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(54) Title: METHOD AND DISTRIBUTED SYSTEM FOR AUTOMATIC IMPORT AND PUBLISHING OF ELECTRONIC DOCUMENTS

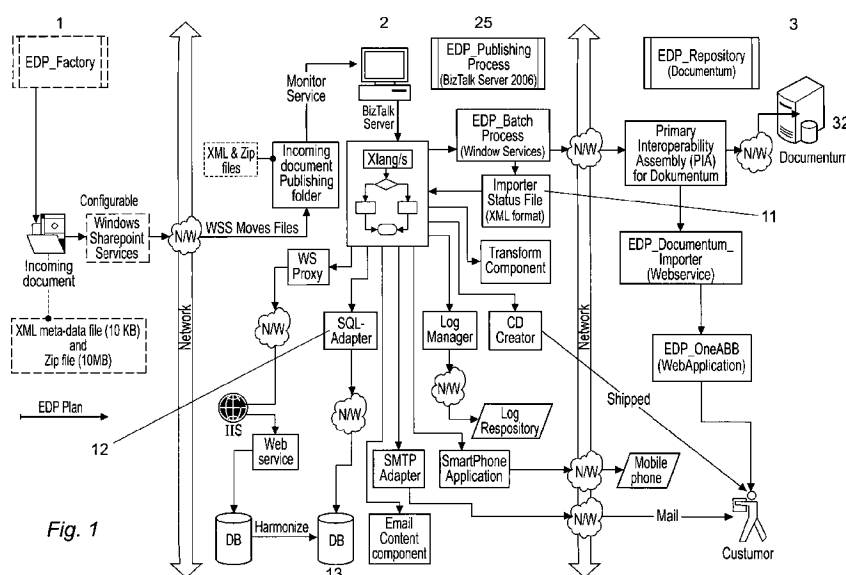


Fig. 1

(57) Abstract: The invention describes an automated electronic publishing method and system for publishing of delivery-specific product technical documentation which is to be delivered by factories to their customers. The system described may be implemented using a number of commercially available tools which can automatically deliver the technical product documentation into a repository with nearly no user interaction. This repository is globally available and can be accessed by users on customer side through web technology. This invention disclosure describes the necessary components, and the method to operate them as distributed system architecture.

Method and distributed system for automatic import and publishing of electronic documents

FIELD OF THE INVENTION

The present invention relates to the field of publication of technical information or documentation of technical equipment, hereafter called documentation in this description. More particularly, the present invention relates to distributed system architecture for automatic import of document files and electronic publication of documents by interlocking of enterprise resource planning systems connected to a plurality of factories to a common Electronic Documentation Program EDP publishing system.

TECHNICAL BACKGROUND

Conventionally, electronic publishing in industry of technical documentation for technical equipment is carried out manually or semi-automatically in a fragmented manner, in particular in the case of a several different factories being involved in making one specific delivery of technical equipment. All the sales and delivery related information is usually maintained in a manufacturing control system, an ordering and sales system or a generic ERP (Enterprise Resource Planning) system or ERP system such as the SAP system (Systems Applications and Products System) provided by SAP AG, of Walldorf, Germany. The technical documentation is usually kept in technical or product databases or systems. As a result it is difficult for an electronic document publishing system to access the information held in other systems. This is particularly the case when a plurality of factories in different locations are involved in one single specific delivery of technical equipment. Delivery specific product documents are often shipped by paper or CD to the customer, which may result in loss or partial loss of technical documentation on the customer side, delay by additional printing and mailing time and involves more cost due to resources needed both in human and material capital.

Presently factories in different geographical regions in large organizations often use different document repository systems which results in more infrastructure and IT cost. Also, the user or publisher of technical documentation often manually uploads the specific product delivery documents.

US patent 7,028,190 describes a consent obtaining method for electronically sending information. It involves providing computer executable instructions to individual for obtaining individual's consent for electronic delivery of information. However, it deals with getting

permission for sensitive data publishing having a number of interesting flow charts for communication with customers, but always in the context of supplier/investor relationship.

5 EP907120 discloses an electronic document delivery apparatus across internet. It has server dynamically generating private Uniform Resource Locator (PURL) to distribute electronic document, PURL uniquely identifies intended recipient of document and optionally other parameters specific to document's delivery. However, the patent is aimed at encryption-decryption and protecting sensitive documents and much emphasis is on tracking for billing purposes. There is no mention of collecting together the documents by a publishing service for
10 one or many receivers.

WO2000060504 discloses an internet-based document management system and methods are provided wherein an electronic document may be stored on an internet-accessible server and accessed using a previously known web browser, downloaded for review or manipulation, and
15 then returned to the server for access by further users. It focuses on tracking "transactions" for billing purposes and is constructed to allow collaborative changes to the documents, and is independent on content, update of content etc.

A set of patents describe a method or system for delivery and exchange of electronic documents.
20 WO2001060035 discloses a system for delivery and exchange of electronic data comprising of a sending device, which functions to send an electronic document, and receiving device, which functions to receive the electronic document from the sending device. A network between the sending device and the receiving device functions to allow the sending device to send a notification to the receiving device. The receiving device sends a notification to the sending
25 device whereby the sending device forwards the electronic document to the receiving device. The sending device automatically records all the notifications sent to and received from the receiving device, and the receiving device automatically records all notifications sent to and received from the sending device. WO2002015518 discloses a method for secure delivery of electronic documents between the users over the internet issuing a request to the Digital Asset
30 Distribution causing files residing on local computers to be transferred to recipients. US Publication 20040225751 deals with information packaging and a delivery system for electronic-business transaction. WO2000051029 describes an electronic document delivery apparatus using the internet. It includes sending to the computer which transmits encoded document to the server for decoding, encoding and transmission to the receiving computer.
35 However it is relevant in such cases where documents are encoded before transmitting on the

network and decoded via a server system before delivering the document to the receiving system.

US publication 20060075047 discloses an electronic file delivery device and delivery method e.g. electronic mail system using simple mail transfer protocol, transmits electronic mail for file delivery permission or non-permission, based on link information acquired from file reception request.

US Publication 20040034686 entitled System and method for delivering targeted data to a subscriber base via a computer network discloses an electronic system for delivering news and information. It has a server that collects electronic information related to the users preset customized profile for delivery to a client component from internal sites and servers. It deals with the collection of documents and their distribution, based on customer subscription and profile. However the method only describes selective to broadcasting of published news and information items to users based on their profile...

In basic concepts of Electronic Documentation Systems and related **E**lectronic **D**ocumentation **P**rograms (EDP), as disclosed in Proceedings of IDETC/CIE 2006, ASME 2006 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, September 10-13, 2006, Philadelphia, Pennsylvania, USA, DETC2006-99194 “MOVING PRODUCT INFORMATION ALONG THE VALUE CHAIN: OVERCOMING CHALLENGES OF DISTRIBUTED ORGANIZATIONAL STRUCTURE AND A HETEROGENEOUS INFORMATION ENVIRONMENT” by Harshavardhan Karandikar, Bruno Schilli, Wolfgang Schellhammer, Roar Karlsen, and as disclosed on the International Conference on Product Lifecycle Management PLMO6, July 10 -12 , 2006 Bangalore in “Cost-effective Electronic Delivery of Product Data and Documentation” by Bruno Schilli, Wolfgang Schellhammer and Harsh Karandikar, the sender of information publishes documents and meta-data into a specific file directory, which is supervised by so called EDP Publishing Services using a procedure called Batch Conversion Service (BCS). The EDP Publishing Services collect, upload and transform the project specific documents and data into a repository, which consists of a database server and a file server. While project specific documents are copied to the file server of the EDP Repository, type specific documentation will remain in the central documentation library. Only references to that kind of documentation are managed in the database server of the EDP Repository. In order to inform the customer about a documentation delivery, EDP Publishing Services creates a notification to the receiver of the respective documentation, which

contains a link to the relevant documentation set. Through this link the customer can access electronically individual documents and properties of one delivery through a web interface. However in the above system documents for uploading must be specified manually and uploaded manually by a sender or publisher. Also, in a large organisation different versions of the same technical documentation for a given product may exist at the same time, for example on different servers or in different regional systems. It is a demanding and time consuming process to identify the correct technical documentation version for a specific delivery. It is also a demanding and time consuming process to coordinate the publishing of technical documentation for a specific delivery which often involves a plurality of factory sites providing parts or systems for a specific delivery of equipment.

