '705 as teaching most of the steps claimed. However, the starting point for *Rinke* '705 is the prepared process protocols themselves, similar to the output of the claimed method. Accordingly, where process protocols are provided from different sources, the methods of *Rinke* '705 may be able to concatenate such prepared process protocols, but the reference would be unable to process raw data in table form. This is clear from Para. [0066] cited by the Office, which indicates that the event projection “creates a new process protocol from a process protocol by concatenating adjacent entries.” (Emphasis added) In fact, *Rinke* '705 generally assumes that process protocols are available and have already been created from raw data, or that such process protocols can be created generically.

In contrast, the claimed method provides technical steps required to create a process protocol from raw data tables imported from different external computer systems. In other words, the process protocols created according to the claimed method may be a starting point for the method as claimed by *Rinke* '705. As noted below, this is apparent in step (f) claimed, which relates to the provision of the newly created process protocol to a Process Mining System for analysis and reconstruction. In contrast, *Rinke* '705 relates to a Process Mining System which may receive already created process protocols for processing.

Accordingly, while the claim provides for a method that includes *determining and reconstructing the relationships between the imported data tables*, *Rinke* '705 is silent on such a determination. This is because *Rinke* '705 is instead concerned with a completely different aspect of a process analysis system, namely the reconstruction of processes from process protocols. See, e.g., *Rinke* '705 at Para. [0025] (describing the query engine leveraged to query defined process protocols). The Office points to Paras. [0025] and [0028]-[0038] as showing the reconstruction of a process. However, the operators described in those paragraphs relate explicitly to reconstruction from already existing process protocols.

Similarly, *Rinke* '705 does not relate to the technical determinations and selections of elements (c) and (d) of the claims, because the reference is not concerned with creating the

process protocols. Instead, the reference simply mentions the potential for prepared process protocols to be merged, but does not teach such an approach. Instead, *Rinke* focuses on direct access to process protocols. See, e.g., *Rinke* '705 at Para. [0027]. In fact, as noted by the Office, the cited paragraphs relate to the use of APE requests to retrieve data, which is explicitly defined as a protocol for querying existing process protocols.

Method step (e) provides for the creation of an executable transformation based on the multiple data tables and the already determined and reconstructed relationships between the data tables. The Office again points to the use of an APE engine by *Rinke* '705 as showing such a transformation. However, the paragraphs identified by the Office appear to relate solely to the transformation of the APE queries themselves into executable form. To the extent that the reference refers to raw data, it simply asserts that the data can be transformed into a process protocol, but does not disclose the mechanics of such a transformation. Indeed, the creations of process protocols discussed in *Rinke* '705 provide for the creation of process protocols from existing process protocols by, for example, concatenating adjacent entries. See, e.g., *Rinke* '705 at Para. [0066].

Such contrasts are clear when reviewing method step (f) of the claim. The claimed method provides for the provision of *the created process protocol to a Process Mining System for analysis and reconstruction of the processes carried out . . .* In contrast, *Rinke* '705 relates the actual reconstruction of the processes from the created process protocol in a process mining system. Accordingly, the process protocols created in accordance with the method of claim 1 may subsequently be analyzed efficiently using the methods of *Rinke* '705. However, *Rinke* '705 cannot operate on the raw data tables retrieved from the external computer systems as claimed.

The Office acknowledges, at Page 5 of the Office Action, that *Rinke* '705 does not disclose the reconstruction of relationships between imported data tables of method step (b), nor does it provide created process protocols to a Process Mining System. In fact, *Rinke* '705 explicitly cannot perform those steps, as the reference does not contemplate operations on raw

data, and because the reference relates to the Process Mining system that receives the created process protocols.

Instead, the Office points to *Rinke '167* as disclosing those steps. However, the secondary reference does not teach or suggest the method steps discussed above. *Rinke '167* provides an alternative method for preparing data for analysis of processes contained therein according to which an event log is created. Data structures of such an event log may show parallels to the data structure of a process protocol created by the method of claim 1. However, the event log of *Rinke '167* is not created by a method similar to that claimed. Instead, the reference relies on “process sensors” to preemptively define relationships needed. Such a process sensor senses different data fields in multiple data tables in a source system. See *Rinke '167* at Para. [0100].

In *Rinke '167*, the relationships between different data tables are defined within the process sensor itself, and are therefore not determined or reconstructed in the local computer system after acquiring the imported data tables from the external computer system. As such, *Rinke '167* does not provide the flexibility of the claimed method, as the relationships between the different data tables has to be encoded preemptively within the process sensors. In contrast, the claimed method can determine and reconstruct such relationships after importing the data tables.

Accordingly, *Rinke '167* relies on a very different methodology than that claimed, and the event logs there are created directly from process sensors and no raw data tables are imported from external computer systems. As such, the reference does not provide any teaching related to the selection of a first data table from imported data tables comprising objects for which the process protocol is to be created, as provided in method step (c), nor does it provide any teaching related to selection of second data tables as provided in method step (d).

Accordingly, none of the references cited relate to the importing of raw data stored in data tables from multiple external systems and determining and reconstructing relationships between such imported data tables. Similarly, none of the references cited provide the additional technical details of the claimed method as outlined in method steps (c), (d), and (e). In fact,

neither *Rinke* reference would have any reason to do so, as *Rinke* '705 relates to evaluating process protocols that have already been created, and *Rinke* '167 relies on a different methodology for organizing raw data based on process sensors. The secondary reference to *Sayal* does nothing to address the deficiencies identified in the two *Rinke* references.

For at least these reasons, claim 1 is not taught or suggested by the prior art, whether taken alone or in combination, and is therefore allowable. All of claims 2-15 ultimately depend from and take all limitations from claim 1, and are therefore similarly allowable.

Accordingly, it is respectfully requested that the Office withdraw the rejections under 35 U.S.C. §103.

An earnest effort has been made to be fully responsive to the Office's objections. In view of the above amendments and remarks, it is believed that claims 1-15, consisting of independent claim 1 and the claims dependent therefrom, are in condition for allowance. Passage of this case to allowance is earnestly solicited. However, if for any reason the Office should consider this application not to be in condition for allowance, the Office is respectfully requested to telephone the undersigned attorney at the number listed below prior to issuing a further Action.

Any fee due with this paper, not already paid through an EFS-Web filing, may be charged to Deposit Account No. 50-3894. Any overpayment may be credited to Deposit Account No. 50-3894.

Respectfully submitted,

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Electronic Acknowledgement Receipt

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International Application Number:	
Confirmation Number:	7124
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First Named Inventor/Applicant Name:	Martin KLENK
Customer Number:	61650
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		schr_8887_20210205_nfoa_res p.pdf	165770 86ebd266c24fb67b095cb739ab322edaf58 15358	yes	12

Multipart Description/PDF files in .zip description			
Document Description	Start	End	
Amendment/Req. Reconsideration-After Non-Final Reject	1	1	
Claims	2	5	
Applicant Arguments/Remarks Made in an Amendment	6	12	

Warnings:

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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.

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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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):

patent@myerswolyn.com

DETAILED ACTION

Response to Amendment

1. This office action is in response to applicant's communication filed on 04/30/2021 in response to PTO Office Action mailed on 02/05/2021. The Applicant's remarks and amendments to the claims and/or the specification were considered with the results as follows.
2. In response to the last Office Action, claims 1, 7, 10 and 13-15 have been amended. No claims are added or canceled. As a result, claims 1-15 are pending in this office action.

Response to Arguments

3. Applicant's arguments with respect to claims 1-15 have been fully considered but are not persuasive and details are as follow:

Applicant's argument with respect to claim 1 states as “ **The prior art, whether taken alone in combination does not teach or suggest the claimed invention...the prior art generally does not relate to the preparation of data for analysis...the reference would be unable to process raw data in table form...the cited para. [0066] is creating a new process protocol from a process protocol by concatenating adjacent entries**”.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The cited reference Rinke'705 discloses a system creating a new process protocol (See para. [0018] para. [0065], para. [0066]) by obtaining data from one or more source systems (See para. [0103] and Figure 1), the obtained data from one or more sources are stored according to a table structure as shown in Figures 2A and 2B in the main memory of the server. The Rinke's system loads the required data for the new process protocol in a database (See para. [0018] and para. [0117] and Figure

1) and determines the required data and reconstructs the processes to provide a process protocol as a result (See para. [0025], para [0028]-para. [0038]). Therefore, the cited reference Rinke's 705 discloses *importing the data tables from the first and second external computer system into the local compute system and storing the imported data tables in the storing device of the local computer system; and determining and reconstructing the processes from the obtained data in the local computer system.* In the previous office action which mailed on 02/05/2021, the Examiner has explicitly indicated that the Rinke'705 reference *does not* explicitly teach ***reconstructing the relationships between the imported data tables and providing the created process protocol to a Process Mining System for analysis and reconstruction of the processes carried out in external computer systems.*** However, the Examiner has relied on Rinke' 167 to teach this feature. The Rinke' 167 reference is *reconstructing the relationships between the imported data tables (See para. [0018] and para. [0100]-para. [0108], providing a data model describing relationships between the tables), creating an executable transformation, which based on the selected first the data table, the selected second data tables and based on relationship between the selected first data table and the selected second data tables from the first data table and from the second data tables (See para. [0017]-para. [0021], creating, based on the data model comprising executable program modules for creating and displaying at least one graphical analysis of the process data stored within the event log and/or of the auxiliary data stored with the set of tables, the data model including indicating relationships between the tables), and providing the created process protocol to a Process Mining System for analysis and reconstruction of the processes (See para. [0008] and para.[0090], providing business process to process mining systems) carried out in external computer systems (See para. [0193]-para. [0201], the created process in the event log and analytical packages for the user's process mining application can be distribute other computer users).* The Rinke's 167 reference may reconstruct the relationships between the imported tables differently than the

current application, but however, the Rinke's 167 still reads on "***reconstructing the relationships between the imported data tables and providing the created process protocol to a Process Mining System for analysis and reconstruction of the processes carried out in external computer systems***". Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). In addition, skilled artisan would have been motivated to reconstruct the relationships between the imported data tables and providing the created process protocol to a Process Mining System for analysis and reconstruction taught by Rinke'167 in order to simplify the process of monitoring and analyzing processes and checking for irregularities (See Rinke '167). Both of the references (Rinke '167 and Rinke '705) are same inventor which disclosed features that are directed to analogous art and they are directed to the same field of endeavor, such as providing business process analysis. This close relation between both of the references highly suggests an expectation of success. Therefore, the 35 USC 103 rejection for claim 1 is maintained.

