(54) Title: RANKING BACKUP FILES

FIG. 1A

(57) Abstract: Example embodiments relate to intelligently ranking backup files to dictate orderly restoration of the backup files. An example computing device disclosed herein receives metadata of a user and a set of files associated with the user. The metadata in- cludes a user identifier for the user and a file identifier for each file of the set of files. The example computing device generates a ranking of files of the user based on preset conditions of the user identifier and the file identifiers.

RANKING BACKUP FILES

BACKGROUND

[0001]   In information technology, data backup is the practice of copying and archiving of computer data so it may be used to restore the backed up computer data at a later time, such as after a data loss event.

BRIEF DESCRIPTION OF THE DRAWINGS

[0002]   The following detailed description references the drawings, wherein:

[0003]   FIG. 1A is a block diagram of a first example computing device for ranking backup files;

[0004]   FIG. 1B is a block diagram of a second example computing device for ranking backup files;

[0005]   FIG. 2 is a block diagram of a third example computing device for ranking backup files;

[0006]   FIG. 3 is a flowchart of an example method for ranking backup files;

[0007]   FIG. 4 is a schematic diagram of an example process of generating a ranking of files; and

[0008]   FIG. 5 is a schematic diagram of an example computer data backup system including a ranking backup files engine for generating a ranking of files.

DETAILED DESCRIPTION

[0009]   The amount of data that is generated, stored, calculated, and transmitted through computers and computing networks have explosively grown with the rapid expansion in the use of computers to host business applications, websites, cloud, etc. As more data is communicated, data protection has also increased in importance. An important issue in securely processing bulk data is the efficient and secure processor of backing up computer data. Computer backups generally have two distinct purposes. The primary purpose is to recover data after its loss, such as by data deletion or corruption. A second purpose is to recover data from earlier time.

[0010]   Standard approaches for computer data backup involves creating a backup copy of data by a backup application. For example, copies of computer data is stored according to a data retention policy. When data loss occurs, a copy of the data is transmitted back to the user in response to a restore command. However, this can result in significant time and bandwidth cost since the backed-up data may be large and unorganized.

[0011]   Examples disclosed herein address these technical challenges by providing for intelligently ranking backup files to dictate orderly restoration of the backup files. For example, a computing device may receive metadata of a user and a set of files associated with the user. The metadata may include a user identifier for the user and a file identifier for each file of the set of files. The computing device may generate a ranking of files of the user based on preset conditions of the user identifier and the file identifiers. In this manner, examples herein may provide a ranking of files that dictate the order of files are restored to an endpoint device when data restore is initiated.

[0012]   Referring now to the drawings, FIG. 1A depicts a first example computing device 100 for ranking backup files. Computing device 100 may be, for example, a cloud server, a local area network server, a web server, a mainframe, a mobile computing device, a notebook or desktop computer, a smart TV, a point-of-sale device, a wearable device, any other suitable electronic device, or a combination of devices, such as ones connected by a cloud or internet network, that perform the functions described herein. In the example shown in FIG. 1A, computing device 100

includes a processor 110 and a non-transitory machine-readable storage medium 120 encoded with instructions to rank backup files.

[0013]   Alternatively or in addition in some examples, computing device 100 may include a series of engines for ranking backup files. An engine as used herein may generally represent any combination of hardware and programming for implementing the functionality described below.

[0014]   Processor 110 may be one or more central processing units (CPUs), semiconductor-based microprocessors, and/or other hardware devices suitable for retrieval and execution of instructions stored in machine-readable storage medium 120. Processor 110 may fetch, decode, and execute instructions 121, 122, and/or other instructions to implement the procedures described herein. As an alternative or in addition to retrieving and executing instructions, processor 110 may include one or more electronic circuits that include electronic components for performing the functionality of one or more of instructions 121, and 122.

[0015]   In one example, the program instructions 121, 122, and/or other instructions can be part of an installation package that can be executed by processor 110 to implement the functionality described herein. In this case, memory 120 may be a portable medium such as a CD, DVD, or flash drive or a memory maintained by a computing device from which the installation package can be downloaded and installed. In another example, the program instructions may be part of an application or applications already installed on computing device 100.

[0016]   Machine-readable storage medium 120 may be any electronic, magnetic, optical, or other physical storage device that contains or stores executable data accessible to computing device 100. Thus, machine-readable storage medium 120 may be, for example, a Random Access Memory (RAM), an Electrically Erasable Programmable Read-Only Memory (EEPROM), a storage device, an optical disc, and the like. Storage medium 120 may be a non-transitory storage medium, where the term "non-transitory" does not encompass transitory propagating signals. Storage medium 120 may be located in computing device 100 and/or in another device in communication with computing device 100. As described in detail below, machine-readable storage medium 120 may be encoded with receive metadata instructions 121 and generate ranking of files instructions 122.

[0017]   Receive metadata instructions 121 may, when executed by processor 110, receive metadata of a user and a set of files associated with the user. The metadata may include a user identifier for the user and a file identifier for each file of the set of files. The metadata may have data that provides information about the user and the set of files associated with the user. The metadata may be received, for example, from an endpoint file restore engine, such as a file backup program of a client device. The metadata may be sent between the client device and computing device 100 by various methods, such as by communication through the cloud.

[0018]   The user identifier may be a title, label, number, symbol name, or other form of identification that identifies a unique user or a unique class of users. For example, the user identifier may indicate a position or title within an organization, such as a corporation. In such organizations, technology users may be organized through various roles or functions that call for different priorities and accesses to particular data and files. Accordingly, varying data backup and recovery policies may be established for classes or groups of members of the organization. In some instances, particular users may have his own policy, and thus the identifier would recognize the particular user.