SUMMARY OF THE INVENTION

In view of the above, consideration is now being given to improving the known systems and methods for automatic and secure connectivity of enterprise resource planning ERP systems and publishing systems. The principal object of the present invention is to provide a distributed system and method of automatically importing electronic documents efficiently and publication of technical data from different locations to a global repository, functioning as Enterprise Content Management System of the enterprise, e.g. Documentum product available from EMC Corporation.

Another object of the present invention is to provide a distributed system for automatic import and publication of technical data into a common archive or repository, in an electronic documentation form by means of a common factory XML interface with a plurality of factory ERP systems.

According to another aspect of the invention, a system is provided for preparation and publication of technical equipment documentation which system comprises at least one data processing device cooperating with at least one data storage device and at least one tool or module for automatically importing documents to a document repository of an electronic publishing system.

Another object of the present invention is to provide a system and method for secure import/assembly of technical data in an electronic documentation form by means of a common factory XML interface with factory ERP systems.

Yet another object of the present invention is to provide a system and method for generation of a trigger from factory interface to start the EDP publishing process.

Still another object of the present invention is to provide information of individual company document deliveries in electronic form in a common look and feel to customers and the company.

Another object of the present invention is to harmonize the publishing data such as but not limited to Metadata for the delivery, the delivered product, sending supplier information and global customer information at one location for quality check at fixed time interval.

Yet another object of the present invention is to provide an electronic document importing tool to import electronic documents efficiently from a defined location to a repository or archive and the method thereof.

Still another object of the present invention is to provide a method of organizing load balancing for individual entity operations at an enterprise level.

Another object of the present invention is to provide a distributed system in an enterprise document publishing system arranged such that all individual entities of the enterprise document publishing system run asynchronously or independently of each other.

Yet another object of the present invention is to provide a method of having one common process across different regions in the globe for publishing delivery documents.

Still another object of the present invention is to provide a method of uniting various resources across the different regions to one location.

Another object of the present invention is to provide a method of enhancing the speed of the publishing process.

Accordingly the present invention provides a system and method of interfacing with the factories and companies across the different regions and generating Metadata in electronic form in an organized manner from different data sources for a publishing process for technical documentation. The use of Metadata is also described in an Indian patent application IN

1099/KOL/2008 filed 24-06-2008, in India entitled System and method for automated preparation and publication of information of technical equipment; which is hereby incorporated in full in this specification by means of this reference. In this description, Metadata comprises information and data which are specific to a specific delivery of technical equipment and formatted in a structured text format such as XML. The technical equipment may comprise equipment according to a standard specification, a custom specification, or both. The system according to the invention may comprise a module based structure with devices and units, wherein the units or devices respectively may be implemented on commercially available workflow management tools. Integrating all the factories of a distributed company to an ERP system and harmonizing the consistency in data and the publishing process helps to have a better quality process with more effective maintainability and enhancement. All the required information related to delivery, product, documents, delivery schedule and customer for a specific delivery are pulled from an ERP system, like SAP, by using a workflow or business process management server system with a custom or application-specific adapter such as a BizTalk SAP/custom adapter through a publishing process controlled by utilizing the orchestration concept of BizTalk Server. For connecting to a ERP system the IP address, user ID and password are given using BizTalk server 2006 SAP/custom adapter. A pre-designed common template in a common document library is used to generate the required user interface form and Metadata for the publishing process in the form of industrial standard XML format.

The described method, possibly implemented as a service, stores the documentation in the enterprise repository provided by an Enterprise Content Management (ECM) system of the enterprise. The described system improves the performance of the publishing process in a scalable manner and in a distributed environment. Moreover, since the constituent components of the system are only loosely coupled and run independently of each other, up gradation and maintenance of features is made easy.

In a preferable embodiment of the present invention, a distributed system for automatic import and publishing of technical documentation for a technical equipment in the form of electronic documents, said system comprising a module providing publishing process services and a means for notifying one or more predefined recipients and providing a link for access to the technical documentation for a specific delivery of technical equipment so published:

(a) adapter means for interfacing with an ERP system of a plurality of factories in different regions for collection of electronic documents;

(b) work sharing server means for storing information for a specific delivery of equipment to a customer in a pre-designed common template in a document library for publishing process;

(c) database adapter means for synchronizing online data and harmonizing publishing database retrieved from a plurality of sources or disparate sources;

(d) document importer means for importing specified electronic documentation for technical documentation for the specific delivery from a defined location to a repository; and

5 (e) publishing process means for pulling specified documents from a repository;

In another embodiment of the present invention, means for collection of electronic documents from different factories comprises of at least one a workflow or business process management server system with a custom or application-specific adapter such as a BizTalk server 2006.

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In yet another embodiment of the present invention, a BizTalk built-in SAP/ custom adapter is configured by giving IP Address, hostname, user ID and password for connectivity to ERP/ SAP system of various factories.

15 In still another embodiment of the present invention, a common template in the document library is used to generate the user interface form and metadata for the publishing process in industrial standard XML format.

In another embodiment of the present invention, product related metadata are stored in industrial
20 standard XML format and documents related to product are in a compressed file or zip format.

In yet another embodiment of the present invention, the authentication of metadata is carried out by means of a Single Sign On (SSO) facility.

25 In still another embodiment of the present invention, Single Sign On (SSO) facility operates by mapping multiple user identity (ID) and password to a single user ID and password in the SSO server.

In another embodiment of the present invention, the synchronization of online data and
30 harmonizing of publishing database from disparate sources is carried out in a defined time interval which is configurable.

In yet another embodiment of the present invention, the repository is globally available and provides access to users via the web.

35 In yet another embodiment of the present invention a method is described for automatic import

and publishing of technical documentation for a technical equipment in the form of electronic documents using a distributed system for automatic import and publishing, said system comprising a module providing publishing process services and a mail server for notifying one or more predefined recipients and providing a link for access to the technical documentation for

a specific delivery of technical equipment so published, wherein the method comprises

(a) collecting electronic documents using an adapter means for interfacing with an ERP system of a plurality of factories in different regions;

(b) storing information for a specific delivery of equipment to a customer in a pre-designed common template in a document library for publishing process using a work sharing server means;

(c) for synchronizing online data retrieved from disparate sources using an SQL adapter means;

(d) importing specified electronic documentation for technical documentation for a specific delivery from a defined location to a documentum repository using document importer means; and

(e) retrieving or pulling the technical documentation for a specific delivery from the documentum repository using a publishing process means.

In still another embodiment of the present invention, the repository importer imports electronic documentation by a process comprising the steps of:

(a) using specific delivery address etc information, document name, and import status information in the Metadata related to the life cycle status and the document set during publishing process to control the publishing process;

(b) specifying the location of the documents to be fetched for import;

(c) specifying the failure location in case of failure in importing documents;

(d) putting specific delivery documents with GUID (global unique ID/delivery ID) as folder under root level Success Transaction Folder if the publishing process and transaction is successful otherwise in root level Failure Transaction Folder, as per publishing process logic;

(e) carrying out error correction on the documents in root level Failure Transaction Folder; and

(f) importing the specified delivery documents to the repository

In another embodiment of the present invention, the repository importer uses the proprietary programmatical interface of the underlying repository to create folder structures, copies files into and set access rights to folders and files.

In yet another embodiment of the present invention, the repository is triggered by the overall publishing process control by utilizing the orchestration concept of BizTalk Server to import

specified delivery documents to the repository.

In still another embodiment of the present invention, the repository importer generates an import status for a specific document in XML format.

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In another embodiment of the present invention, document import status is used for follow up processes such as archiving and for access for authorised users via a collaborative portal.

10 In another embodiment of the present invention a distributed system and method of automatically importing electronic documents efficiently and publication of technical data from different locations to a global repository, comprises a publishing process means for retrieving or pulling the technical documentation

15 In yet another embodiment of the present invention, EDP documentum exporter makes use of an interface provided by an framework application compatible assembly or partially compiled code library, such as a PIA (Primary Interoperability Assembly) as an intermediate interface for the documents.