Claim Rejections - 35 USC § 103

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, 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.

4. Claims 1-5, 8-10 and 12-15 are rejected under 35 U.S.C. 103 as being unpatentable over Rinke et al. (US 2017/0068705 A1), hereinafter Rinke'705 and in view of Rinke et al. (US 2017/0213167 A1), hereinafter Rinke '167.

Referring to claim 1, Rinke '705 discloses a computer-implemented method of creating a process protocol in a local computer system (LC) (***See para. [0018], para. [0065], para. [0066] a server creates a new process protocol***), which comprises a processor and a storage device (***See para. [0018] and Figure 1 , the server has a memory and a storage, the created/merged process protocol can be stored in the storage means of the server***), wherein the process protocol is created from raw data, which is stored in part in a first external computer system (EC1) and in part in a second external computer system (EC2) (***See para. [0103] and Figure 1, data required for the process protocol are obtained from one or more source systems e.g., CRM 1 to CRM n***), wherein the raw data in the external computer systems is stored in a number of data tables, wherein the raw data comprises data, which is created during the execution of processes in the first external computer system and in the second external computer system (***See para. [0071] para. [0103], para. [0107], para. [0109], para. [0117] and Figures 1 and 2A, the data obtained from the one or more sources systems are loaded during execution of ETL processes, the data are stored according a data structure according to process protocol, the data structure [table(s)] of the process protocol is shown in Figure 2A***) and wherein the method comprises:

(a) importing the data tables from the first external computer system and from the second external computer system into the local computer system (***See para. [0103], para. [0104], para. [0107] and para. [0117], loading the required data for the process protocol from the one or more source systems [e.g. CRM 1 to CRM n], the required data is stored according to the data structure [e.g. Figure 2A] required for the process protocol to main memory of the server and then is sorted physically in the main memory***); and storing the imported data tables in the storing device of the local computer system (***See para. [0018], para. [0117] and Figure 1, storing the source data comprises process data in a database***),

(b) in the local computer system, determining and reconstructing [...] (***See para. [0025], para [0028]-para. [0038], the server is adapted to determining processes and reconstruct processes to analyze the data from the one or more source systems***);

(c) in the local computer system, determining and selecting a first data table from the number of imported data tables, which comprises objects for which the process protocol is to be created (***See para. [0027]-para.[0046], para. [0060]-para.[0068] and para. [0071], the server is adapted to receive an APE request includes selection operators, which filters process instances to a certain process pattern and make results of the processing available, for example, a purchasing process having vendor table information***),

(d) in the local computer system, determining and selecting a number of second data tables from the number of imported data tables, which are necessary for the creation of the process protocol, based on the selected first data table and based on the relationships between the imported data tables (***See para. [0027]-para.[0046], para. [0060]-para.[0068] and para. [0071], the server is adapted to receive an APE request includes selection operators, which filters process instances to a certain process pattern and make results of the processing available, for example, a purchasing process having order table information***),

(e) in the local computer system, creating an executable transformation, which based on the selected first the data table, the selected second data tables [...] is adapted to extract data from the first data table and from the second data tables (***See para. [0102] and para. [0103], in response to the APE request [e.g. the APE request includes selection operators], the server is adaptor to convert and transform the APE request into an executable form, the data required for the process protocol loaded within an ETL process from one or more source systems and stored according to a data structured according to the invention as process protocol***) and to store the extracted data as process protocol (***See para. [0018],***

para. [0117] and Figure 1, storing the source data comprises process data in a database),

(f) in the local computer system, executing the transformation and storing the extracted data as process protocol (***See para. [0121] and para. [0122], the process protocol is stored in the main memory in a column orientated manner and executing the reconstruction of processes and operation in linear time***).

Rinke'705 does not explicitly disclose reconstructing the relationships between the imported data tables and providing the created process protocol to a Process Mining System for analysis and reconstruction of the processes carried out in external computer systems.

However, Rinke '167 discloses determining and reconstructing the relationships between the imported data tables (***See para. [0018] and para. [0100]-para. [0108], providing a data model describing relationships between the tables***), creating an executable transformation, which based on the selected first the data table, the selected second data tables and based on relationship between the selected first data table and the selected second data tables from the first data table and from the second data tables (***See para. [0017]-para. [0021], creating, based on the data model comprising executable program modules for creating and displaying at least one graphical analysis of the process data stored within the event log and/or of the auxiliary data stored with the set of tables, the data model including indicating relationships between the tables***), and providing the created process protocol to a Process Mining System for analysis and reconstruction of the processes (***See para. [0008] and para.[0090], providing business process to process mining systems***) carried out in external computer systems (***See para. [0193]-para. [0201], the created process in the event log and analytical packages for the user's process mining application can be distribute other computer users***).

Therefore, it would have been obvious to a person of ordinary skill in the computer art before the effective filing date of the claimed invention to incorporate the Rinke'167 teachings in the Rinke'705 system. Skilled artisan would have been motivated to reconstruct the relationships between the imported data tables and providing the created process protocol to a Process Mining System for analysis and reconstruction taught by Rinke'167 in order to simplify the process of monitoring and analyzes processes and checking for irregularities (See Rinke '167). In addition, both of the references (Rinke '167 and Rinke '705) teach features that are directed to analogous art and they are directed to the same field of endeavor, such as providing business process analysis. This close relation between both of the references highly suggests an expectation of success.

As to claim 2, Rinke '705 discloses wherein at least one of the selected data tables is imported from the first external computer system (ES1), and at least one of the selected data tables is imported from the second external computer system (ES2) (*See para. [0103], para. [0104], para. [0107] and para. [0117], loading the required data for the process protocol from the one or more source systems [e.g. CRM 1 to CRM n], the required data is stored according to the data structure [e.g. Figure 2A] required for the process protocol to main memory of the server and then is sorted physically in the main memory*).

As to claim 3, Rinke '705 discloses wherein during execution of the transformation in the step (f), the data is extracted from the data tables stored in the external computer systems (ES1, ES2) (*See para. [0103], para. [0104], para. [0107] and para. [0117], the required data for the process protocol is loaded within an ETL "Extraction-Transformation-Loading" from the one or more source systems [e.g. CRM 1 to CRM n]*).

As to claim 4, Rinke'705 in view of Rinke '167 discloses wherein during reconstructing of the relationships between the imported data tables, it is determined via which attributes the data tables are related to each other (***See Rinke '167, para. [0100-0106], determining which attribute [identifier] can consist of any transformation of the fields [attributes] contained in the consecutive join over multiple tables***).

Therefore, it would have been obvious to a person of ordinary skill in the computer art before the effective filing date of the claimed invention to incorporate the Rinke'167 teachings in the Rinke'705 system. Skilled artisan would have been motivated to reconstruct the relationships between the imported data tables taught by Rinke'167 in order to identify relations between different tables since data fields which are stored in a database system are often scattered among different tables (See Rinke'167, para. [0100]). In addition, both of the references (Rinke '167 and Rinke '705) teach features that are directed to analogous art and they are directed to the same field of endeavor, such as providing business process analysis. This close relation between both of the references highly suggests an expectation of success.

As to claim 5, Rinke'167 also discloses wherein two data tables are related to each other, if an attribute of the one data table is identical or similar to an attribute of the other data table (***See para. [0100]-0106], relating or joining tables when the unique attribute [identifier] of a first table is identical to the attribute field [unique identifier] of another table***).

As to claim 8, Rinke' 705 discloses wherein during determining and selecting of a first data table in the step (c), it is determined, which data table meets one or more conditions, wherein the conditions are selected from a group, consisting of the data table comprises less data sets compared to the other data tables, the data table

comprises an attribute, in which the time stamps are stored, the data table is referenced by a few other data tables, and combinations thereof (***See para. [0027]-para.[0046], para. [0060]-para.[0068] and para. [0071], the server is adapted to receive an APE request includes selection operators, which filters process instances to a certain process pattern and make results of the processing available, for example, the purchasing order table meets the APE request, the purchasing order table also referenced vendor information table***)

As to claim 9, Rinke'705 disclose wherein information with respect to the selected first data table is stored (***See para. [0071], the information on respective vendor is stored for each process step***).

As to claim 10, Rinke'705 discloses wherein during determining and selecting of the number of second data tables in the step (d) those data tables are selected, which meet one or more conditions, wherein the conditions are selected from the group, consisting of the data tables comprise many data sets compared to the first data table, the data table is referenced directly or indirectly by the first data table, the data tables respectively comprise an attribute, in which the time stamps are stored, and combinations thereof (***See para. [0027]-para.[0046], para. [0060]-para.[0068] and para. [0071], para. [0122] and para. [0123], the server is adapted to receive an APE request includes selection operators and relational algebra, which filters process instances to a certain process pattern and make results of the processing available, note the data structure [e.g. second table] of the process protocol may comprise one or more reference foreign keys indirectly referenced by the first table***).