[0019]   The set of files associated with the user may include various computer files for storing information of the user, which is available to a computer program. The set of files may include documents, applications, metadata, and any other type of computer files. The set of files may be the files of the user that is backed up to a durable storage. The durable storage may allow the files to be stored so that it remains available for access when the program that created the files has finished executing. The durable storage may also retain the backed up set of files in the event of failure of the user's endpoint device that created the set of files. In some examples, the durable storage may be a separate storage medium remotely connected by a network, such as a cloud. In some examples, the set of files may not be directly communicated to computing device 100. Instead, the metadata containing file identifiers for the set of files may instead be sent to computing device 100.

[0020]   The metadata received by computing device 100 may include a file identifier for each file of the set of files. In some examples, each file may have one or multiple file identifiers. A file identifier may be a label or some form of identification for a unique file or class of files. The file identifiers, in coordination with the user identifier, may be used

to intelligently rank the files as described herein. Specifically, as mentioned above, varying data backup and recovery policies may be established for classes or groups of members of the organization. The file identifiers may allow the specific policies to be established for the set of files.

[0021]   In some examples, a file identifier may include a file path, file size, file activity, file content, preconfigured policy, application specific data, or any combination thereof. For example, files located on specific paths, such as files on a desktop, may be ranked higher than files in other locations, such as a program files folder. Smaller size files may be ranked higher. Certain file types may be ranked higher than others. For example, documents and other working files may be placed above media files. Furthermore, files which have a high number of revisions in the user device in a particular time frame, such as a recent time period, may be ranked higher.

[0022]   In some examples, files may be analyzed for certain file content, such as personal identifiable information, keywords, and tags. Personal identifiable information may be any data that could potentially identify a specific individual. Keywords may include such terms as "confidential" or "priority" that may indicate importance of certain files. Tags may be associated with files and used to prioritize the files. These examples of file contents may be used to distinguish files for ranking as described herein.

[0023]   Furthermore, ranking may be influenced by preconfigured policy or rules of the files. For example, a user, such as an administrator, may define a policy regarding which files should be considered higher priority. In another example, certain application specific files may be ranked above other files. For example, an email address book may be ranked high for metadata having certain user identifiers. For example, a ranking policy for a salesperson may have a contact book at a very high ranking.

[0024]   Generate ranking of files instructions 122 may, when executed by processor 110, generate a ranking of files of the user based on present conditions of the user identifier and the file identifiers. The ranking of files may be a relative order of the set of files which may guide the orderly restoration of the files. For example, the ranking of files may dictate restoration of the set of files to a user in an order or process as indicated by the ranking. Further details of the restoration of the files is described in relation to FIG. 1B and FIG. 2.

[0025]   The ranking of files may be generated based on preset conditions of the user identifier and the file identifiers. The present conditions may in essence be a ranking policy for particular users and particular files. For example, the preset conditions may be determined by an administrator and may be based on the user identifiers and file identifiers as previously described herein.

[0026]   The operation of FIG. 1A is illustrated by FIG. 4, which depicts an example process 400 of generating a ranking of files 430. In the example illustrated, a ranking backup files engine 420 may receive metadata 410. As an example, ranking backup files engine 420 may be a combination of hardware and software executed by a computing device, such as computing device 100.

[0027]   Metadata 410 may contain a user identifier 411 and file identifiers 412A-C for file A, file B, and file C. The metadata 410 is not limited by any organization or structure. Metadata 410 may be received from a user device.

[0028]   The ranking backup files engine 420 may receive the metadata 410 and generate ranking of files 430. Ranking backup files engine 420 may perform the functionalities described in instructions 121 and 122 of computing device 100. For example, ranking backup files engine 420 may generate ranking 430 based on preset conditions of the user identifier 411 and the file identifiers 412A-C.

[0029]   FIG. 1B depicts a second example computing device 150 for ranking backup files. In the example shown in FIG. 1B, computing device 150 may include the processor 110 and non-transitory machine-readable storage medium 120 encoded with instructions 121 and 122 to rank backup files, as well as additional instructions 123 and 124. Details for the operations of instructions 121 and 122 are described above in relation to FIG. 1A.

[0030]   In response to the generation of the ranking of files, send ranking instructions 123 may, when executed by processor 110, send the ranking to an endpoint file restore engine. The endpoint file restore engine may be, for example, a file backup program of a client device. The ranking may be sent between computing device 150 and the client device by various methods, such as by communication through the cloud. As described herein below, the endpoint file restore engine may then initiate backup file restore of the set of files to the client device according to the ranking.

[0031]   Furthermore, store ranking instructions 124 may, when executed by
processor 110, store the ranking generated by generate ranking of files instructions 122
in a database that collects and stores rankings for a plurality of users. The database
may be hosted on a non-transitory storage medium. The database may be part of
computing device 150 or it may be a separate storage medium remotely connected by
a network, such as a cloud.

[0032]   FIG. 2 depicts a third example computing device 200 for ranking backup
files. Computing device 200 may be, for example, any suitable electronic device, or a
combination of devices, such as ones connected by a cloud or internet network, that
perform the functions described. In some examples, computing device 200 may be a
client device or an intermediate device between the client device and other devices.
In the example shown in FIG. 2, computing device 200 includes a processor 210 and
a non-transitory machine-readable storage medium 220 encoded with instructions to
rank backup files.

[0033]   Alternatively or in addition in some examples, computing device 200 may
include a series of engines for ranking backup files. An engine as used herein may
generally represent any combination of hardware and programming for implementing
the functionality described below.