20 In still another embodiment of the present invention, for notifying one or more predefined recipients of an access to stored information comprises of at least one web access application service.

In another embodiment of the present invention, web access application service provides a web interface for internal/external customer to access their specific delivery document for download.

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In yet another embodiment of the present invention, web access application is organized in a multilayered format comprising the layers of:

- (a) presentation layer;
- (b) publishing process layer;
- 30 (c) data logic layer; and
- (d) data access layer.

In still another embodiment of the present invention, the individual components of the said system are loosely coupled and run independent of each other. In another embodiment of the present invention, the individual components of the said system run asynchronously.

The invention provides the advantage that the delivery-specific technical documents are delivered on time to the customer. Automating the document delivery process also reduces the burden on the supplying factory people, the sender or publisher, and, at the same time reduces manual intervention of users and thus avoids misleading data, for example in respect which technical documents to upload being given to the EDP Publishing process. It provides assurance that all the specified technical documents have been collected for publishing and then via a Notification process provides assurance that the receiving customer has received all the documents. The publishing process may be represented in standard symbols in BizTalk orchestration and web-based document sharing and collaboration tools such as in a Windows Sharepoint Service WSS work flow. Each module may be arranged to produce status reports or logs using an Industrial standard format such as XML.

Another advantage is that network utilization is optimized by arranging the modules in the EDP process to run independently and be only loosely coupled to the publishing process. Further each module may be arranged to have its own back end local repository. Load balancing is taken into consideration by identifying the possible demand on the application modules.

Another advantage is that the implementation of the EDP process is carried out in a multilayer format. This enhances the reusability of the code, especially for adding improvements, making changes, and for updates. Use of a single sign on function or SSO facility helps to maintain security by authenticating different Metadata sources by mapping the multiple user identity (ID) and password to the single user ID and password in the SSO server. The modular design and loosely coupled implementation of the invention can be easily integrated to the application running under a heterogeneous system comprising, for example, one or more legacy systems.

BRIEF DESCRIPTION OF THE DRAWINGS

It is to be noted, however, that the appended drawings illustrate only typical embodiments of this invention and are therefore not to be considered for limiting of its scope, for the invention may admit to other equally effective embodiments.

FIG. 1 shows a diagram of the representative system according to the invention (with manual upload removed);

FIG. 2 shows the distributed architecture model for a system according to an aspect of the present invention;

FIG. 3 shows data flow during an embodiment of the EDP publishing process;

FIG. 4 shows functional elements of an EDP publishing server log viewer according to another

embodiment;

FIG. 5 shows EDP-components implementation layer diagram according to an embodiment of the invention.

5 DETAILED DESCRIPTION OF THE INVENTION

According to one aspect of the present invention, a method is provided for developing necessary components/ modules using multilayer and service oriented architecture and to operate them as a distributed system. According to another aspect of the invention, a system is provided as part of electronic publishing process which improves the performance, in a scalable manner, in a distributed environment. Moreover, since the constituent components of the system are only loosely coupled and may run independently of each other, up grade and maintenance of features is simplified.

Fig. 1 shows a diagram of a representative system according to the invention. The lines indicate the work flow of the representative system starting from the step of addressing various components in different locations till the step where the documents reach the customer. The invention describes an automated EDP process for delivery-specific product documentation to be delivered by factories to their customers. The system described may be carried out by using a number of commercially available tools which can automatically deliver the product documentation into a repository with nearly no user interaction. The system may be implemented using specifically made tools or applications or a combination of commercially available and custom tools. The system includes a document library 10, preferably in the form of a company repository or Enterprise Content Management ECM system which is globally available to all factories involved in making technical products for one single specific delivery and can also be accessed by users on customer side through web technology. Fig 1 shows the three sections of the system numbered 1, 2 and 3. In section 1, technical data such as 10MB compressed technical document file and/or its related meta-data, such as a 10KB XML metadata file, are automatically collected and assembled from one or more manufacturing control systems or enterprise resource planning (ERP) factory systems to an integrated and common EDP publishing system. The collection, import and storage of each technical document and delivery document required for a specific delivery of equipment is subsequently carried out as an individual transaction and each of the transactions and the result of each transaction is recorded.

The Metadata for technical documentation for a specific delivery of equipment are placed in an XML format file at a common location, preferably in document library 10, which is preferably

provided by a web-based document sharing and collaboration tool such as, for example, a Windows Sharepoint Service (WSS). A trigger may be automatically generated to start the publishing process to publish required product documents. In section 2, the information of individual company document deliveries and/or its related meta-data are provided in a pre-designed common template in the document library 10 for the publishing process. This information is stored in the form of an industrial standard XML format. In order to synchronize the online data and harmonize the publishing database from disparate sources different Metadata sources are authenticated when a request is received for publication of Metadata for a specific delivery. Metadata from different sources are collected and placed inside a database such as a SQL Server-2005 database which acts as local reference database (13, Fig 3) for the publishing process control. The publishing process control may be run on a file sharing and workflow management server system such as BizTalk Server 2006 arranged with a custom and/or an application-specific adapter. In section 3, the Metadata related to the publishing transaction status and the document set (the delivery-specific technical documents) are imported from a defined location to an EDP document repository also known as a Documentum, supplied by EMC. This is done by specifying the location of the documents to be fetched. Initially Metadata in XML format, according to an EDP XML specification has the information related to the specific delivery, products involved and set of documents associated.

Once the publishing process starts, the Metadata XML-file undergoes schema validation, using the EDP XML Specification and a quality check for the contents of the XML-file and accordingly the XML-file gets extended to include a validation check result and the quality check result, as well as appended runtime generated information items, such as unique delivery GUID, time stamp of processing, or history of process. It now holds the individual transaction status along with the original information. Upon importing the specified delivery documents for a specific delivery to the document library 10, a report on the import status 11 is generated. The generated import status 11 is utilized by the publishing process control for sending notification to the customer, which notification may provide an active link to access the technical documentation. The link may be communicated by means of e-mail, phone, text message and the like.

Fig. 2 illustrates the distributed architecture model according to the present invention. This model provides services for an enterprise resource planning ERP system (Factory ERP System) 21, publishing data sources 22 (people, products, a Global Identification System (GIS), a document library) and an internal and/or external customer 23. This model comprises of five

major functional blocks namely factory interface 24, EDP publishing process 25, EDP documentum (repository) importer 26, EDP documentum exporter 27 and web application access 28.

5 Factory Interface 24:

The Factory Interface 24 (Fig 2) may be a web based application, which runs on a workflow server, preferably Windows Share Point Service. A method is provided for interfacing with an enterprise resource planning (ERP) system connected to a plurality of factories in different regions of the world and generating Metadata in electronic form from different data sources within the ERP system in an organized manner, for the EDP publishing process. This may be described as linking or of interlocking of the ERP system to the EDP publishing process. The Factory interface 24 helps to unite different factories from different regions across the globe and make the delivery process more uniform and facilitate automatic collection of the specific delivery information called Metadata. The Metadata is provided as an XML file, which follows an EDP XML schema (EDP XML Specification), and facilitates the user to automatically upload the delivery specific documentation. The factory interface is maintained by adding new/modifying web parts (customizable user interface) of a file sharing application such as provided by Windows Sharepoint web pages. In the case of a form-based implementation the user interface may be a data registration form provided by an enterprise form server in a suitable format, such as implemented as a local client or implemented in a suitable format for a Visual Basic compatible application such as Excel, or the data registration form may be provided as eg a web form, wherein, as well as collecting manually or automatically input information. Web forms such as InfoPath form templates provided through the factory interface 24 are published to the document library 10 to capture the required information from the publisher in each of the factories concerned with a specific delivery. First of all, the required Metadata/ documentation for a specific delivery to a customer are collected in the document library 10. Once all the data are collected from different data sources, the ERP or SAP system generates a trigger signal for the publishing process to start the publishing of documents for the specific delivery

30 The factory interface 24 is a common interface for many factories which are connected to one or more ERP Systems. It facilitates collection of the specific delivery information through the user factory interface 24 wherein the factory user can, if so required, upload the delivery documents manually. The Metadata for specific delivery information is usually obtained from ERP system as an automated process. It can also be extended to have a trigger from the ERP system to start the publishing process. The factory interface also provides a window for the internal customer

(factory people) to see their delivery process and helps to organize the delivery information region wise. Such a window to the delivery process may be used to access updates of error cases.. The factory interface also allows sharing with the use of a security feature, preferably using Windows Share Point Service (WSS). EDMS is a customized version of documentum (a product provided by EMC Corporation) for content management. This feature runs as an independent service with its own local repository 29 and isolated from EDP publishing process.