As to claim 12, Rinke'705 discloses wherein during creating of the executable transformation in the step (e) it is determined, which attributes of the selected first data table and of the selected second data tables are considered during extracting of the data (*See para. [0027]-para.[0046], para. [0060]-para.[0068] and para. [0071], the server is adapted to receive an APE request includes selection operators, which filters process instances to a certain process pattern and make results of the processing available, for example, the purchasing order table meets the APE request, the purchasing order table also referenced vendor information table.*

As to claim 13, Rinke'705 discloses wherein during executing of the transformation in the step (f) data sets are read out from the first data table and from the second data tables, wherein the data sets, which have been read out, comprise the attribute values of the attributes determined for the respective data table, wherein the data sets, which have been read out, are stored as process protocol, wherein each data set stored in the process protocol represents a process step (Event) of a process executed in the first external computer system and in the second external computer system (*see para. [0103, para. [0109]-para. [0122]. All data required for the process protocol is loaded and stored as process protocol, figure 2A shows the data structure of the process protocol has three attributes: Case ID, Activity and Order, the attribute "Activity" describes a process step of a process instance, the attribute "order" indicates the sequence of the process steps within a process instance, the data for processes steps are obtained from one or more source systems CRM1 to CRM2).*

As to claim 14, Rinke'705 discloses wherein the data sets, which have been read out, are stored according to a predetermined data structure in the process protocol, wherein the predetermined data structure comprises at least: a first attribute, in which a first unique identifier of the process of the respective process step is stored; a second attribute, in which an identifier of the respective process step is stored; and a third attribute, in which a sequence of the process steps within a process is stored (***see para. [0103], para. [0109]-para. [0122]. All data required for the process protocol is loaded and stored as process protocol, figure 2A shows the data structure of the process protocol has three attributes: Case ID, Activity and Order, the attribute "Case ID" is a unique identification of a process instance, the attribute "Activity" describes a process step of a process instance, the attribute "order" indicates the sequence of the process steps within a process instance, the data for processes steps are obtained from one or more source systems CRM1 to CRM2).***

As to claim 15, Rinke' 705 discloses wherein the attribute values of the attributes of the process protocol are determined from the attribute values of the data sets, which have been read out, and/or the table names and/or column names of the selected first data table and/or the selected second data tables (***See para. [0114], para. [0120] , the example of the process protocol with data columns and attributes values).***

5. Claims 6, 7 and 11 are rejected under 35 U.S.C. 103 as being unpatentable over Rinke '705 (US 2017/0068705 A1) and in view of Rinke '167 (US 2017/0213167 A1) and further in view of Sayal et al. (US 2011/0178974), hereinafter Sayal.

As to claim 6, Rinke' 705 in view of Rinke ' 167 do not explicitly teach the relationships reconstructed between two imported data tables are stored, wherein the names of the two data tables, the respective attributes, and an assignment of the attributes of the one data table to the attributes of the other data table are stored .

However, Sayal discloses wherein the relationships reconstructed between two imported data tables are stored, wherein the names of the two data tables, the respective attributes, and an assignment of the attributes of the one data table to the attributes of the other data table are stored (***See para. [0031] and Figures 2 and 9, comparing the stored tables in a database to reconstruct relationships by comparing names in the two tables, for example, determining the names of attributes 906, 908 of the first table are identical with the names of the second table***).

Therefore, it would have been obvious to a person of ordinary skill in the computer art before the effective filing date of the claimed invention to incorporate the Sayal teachings in the Rinke'705/Rinke'167 system. Skilled artisan would have been motivated to reconstruct the relationships between two imported data tables are stored, wherein the names of the two data tables, the respective attributes, and an assignment of the attributes of the one data table to the attributes of the other data table are stored, as taught by Sayal in the Rinke'705/Rinke'167 system in order to facilitate extracting and reconstructing, the logic, meaning and understanding of the data stored in electronic database since obtaining the various different levels of knowledge and understanding of the data stored in an electronic database can be complex, tedious, time-consuming and often intractable (See Sayal, para. [0004]). In addition, all of the references (Sayal, Rinke '167 and

Rinke '705) teach features that are directed to analogous art and they are directed to the same field of endeavor, such as data analysis. This close relation between both of the references highly suggests an expectation of success.

As to claim 7, Rinke' 705 in view of Rinke'167 discloses wherein a first data model belonging to the data tables imported from the first external computer system (EC1) is imported from the first external computer system into the local computer system (***See Rinke'167, para. [0012]-para. [0019], providing a data model to the local processor, the model describing the predetermined data structure, the set of tables and the relations with the tables, the data model is associated with the process data derived from raw data stored in a source system, the process data is stored in a predetermined data structure [tables]***), wherein the relationships between the data tables imported from the first external computer system (EC1) are reconstructed based on the first data model (***See Rinke '167, See para. [0018] and para. [0100]-para. [0108], providing a data model to reconstruct relationships between the tables***), a second data model belonging to the data tables imported from the second external computer system (EC2) is imported from the second external computer system into the local computer system (***See Rinke '167, para. [0093], para. [0134], raw data stored in more than one source system and each process sensor is configured according to different source systems, also see Rinke'167, para. [0012]-para. [0019], providing a data model to the local processor, the model describing the predetermined data structure, the set of tables and the relations with the tables, the data model is associated with the process data derived from raw data stored in a source system, the process data is stored in a predetermined data structure***

[tables]]), wherein the relationships between the data tables imported from the second external computer system (EC2) are reconstructed based on the second data model **(See Rinke '167, See para. [0018] and para. [0100]-para. [0108], providing a data model to reconstruct relationships between the tables)**.

Rinke' 705 in view of Rinke'167 does not explicitly disclose the relationships between the data tables from the first external computer system and the data tables from the second external computer system have to be reconstructed without the use of a data model.

However, Sayal discloses the relationships between the data tables from the first external computer system and the data tables from the second external computer **(See para. [0021], relational database databases are distributed in more than one storage devices)** have to be reconstructed without the use of a data model **(See para. [0031] and Figures 2 and 9, comparing the stored tables in a database to reconstruct relationships by comparing names in the two tables, for example, determining the names of attributes 906, 908 of the first table are identical with the names of the second table)**.

Therefore, it would have been obvious to a person of ordinary skill in the computer art before the effective filing date of the claimed invention to incorporate the Sayal teachings in the Rinke'705/Rinke'167 system. Skilled artisan would have been motivated to reconstruct the relationships between two imported data tables are stored, as taught by Sayal in the Rinke'705/Rinke'167 system in order to facilitate extracting and reconstructing, the logic, meaning and understanding of the data stored in electronic database since obtaining the various different levels of knowledge and understanding of the data stored in an electronic

database can be complex, tedious, time-consuming and often intractable (See Sayal, para. [0004]). In addition, all of the references (Sayal, Rinke '167 and Rinke '705) teach features that are directed to analogous art and they are directed to the same field of endeavor, such as data analysis. This close relation between both of the references highly suggests an expectation of success.

As to claim 11, Rinke' 705 in view of Rinke'167 does not explicitly disclose wherein information with respect to the relationships between the selected second data tables and the first data table are stored.

Sayal discloses wherein information with respect to the relationships between the selected second data tables and the first data table are stored (***See para. [0035] and para. [0037] storing information describing the relationships between the two tables in memory for subsequent use***).

Therefore, it would have been obvious to a person of ordinary skill in the computer art before the effective filing date of the claimed invention to incorporate the Sayal teachings in the Rinke'705/Rinke'167 system. Skilled artisan would have been motivated to reconstruct the relationships between two imported data tables are stored, as taught by Sayal in the Rinke'705/Rinke'167 system in order to facilitate extracting and reconstructing, the logic, meaning and understanding of the data stored in electronic database since obtaining the various different levels of knowledge and understanding of the data stored in an electronic database can be complex, tedious, time-consuming and often intractable (See Sayal, para. [0004]). In addition, all of the references (Sayal, Rinke '167 and Rinke '705) teach features that are directed to analogous art and they are directed to the same field of endeavor, such as data analysis. This close relation between both of the references highly suggests an expectation of

success.

Conclusion

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

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

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YUK TING CHOI whose telephone number is (571)270-1637. The examiner can normally be reached on Monday-Friday 9am-6pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alford W Kindred can be reached on 5712724037. 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 <https://ppair-my.uspto.gov/pair/PrivatePair>. 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.

YUK TING CHOI
Examiner
Art Unit 2153

/YUK TING CHOI/
Primary Examiner, Art Unit 2153

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL (Submitted Only via EFS-Web)

Application Number	16/256,380	Filing Date	2019-01-24	Docket Number (if applicable)	SCHR 8887	Art Unit	2153
First Named Inventor	Martin Klenk			Examiner Name	Yuk Ting Choi		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.