[0034]   Processor 210 may perform the functionality of one or more of instructions
221, 222, and 223. In an example, the program instructions 221, 222, 223, and/or
other instructions can be part of an installation package that can be executed by
processor 210 to implement the functionality described herein. Machine-readable
storage medium 220 may be any electronic, magnetic, optical, or other physical storage
device that contains or stores executable data accessible to computing device 200.
Storage medium 220 may be located in computing device 200 and/or in another device
in communication with computing device 200. As described in detail below, machine-
readable storage medium 220 may be encoded with receive file restore prompt
instructions 221, retrieve ranking of files instructions 222, and initiate file restore
instructions 223.

[0035]   Receive file restore prompt instructions 221, when executed by processor
210, may receive a file restore prompt of a user. A file restore prompt may be a
computer instruction to communicate to computing device 200 to begin a file restore

procedure. A file restore prompt may originate, for example, from an endpoint device of a user. For example, a user may lose his data due to an event such as a computer crash. The user may initiate a file backup program on a device. The file backup program may send the file restore prompt to computing device 200. It should be noted that in some examples, computing device 200 is the client device, and the file backup program is hosted on the same device.

[0036]   In response to receiving the file restore prompt by file restore prompt instructions 221, retrieve ranking of files instructions 222 may retrieve a ranking of files of the user from a database. Database may include rankings generated such as by example computing devices 100 and 150 of FIG. 1A and FIG. 1B, respectively. The ranking of files may be based on preset conditions of a user identifier of the user and file identifier for each file in a set of files associated with the user.

[0037]   Initiate file restore instructions 223 may, when executed by processor 210, initiate file restore from a backup file store based on the ranking of files retrieved by the execution of retrieve ranking of files instructions 222. The execution of initiate file restore instructions 223 may cause the files of the set of files to be sent from the backup file store to the client device, which as explained previously may be computing device 200 or another device in communication with computing device 200.

[0038]   The backup file store may include the set of files. The set of files may have been previously backed up from the client device to the backup file store. The backup file store may be a non-transitory storage medium. The backup file store may be a separate storage medium remotely connected by a network, such as a cloud.

[0039]   In some examples, file restore may include retrieving, from the backup file store, files of the set of files in an order dictated by the ranking. Such an order may facilitate an efficient file restore procedure where highly ranked files, as determined by the ranking of files, may be restored first. This may allow for a shorter recovery time before a particular user may access files deemed important for the particular user.

[0040]   Furthermore, in some examples, a subset of the set of files is retrieved in the order dictated by the ranking, wherein the subset is determined by a network policy. A network policy, as used herein, may be a status, rule, or instruction that influences the file restore process. For example, the network policy may be established to control network traffic. In a heavy-traffic and/or low-bandwidth network, file restore may

delayed or deprioritized in favor of other network activity. Accordingly, a subset of the set of the files, such as the most highly-ranked files, may be retrieved.

[0041]   For example, a network policy may be dictated by a state of a network For example, in a metered connection network, such as a cellular network connection, precious network resources may be reserved for other network activity outside of backup file restore.

[0042]   FIG. 3 depicts an example method 300 for ranking backup files. Although execution of method 300 is described below with reference to the examples illustrated in FIG. 1A, 1B, and 2, other suitable devices for execution of this method should be apparent. Furthermore, the operation of FIG. 3 is illustrated by FIG. 5, which depicts an example computer data backup system 500 including a ranking backup files engine 510 for generating a ranking of files. The components of system 500 may be parts of a computing device, or be a part of a network, such as cloud, system. Method 300 may be implemented in the form of executable instructions stored on a machine-readable storage medium and/or in the form of electronic circuitry.

[0043]   In an operation 310, ranking backup files engine 510 may receive metadata of a user and of a set of files associated with the user. The metadata may originate from endpoint device 520, which may have an endpoint device memory 521 and an endpoint file restore engine 525. Endpoint device 520 may be an endpoint client device, such as a computer, mobile device, or any other computing device that may have data to be backed up. The metadata may be sent between endpoint device 520 and ranking backup files engine 510 by various methods, such as by communication through the cloud.

[0044]   As described herein, the metadata may have data that provides information about the user and the set of files associated with the user. The user identifier may be a title, label, number, symbol name, or other form of identification that identifies a unique user or a unique class of users.

[0045]   The set of files associated with the user may include various computer files for storing information of the user, which is available to a computer program. The set of files may include documents, applications, metadata, and any other type of computer files. The set of files may be the files of the user that is backed up to a backup file storage 530. The durable storage 530 may retain the backed up set of files in the event

of failure of the user's endpoint device, such as endpoint device 520 that created the set of files. In some examples, the metadata of the user and of the set of files is communicated to the ranking backup files engine 510 in response to the set of files being backed up in storage 530.

[0046]   The metadata received by ranking backup files engine 510 may also include a file identifier for each file of the set of files. In some examples, each file may have one or multiple file identifiers. A file identifier may be a label or some form of identification for a unique file or class of files. The file identifiers, in coordination with the user identifier, may be used to intelligently rank the files as described herein. For example, a file identifier may be a file path, file size, file activity, file content, preconfigured policy, application specific data, or any combination thereof.

[0047]   In an operation 320, ranking backup files engine 510 may generate a ranking of files based preset conditions of the user identifier and file identifiers. The ranking of files may be a relative order of the set of files which may guide the orderly restoration of the files as described herein with operation 360. The present conditions may in essence be a ranking policy for particular users and particular files. For example, the preset conditions may be determined by an administrator and may be based on the user identifiers and file identifiers as previously described herein.