The factory interface 24 may be provided using a BizTalk built-in SAP adapter and/or a custom adapter. The BizTalk built-in SAP/ custom adapter of WSS application 24 is configured by giving IP Address, hostname, user ID and password for connectivity to ERP/ SAP system. The required delivery information is pulled through orchestration concept of BizTalk Server (running the publishing process 25, Fig 2) from ERP/ SAP system and delivery documents from delivery scheduling system of the ERP/ SAP system modules such as but not limited to document management system, sales and support etc. Pulled information is organized in a common template (preferably of an MS Office InfoPath 2007 web form) by following a publishing process rule (see also Step 2, Fig 3). A common location, document library 10, and the common template are preferably designed region wise. The pulled information is populated in the factory interface form. Publisher 25 automatically uploads the delivery documents from ERP/ SAP system using the BizTalk built in and/or custom SAP adapter and submits the form. Submitted forms are parsed (attached documents and Metadata in EDP XML format) separately. Client side publishing process validation is done using a work flow of the WSS. After ensuring that the Metadata and attached documents, the zipped files, follow a publishing process rule (Step 2, Fig 3), it places the forms in the document library 10 of the WSS. Accordingly, based on the customer ID, factory interface 24 fetches the data related to the receiving customer such as company name, first name, city, zip code etc. automatically by connecting to the local database 29. If the customer details are not present in the local database then it calls a Global Identification Service GIS service 22 which updates the customer information from an online GIS database to the local database. Based on product unique ID (Classification ID), factory interface 24 retrieves the product related properties automatically from the local database and if the properties are not available then it calls products web service which synchronizes the local database with the online product database. When the product related Metadata which is in XML format and documents related to product which are in a suitable compressed file format such as a zip format for a specific delivery are published into the common location, document library 10, both the files are checked to see if they fulfill a certain criteria. It is also confirmed that none of the two files are corrupted by validating the attributes of the files. Specific delivery documents

which are in zipped format are also placed in the document library 10 of the WSS, before creating and placing delivery specific Metadata in XML format inside the document library. Once the files are placed in document library, the files are not deleted. Security is provided for the document library 10 to be accessed by region and/or group wise by using WSS.. Even if delivery documents are stored in SAP DMS/ EDMS (customized version for Documentum) system, they can be organized smoothly because WSS 2007 gives support for the EMC Documentum product. The EDP publishing process monitors the availability of the delivery documents and required specific delivery data for generating the EDP XML-file. Thus SAP can trigger the EDP publishing process.

By using the above system, without any user intervention, the specific customer gets the confirmation that the documentation related to his/ her order has been delivered electronically to him/ her. All the technical documents specified in by the Metadata are checked to be present ready for publication. The Notification ensures that the customer receives all the technical documents. The above system automatically identifies the documents based on the delivery order number, Metadata and publish the documents and metadata without any user interference.

Publishing Process 25

Fig 3 shows data flow during EDP publishing process. At Step.1, the publishing process (25, Fig 2) monitors the availability of the Metadata in XML format in the document library 10. Based on the Metadata, the publishing process is controlled at Step. 2 by undergoing quality check and schema validation and at Step .3 the publishing process control invokes the custom components (such as a BizTalk 2006 adapter) to move the specific delivery documents at Step. 4 in zip format to the transaction folder with unique GUID folder name for that individual file movement transaction. As a part of publishing process it generates a delivery sheet, logs, it extends the Metadata and puts specific delivery documents with same transaction GUID folder name under root level Success Transaction Folder (TF) if the publishing process and transaction is successful otherwise in root level Failure TF. The delivery sheet, delivery documents, and extended Metadata, are set ready to get imported by the document importer (26, Fig 2). Step.5 updates the reference database 13. Independent document importer service creates the status file (11, Fig 1) in XML format with GUID for the transaction as a file name. At Step.6, Notification, the publishing process reads the status file, based on the information and it notifies the status for example by means of a mail server 16 through email, phone, smartphone, or by a text message service.

The automatic Notification based on Import Status provides assurance that the customer has received the documentation., all the documents specified by the Metadata, complete and un-corrupted.

- 5 The publishing process (25 , Fig 2) also helps to collect the required information to harmonize the publishing data such as delivery, products, supplier and customer information at one location for quality check (30, Fig 2) at a fixed frequency interval. Publishing process service may run as tray icon on status bar. It has the option to start and stop the publishing process. At the time of start of the process, the system pings the repository (Documentum) server and mail server (31,
- 10 Fig 2) for the availability with up-running condition. Accordingly it traces & updates the admin publishing log file. It ensures the stability of the product. The admin monitoring tool (Fig 4) enables and disables log settings for an application from a framework application, a framework being an application which provides a simple API but has software libraries and partial source code for solving programming problems in a given domain, such as .NET application (from
- 15 Microsoft) . It shows log details and exports to file. It archives the log files to a specified location and purges those files between the dates specified. It helps to start and stop the publishing process. It provides a number of log options such as admin log, publishing server log, quality checker log, publisher log and receiver log.
- 20 Figure 4 shows an example of a EDP publishing server log viewer. The figure shows an editable field 41 for specifying a location for a publication folder. It also shows section buttons 42 to turn on/off a Admin log, Publisher log, Publishing server log, Receiver log, and a Quality checker log. On/Off logging is provided with options 43 including Error, Warn and Information. A database log in the form of a DB Manager Tracer 44 may be switched on or off and a Request
- 25 tracer 45 may also be switched on or off. The Publishing process server may be run as a tray icon on status bar. It has a menu option to start and stop the EDP publishing process by admin. Admin monitors the EDP publishing process by viewing one or more log files. At any point the latest 20 lines updated information is shown as console. A menu option is provided to see the graphical representation of number of transactions, number of success transactions, number of
- 30 failure transactions in bar/ pie chart. Further, it provides an option to see archived/ purged log file based on date range. The viewer log allows factory users or publishers to see errors such as a notification of a severe system error to services group for the publishing application, or a notification in the case of minor data errors reported to publishing person.
- 35 The advantage of having server log viewer is that the publishing process flow is visible to a user.

It has separate host instance to receive and send message through port as well as separate instance to maintain the publishing process control process. It helps to increase the number of transactions in a scalable manner. The publishing process is carried out using BizTalk server. Zip files are moved by custom developed components, C# (C sharp language) components without populating BizTalk server database. The publishing process and the document importer are thus loosely coupled. These features run as an independent service with the two databases one for BizTalk internal use and one for quality checking. A single sign-on SSO facility is provided to authenticate different Metadata sources by mapping a multiple user identity (ID) and password to the single user ID and password in the SSO server. It helps to maintain a high degree of security with easy implementation. Another advantage of the publishing server log viewer is that it provides a detailed view of all transactions so that it can be assured and traced that all of the necessary documents for a specific delivery have been successfully published to the repository. It is important to verify that the complete technical information for a specific delivery has been delivered and received. The notification process ensures that the documentation is received.

Document Importer 26:

EDP document importer tool (EDIT) 26 (Fig 2) is a tool to import documentation into a document repository 32 (figs 2, 3) or documentum. It is a configurable tool, which has an option to configure, to specify location of the documents to be fetched for import, to specify failure location in case of failure in importing documents, preparing import status in XML format for transaction, to specify the log option to be traced and to specify the log files to be deleted or retained. All these features run as an independent service. The advantage provided by running these features independently is that the process of importing documents is isolated from the publishing process. The Document importer tool 26 uses may use a proprietary programmatical interface of the underlying EDP repository 32 to create folder structures, to copy files into folders and files and to set access rights to folders and files.

During the EDP publishing process, the Metadata XML-file (EDP XML format) is used by the publishing process (25, Fig 2) to control the publishing process. As per EDP publishing process logic, it stores specific delivery documents with Transaction GUID (delivery ID) as folder under root level Success TF (Transaction Folder) if the publishing process and transaction is successful, and other wise in root level Failure TF Folder. EDIT 26 is configured for reading the Metadata XML file from Success TF to import document and generate the import status 11 in XML format, which contains the information about the recipient of the notification of the delivery information. The generated import status XML is utilized by the EDP publishing

process for notification, Step 6. Once the correction process has been completed specific delivery documents in Failure TF, EDIT 26 is configured to import all the documents from that folder to the central EDP repository 32.

5 Document Exporter 27:

The document exporter 27 is the component which helps to pull the document from the EDP repository 32. This component makes use of the PIA interface (a partially compiled code library assembly for .NET applications which may be a product of EMC Corporation) as an intermediate interface for the EDP repository (Documentum). An advantage of having the document exporter 27 as independent component is that it allows reuse of the code for the web based application. This component is well organized in a multilayered format comprising of presentation layer, publishing process logic, and data logic and data access layer. Separation of components in different layers allows for a more easily maintained code base and also ensures that when the code is to be turned into a component, the effort required is minimum and hence reusability of the code is enhanced.

Web Access Application 28:

Figure 5 explains an implementation of EDP-components in a layer diagram. All the components are arranged according to the functionality and operations in respective layers. This application is the web interface for the internal/ external customer to access their specific delivery document for download, that is, after notification (see Step 6, Fig 3) that technical documentation for a specific delivery has been electronically published. This is achieved with the combination of the document exporter 27 (Fig 2) and web access application service 28. All the implementations are focused and maintained in a multilayer architecture comprising of presentation layer 51, publishing process layer 52, data logic layer 53 and data access layer 54. This allows the EDP components to be included in the factory portal site of the web.

Presentation layer 51 Fig 5 is provided including at least one interface to the end user to specify the location where the Metadata and the document set is to be monitored and picked up from. Other purposes of this layer may include to set up the functions to be performed such as archiving, trace transaction log, collaborative portals etc. The main function of the publishing process layer 52 is to identify and categorize the required service such as trace transaction log, import status, archiving etc as per the option selection in the presentation layer. This is achieved by first reading the Metadata (EDP xml schema) from the specified location in the presentation layer 51. Accordingly, the publishing process logic is created for categorizing the required folder

structure and for placing the document inside the repository. The security level access is maintained by means of a secure access system such as by an ACL (Access Control List) parameters for placing the document set in the repository. Finally, the import status XML file (Importer status file (XML) Fig 1) is prepared which has sufficient information required for sending notification at Step 6, Fig 3. Based on the logic of the publishing process layer 52, the data logic is created i.e. required publishing data is organized in the data logic layer 53. Implementation logic for the individual categorization for folder structure and ACL security for the document set in the repository is created. The data access layer 54 provides a simplified access to data stored in the repository. The required application program interface (API) to communicate to the central repository is implemented in this layer.

The EDP (Electronic Documentation Program) publishing process for publishing documentation for a specific delivery maintained available to a plurality of different factories, which may be associated with a specific geographical region, has the advantage that factories can share the existing specific delivery information for one or more products across such a region or group wise. The EDP publishing process system overcomes the present lack of standard communication protocols for sharing such information across the factories and customers.

The above system reduces the network traffic to the central server because the different modules are loosely coupled, for example certain module may run asynchronously. It enhances the speed of the publishing process as the factories access only their local/ regional server for their publishing, which may be in the same LAN/ WAN network for the factory/ region. The advantage is that it enables disparate and different factories people to put documents for a specific delivery of technical documentation at one location by bridging the ERP System to which the factories are linked. As a result, it ensures a common discipline and behavior across different factories. All these features run as an independent service with their own local repository.

The methods for automatic import and publishing of technical documentation in a distributed system as described in this specification may be carried out by a computer application comprising computer program elements or software code which, when loaded in a processor or computer, causes the computer or processor to carry out the method steps. The functions of the modules of the EDP system may be carried out by processing digital functions, algorithms and/or computer programs and/or by analogue components or analogue circuits or by a combination of both digital and analogue functions.

The methods of the invention, as previously described for example in respect of Fig 3, as well as processes indicated in Figs 1,2, may be carried out by means of one or more computer programs comprising computer program code or software portions running on a computer or a processor. The microprocessor (or processors) comprises a central processing unit CPU performing the steps of the method according to one or more facets of the invention. This is performed with the aid of one or more said computer programs, such as, which are stored at least in part in memory and as such accessible by the one or more processors. The or each processor may be in a module, a server or hub or router unit or may as well run in a local or central computer system in a local or regional distributed computerised system.

Various other modifications and alterations in the structure and method of operation of this invention will be apparent to those skilled in the art without departing from the scope and spirit of the invention. Although the invention has been described in connection with specific preferred embodiments, it should be understood that the invention as claimed should not be unduly limited to such specific embodiments. It is intended that the following claims define the scope of the present invention and that structures and methods within the scope of these claims and their equivalents be covered thereby.

CLAIMS

1. A distributed system for automatic import and publishing of technical documentation for a technical equipment in the form of electronic documents, said system comprising a module providing publishing process services and a mail server (16) for notifying one or more predefined recipients and providing a link for access to the technical documentation for a specific delivery of technical equipment so published, **characterized by**
- (a) an adapter means (24) for interfacing with an enterprise resource planning ERP system of a plurality of factories in different regions for collection of electronic documents;
- (b) a work sharing server (24) means for storing information for a specific delivery of equipment to a customer in a pre-designed common template in a document library for publishing process;
- (c) an SQL adapter means (12) for synchronizing online data retrieved from disparate sources;
- (d) document importer means (26) for importing specified electronic documentation for technical documentation for a specific delivery from a defined location to a documentum repository (32); and
- (e) a publishing process means (25) for retrieving or pulling the technical documentation for a specific delivery from the documentum repository;
- ..
2. The distributed system for automatic import and publishing of electronic documents as claimed in claim 1, wherein said publishing process means (25) for collection of electronic documents from different factories comprises at least one BizTalk server 2006 built-in custom adapter.
3. The distributed system for automatic import and publishing of electronic documents as claimed in claim 1, wherein said publishing process means (25) for collection of electronic documents from different factories is arranged with an interface for configuration by giving IP Address, hostname, user ID and password for connectivity to a ERP/ SAP System of different factories.
- 4 . The distributed system for automatic import and publishing of electronic documents as claimed in claim 1, wherein the pre-designed common template in the document library is arranged to generate the user interface form and EDP XML file (metadata) for the publishing process in an industrial standard XML format.
5. The distributed system for automatic import and publishing of electronic

documents as claimed in claim 1, wherein product related metadata are stored in industrial standard XML format and documents related to product are stored in a compressed file format.

6. The distributed system for automatic import and publishing of electronic documents as claimed in claim 1, wherein the SQL adapter means (12) for the synchronization of online data and harmonizing of publishing database from disparate sources is further arranged for authentication of metadata from different sources.

7. The distributed system for automatic import and publishing of electronic documents as claimed in claim 6, wherein a Single Sign On (SSO) facility is arranged for the authentication of metadata.

8. The distributed system for automatic import and publishing of electronic documents as claimed in claim 6, wherein said Single Sign On (SSO) facility is arranged to operate by mapping multiple user identity (ID) and password to a single user ID and password in the SSO server.

9. The distributed system for automatic import and publishing of electronic documents as claimed in claim 1, wherein the SQL adapter means (12) for the synchronization of online data and harmonizing of publishing database from disparate sources is arranged configurable so that synchronization is carried out in a defined time interval.

10. The distributed system architecture for automatic import and publishing of electronic documents as claimed in claim 1, wherein said documentum repository is globally available and provides access to users via web.