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

SUBMISSION REQUIRED UNDER 37 CFR 1.114

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

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

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

☐ Other _____

☒ Enclosed

☒ Amendment/Reply

☐ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

MISCELLANEOUS

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

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 503894

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

Signature of Registered U.S. Patent Practitioner			
Signature	/Daniel Gross/	Date (YYYY-MM-DD)	2021-09-20
Name	Daniel Gross	Registration Number	66449

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

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

Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	16256380			
Filing Date:	24-Jan-2019			
Title of Invention:	METHOD OF CREATING PROCESS PROTOCOLS			
First Named Inventor/Applicant Name:	Martin KLENK			
Filer:	Daniel Jacob Gross			
Attorney Docket Number:	SCHR 8887			
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(\$)
Extension - 1 month with \$0 paid	1251	1	220	220
Miscellaneous:				
RCE- 1ST REQUEST	1801	1	1360	1360
Total in USD (\$)				1580

Electronic Acknowledgement Receipt

EFS ID:	43807371
Application Number:	16256380
International Application Number:	
Confirmation Number:	7124
Title of Invention:	METHOD OF CREATING PROCESS PROTOCOLS
First Named Inventor/Applicant Name:	Martin KLENK
Customer Number:	61650
Filer:	Daniel Jacob Gross
Filer Authorized By:	
Attorney Docket Number:	SCHR 8887
Receipt Date:	20-SEP-2021
Filing Date:	24-JAN-2019
Time Stamp:	13:03:12
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1580
RAM confirmation Number	E20219JD03314529
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		schr_8887_20210519_foa_resp.pdf	175258	yes	16
			998fd20bcd0f1c521bbea6ca50b26a4002a1620		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Response After Final Action		1	1	
	Claims		2	6	
	Applicant Arguments/Remarks Made in an Amendment		7	16	
Warnings:					
Information:					
2	Request for Continued Examination (RCE)	schr_8887_20210519_foa_resp_rce.pdf	1349964	no	3
			1864e17b9e22345bbe06c755ca54e3b2cdf0fedf		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	40642	no	2
			23e3a6b48f196364735c6858e7b3183fde0be878		
Warnings:					
Information:					
Total Files Size (in bytes):			1565864		

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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

Applicant: Celonis SE

Serial No.: 16/256,380

Filing Date: January 24, 2019

For: **METHOD OF CREATING PROCESS
PROTOCOLS**

Examiner: Yuk Ting Choi

Art Unit: 2153

Confirmation No.: 7124

Attorney Docket No.: SCHR 8887

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

September 20, 2021

RESPONSE TO NON-FINAL OFFICE ACTION

Sir:

Because the four month date for this response, September 19, 2021, fell on a weekend, the deadline is extended to Monday, September 20, 2021. Accordingly, Applicant hereby requests a one month extension of time.

In response to the Final Office Action dated May 19, 2021, please amend the subject application as follows:

Amendments to the **Claims** begin on page 2 of this paper.

Remarks begin on page 7 of this paper.

AMENDMENTS TO THE CLAIMS

1. (Currently amended) A computer-implemented method of creating a process protocol in a local computer system (LC), which comprises a processor and a storage device, wherein the process protocol ~~encodes object related activities and is created from raw data, which is stored in part in a first external computer system (EC1) and in part in a second external computer system (EC2), wherein the raw data in the external computer systems is stored in a number of data tables, wherein the raw data comprises data, which is created during the execution of processes in the first external computer system and in the second external computer system, wherein a process comprises several process steps, wherein each process step creates the data during execution,~~ and wherein the method comprises:
 - (a) importing the data tables from the first external computer system and from the second external computer system into the local computer system, and storing the imported data tables in the storing device of the local computer system,
 - (b) in the local computer system, determining and reconstructing the relationships between the imported data tables,
 - (c) in the local computer system, determining and selecting a first data table from the number of imported data tables, ~~which comprises wherein each data record stored in the first data table represents an object objects-~~for which the process protocol is to be created,
 - (d) in the local computer system, determining and selecting a number of second data tables from the number of imported data tables, which are necessary for the creation of the process protocol, based on the selected first data table and based on the ~~reconstructed relationships between the imported data tables, wherein each data record stored in the number of second data tables represents a process step.~~
 - ~~(e) in the local computer system, determining activities for the objects of the selected first data table based on the selected second data tables and the reconstructed relationships between the selected first data table and the selected second data tables.~~

~~(e)(d)~~ in the local computer system, creating an executable transformation, which based on the selected first ~~the~~ data table, the selected second data tables, and ~~the~~ the relationships between the selected first data table and the selected second data tables

is adapted to extract data from the first data table and from the second data tables based on the determined activities, and to store the extracted data as process protocol, and

~~(f)(g)~~ in the local computer system, executing the transformation, wherein during execution of the transformation the data is extracted from the data tables stored in the external computer systems (ES1, ES2), and storing the extracted data as process protocol, and providing the created process protocol to a Process Mining System for analysis and reconstruction of the processes carried out in the first external computer system and in the second external computer system.

2. (Original) The method of claim 1, wherein at least one of the selected data tables is imported from the first external computer system (ES1), and at least one of the selected data tables is imported from the second external computer system (ES2).
3. (Cancelled)
4. (Original) The method of claim 1, wherein during reconstructing of the relationships between the imported data tables in the step (b), it is determined via which attributes the data tables are related to each other.
5. (Original) The method of claim 4, wherein two data tables are related to each other, if an attribute of the one data table is identical or similar to an attribute of the other data table.
6. (Original) The method of claim 1, wherein the relationships reconstructed between two imported data tables are stored, wherein the names of the two data tables, the respective

attributes, and an assignment of the attributes of the one data table to the attributes of the other data table are stored.

7. (Previously presented) The method of claim 1, wherein
a first data model belonging to the data tables imported from the first external computer system (EC1) is imported from the first external computer system into the local computer system, wherein the relationships between the data tables imported from the first external computer system (EC1) are reconstructed based on the first data model,
a second data model belonging to the data tables imported from the second external computer system (EC2) is imported from the second external computer system into the local computer system, wherein the relationships between the data tables imported from the second external computer system (EC2) are reconstructed based on the second data model,
such that only the relationships between the data tables from the first external computer system and the data tables from the second external computer system have to be reconstructed without the use of a data model.
8. (Previously presented) The method of claim 1, wherein during determining and selecting of a first data table in the step (c), it is determined, which data table meets one or more conditions, wherein the conditions are selected from a group, consisting of
the data table comprises less data sets compared to the other data tables,
the data table comprises an attribute, in which the time stamps are stored,
the data table is referenced by a few other data tables,
and combinations thereof.
9. (Original) The method of claim 8, wherein information with respect to the selected first data table is stored.

10. (Previously presented) The method of claim 1, wherein during determining and selecting of the number of second data tables in the step (d) those data tables are selected, which meet one or more conditions, wherein the conditions are selected from the group, consisting of
 - the data tables comprise many data sets compared to the first data table,
 - the data table is referenced directly or indirectly by the first data table,
 - the data tables respectively comprise an attribute, in which the time stamps are stored,
 - and combinations thereof.
11. (Original) The method of claim 10, wherein information with respect to the selected second data tables and with respect to the relationships between the selected second data tables and the first data table are stored.
12. (Currently amended) The method of claim 1, wherein during creating of the executable transformation in the step ~~(e)-(f)~~ it is determined, which attributes of the selected first data table and of the selected second data tables are considered during extracting of the data.
13. (Currently amended) The method of claim 12, wherein during executing of the transformation in the step ~~(g)-(h)~~ data sets are read out from the first data table and from the second data tables, wherein the data sets, which have been read out, comprise the attribute values of the attributes determined for the respective data table, wherein the data sets, which have been read out, are stored as process protocol, wherein each data set stored in the process protocol represents a process step (Event) of a process executed in the first external computer system and in the second external computer system.
14. (Previously presented) The method of claim 13, wherein the data sets, which have been read out, are stored according to a predetermined data structure in the process protocol, wherein the predetermined data structure comprises at least:
 - a first attribute, in which a first unique identifier of the process of the respective process step is stored;
 - a second attribute, in which an identifier of the respective process step is stored; and

a third attribute, in which a sequence of the process steps within a process is stored.

15. (Previously presented) The method of claim 14, wherein the attribute values of the attributes of the process protocol are determined from
- the attribute values of the data sets, which have been read out, and/or
 - the table names and/or column names of the selected first data table and/or the selected second data tables.

REMARKS

A Final Office Action was mailed on May 19, 2021. Claims 1-15 are pending. In this response, claim 1 is amended for clarity and to incorporate limitations previously in claim 3. Claims 12 and 13 are amended to reflect amendments to claim 1. Claim 3 is cancelled. No new matter is added. However, if any support is believed necessary, such support may be found in the specification in paras. [0002], [0104]-[0105], [0109], [0113], and [0125].

REJECTIONS UNDER 35 U.S.C. §103

Claims 1-5, 8-10, and 12-15 are rejected under 35 U.S.C. §103 as being unpatentable over *Rinke et al.* (US 2017/0068705) in view of *Rinke et al.* (US 2017/0213167); claims 6, 7, and 11 are rejected under 35 U.S.C. §103 as being unpatentable over *Rink '705* in view of *Rinke '167* and further in view of *Sayal et al.* (US 2011/0178974).

Applicant respectfully submits that the prior art, whether taken alone or in combination, does not teach or suggest the claimed invention. For instance, claim 1 as amended provides a computer-implemented method of creating a process protocol in a local computer system from raw data stored in at least two external computer systems (EC1 and EC2). The *process comprises several process steps and each process step creates the data during execution*. The raw data is stored in data tables in each of the external computer systems, and *the method comprises:*

- (a) *importing the data tables from the first external computer system and from the second external computer system into the local computer system, and storing the imported data tables in the storing device of the local computer system,*
- (b) *in the local computer system, determining and reconstructing the relationships between the imported data tables,*
- (c) *in the local computer system, determining and selecting a first data table from the number of imported data tables, wherein each data record stored in*

- the first data table represents an object for which the process protocol is to be created,
- (d) in the local computer system, determining and selecting a number of second data tables from the number of imported data tables, which are necessary for the creation of the process protocol, based on the selected first data table and based on the reconstructed relationships between the imported data tables, wherein each data record stored in the number of second data tables represents a process step,
- (e) in the local computer system, determining activities for the objects of the selected first data table based on the selected second data tables and the reconstructed relationships between the selected first data table and the selected second data tables,
- (f) in the local computer system, creating an executable transformation, which based on
the selected first data table,
the selected second data tables, and
the relationships between the selected first data table and the selected second data tables
is adapted to extract data from the first data table and from the second data tables based on the determined activities, and to store the extracted data as process protocol, and
- (g) in the local computer system, executing the transformation, wherein during execution of the transformation the data is extracted from the data tables stored in the external computer systems (ES1, ES2), and storing the extracted data as process protocol, and providing the created process protocol to a Process Mining System for analysis and reconstruction of the processes carried out in the first external computer system and in the second external computer system. (Emphasis added)

Traditional process mining systems typically analyze processes that take place on computer systems based on data in processed form. Such data is referred to as a process protocol. In process mining systems that execute on computers on which the underlying raw data has been created and stored, the processing of data into process protocols is known. Existing methods may also retrieve data from a single external computer system for analysis.