[0048]   In an operation 330, the ranking may be stored in a database 515 that collects and stores rankings for a plurality of users. The database 515 may be hosted on a non-transitory storage medium. Database 515 may be part of ranking backup files engine 510 or it may be a separate storage medium remotely connected by a network, such as a cloud.

[0049]   In an operation 340, endpoint file restore engine 525 may receive a ranking retrieval prompt, which may communicate to storage 530 to begin a file restore procedure. A file restore prompt may originate, for example, from a data loss event of the user. For example, a user may lose his data due to an event such as a computer crash. The user may initiate a file backup program on device 520.

[0050]   In an operation 350, the ranking may be sent from database 515 to endpoint file restore engine 525. In response to receiving the ranking from database 515, endpoint file restore engine 525 may, in an operation 360, initiate file restore from backup file storage 530 based on the ranking.

[0051]   For example, endpoint file restore engine 525 may cause the files of the set of files to be sent from the backup file store 530 to the client device, which as explained previously may be computing device 520 or another device in communication with computing device 520. In other examples, the files may be sent to a new device, which may a new user device due to failure of the original client device.

[0052]   In some examples, endpoint file restore engine 525 may cause retrieving, from the backup file store, files of the set of files in an order dictated by the ranking. Such an order may facilitate an efficient file restore procedure where highly ranked files, as determined by the ranking of files, may be restored first. This may allow for a shorter recovery time before a particular user may access files deemed important for the particular user.

[0053]   The foregoing disclosure describes a number of example embodiments for generating recommended inputs for changing an outcome of a predictive model. The disclosed examples may include systems, devices, computer-readable storage media, and methods for generating recommended inputs. For purposes of explanation, certain examples are described with reference to the components illustrated in FIGS. 1-5. The functionality of the illustrated components may overlap, however, and may be present in a fewer or greater number of elements and components. All or part of the functionality of illustrated elements may co-exist or be distributed among several geographically dispersed locations. Moreover, the disclosed examples may be implemented in various environments and are not limited to the illustrated implementations.

[0054]   Further, the sequence of operations described in connection with FIGS. 1-5 are examples and are not intended to be limiting. Additional or fewer operations or combinations of operations may be used or may vary without departing from the scope of the disclosed examples. Furthermore, implementations consistent with the disclosed examples need not perform the sequence of operations in any particular order. Thus, the present disclosure merely sets forth possible examples of implementations, and many variations and modifications may be made to the described examples. All such modifications and variations are intended to be included within the scope of this disclosure and protected by the following claims.

[0055] It should further be noted that, as used in this application and the appended claims, the singular forms "a," "an," and "the" include plural elements unless the context clearly dictates otherwise.

13

CLAIMS

What is claimed is:

1.   A non-transitory machine-readable storage medium encoded with instructions executable by a processor of a computing device, the non-transitory storage medium comprising instructions to:

   receive metadata of a user and a set of files associated with the user, wherein the metadata comprises a user identifier for the user and a file identifier for each file of the set of files;

   generate a ranking of files of the user based on preset conditions of the user identifier and the file identifiers.

2.   The non-transitory machine-readable storage medium of claim 1, further comprising instructions to send the ranking to an endpoint file restore engine.

3.   The non-transitory machine-readable storage medium of claim 1, wherein the metadata comprises at least one of the following file identifiers for each file of the set of files: file path, file size, file type, file activity, file content, preconfigured policy, and application specific data.

4.   The non-transitory machine-readable storage medium of claim 3, wherein the file content comprises at least one of personal identifiable information, keywords, and tags.

5.   The non-transitory machine-readable storage medium of claim 1, further comprising instructions to store the ranking in a database comprising rankings for a plurality of users.

6.   A non-transitory machine-readable storage medium encoded with instructions executable by a processor of a computing device, the non-transitory storage medium comprising instructions to:

   receive a file restore prompt of a user;

   in response to receiving the file restore prompt, retrieve a ranking of files of

the user from a database, wherein the ranking of files is based on preset conditions of a user identifier of the user and a file identifier for each file in a set of files associated with the user;

initiate file restore from a backup file store based on the ranking, wherein the backup file store comprises the set of files.

7.   The non-transitory machine-readable storage medium of claim 6, wherein the ranking of files is based on at least one of the following file identifiers for each file of the set of files: file path, file size, file type, file activity, file content, preconfigured policy, and application specific data.

8.   The non-transitory machine-readable storage medium of claim 7, wherein the file content comprises at least one of personal identifiable information, keywords, and tags.

9.   The non-transitory machine-readable storage medium of claim 6, wherein the file restore comprises retrieving, from the backup file store, files of the set of files in an order dictated by the ranking.

10.   The non-transitory machine-readable storage medium of claim 9, wherein a subset of the set of files is retrieved in the order dictated by the ranking, wherein the subset is determined by a network policy.

11.   A method for restoring backup files, comprising:

receiving metadata of a user and a set of files associated with the user, wherein the metadata comprises a user identifier for the user and a file identifier for each file of the set of files;

generating a ranking of files of the user based on preset conditions of the user identifier and the file identifiers;