11. The distributed system architecture for automatic import and publishing of electronic documents as claimed in claim 1, wherein said means for importing the specified electronic documentation from defined location to a documentum repository comprises of at least one EDP documentum importer (26).

12. The distributed system for automatic import and publishing of electronic documents as claimed in claim 12, wherein said EDP documentum importer is arranged for importing electronic documentation by a process comprising the steps of:

(a) using Metadata related to the life cycle status of a technical equipment and the document set

during EDP publishing process, to control the publishing process;

(b) specifying the location of the documents to be fetched for import;

(c) specifying the failure location in case of failure in importing documents;

(d) storing specific delivery documents with Transaction GUID (global unique ID/delivery ID)

5 as folder under root level Success Transaction Folder if the publishing process and transaction is successful otherwise in root level Failure Transaction Folder, as per EDP publishing process logic;

(e) carrying out error correction on the documents in root level Failure Transaction Folder; and

(f) importing the specified delivery documents to the EDP repository.

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13. The distributed system for automatic import and publishing of electronic documents as claimed in claim 13, wherein said EDP documentum importer is a configurable tool comprising options of:

(a) specifying a location of documents to be fetched;

15 (b) specifying a failure location in case of failure in import of documents;

(c) preparing an import status in XML format;

(d) specifying one or more log options to be traced; and

(e) specifying one or more log files to be deleted or retained.

20 14. The distributed system for automatic import and publishing of electronic documents as claimed in as claimed in claim 13, wherein said EDP documentum importer imports specified delivery documents to the EDP repository as a batch process.

25 15. The distributed system for automatic import and publishing of electronic documents as claimed in claim 13, wherein said EDP documentum is triggered by the overall publishing process control to import specified delivery documents to the EDP repository.

30 16. The distributed system for automatic import and publishing of electronic documents as claimed in claim 13, wherein said EDP documentum importer generates an import status (11) for a specific document in XML format.

17. The distributed system for automatic import and publishing of electronic documents as claimed in claim 19, wherein said document import status is used for follow up processes like notification, archiving and access by means of a collaborative portal.

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18. The distributed system for automatic import and publishing of electronic documents as claimed in claim 19, wherein said document import status contains information about the recipient of the notification of delivery information.

20. The distributed system for automatic import and publishing of electronic documents as claimed in claim 22, wherein said publishing process means (25) for retrieving or pulling the technical documentation for a specific delivery from the documentum repository makes use of an intermediate or a PIA (Primary Interoperability Assembly) as interface for the documents as an EDP Exporter (27).

21. The distributed system for automatic import and publishing of electronic documents as claimed in claim 1, wherein said means for notifying one or more predefined recipients of an access to stored information comprising of at least one web access application service (28).

22. The distributed system for automatic import and publishing of electronic documents as claimed in claim 21, wherein said web access application service provides a web interface for internal/external customer to access their specific delivery document for download.

23. A system for automatic import and publishing of electronic documents as claimed in claim 2, further comprising at least one computer readable memory storage medium containing one or more of computer programs for carrying out a method according claim 25 .

24. A computer program product directly loadable into the internal memory of a digital computer comprising software code portions for performing the steps of claim 25 when said product is run on a computer.

25. The distributed system for automatic import and publishing of electronic documents as claimed in claim 1, wherein the individual components of the said system are loosely coupled and run independent of each other.

26. A method for automatic import and publishing of technical documentation for a technical equipment in the form of electronic documents using a distributed system for automatic import and publishing, said system comprising a module providing publishing process services and a mail server (16) for notifying one or more predefined recipients and providing a link for access to the technical documentation for a specific delivery of technical equipment so published,

characterized by

(a) collecting electronic documents using an adapter means (24) for interfacing with an ERP system of a plurality of factories in different regions;

(b) storing information for a specific delivery of equipment to a customer in a pre-designed common template in a document library (10) for publishing process using a work sharing server (24) means;

(c) for synchronizing online data retrieved from disparate sources using an SQL adapter means (12);

(d) importing specified electronic documentation for technical documentation for a specific delivery from a defined location to a documentum repository (32) using document importer means (26); and

(e) retrieving or pulling the technical documentation for a specific delivery from the documentum repository using a publishing process means (25).

27. The method as claimed in claim 26, wherein said EDP documentum importer imports electronic documentation by a process comprising the steps of:

(a) using Metadata related to the life cycle status of a technical equipment and the document set during EDP publishing process, to control the publishing process;

(b) specifying the location of the documents to be fetched for import;

(c) specifying the failure location in case of failure in importing documents;

(d) storing specific delivery documents with GUID (global unique ID/delivery ID) as folder under root level Success Transaction Folder if the publishing process and transaction is successful otherwise in root level Failure Transaction Folder, as per EDP publishing process logic;

(e) carrying out error correction on the documents in root level Failure Transaction Folder; and

(f) importing the specified delivery documents to the EDP repository.

28. The method as claimed in claim 26, wherein said EDP documentum importer imports electronic documentation by a process comprising the steps of:

(a) interfacing using an adapter (24) provided for with interfacing with an ERP system of a plurality of factories across different regions for collection of electronic documents;

(b) storing (Step 3) information of individual company document deliveries in a pre-designed common template in the document library (10) for publishing process;

(c) synchronizing (Step. 2) online data retrieved from disparate sources;

- (d) importing (Step.1) specified electronic documentation from a defined location to the documentum repository (32);
- (e) retrieving or pulling specified documents from the documentum repository.

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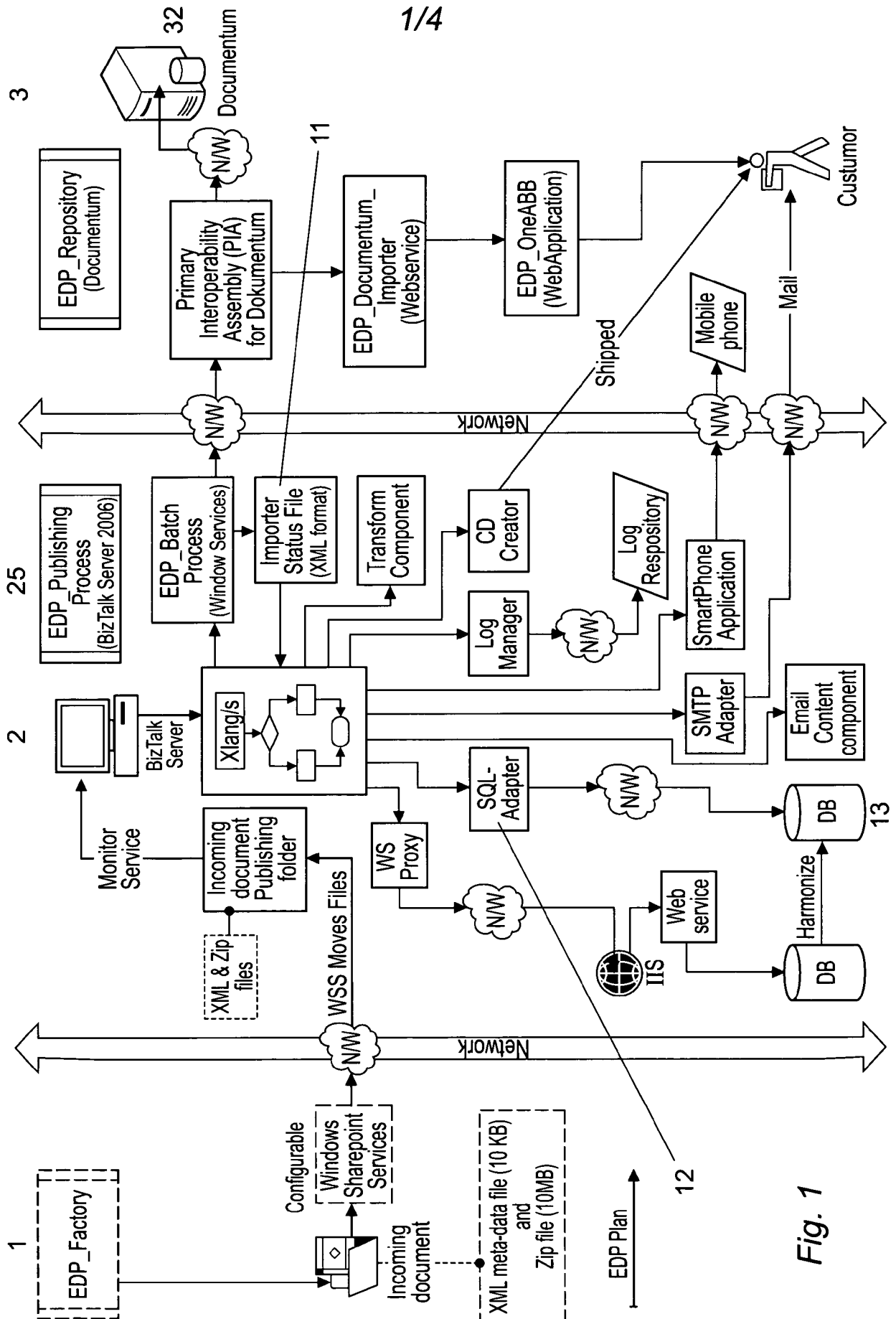


Fig. 1

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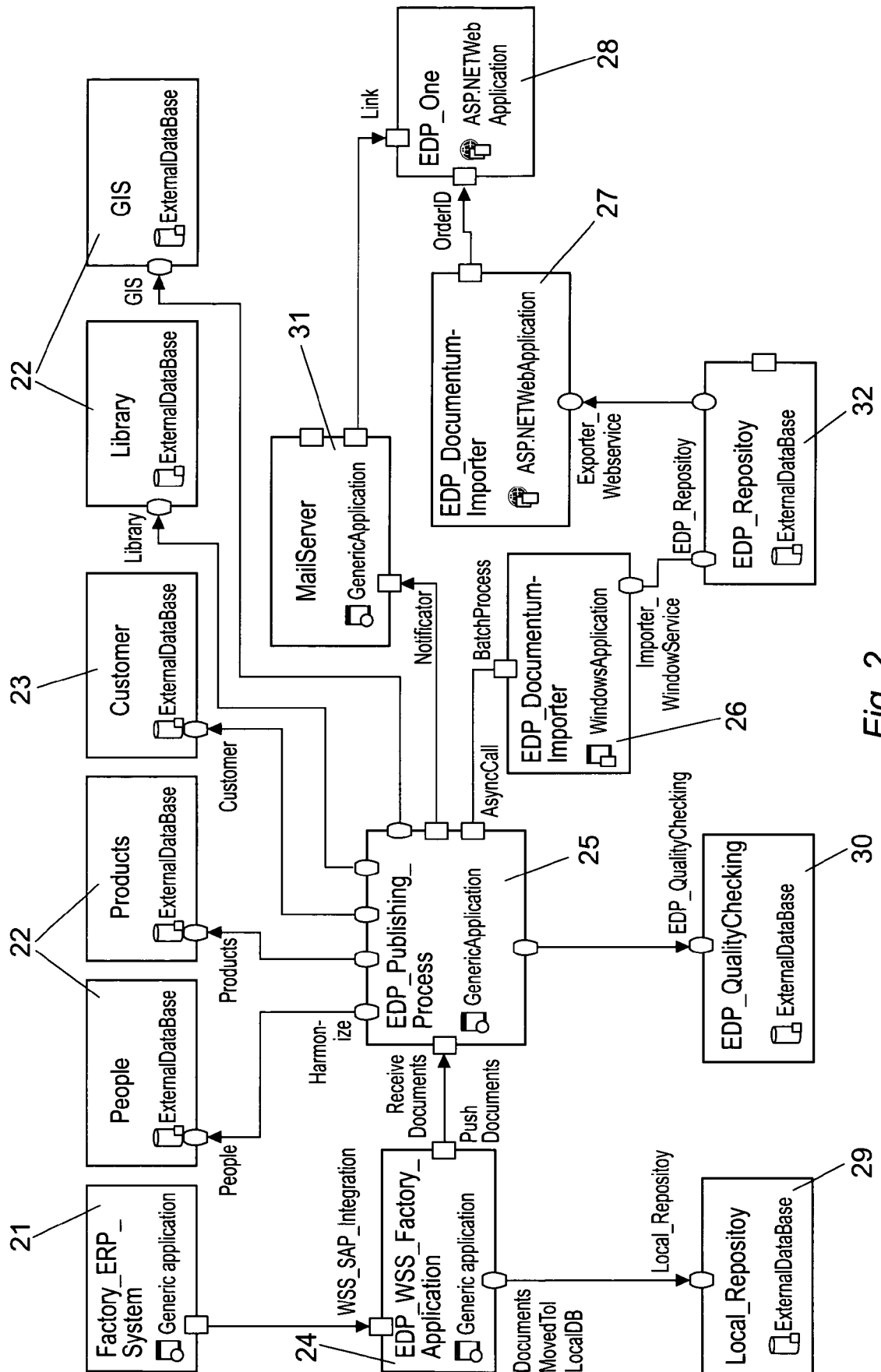


Fig. 2

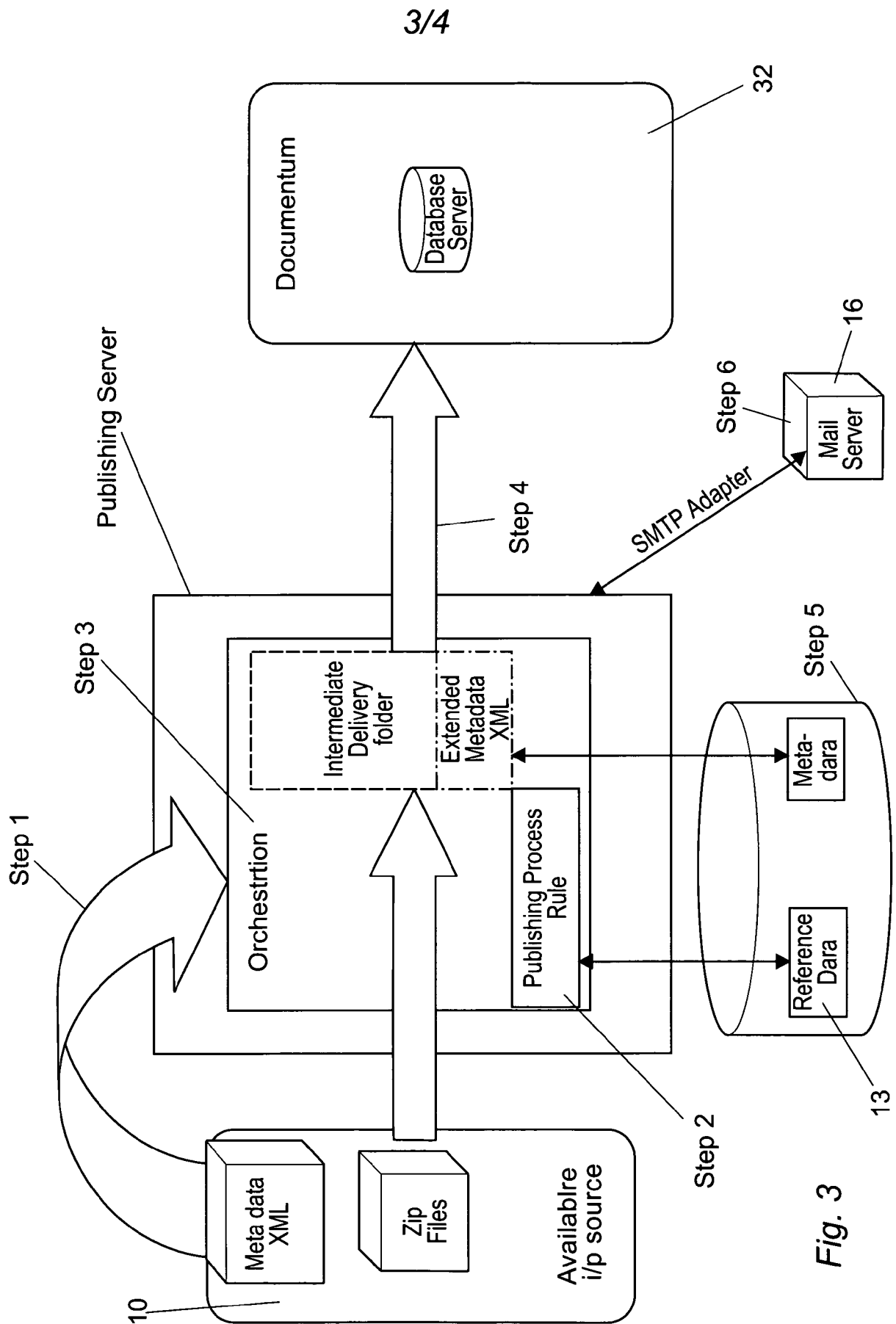


Fig. 3

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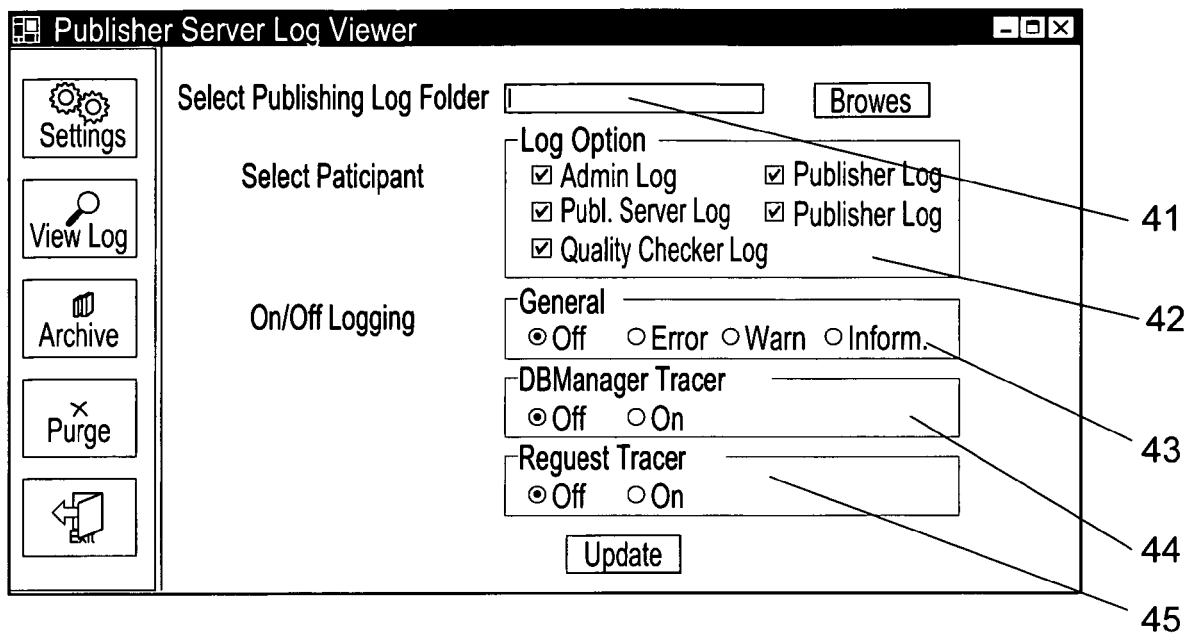


Fig. 4

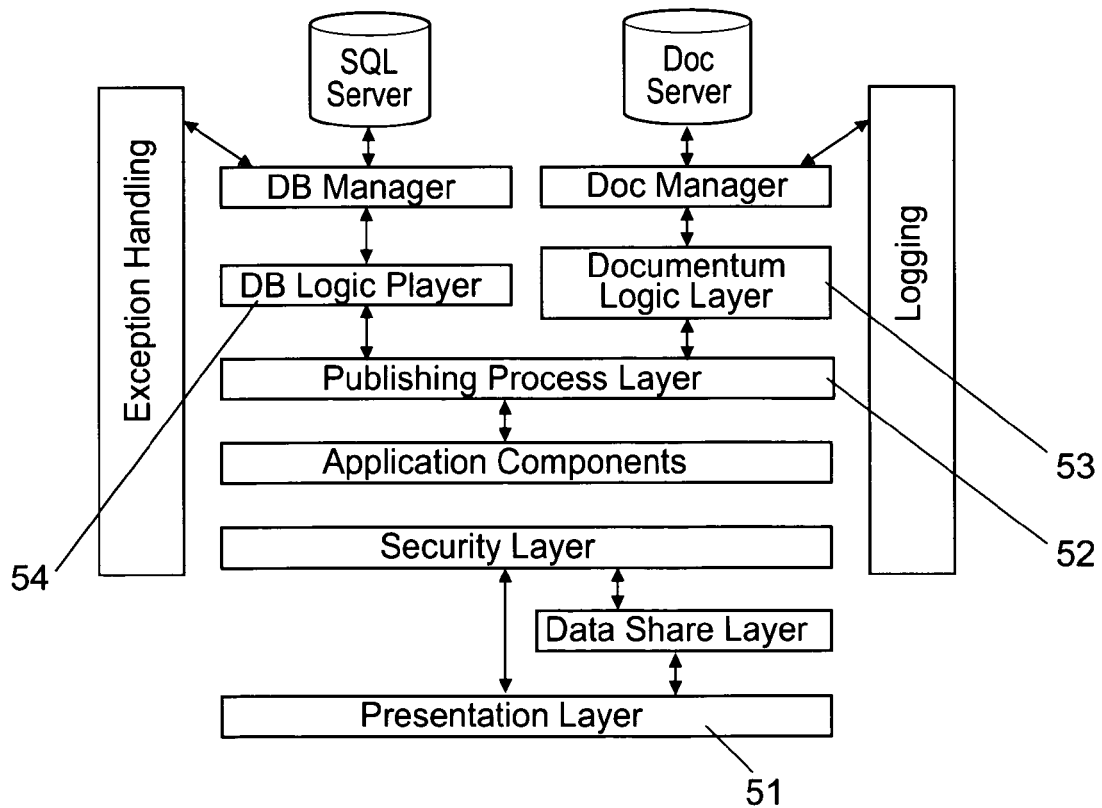


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2008/065814

A. CLASSIFICATION OF SUBJECT MATTER

INV. G06Q10/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G06F G06Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/167711 A1 (CHAKRABORTY AMIT [US] ET AL) 27 July 2006 (2006-07-27) abstract; figures 1,2a-2e,3 paragraph [0002] paragraph [0006] - paragraph [0009] paragraph [0035] paragraph [0040] - paragraph [0043] paragraph [0047] - paragraph [0052]	1-28
X	US 2008/027830 A1 (JOHNSON JERRY [US] ET AL) 31 January 2008 (2008-01-31) abstract; figures 1,2 paragraph [0003] - paragraph [0005] paragraph [0009] - paragraph [0010] ----- -/--	1-28

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

8 June 2009

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2008/065814

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/031746 A1 (TOEPFER JOHN R [US] ET AL) 9 February 2006 (2006-02-09) abstract figures 1-3 paragraph [0002] paragraph [0014] paragraph [0033] - paragraph [0038] paragraph [0115] - paragraph [0116] -----	1-28
A	US 2002/002560 A1 (SHAH SNEHANSHU [US] ET AL) 3 January 2002 (2002-01-03) abstract figures 2-5 paragraph [0003] paragraph [0012] -----	1-28
X	KARANDIKAR H ET AL: "Moving product information along the value chain: overcoming challenges of distributed organizational structure and a heterogeneous information environment" PROCEEDINGS OF THE ASME INTERNATIONAL DESIGN ENGINEERING TECHNICAL CONFERENCES AND COMPUTERS AND INFORMATION IN ENGINEERING CONFERENCE - 2006 SEPTEMBER 10 - 13, 2006, PHILADELPHIA, PENNSYLVANIA, USA, ASME, NEW YORK, NY, US, 1 January 2006 (2006-01-01), pages 549-559, XP008106863 cited in the application. the whole document -----	1-28

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2008/065814

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2006167711	A1	27-07-2006	NONE
US 2008027830	A1	31-01-2008	NONE
US 2006031746	A1	09-02-2006	NONE
US 2002002560	A1	03-01-2002	NONE