However, in practice, processes that require analysis often occur on multiple external computer systems. The data required to create an accurate process protocol may then comprise separate data created on multiple external computer systems. For example, data related to ordering information for an order process and associated history may be stored on a first external computer system while data related to sales and vendor calls for such an order may be stored on a second computer system.

In such a scenario, methods exist in the prior art for analyzing the partial processes executed on the first computer system as well as the partial processes executed on the second computer system. However, such methods cannot generate an analysis of the overall process. The claimed method therefore allows for preparation of data for efficient and flexible analysis of processes which have been partially executed in different computer systems or by different processing units.

The method does this by first creating an executable transformation in the local system based on imported data tables and then executing that transformation directly on tables still *stored in the external computer systems*.

To create such an executable transformation, the local computer system first imports data tables from both the first and second external computer system and stores the imported data tables locally. The method then determines relationships between the imported data tables and reconstructs such relationships accordingly.

The method then proceeds to select a first data table from the imported data tables which comprises “objects” for which a process protocol is to be created and then selects additional

tables necessary for such a process protocol. The system then creates a transformation that can extract data from both tables and store the extracted data as a process protocol.

This allows “objects” to be identified for analysis in a first data table, at step (c), and then based on determined relationships, fill in gaps in data available in the first data table from secondary data tables. As noted in Applicant’s previous response, without first *determining and reconstructing the relationships between the imported data tables*, such an approach would not be possible.

Only once the relationships are reconstructed can the method *determin[e] activities for the objects of the selected first data table based on the selected second data tables and the reconstructed relationships* and then *creat[e] an executable transformation*. The *executable transformation* created can then directly *extract data from the first data table and from the second data tables based on the determined activities, and . . . store the extracted data as process protocol*.

Once such an executable transformation is created, *during execution of the transformation the data is extracted from the data tables stored in the external computer systems (ES1, ES2)*.

Accordingly, claim 1 as amended clarifies that in the claimed method:

- Raw data tables are imported from a plurality of external source systems into a local system;
- Relationships between the imported raw data tables are determined and reconstructed;
- Based on the imported raw data tables and their reconstructed relations, an executable transformation to generate process protocols from the raw data tables is created in the local system; and
- The transformation is then executed in the external source systems such that process protocols are generated from the external raw data tables.

Once the executable transformation is developed based on the imported data tables, it can be executed based on the external data tables in the external systems. This approach, now clearly represented in the claim, is fundamentally different than that taken in *Rinke ‘167*, and the role of

the determining and reconstruction of the relationships in the imported data tables is now clarified.

No such approach is shown in the prior art, and the prior art generally does not relate to the preparation of data for analysis. The Office points to *Rinke* '705 as teaching most of the steps claimed. However, as noted previously, the starting point for *Rinke* '705 is the prepared process protocols themselves, similar to the output of the claimed method. Accordingly, where process protocols are provided from different sources, the methods of *Rinke* '705 may be able to concatenate such prepared process protocols, but the reference would be unable to process raw data in table form. This is clear from Para. [0066] cited by the Office, which indicates that the event projection “creates a new process protocol from a process protocol by concatenating adjacent entries.” (Emphasis added) In fact, *Rinke* '705 generally assumes that process protocols are available and have already been created from raw data, or that such process protocols can be created generically.

In contrast, the claimed method provides technical steps required to create a process protocol from raw data tables imported from different external computer systems. In other words, the process protocols created according to the claimed method may be a starting point for the method as claimed by *Rinke* '705. As noted previously, this is apparent in step (g) claimed, which relates to the provision of the newly created process protocol to a Process Mining System for analysis and reconstruction. In contrast, *Rinke* '705 relates to a Process Mining System which may receive already created process protocols for processing.

Accordingly, while the claim provides for a method that includes *determining and reconstructing the relationships between the imported data tables*, *Rinke* '705 is silent on such a determination. This is because *Rinke* '705 is instead concerned with a completely different aspect of a process analysis system, namely the reconstruction of processes from process protocols. See, e.g., *Rinke* '705 at Para. [0025] (describing the query engine leveraged to query defined process protocols). The Office points to Paras. [0025] and [0028]-[0038] as showing the reconstruction of a process. However, the operators described in those paragraphs relate explicitly to reconstruction from already existing process protocols.

Similarly, *Rinke* '705 does not relate to the technical determinations and selections of elements (c) and (d) of the claims, because the reference is not concerned with creating the process protocols. Instead, the reference simply mentions the potential for prepared process protocols to be merged, but does not teach such an approach. Instead, *Rinke* focuses on direct access to process protocols. See, e.g., *Rinke* '705 at Para. [0027]. In fact, as noted by the Office, the cited paragraphs relate to the use of APE requests to retrieve data, which is explicitly defined as a protocol for querying existing process protocols.

Method step (f) (previously (e)) provides for the creation of an executable transformation based on the multiple data tables and the already determined and reconstructed relationships between the data tables. The Office again points to the use of an APE engine by *Rinke* '705 as showing such a transformation. However, the paragraphs identified by the Office appear to relate solely to the transformation of the APE queries themselves into executable form. To the extent that the reference refers to raw data, it simply asserts that the data can be transformed into a process protocol, but does not disclose the mechanics of such a transformation. Indeed, the creations of process protocols discussed in *Rinke* '705 provide for the creation of process protocols from existing process protocols by, for example, concatenating adjacent entries. See, e.g., *Rinke* '705 at Para. [0066].

Such contrasts are clear when reviewing method step (g) of the claim. The claimed method provides for the provision of *the created process protocol to a Process Mining System for analysis and reconstruction of the processes carried out . . .* In contrast, *Rinke* '705 relates the actual reconstruction of the processes from the created process protocol in a process mining system. Accordingly, the process protocols created in accordance with the method of claim 1 may subsequently be analyzed efficiently using the methods of *Rinke* '705. However, *Rinke* '705 cannot operate on the raw data tables retrieved from the external computer systems as claimed.

The Office acknowledges, at Page 5 of the Office Action, that *Rinke* '705 does not disclose the reconstruction of relationships between imported data tables of method step (b), nor does it provide created process protocols to a Process Mining System. In fact, *Rinke* '705

explicitly cannot perform those steps, as the reference does not contemplate operations on raw data, and because the reference relates to the process mining system that receives the created process protocols.

Instead, the Office points to *Rinke '167* as disclosing those steps. However, the secondary reference does not teach or suggest the method steps discussed above. *Rinke '167* provides an alternative method for preparing data for analysis of processes contained therein according to which an event log is created. Data structures of such an event log may show parallels to the data structure of a process protocol created by the method of claim 1. However, the event log of *Rinke '167* is not created by a method similar to that claimed. Instead, the reference relies on “process sensors” to preemptively define relationships needed. Such a process sensor senses different data fields in multiple data tables in a source system. See *Rinke '167* at Para. [0100].

Accordingly, and in contrast with the claimed method, in *Rinke '167*, the relationships between different data tables are defined within the process sensor itself, and are therefore not determined or reconstructed in the local computer system after acquiring the imported data tables from the external computer system. As such, *Rinke '167* does not provide the flexibility of the claimed method, as the relationships between the different data tables has to be encoded preemptively within the process sensors.

Accordingly, *Rinke '167* relies on a different methodology than that claimed, where event logs there are created directly from process sensors and no raw data tables are imported from external computer systems.

Applicant thanks the Office for providing a Response to Arguments section beginning on Page 2 of the Office Action. The Office has clarified that the Office has relied on *Rinke '167* for the features discussed herein, and acknowledges that the reference reconstructs relationships between imported tables in a very different way than that claimed. However, the Office indicates that the claim elements were read broadly such that *Rinke '167* need only show the reconstruction of relationships in imported data tables and the provision of a created process protocol to a process mining system.

With this in mind, claim 1 has been amended to clarify the steps of the claimed method, as discussed above.

As previously noted, once the executable transformation is developed in the claimed method based on the imported data tables, it can be executed based on the external data tables in the external systems. This approach is fundamentally different than that taken in *Rinke* '167.

Accordingly, as noted previously, *Rinke* '167 does not teach the *determining and reconstruction of the relationships between the imported data tables* in step (b), nor would it have any reason to do so. In *Rinke* '167, all such relationships are already known and would not need to be reconstructed. The Office argues that the provision of an existing data model of *Rinke* '167 would be captured in the claim language, but the distinction between these approaches is now believed to be clearer in the amended claim language.

Similarly, while *Rinke* '705 does not relate to the raw data on which the claimed method acts, as acknowledged by the Office, *Rinke* '167 does not provide any details of the potential handling of raw data tables. To highlight this lack of details in the cited reference, the claim language has been amended to incorporate details that would not appear in any implementation of *Rinke* '167. As such, the claimed method provides that in the first and second data table, *each data record stored in the first data table represents an object for which the process protocol is to be created and each data record stored in the number of second data tables represents a process step*.

The claim then provides that the method *determin[es] activities for the objects of the selected first data table based on the selected second data tables and the reconstructed relationships between the selected first data table and the selected second data tables*. This step would not be performed by either of the cited references, since *Rinke* '705 merges multiple process protocols where the object related activities are already determined and are concatenated, and *Rinke* '167 does not determine any activities based on the data tables and the reconstructed relationships, since the data model is already predetermined and provided with the definition of a process sensor.