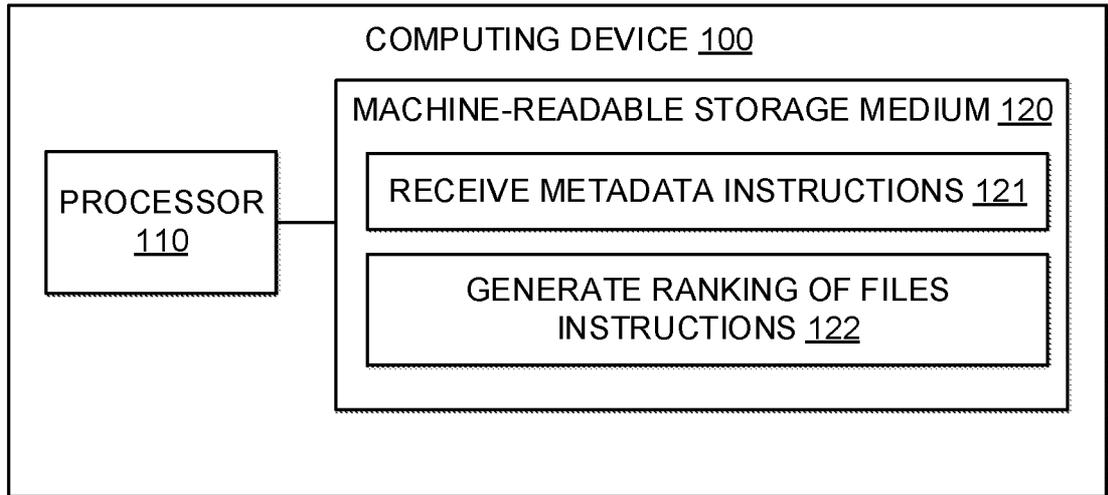receiving a ranking retrieval prompt of a user; and

in response to receiving the ranking retrieval prompt, sending the ranking to an endpoint file restore engine.

12.   The method of claim 11, further comprising storing the ranking in a database comprising rankings for a plurality of users, wherein the ranking is sent from the database to the endpoint file restore engine in response to receiving the ranking retrieval prompt.
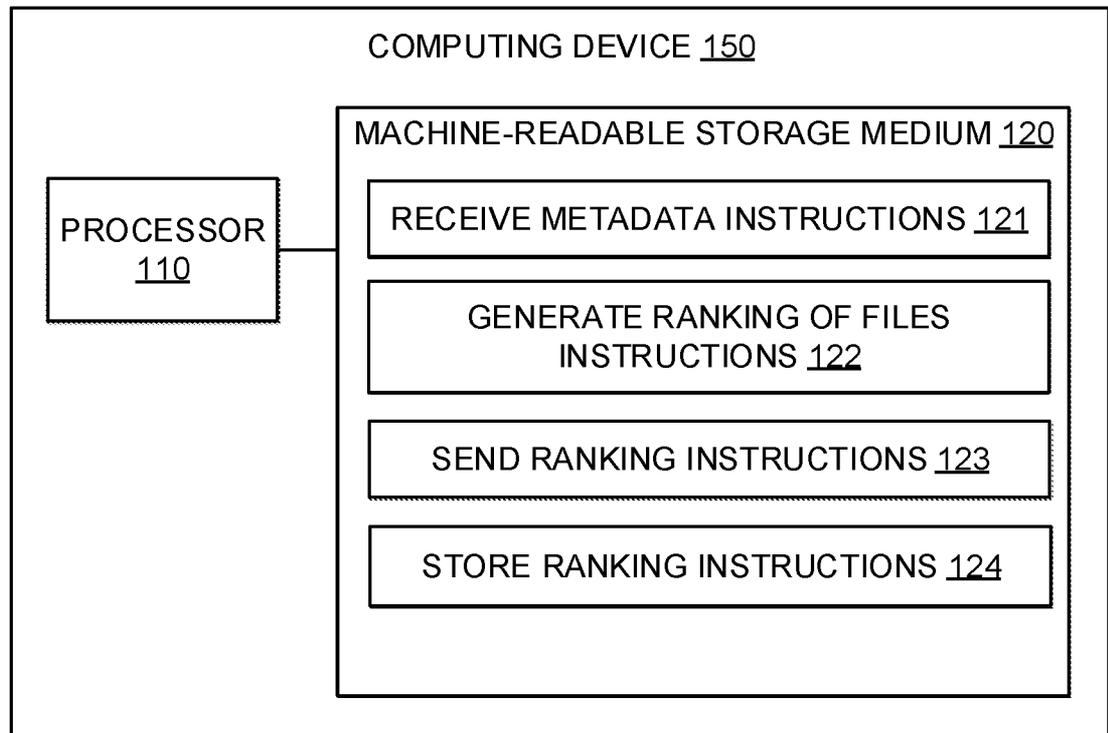
13.   The method of claim 11, further comprising causing the endpoint file restore engine to initiate file restore from a backup file store based on the ranking, wherein the backup file store comprises the set of files.

14.   The method of claim 11, wherein the metadata comprises at least one of the following file identifiers for each file of the set of files: file path, file size, file type, file activity, file content, preconfigured policy, and application specific data.