Accordingly, as noted above *Rinke* '167 assumes known relationships between raw data tables in an external IT system. In contrast, the claimed method builds on a relationship discovery method implemented during the generation of process protocols from raw tables.

With this in mind, the cited references, whether taken alone or in combination, would not teach or suggest any method in which *during execution of the transformation the data is extracted from the data tables stored in the external computer systems (ES1, ES2)*. This limitation, previously in claim 3, provides the advantage that the transformation, based on the relationship between selected raw data tables, need only be created once (in the local system). Once created, when new data is generated in the same external raw data tables in the external source system, the same transformation can be executed repeatedly to update the generated process protocols. For these updates, no new data import and no further creation of a transformation is required.

With respect to this limitation, previously provided in claim 3, the Office cites *Rinke* '705 as showing such an extraction at paras. [0103], [0104], and [0107]. However, the Office points to these same paragraphs in *Rinke* '705, along with para. [0117], as disclosing the elements of claimed step (a), namely the initial import of the data tables initially. Para. [0117] of *Rinke* '705 relates to loading the data and physically sorting such data. Accordingly, while the initial importing of the data table from the external computer systems may be a viable interpretation of these paragraphs of *Rinke* '705, this interpretation would necessarily prevent those paragraphs from teaching or suggesting the limitations of step (g), which provides the extraction of the data from the data tables by way of the execution of the created transformation directly from those external computer systems.

Rinke '167 was not relied on for teaching this limitation, but it is noted that because the cited reference relates to the transformation of raw data from the IT source system using predetermined process sensors, new data would be transformed using the same process sensors. There is no teaching of the creation of an executable transformation followed by the application of that transformation to data tables stored in the external computer systems.

For at least these reasons, the cited references to *Rinke* '705 and *Rinke* '167 do not teach or suggest the method of claim 1, whether taken alone or in combination. The secondary reference to *Sayal* does nothing to address the deficiencies identified in the two *Rinke* references.

For at least these reasons, claim 1 is not taught or suggested by the prior art, whether taken alone or in combination, and is therefore allowable. All of claims 2 and 4-15 ultimately depend from and take all limitations from claim 1, and are therefore similarly allowable.

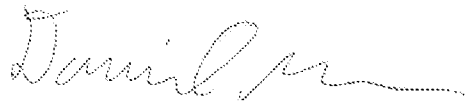
Accordingly, it is respectfully requested that the Office withdraw the rejections under 35 U.S.C. §103.

An earnest effort has been made to be fully responsive to the Office's objections. In view of the above amendments and remarks, it is believed that claims 1, 2, and 4-15, consisting of independent claim 1 and the claims dependent therefrom, are in condition for allowance. Passage of this case to allowance is earnestly solicited. However, if for any reason the Office should consider this application not to be in condition for allowance, the Office is respectfully requested to telephone the undersigned attorney at the number listed below prior to issuing a further Action.

Any fee due with this paper, not already paid through an EFS-Web filing, may be charged to Deposit Account No. 50-3894. Any overpayment may be credited to Deposit Account No. 50-3894.

Respectfully submitted,

MYERS WOLIN, LLC



Daniel Gross
Reg. No. 66,449

CUSTOMER NUMBER 61650

PHONE: (973) 828-1284

FAX: (866) 864-3947

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 16/256,380		Filing Date 01/24/2019		☐ To be Mailed			
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO											
APPLICATION AS FILED - PART I											
		(Column 1)		(Column 2)							
FOR		NUMBER FILED		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											
		(Column 1)		(Column 2)		(Column 3)					
AMENDMENT	09/20/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	* 14	Minus	** 20	= 0		x \$100 =		0		
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0		x \$480 =		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	
		(Column 1)		(Column 2)		(Column 3)					
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		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".								/BRENDA V HARRISON/			
*** 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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NOTICE OF ALLOWANCE AND FEE(S) DUE

61650 7590 10/20/2021
MYERS WOLIN, LLC
100 SOUTH JEFFERSON ROAD
SUITE 202
WHIPPANY, NJ 07981-1009

EXAMINER	
CHOI, YUK TING	
ART UNIT	PAPER NUMBER

2153

DATE MAILED: 10/20/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/256,380	01/24/2019	Martin KLENK	SCHR 8887	7124

TITLE OF INVENTION: METHOD OF CREATING PROCESS PROTOCOLS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	01/20/2022

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.

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)

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.

61650 7590 10/20/2021
MYERS WOLIN, LLC
100 SOUTH JEFFERSON ROAD
SUITE 202
WHIPPANY, NJ 07981-1009

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.
16/256,380	01/24/2019	Martin KLENK	SCHR 8887	7124

TITLE OF INVENTION: METHOD OF CREATING PROCESS PROTOCOLS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	01/20/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
CHOI, YUK TING	2153	707-776000

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,

1 _____

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

2 _____

3 _____

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document 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)

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☐ 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.

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 _____

Date _____

Typed or printed name _____

Registration No. _____



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/256,380	01/24/2019	Martin KLENK	SCHR 8887	7124
61650	7590	10/20/2021	EXAMINER	
MYERS WOLIN, LLC			CHOI, YUK TING	
100 SOUTH JEFFERSON ROAD				
SUITE 202				
WHIPPANY, NJ 07981-1009				
			ART UNIT	PAPER NUMBER
			2153	

DATE MAILED: 10/20/2021

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.

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. 16/256,380	Applicant(s) KLENK et al.	
	Examiner YUK TING CHOI	Art Unit 2153	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 09/20/2021.
☐ 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 1-2 and 4-15. 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 _____. 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____.	5. ☐ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
---	--

/YUK TING CHOI/
Primary Examiner, Art Unit 2153

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 09/20/2021 has been entered.

REASONS FOR ALLOWANCE

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

2. The closest Prior art fail to anticipate or render obvious the recited features in the instant claim 1. The recited features in independent claim 1 is novel and non-obvious over closest prior art. The dependent claims 2 and 4-15 are being definite, enabled by the specification, and further limiting to the independent claims, are also 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 Reason for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YUK TING CHOI whose telephone number is (571)270-1637. The examiner can normally be reached on Monday-Friday 9am-6pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alford W Kindred can be reached on 5712724037. 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 <https://ppair-my.uspto.gov/pair/PrivatePair>. 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.

/YUK TING CHOI/

Primary Examiner, Art Unit 2153

<i>Search Notes</i> 	Application/Control No. 16/256,380	Applicant(s)/Patent Under Reexamination KLENK et al.
	Examiner YUK TING CHOI	Art Unit 2153

CPC - Searched*		
Symbol	Date	Examiner
G06F16/2465 OR G06F16/212 G06F16/288 OR G06F16/2474 OR G06F16/254 OR G06N5/00 G06F215/03	10/06/2021	
G06F16/254 OR G06F16/258 OR G06F2216/03 OR G06N5/00	10/06/2021	

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.

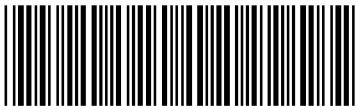
Search Notes		
Search Notes	Date	Examiner
G06F16/2465 OR G06F16/212 G06F16/288 OR G06F16/2474 OR G06F16/254 OR G06N5/00 G06F215/03	10/06/2021	
NPL Google Search	10/06/2021	
East Text search	10/06/2021	
Assignee and Inventor Search		
G06F16/254 OR G06F16/258 OR G06F2216/03 OR G06N5/00	10/06/2021	

/YUK TING CHOI/ Primary Examiner, Art Unit 2153	
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<i>Search Notes</i> 	Application/Control No. 16/256,380	Applicant(s)/Patent Under Reexamination KLENK et al.
	Examiner YUK TING CHOI	Art Unit 2153

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	G06F16/2465 OR G06F16/212 G06F16/288 OR G06F16/2474 OR G06F16/254 OR G06N5/00 G06F215/03 and East Text Search	10/06/2021	

/YUK TING CHOI/ Primary Examiner, Art Unit 2153	
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Issue Classification 	Application/Control No. 16/256,380	Applicant(s)/Patent Under Reexamination KLENK et al.
	Examiner YUK TING CHOI	Art Unit 2153

CPC						
Symbol					Type	Version
G06F	/	16	/	2465	F	2019-01-01
G06F	/	16	/	212	I	2019-01-01
G06F	/	16	/	288	I	2019-01-01
G06F	/	16	/	2474	I	2019-01-01
G06F	/	16	/	254	I	2019-01-01
G06N	/	5	/	00	I	2013-01-01
G06F	/	2216	/	03	A	2013-01-01

CPC Combination Sets				
Symbol	Type	Set	Ranking	Version
/				

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 14	
/YUK TING CHOI/ Primary Examiner, Art Unit 2153 (Primary Examiner) _____ (Date) 06 October 2021		O.G. Print Claim(s) 1	O.G. Print Figure 2

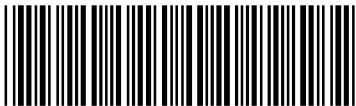
Issue Classification 	Application/Control No. 16/256,380	Applicant(s)/Patent Under Reexamination KLENK et al.
	Examiner YUK TING CHOI	Art Unit 2153

INTERNATIONAL CLASSIFICATION			
CLAIMED			
G06F16/21	/	16	/ 21
G06F16/25	/	16	/ 25
G06N5/00	/	5	/ 00
NON-CLAIMED			
	/		/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	14	
/YUK TING CHOI/ Primary Examiner, Art Unit 2153	06 October 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

<i>Issue Classification</i> 	Application/Control No. 16/256,380	Applicant(s)/Patent Under Reexamination KLENK et al.
	Examiner YUK TING CHOI	Art Unit 2153

☐ 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	9	10												
2	2	10	11												
	3	11	12												
3	4	12	13												
4	5	13	14												
5	6	14	15												
6	7														
7	8														
8	9														

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 14	
/YUK TING CHOI/ Primary Examiner, Art Unit 2153 (Primary Examiner) _____ (Date) 06 October 2021		O.G. Print Claim(s) 1	O.G. Print Figure 2

Process mining in peoplesoft

A Ramesh, MH Jansen-Vuller, PAP Thiran... - ... The Netherlands http ..., 2006 - pure.tue.nl
... 1.5 Research goal The objective of this research is to contribute to the existing **Process Mining** research by adding another source **system** to the list of **systems** that can be **mined** ... In order to **mine processes** in PeopleSoft, one PeopleSoft ERP module is analyzed at a time ...

☆ 99 Cited by 10 Related articles All 6 versions

Financial process mining-Accounting data structure dependent control flow inference

M Werner - ... Journal of Accounting Information Systems, 2017 - Elsevier
... the universal structure of accounting data which is in principle independent of the ERP **system** used for transaction **processing** ... 3 draws on contemporary literature to provide background information on **process mining**, the role of business **processes** in financial ... **Process mining** ...

☆ 99 Cited by 28 Related articles All 6 versions

From Package to Process: dynamic software architecture reconstruction using process mining

TTJ de Jong - 2019 - dspacelibrary.uu.nl
... Finally, we take small samples of the interactions and use them to **mine process** models from parts of JabRef's logged behavior ... Introduced in the early 2000s, **process mining** aims to improve business **processes** [15, Ch ...

☆ 99 Cited by 3 Related articles

Event log imperfection patterns for process mining: Towards a systematic approach to cleaning event logs

S Suriadi, R Andrews, AHM ter Hofstede, MT Wynn - Information systems, 2017 - Elsevier
... **mining**. **Data mining**. **Data quality**. **Event log quality**. **Patterns**. **Systematic data pre-processing**. **Event log** ... in which **processes** were carried out; the (non-)conformance of **processes** to guidelines ... **systems** in general and do not deal directly with specific requirements of **process mining** ...

☆ 99 Cited by 152 Related articles All 8 versions

Business process mining and reconstruction for financial audits

M Werner, N Gehrke, M Nuttgens - ... Conference on System ..., 2012 - ieeeexplore.ieee.org
... the **system** for the purpose of the financial audit automated **processing** of transactions ... We point out that business **process mining** and **reconstruction** does not merely represent another ... the audit of companies with highly integrated and automated business **processes** as shown ...

☆ 99 Cited by 30 Related articles All 5 versions

Continual process improvement based on reference models and process mining

K Gerke - 2011 - edoc.hu-berlin.de
... It is further demonstrated that the integrated use of **process mining** with reference models is ... compliance is identified as a substantial functional requirement for verifying **processes** within methodology ... that **process** models can have different structures but one **process** can still be ...

☆ 99 Cited by 1 Related articles All 4 versions

Process mining techniques in business environments

A Burattin - ... of Lecture Notes in Business Information Processing, 2015 - Springer
... ISSN 1865-1348 ISSN 1865-1356 (electronic) Lecture Notes in Business Information **Processing** ISBN 978-3-319-17481-5 ISBN 978-3-319-17482-2 (eBook) DOI 10.1007/978-3-319 ... 164
16.1.1 The **Processes** Generation Phase ... 17 **Process Mining** for Stream Data Sources ...

☆ 99 Cited by 51 Related articles All 3 versions

Discovering social networks from event logs

WMP Van Der Aalst, HA Reijers, M Song - ... Supported Cooperative Work ..., 2005 - Springer
... Another example is the **processing** of job ... and its users and may provide insights that can be used to increase the efficiency and effectively of **processes** and organizations ... a sociogram is a graph (P, R) where P is the set of individuals (in the context of **process mining** referred to ...

☆ ⓘ Cited by 613 Related articles All 16 versions ⓘ

A semantic rule-based approach supported by **process mining** for personalised adaptive learning

K Okoye, ARH Tawil, U Naeem, R Bashroush... - Procedia Computer ..., 2014 - Elsevier
... 450–475. [11] Nooijen EHJ, Van Dongen BF, Fahland D. Automatic Discovery of Data-Centric and Artifact-Centric **Processes**. International Business **Process** Management (BPM) Workshops. Lecture Notes in Business Information **Processing**, 2013; Vol. 132, pp. 316-327 ...

☆ ⓘ Cited by 30 Related articles All 13 versions

A practical approach for **process mining** in production **processes**

C Natschläger, F Kossak, C Lettner, V Geist... - ... Planning Systems, 2016 - Springer
... Conference paper First Online: 03 May 2017. 1 Citations; 1.5k Downloads. Part of the Lecture Notes in Business Information **Processing** book series (LNBIP, volume ... Bögl, A., Natschläger, C., Geist, V.: Towards flexibility in business **processes** by **mining process** patterns and ...

☆ ⓘ Cited by 3 Related articles All 4 versions ⓘ

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L22	19	celonis.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 11:58
L21	13	(import\$3 select\$3) near20 (table\$3) and (build\$3 construct\$3 creat\$3) near20 (relationship\$3) near20 (tables) and (discover\$3 mining) near5 process\$3 and (rebuild\$3 reform\$3 regnerat\$3 remodel\$3 rebuild\$3 reorganiz\$3 re- build\$3 re-organiz\$3 re-construct\$3 reconstruct\$3) near20 (process\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 11:23
L19	1	(import\$3 select\$3) near20 (table\$3) and (build\$3 construct\$3 creat\$3) near20 (process) near20 (tables) and (discover\$3 mining) near5 process\$3 and (rebuild\$3 reform\$3 rearrang\$3 regnerat\$3 remodel\$3 rebuild\$3 reorganiz\$3 re- build\$3 re-organiz\$3 re-construct\$3 reconstruct\$3) near20 relationship\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 11:18
L18	10	14 AND ((G06F2216/03 OR G06F16/254 OR G06N20/00).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 11:16
L17	86	(import\$3 select\$3) near20 (table\$3) and (build\$3 construct\$3 creat\$3) near20 (relationship\$3) near20 (tables) and (discover\$3 mining) near5 process\$3 and (rebuild\$3 reform\$3 rearrang\$3 regnerat\$3 remodel\$3 rebuild\$3 reorganiz\$3 re-build\$3 re-organiz\$3 re- construct\$3 reconstruct\$3) near20 (process\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 11:14
L16	17	(import\$3 select\$3) near20 (table\$3) and (build\$3 construct\$3 creat\$3) near20 (relationship\$3) near20 (tables) and (discover\$3 mining) near5 process\$3 and (rebuild\$3 reform\$3 rearrang\$3 regnerat\$3 remodel\$3 rebuild\$3 reorganiz\$3 reconstruct\$3) near20	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 11:13

		(process\$3) AND ((G06F16/258 OR G06F2216/03 OR G06F40/177 OR G06F16/254 OR G06N20/00).CPC.)				
L15	17	L14 AND ((G06F16/258 OR G06F2216/03 OR G06F40/177 OR G06F16/254 OR G06N20/00).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 11:12
L14	86	(import\$3 select\$3) near20 (table\$3) and (build\$3 construct\$3 creat\$3) near20 (relationship\$3) near20 (tables) and (discover\$3 mining) near5 process\$3 and (rebuild\$3 reform\$3 rearrang\$3 regnerat\$3 remodel\$3 rebuild\$3 reorganiz\$3 reconstruct\$3) near20 (process\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 11:12
L11	1	transformation and (re-construct\$3 reconstruct\$3 rebuild\$3) near20 relationship same table\$3 and (generat\$3 mining creat\$3) near20 (process\$3) near20 (select\$3) near20 tables	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 11:12
L10	1	(G06F16/2465 OR G06F16/212 G06F16/288 OR G06F16/2474 OR G06F16/254 OR G06N5/00 G06F215/03).CPC. and transformation and (re-construct\$3 reconstruct\$3 rebuild\$3) near20 relationship same table\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 11:09
L8	1	7 AND ((G06F16/254 OR G06F16/258 OR G06F2216/03 OR G06N5/00).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 11:07
L7	4	"16256380"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 11:06
L6	18	((rink4 near5 alexander)(martin near5 klenk)(bastian near5 nominacher)(raimar near5 wagner)).in. and process near5 mining	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 11:06

L5	5	process near20 transformation and (re-construct\$3 reconstruct\$3 rebuild\$3) near20 relationship same table\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 11:05
L4	3	process near20 protocol and transformation and (re-construct\$3 reconstruct\$3 rebuild\$3) near20 relationship same table\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 11:04
L2	2	"20170213167" and reconstru\$6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 10:33
L1	3	"20170213167"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/10/06 10:32

10/6/2021 1:08:06 PM

C:\Users\cchoi\Documents\EAST\Workspaces\16256380_method_creating_process_protocols.wsp

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
 Stylesheet Version v1.2

EPAS ID: PAT7086712

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT
CONVEYING PARTY DATA	
Name	Execution Date
MARTIN KLENK	01/24/2019
ALEXANDER RINKE	01/24/2019
RECEIVING PARTY DATA	
Name:	CELONIS SE
Street Address:	THERESIENSTR. 6
City:	MÜNCHEN
State/Country:	GERMANY
Postal Code:	80333
PROPERTY NUMBERS Total: 1	
Property Type	Number
Application Number:	16256380
CORRESPONDENCE DATA	
Fax Number:	(866)864-3947
<i>Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.</i>	
Phone:	9738281284
Email:	patent@myerswol.in.com
Correspondent Name:	MYERS WOLIN, LLC
Address Line 1:	100 SOUTH JEFFERSON ROAD
Address Line 2:	SUITE 202
Address Line 4:	WHIPPANY, NEW JERSEY 07981
ATTORNEY DOCKET NUMBER:	SCHR 8887
NAME OF SUBMITTER:	DANIEL J. GROSS
SIGNATURE:	/DANIEL J. GROSS/
DATE SIGNED:	12/21/2021
This document serves as an Oath/Declaration (37 CFR 1.63).	
Total Attachments: 2	
source=schr_8887_20200724_dec_assign_executed#page1.tif	
source=schr_8887_20200724_dec_assign_executed#page2.tif	

**DECLARATION AND ASSIGNMENT
FOR PATENT APPLICATIONS**

As a below named inventor (designated as "the undersigned"), I hereby declare that:

This declaration is directed to the application attached hereto and entitled **METHOD OF CREATING PROCESS PROTOCOLS**. If the application is not attached hereto, the application is as identified by the attorney docket number as set forth above.