15.   The method of claim 14, wherein the file content comprises at least one of personal identifiable information, keywords, and tags.
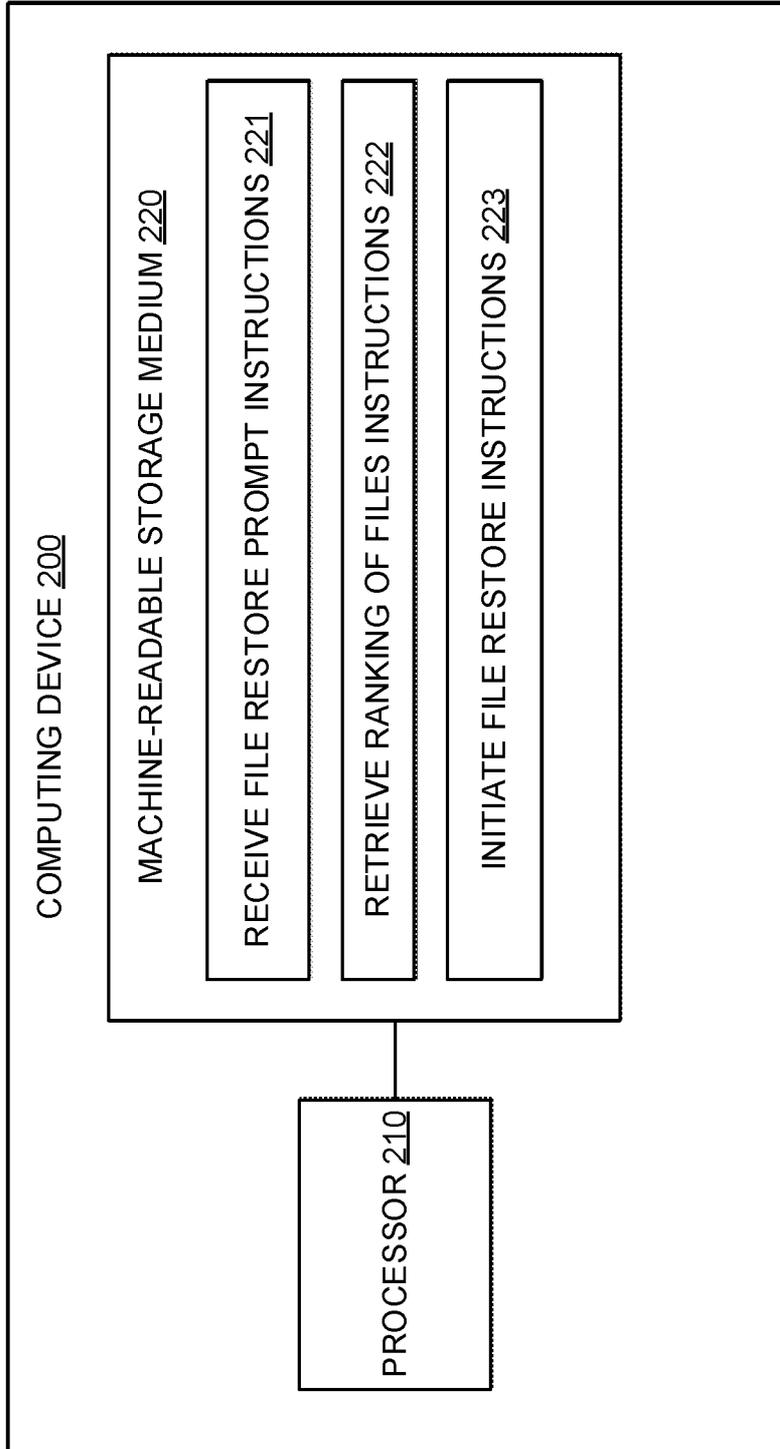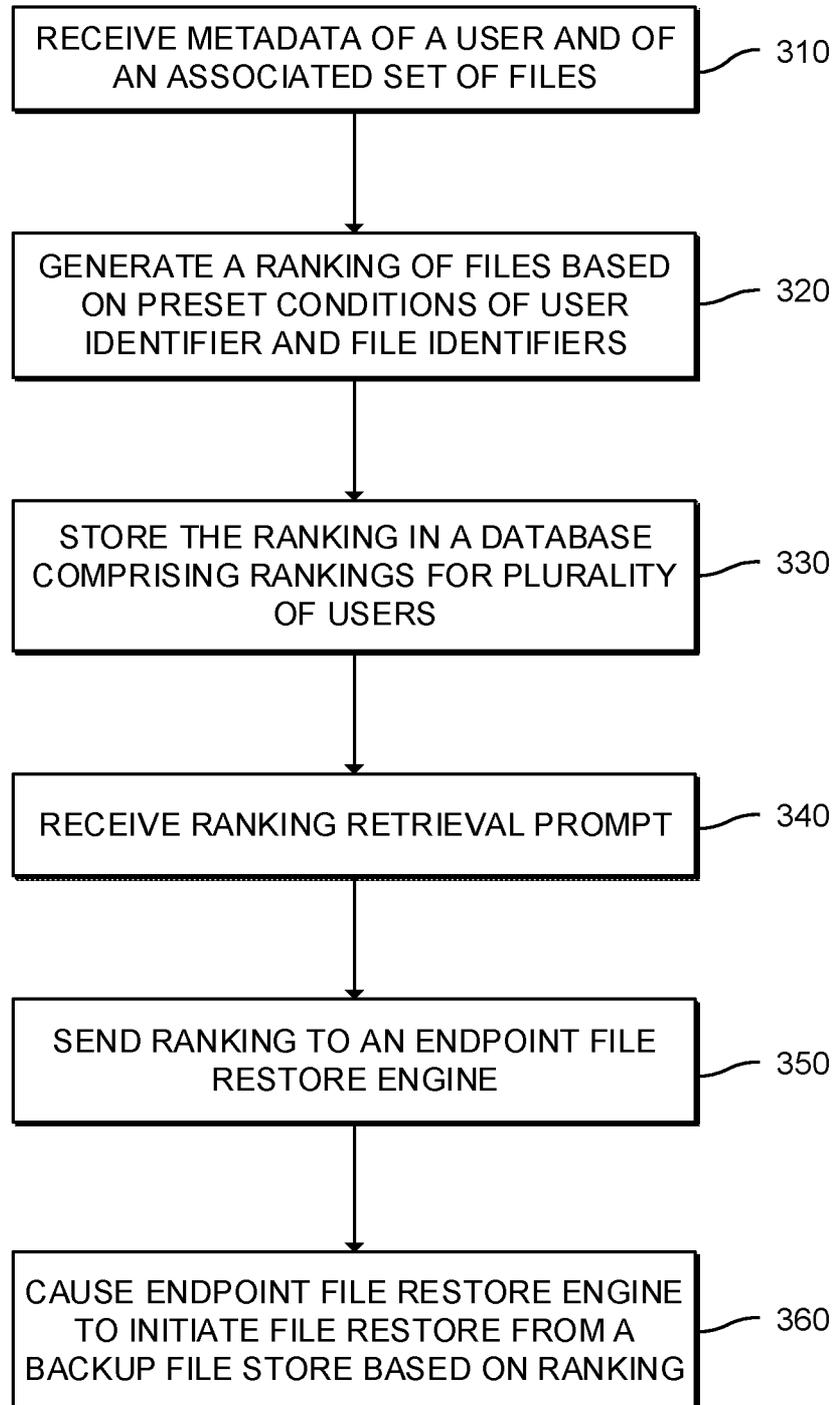
FIG. 1A

FIG. 1B

COMPUTING DEVICE 200

MACHINE-READABLE STORAGE MEDIUM 220

RECEIVE FILE RESTORE PROMPT INSTRUCTIONS 221

RETRIEVE RANKING OF FILES INSTRUCTIONS 222

INITIATE FILE RESTORE INSTRUCTIONS 223

PROCESSOR 210

FIG. 2

300

RECEIVE METADATA OF A USER AND OF AN ASSOCIATED SET OF FILES — 310

GENERATE A RANKING OF FILES BASED ON PRESET CONDITIONS OF USER IDENTIFIER AND FILE IDENTIFIERS — 320

STORE THE RANKING IN A DATABASE COMPRISING RANKINGS FOR PLURALITY OF USERS — 330

RECEIVE RANKING RETRIEVAL PROMPT — 340

SEND RANKING TO AN ENDPOINT FILE RESTORE ENGINE — 350

CAUSE ENDPOINT FILE RESTORE ENGINE TO INITIATE FILE RESTORE FROM A BACKUP FILE STORE BASED ON RANKING — 360
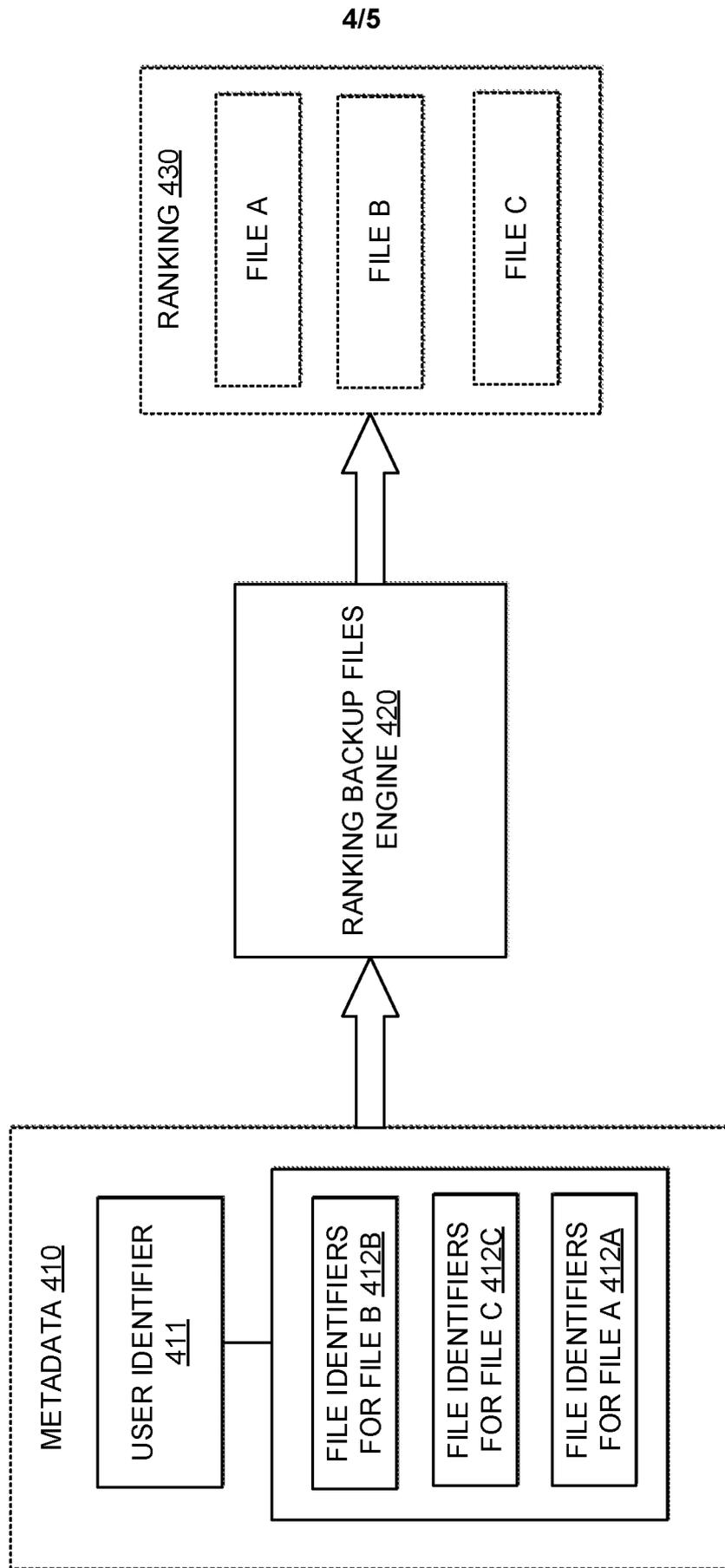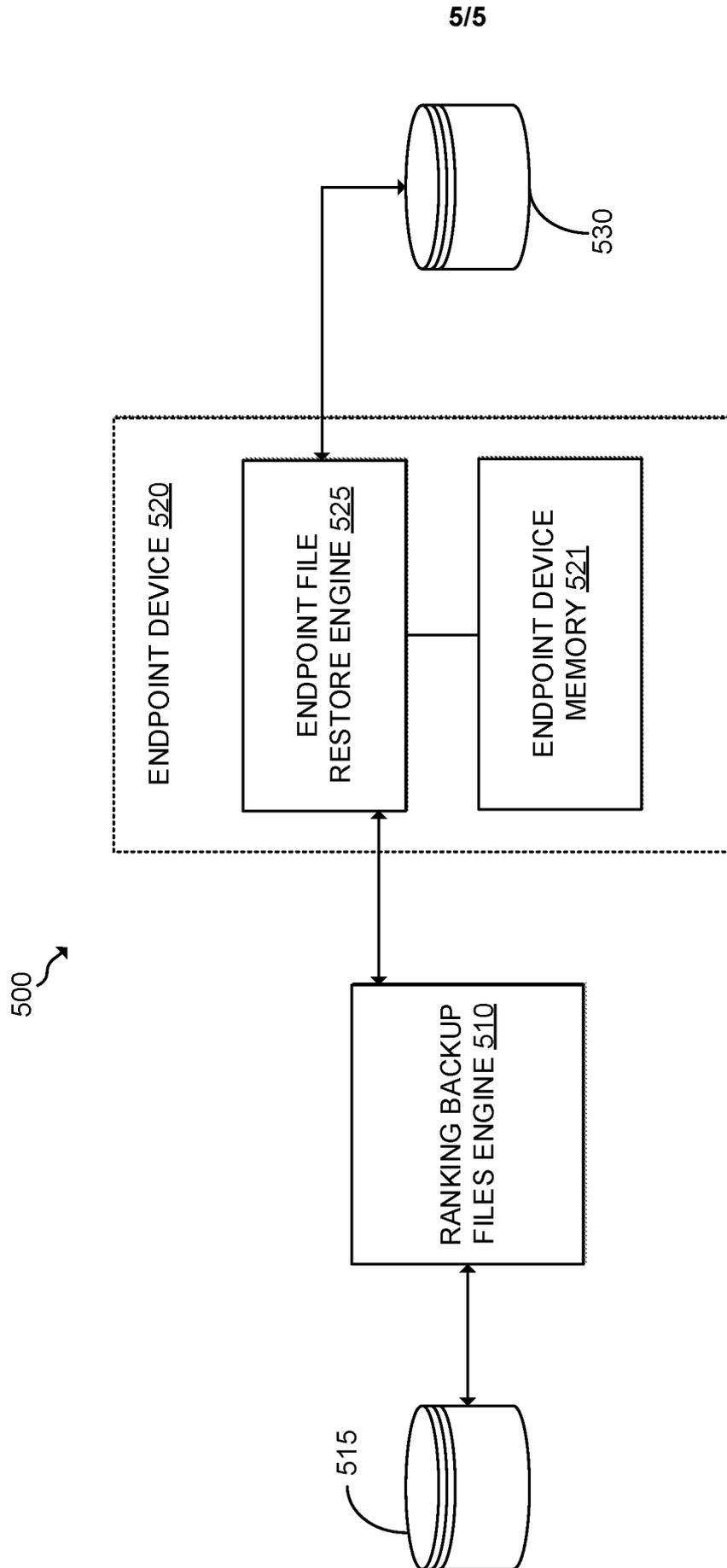
FIG. 3

FIG. 4

FIG. 5

A. CLASSIFICATION OF SUBJECT MATTER

G06F 11/14(2006.01)i, G06F 17/30(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06F 11/14; G06F 17/00; G06F 17/30; G06F 7/00; G06F 12/00; G06F 12/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: backup, restore, metadata, rank, and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2013-0159768 A1 (GAVIN BRENT MCKAY et al.) 20 June 2013 See paragraphs [0030]-[0034] and [0038]; and figure 1.	1-15
Y	US 2003-0046313 A1 (ALBERT LEUNG et al.) 06 March 2003 See paragraphs [0025]-[0026].	1-15
Y	US 2012-0310896 A1 (GORDON J. FREEDMAN et al.) 06 December 2012 See paragraphs [0084]-[0085].	10
A	US 2012-0084261 A1 (NITIN PARAB) 05 April 2012 See paragraphs [0035]-[0045] and figure 3.	1-15
A	US 8,127,095 B1 (JOHN COLGROVE et al.) 28 February 2012 See column 33, line 24 - column 37, line 17; and figures 14A-15.	1-15

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

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 September 2016 (12.09.2016)	**12 September 2016 (12.09.2016)**

Name and mailing address of the ISA/KR	Authorized officer
International Application Division Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea	LEE, EUN KYU
Facsimile No. +82-42-481-8578	Telephone No. +82-42-481-3580

Form PCT/ISA/210 (second sheet) (January 2015)

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2013-0159768 A1	20/06/2013	AU 2012-209047 A1	21/02/2013
US 2003-0046313 A1	06/03/2003	CA 2458416 A1 EP 1421522 A1 JP 2005-503616 A WO 03-025795 A1	27/03/2003 26/05/2004 03/02/2005 27/03/2003
US 2012-0310896 A1	06/12/2012	US 2012-0310894 A1 US 2015-0254137 A1 US 9317369 B2	06/12/2012 10/09/2015 19/04/2016
US 2012-0084261 A1	05/04/2012	None	
US 8127095 B1	28/02/2012	None	