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 above-identified application, including the claims.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

Address all correspondence to **CUSTOMER NUMBER 61650**.

ASSIGNMENT

WHEREAS, **Celonis SE**, having an address at **Theresienstr. 6, 80333 München, GERMANY** (hereinafter "ASSIGNEE"), is desirous of acquiring the entire right, title and interest in, to and under the above identified application and invention, and to any Letters Patent(s) that may be granted therefor.

NOW, THEREFORE, for good and valuable consideration, the receipt of which is hereby acknowledged, the undersigned has sold, assigned, transferred and set over, and by these presents does hereby sell, assign, transfer and set over, unto the said ASSIGNEES, its successors, legal representatives and assigns, the entire right, title and interest in, to and under the said invention, and the said United States application and all divisions, renewals and continuations thereof, and all Patents of the United States which may be granted thereon and all reissues and extensions thereof; and all applications for industrial property protection, including, without limitation, all applications for patents, utility models, and designs which may hereafter be filed for said invention in any country or countries foreign to the United States, together with the right to file such applications and the right to claim for the same the priority rights derived from said United States application under the Patent Laws of the United States, the International Convention for the Protection of Industrial Property, or any other international agreement or the domestic laws of the country in which any such application is filed, as may be applicable; and all forms of industrial property protection, including, without limitation, patents, utility models, inventor's certificates and designs which may be granted for said invention in any country or countries foreign to the United States and all extensions, renewals and reissues thereof;

The undersigned authorizes and requests the Commissioner of Patents and Trademarks of the United States, and any Official of any country or countries foreign to the United States, whose duty it is to issue patents or other evidence or forms of industrial property protection on applications as aforesaid, to issue the same to the said ASSIGNEES, its successors, legal representatives and assigns, in accordance with the terms of this instrument.

The undersigned covenants and agrees that he has full right to convey the entire interest herein assigned, and has not executed, and will not execute, any agreement in conflict herewith.

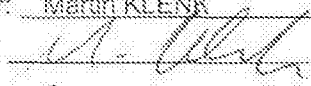
The undersigned further covenants and agrees that he will communicate to the said ASSIGNEE, its successors, legal representatives and assigns, any facts known respecting said invention, and testify in any legal proceeding, sign all lawful papers, execute all divisional, continuing, reissue and foreign applications, make all rightful oaths, and generally do everything possible to aid the said ASSIGNEE, its successors, legal representatives and assigns, to obtain and enforce proper protection for said invention in all countries.

The undersigned hereby grants the law firm of Myers Wolin, LLC the power to insert any further identification which may be necessary or desirable in order to comply with the rules of the U.S. Patent and Trademark Office.

The undersigned hereby acknowledges 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.

In witness whereof, executed by the undersigned on the date opposite the undersigned name.

Full name of inventor: Martin KLENK

Inventor's Signature:  Date: January 24, 2019

Residence: München, Germany

Post Office Address: c/o Celonis SE, Theresienstr. 6, 80333 München, GERMANY

Full name of inventor: Alexander RINKE

Inventor's Signature:  Date: January 24, 2019

Residence: München, Germany

Post Office Address: c/o Celonis SE, Theresienstr. 6, 80333 München, GERMANY

Document Description: Issue Fee Payment (PTO-85B)

Issue Fee Transmittal Form

Application Number	Filing Date	First Named Inventor	Atty. Docket No.	Confirmation No.
16256380	24-Jan-2019	Martin KLENK	SCHR 8887	7124

TITLE OF INVENTION :

METHOD OF CREATING PROCESS PROTOCOLS

Entity Status	Application Type	Art Unit	Class - Subclass	EXAMINER
Regular Undiscounted	Utility under 35 USC 111(a)	2153	776000	
Issue Fee Due	Publication Due	Total Fee(s) Due	Date Due	Prev. Paid Fee
\$1200	\$0	\$1200	20-Jan-2022	\$0

1.Change of Correspondence Address and/or Indication Of Fee Address (37 CFR 1.33 & 1.363)

Current Correspondence Address:	Current Indicated Fee Address :
61650 MYERS WOLIN, LLC 100 SOUTH JEFFERSON ROAD SUITE 202 WHIPPANY NJ 07981-1009 UNITED STATES 973-401-7157 patent@myerswoln.com	
☐ Change of correspondence address requested, system generated AIA/122-EFS form attached	☐ Fee Address indication requested, system generated SB/47-EFS form attached

2.Entity Status**Change in Entity Status**

Applicant certifying micro entity status; system generated Micro Entity certification form attached. See 37 CFR 1.29.

Note: Absent a valid certification of micro entity status, issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment. If this box is checked, you will be prompted to choose a micro entity status on the gross income basis (37 CFR 1.29(a)) or the institution of higher education basis (37 CFR 1.29(d)), and make the applicable certification online.



Applicant asserting small entity status. See 37 CFR 1.27.

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.



Applicant changing to regular undiscounted fee status.

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



Document Description: Issue Fee Payment (PTO-85B)

3.The Following Fee(s) Are Submitted:

☒ Issue Fee

☐ I authorize USPTO to apply my previously paid issue fee to the current fees due

☐ Publication Fee

☐ The Director is hereby authorized to apply my previously paid issue fee to the current fee due and to charge deficient fees to Deposit Account Number _____

☐ Advance Order - # of copies _____

☒ If in **addition** to the payment of the issue fee amount submitted with this form, there are any discrepancies in any amount(s) due, the Director is authorized to charge any deficiency, or credit any overpayment, to Deposit Account Number 503894.
The **issue fee must be submitted** with this form. **If payment of the issue fee does not accompany this form, checking this box and providing a deposit account number will NOT be effective to satisfy full payment of the fee(s) due.**

4.Firm and/or Attorney Names To Be Printed

NOTE: If no name is listed, no name will be printed
For printing on the patent front page, list to be displayed as entered

1. MYERS WOLIN, LLC

2.

3.

5.Assignee Name(s) and Residence Data To Be Printed

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

Name	City	State	Country	Category
Celonis SE	München		GERMANY	corporation

6.Signature

I certify, in accordance with 37 CFR 1.4(d)(4) that I am an attorney or agent registered to practice before the Patent and Trademark Office who has filed and has been granted power of attorney in this application. I also certify that this Fee(s) Transmittal form is being transmitted to the USPTO via EFS-WEB on the date indicated below.

Signature	/Daniel J. Gross/	Date	01-07-2022
Name	Daniel Jacob Gross	Registration Number	66449

Electronic Patent Application Fee Transmittal

Application Number:	16256380			
Filing Date:	24-Jan-2019			
Title of Invention:	METHOD OF CREATING PROCESS PROTOCOLS			
First Named Inventor/Applicant Name:	Martin KLENK			
Filer:	Daniel Jacob Gross/Michaelanne Stelling			
Attorney Docket Number:	SCHR 8887			
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 APPL ISSUE FEE	1501	1	1200	1200
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
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 (\$)				1200

Electronic Acknowledgement Receipt

EFS ID:	44692492
Application Number:	16256380
International Application Number:	
Confirmation Number:	7124
Title of Invention:	METHOD OF CREATING PROCESS PROTOCOLS
First Named Inventor/Applicant Name:	Martin KLENK
Customer Number:	61650
Filer:	Daniel Jacob Gross/Michaelanne Stelling
Filer Authorized By:	Daniel Jacob Gross
Attorney Docket Number:	SCHR 8887
Receipt Date:	07-JAN-2022
Filing Date:	24-JAN-2019
Time Stamp:	16:35:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1200
RAM confirmation Number	E202217G35521651
Deposit Account	503894
Authorized User	Michaelanne Stelling

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.20 (Post Issuance 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)	Web85b.pdf	62659	no	2
			69697a1f0314d806bb158a8638f9af5ab541ed9b		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	40268	no	2
			bed27942922b03eae4ae01d0ac7680b503569629		
Warnings:					
Information:					
Total Files Size (in bytes):			102927		
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.					



APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/256,380	02/22/2022	11256708	SCHR 8887	7124

61650 7590 02/02/2022
MYERS WOLIN, LLC
100 SOUTH JEFFERSON ROAD
SUITE 202
WHIPPANY, NJ 07981-1009

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 286 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.

INVENTOR(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional inventors):

Martin KLENK, München, GERMANY;
Alexander RINKE, München, GERMANY;

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

Celonis SE, Munchen, GERMANY;

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.

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas - Marshal Division on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO. 2:25-cv-1037	DATE FILED 10-10-25	U.S. DISTRICT COURT EDTX-Marshall Division
PLAINTIFF Celonis SE and Celonis, Inc.		DEFENDANT SAP SE and SAP America, Inc.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 USPTO No. 10,162,861	12/25/2018	Celonis SE
2 USPTO No. 11,256,708	2/22/2022	Celonis SE
3 USPTO No. 10,796,257	10/6/2020	Celonis SE
4 USPTO No. 10,073,895	9/11/2018	Celonis SE
5		

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
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Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy