



(51) International Patent Classification:

G06F 17/40 (2006.01) *G06F 15/16* (2006.01)
G06F 17/30 (2006.01)

(21) International Application Number:

PCT/US2016/024214

(22) International Filing Date:

25 March 2016 (25.03.2016)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

14/674,681 31 March 2015 (31.03.2015) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

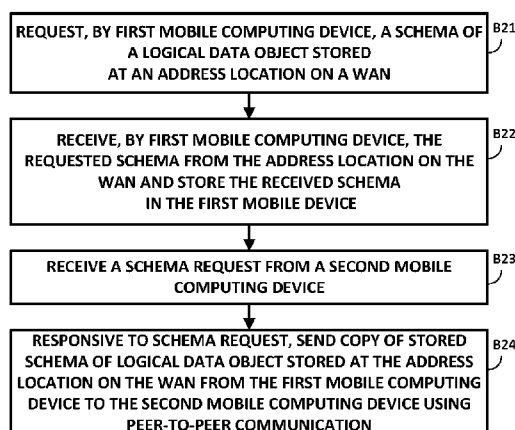
- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

Published:

- with international search report (Art. 21(3))

(54) Title: SYNCING WITH A LOCAL PAIRED DEVICE TO OBTAIN DATA FROM A REMOTE SERVER USING POINT-TO-POINT COMMUNICATION

FIG. 2



(57) Abstract: A computer-implemented method may comprise requesting, by a first mobile computing device, a logical data object stored at an address location on a wide area network (WAN); receiving, by the first mobile computing device, the requested logical data object from the address location on the WAN and storing the received logical data object in the first mobile computing device. A logical data object request may then be received from a second mobile computing device. Responsive to the logical data object request, a copy of the stored logical data object of the logical data object stored at the address location on the WAN may be sent from the first mobile computing device to the second mobile computing device using a peer-to-peer communication protocol. The sent copy of the stored logical data object may be devoid of data or data files referred to by the stored logical data object.

SYNCING WITH A LOCAL PAIRED DEVICE TO OBTAIN DATA FROM A REMOTE SERVER USING POINT-TO-POINT COMMUNICATION

BACKGROUND

[0001] Downloading the contents and/or structure of a database or other logical data object to a tablet, phone or other mobile computing device from a remote server over a wide area network (WAN) can be a lengthy and bandwidth-intensive task. Moreover, there are times in which it may be desired to transfer or replicate data from one device to another device. However, downloading permissions, authentication information, schema and data from a remote server over a WAN can be burdensome, in terms of computational resources, time and bandwidth.

BRIEF DESCRIPTION OF THE DRAWINGS

[0002] Fig. 1 is a block diagram of a method, devices and systems according to one embodiment.

[0003] Fig. 2 is a flowchart of a method according to one embodiment.

[0004] Fig. 3 is a flowchart of a method according to one embodiment.

[0005] Fig. 4 is a block diagram of a device configured according to one embodiment.

DETAILED DESCRIPTION

[0006] Fig. 1 is a block diagram of a method, devices and systems according to one embodiment. As shown therein, reference numeral 102 denotes a data storage device coupled to a WAN 106 including, for example, the Internet. The data storage device 102 may comprise, for example, a network attached storage (NAS), a storage area network (SAN), a server or other computing device at an

address location on the WAN 106. The data storage device 102 may store, for example, a database 104, a configuration file, an XML file or any other logical data structure. For example, the database may comprise a collection of pictures and videos of a user of a mobile computing device or may comprise, for example, a Customer Relationship Management (CRM) database, in the case in which an embodiment is deployed in the enterprise arena. Herein, for brevity and simplicity's sake, reference will be made below to a "database" as an exemplary logical data structure, it being understood that the term "database" is expressly intended herein to encompass any form of such logical data structures. A mobile or other computing device 110 may be coupled to a local area network (LAN) 108, as may be mobile or other computing device 112. Mobile computing devices 110, 112 may be coupled to the LAN 108 as well as to the WAN 106.

[0007] According to one embodiment, one of the mobile computing devices, such as mobile computing device 110, may store a complete copy of the database 104, a partial copy thereof or may only store the schema of the database 104. The schema of the database 104 stored by the mobile computing device 110, for example, may include the logical organization (e.g., file structure) of the database 104, as well as references (e.g., fully qualified paths) to the data, files and other logical data constructs stored in the database 104. There may be instances in which a second mobile computing device, such as shown at 112 in Fig. 1, wishes to obtain or access the database 104. Such may be the case when mobile computing device 112 is a new mobile computing device or is newly issued to the user. Such may also be the case when mobile computing device simply has not previously accessed the database 104.

[0008] One embodiment enables a peer-to-peer, point-to-point or

otherwise direct transfer of database or other logical data structure from a first mobile computing device such as mobile computing device 110 to a second mobile such as mobile computing device 112 within the LAN 108. Indeed, after proper authentication and/or permissions (if any) are established, such a transfer may be carried out over the LAN 108, at LAN speeds or may be carried out using a peer-to-peer, point-to-point or other fast communication protocol. Herein, it is assumed that data transfers may be carried out faster between mobile devices 110 and 112 and with less latency than is typical over the WAN 106.

[0009] According to one embodiment, the mobile computing devices 110, 112 may be paired, so as to establish authentication, trust and/or permission and data such as a database schema may be carried out from one of the mobile computing device 110, 112 to the other of the mobile computing devices 112 using a peer-to-peer communication protocol, without involvement of a device outside of the LAN 108. According to one embodiment, such peer-to-peer communication may be effectuated or facilitated by any of a number of, for example, short distance data transfer protocols, such as Bluetooth, Near Field Communication (NFC) and the like. According to one embodiment, the database schema that is transferred between the mobile computing devices 110, 112 may only comprise the schema itself; namely the logical structure of the database and references to the files or other data structures contained therein, to the exclusion of the database data or database files themselves. Thereafter, when the user of the mobile computing device having received the database schema, shown at 114 in Fig. 1, wishes to access the data referred to by the just-received database schema 114, access thereto may be requested and obtained from the mobile computing device from which it received the database schema, if this mobile computing device has the data, is still present and accessible within the same LAN

108 or is still coupled to the requesting computing device using the peer-to-peer communication protocol. Alternatively, access the data referred to by the just-received database schema 114 may be requested and obtained from a remote location on the WAN 106, such as from NAS 102.

[0010] According to one embodiment, a mobile computing device such as shown at 110 in Fig. 1 may request, over its network interface, logical data object from an address location on the WAN 106. According to one embodiment, the logical data object may comprise a schema such as, for example, a schema of a database. For example, mobile computing device 110 may request a selected database or other schema from a NAS 102 on the WAN 106. The NAS 102 may then transfer, and the mobile computing device 110 may receive, the requested schema. The received schema may then be stored by and within the mobile device 110. Full or partial contents of the database 104 may also be requested, transferred to and stored by the mobile computing device 110. The database schema received and stored by the mobile computing device 110 may also comprise the address of the NAS 102 and references (e.g., paths and/or pointers) to the data, files or other logical data constructs stored or referred to by the database 104. For example, the schema of database 104 may be transferred upon request to the mobile computing device 110, whereupon the data, files and other logical data constructs contained or referred to by the database 104 may thereafter be transferred to the mobile computing device 110 in the background or on demand. Herein, reference is made to “schema”, although it is to be understood that the term may be replaced by the more generic phrase “logical data object”. Also, repeated reference is made herein to “mobile” computing devices. However, it is to be understood that embodiments may be implemented with most any computing devices, whether mobile or not.

[0011] Another mobile computing device, say mobile computing device 112 on LAN 108, may desire to access the database 104. Mobile computing device 110 could request and gain access to the database 104, provided sufficient credentials are presented, by accessing the NAS 102 over the WAN 106. Such request and access may, however, be quite slow, as being carried out over a potentially slow, unreliable public network. However, rather than accessing the database 104 over the WAN 106, according to one embodiment, mobile computing device 112 may, as shown at (1) in Fig. 1, send a message to mobile computing device 110, requesting the schema of the database 104 from it, instead of from the NAS 102. Such a schema request may be made to the mobile computing device 110 upon discovery thereof on the LAN 108, upon pairing therewith in a peer-to-peer manner through the mutual exchange of authentication, trust and permission information and upon determining that the mobile computing device 110, in fact, stores a copy of the database schema. Any of a number of discovery protocols may be employed to determine the presence of an eligible mobile computing device on the LAN 108 from which the database schema may be requested. Examples of such discovery protocols include Bluetooth Service Discovery Protocol (SDP), DNS Service Discovery (DNS-SD), Dynamic Host Configuration Protocol (DHCP), Internet Storage Name Service (iSNS), Jini for Java objects, Service Location Protocol (SLP); Session Announcement Protocol (SAP) used to discover RTP sessions; Simple Service Discovery Protocol (SSDP) a component of Universal Plug and Play (UPnP); Universal Description Discovery and Integration (UDDI) for web services; Web Proxy Autodiscovery Protocol (WPAD); WS-Discovery (Web Services Dynamic Discovery); XMPP Service Discovery (XEP-0030) or \XRDS (eXtensible Resource Descriptor Sequence), to name but a few possibilities.

[0012] Responsive to the schema request from mobile computing device

112, mobile computing device 110 may retrieve the requested schema from its local storage and may send a copy thereof to requesting mobile computing device 112, as suggested at (2) in Fig. 1. This schema may be transferred from mobile computing device 110 to mobile computing device 112 using peer-to-peer communications, at speeds characteristic of point-to-point communications, which may be higher than communications over the WAN 106. The mobile computing device 112, having received the requested database schema 114 from mobile communication device 110, may store the received schema in its memory or in a local, readily-accessible memory.

[0013] At this stage, according to one embodiment, mobile computing device 112 stores a copy of the schema of the database 104. Therefore, mobile computing device 112 has full access to the structure of the database 104, but not to the data contained or referred to therein. For example, mobile device 112 does not yet store any of the files or other data contained or referred to by the received schema of database 104. According to one embodiment, mobile computing device 112 may then request one or more selected files or other logical data constructs referred to in the schema from mobile device 110, if mobile device 110 is still in peer-to-peer communication with mobile device 112 or otherwise accessible to the mobile computing device 112, such as over LAN 108. If mobile computing device 110 is indeed still in peer-to-peer communication with the mobile computing device 112 or can re-establish such communication, it may respond to such request and provide the requested file, data or other logical data structure to the mobile computing device 112, provided that mobile computing device 110 actually stores the requested data, file(s) or other logical data structure(s). Such transfer of data from mobile computing device 110 to mobile device 112 may be effectuated using a peer-to-peer communication protocol, and may take place entirely within LAN 108.

[0014] If, however, mobile device 110 is no longer reachable on the LAN 108 or, in fact, does not store a local copy of the requested data, file(s) or other logical data structure(s), mobile computing device 112 may request the same from remote computing device 102, over the WAN 106. This request is shown in Fig. 1 at (3). The remote computing device 102 (a NAS in the example being developed herewith) may then access the requested data, file(s) and/or other logical data structure stored in database 104 and provide the same to mobile computing device 112, as shown at (4) in Fig. 1, provided that mobile computing device possesses the requisite permissions and/or other credentials to access such data. The data so received from the NAS 102 may then be stored in accordance with the schema in a memory local or accessible to mobile computing device 112.

[0015] According to one embodiment, the schema provided to mobile computing device 112 by mobile computing device 110 may be periodically updated. Such an update may originate from the NAS 102 when the mobile computing device 112 connects thereto over the WAN 106. However, according to one embodiment, the schema stored by mobile device 112 may be updated by another mobile computing device in communication therewith. For example, the schema stored in mobile computing device 112 may be updated by mobile computing device 110 if the schema stored by mobile computing device 110 is more recent than the schema stored by mobile computing device 112. Alternatively, the schema stored in mobile computing device 110 may be updated by mobile computing device 112 if the schema stored by mobile computing device 112 is more recent than the schema stored by mobile computing device 110, thereby reversing the schema and data provider and the schema and data requester roles previously established. This updating may be carried out asynchronously or at scheduled, regular intervals. In this manner, the

schema stored by mobile computing device 112 may be kept synchronized with the schema stored by NAS 102 and/or the schema stored by mobile computing device 110. A publish-subscribe model may be implemented to disseminate changes to selected computing devices within the LAN or coupled to the WAN 106. Alternatively, changes may be propagated when a point-to-point connection between mobile computing devices is established. Other messaging schemes may be implemented.

[0016] There may be instances in which the computational horsepower or accessible bandwidth of one computing device far eclipses that of another computing device. In that case, the more capable mobile computing device may, after conferring exchanging suitable information with the other mobile computing device, take on the responsibility of requesting an updated schema and/or data from the (for example) NAS 102 over the WAN. Having obtained such updated schema and/or data, the more capable mobile computing device may then transfer the obtained schema and/or data to its comparatively less capable conferee, using peer-to-peer communication.

[0017] To determine which of two schemas is the newest, when a schema is requested or sent from one mobile computing device to another on the LAN 108, schema request and/or the schema itself may comprise a timestamp, which indicates when the schema was last modified. For example, when a copy of a schema is requested from another mobile computing device, the recipient of the request may not send the requested schema if its own copy of the schema is older than the copy thereof on the requesting mobile computing device. Similarly, if a mobile computing device is sent (whether requested or not) a schema, it may not replace its currently-stored schema with the just-received copy thereof if the timestamp of the received schema is older than the timestamp of the schema it has stored locally.

[0018] According to one embodiment, the second mobile computing device 112 may send, and the mobile computing device 110 may receive access rights along the schema request. The access rights may comprise authentication information, trust information, authority information and/or any other information or credentials that are effective to define the rights of the schema requestor. Responsive thereto, the recipient of the access rights and schema request may send only that portion of the schema that is compatible with the access rights received. That may be the entire schema, a portion thereof or no part of the schema.

[0019] Fig. 2 is a flowchart of a method according to one embodiment. As shown therein, block B21 calls for requesting, by a first mobile computing device (such as 110 in Fig. 1), a schema 114 of a logical data object (database, files, XML objects, etc.) stored at an address location, such as the address of the NAS 102 on a WAN 106. The mobile computing device 110 may then receive the requested schema from the address location on the WAN 106 and may store the received schema in the first mobile computing device 110, as shown at B22 in Fig. 2. The first mobile computing device 110, as shown at B23, may then receive a schema request from a second mobile computing device, such as mobile computing device 112 in Fig. 1. Thereafter, responsive to the schema request, the first mobile computing device 110, as shown at B24, may then send a copy of the stored schema of the logical data object stored at the address location on the WAN from the first mobile computing device 110 to the second mobile computing device 112 using peer-to-peer or other point-to-point communication. According to one embodiment, the copy of the stored schema sent to the second mobile computing device 112 is devoid of (i. e., does not comprise) data or data files referred to by the stored schema. According to one embodiment, the copy of the stored schema sent to the second mobile computing device 112 may contain

some or all of the data referred to by the stored schema

[0020] Whereas Fig. 2 shows aspects of a method according to one embodiment, from the point of view of a recipient of a schema request, Fig. 3 shows aspects of a computer-implemented method according to one embodiment, from the point of view of a mobile computing device making the schema request and receiving the requested schema. Block B31 calls for using peer-to-peer or other point-to-point communication, sending a request for a schema from a first mobile computing device such as 112 in Fig. 1, to a second mobile computing device such as shown at 110 in Fig. 1. The requested schema, according to one embodiment, may be or comprise a schema of a logical data object stored (e.g., database or other data construct) at a remote address location on a wide area network (WAN). As shown at B32, the mobile computing device 112 may then receive a copy of the requested schema from the second mobile computing device 110 using a peer-to-peer communication method and may then store the received copy of the schema in the first mobile computing device 112 or in a location accessible to the first mobile computing device 112. According to one embodiment, after having received the copy of the schema from the second mobile computing device 110, the first mobile computing device 112 may then request data referred to in the stored schema either from the first mobile device 110 (the sender of the schema) or from an address location on the WAN specified in the stored schema, as shown at B33. Block B33 may be carried out immediately after block B32 or long thereafter, when one or more files or other data constructs referred to by the schema are required. Block B34 then calls for receiving the requested data from the mobile computing device 110 or the address location on the WAN (e.g., a NAS or other server on the WAN) and storing the received data in the first mobile computing device in accordance with the received and stored schema (e.g., in an

appropriate place within the file structure defined by the received schema). The received and stored schema, according to one embodiment, may be devoid of data or data files referred to by the received schema.

[0021] In another illustrative implementation, some organizations have many computing devices that are coupled to LAN having a single shared WAN connection such as, for example, libraries or schools. It is not uncommon for such a shared WAN connection to be sub-par (low bandwidth), as is common in rural areas or other areas of the world. In such an environment, a user of one of the computing devices on the LAN may access a search engine homepage. Responsive thereto, the search server may download many files (images, stylesheets, javascript files and the like) to the user's computing device. These downloaded files, however, are the same for all users of this search engine. Rather than each computing device requesting the same files from the search engine server over the WAN, these files may be requested from the single computing device within the LAN. The single computing device from which the files were requested may then serve up these files on demand to the requesting computing devices utilizing intra-LAN communication or a peer-to-peer communication channel. In this manner, rather than each computing device requesting the same files from the slow WAN connection, these devices may, instead requested them from a local computing device utilizing the LAN or a peer-to-peer communication channel to fetch the data instead of using up the limited bandwidth on the WAN connection.

[0022] As another example, a first computing device may check the weather forecast. Another nearby second computing device may also check the same weather forecast. However, rather than requesting the same data from the weather forecast server, such weather data may be requested from the first computing device

who already has the desired forecast stored. In this manner, the weather forecast server endpoint need not again be accessed by the second another computing device that is nearby the first computing device. Other implementations and applications may occur to those of skill in this art.

[0023] Figure 4 illustrates a block diagram of a computing device 400 with which an embodiment may be implemented. Computing device 400 may comprise, for example, a NAS, a SAN, a host, server and/or other electronic devices. Computing device 400 may comprise a bus 401 or other communication mechanism for communicating information, and a processor 402 coupled with bus 401 for processing information. The processor may be configured to carry out the functionality shown and described relative to Figs. 1, 2 and 3. Computing device 400 may further comprise a random access memory (RAM) 404 or other dynamic storage device 404 (referred to as main memory), coupled to bus 401 for storing information and instructions to be executed by processor 402. Main memory 404 also may be used for storing temporary variables or other intermediate information during execution of instructions by processor 402. Computing device 400 may also comprise a read only memory (ROM) and/or other static storage device 406 coupled to bus 401 for storing static information and instructions for processor 402. A data storage device 407, such as a magnetic, solid state and/or optical disk, may be coupled to bus 401 for storing information and instructions. A network interface device 408, such as a modem or network (such as Ethernet, for example) card may also be coupled to the bus 401 to provide access to a network, such as shown at 106 and 108 in Fig. 1.

[0024] The computing device 400 may also be coupled via bus 401 to a display device 421 for displaying information to a computer user. Other user interface mechanisms may be provided, as shown at 422 and 423 for communicating direction

information and command selections to processor 402. One embodiment is related to the use of a computing device 400 configured for providing and/or receiving a schema object over a LAN, as shown and as described herein. According to one embodiment, the processing described herein may be carried out by one or more computing devices 400 in response to processor(s) 402 executing sequences of instructions contained in memory 404. Such instructions may be read into memory 404 from another computer-readable and non-transitory medium, such as data storage device 407 and/or from a remotely located server. Execution of the sequences of instructions contained in memory 404 may causes processor(s) 402 to implement the methods and functionality described above. In alternative embodiments, hard-wired circuitry may be used in place of or in combination with software instructions to implement an embodiment. Thus, the described embodiments are not limited to any specific combination of hardware circuitry and software.

[0025] The functionality and structures shown and described relative to Figs. 1-4 enable a peer-to-peer or point-to-point transfer that allows a user to access a remote database or other data construct quickly and without necessarily downloading a full copy thereof. Device configuration and preferences may be transferred at peer-to-peer speeds, thereby enabling a user to synchronize a new or other device with an existing device more quickly than was previously possible. Significantly, faster transfer of data from one device to another device are made possible, without accessing the WAN (e.g., the Internet). Moreover, in addition of direct, point-to-point transfers of schemas from one device to another, embodiments enable transfers of permissions and/or other credentials to access, for example, a remote database from one device to another device using, for example, a point-to-point or peer-to-peer communication protocol.

[0026] While certain embodiments of the disclosure have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the disclosure. Indeed, the novel methods, devices and systems described herein may be embodied in a variety of other forms. Furthermore, various omissions, substitutions and changes in the form of the methods and systems described herein may be made without departing from the spirit of the disclosure. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the disclosure. For example, those skilled in the art will appreciate that in various embodiments, the actual physical and logical structures may differ from those shown in the figures. Depending on the embodiment, certain steps described in the example above may be removed, others may be added. Also, the features and attributes of the specific embodiments disclosed above may be combined in different ways to form additional embodiments, all of which fall within the scope of the present disclosure. Although the present disclosure provides certain preferred embodiments and applications, other embodiments that are apparent to those of ordinary skill in the art, including embodiments which do not provide all of the features and advantages set forth herein, are also within the scope of this disclosure. Accordingly, the scope of the present disclosure is intended to be defined only by reference to the appended claims.

CLAIMS:

1. A computing device, comprising:
 - memory;
 - a network interface configured to couple to a local area network (LAN) and to a wide area network (WAN);
 - a processor coupled to the memory and to the network interface, the processor being configured to:
 - request, over the network interface, a logical data object from an address location on the WAN;
 - receive the requested logical data object from the address location on the WAN and storing the received logical data object in the memory of The computing device;
 - receive a logical data object request from an other computing device;
 - and
 - responsive to the logical data object request, send a copy of the stored logical data object stored on the WAN from The computing device to the other computing device using peer-to-peer communication.
2. The computing device of claim 1, wherein the logical data object comprises a schema of the logical data object stored on a remote device at the address location on the WAN.
3. The computing device of claim 2, wherein the remote device comprises a Network Attached Storage (NAS).

4. The computing device of claim 2, wherein the processor is further configured to maintain the stored logical data object synchronized with the logical data object stored on the remote device at the address location on the WAN.

5. The computing device of claim 1, wherein the logical data object comprises a database.

6. The computing device of claim 1, wherein the received logical data object request comprises a timestamp of a logical data object stored in the other computing device and wherein the processor is further configured to send the copy of the stored logical data object to the other computing device only if the timestamp in the logical data object request is later in time than the timestamp of the received and stored logical data object.

7. The computing device of claim 1, wherein the received logical data object request comprises access rights and wherein processor is further configured to send to the other computing device only that portion of the stored logical data object that is compatible with the received access rights.

8. The computing device of claim 1, wherein the processor is configured to only send the stored logical data object and not data or files referred to in the stored logical data object.

9. A computing device, comprising:

memory;

a network interface configured to couple to a local area network (LAN) and to a wide area network (WAN);

a processor coupled to the memory and to the network interface, the processor being configured to:

using peer-to-peer communication, send over the network interface a logical data object request to an other computing device and to receive, responsive to the sent logical data object request, a copy of a logical data object from the other computing device;

store the received logical data object in the memory;

request, from one of the other device and an address location on the WAN specified in the stored logical data object, data referred to in the stored logical data object; and

receive the requested data and storing the received data in accordance with the received and stored logical data object.

10. The computing device of claim 9, wherein the received logical data object comprises a schema of the logical data object stored on a remote device at the address location on the WAN.

11. The computing device of claim 10, wherein the remote device comprises a Network Attached Storage (NAS).

12. The computing device of claim 10, wherein the processor is further configured to maintain the stored logical data object synchronized with the logical data object of the logical data object stored on the remote device at the address location on the WAN.

13. The computing device of claim 9, wherein the logical data object comprises a database.

14. The computing device of claim 9, wherein the received and stored logical data object is time-stamped.

15. The computing device of claim 9, wherein the sent logical data object request comprises a timestamp of a last-in-time stored logical data object and wherein the processor is further configured to update the last-in-time stored logical data object only if a timestamp of the logical data object received from the other computing device is later in time than the last-in-time stored logical data object.

16. The computing device of claim 9, wherein the processor is further configured to send access rights to the other computing device along with the logical data object request and wherein the logical data object received from the other computing device is compatible with the sent access rights.

17. The computing device of claim 9, wherein the received and stored logical data object is devoid of data and files referred to in the received and stored logical data object.

18. A computer-implemented method, comprising:

requesting, by a first computing device coupled to a local area network (LAN), logical data object stored at an address location on a wide area network (WAN);

receiving, by the first computing device, the requested logical data object from the address location on the WAN and storing the received logical data object in the first computing device;

receiving a logical data object request from a second computing device; and

responsive to the logical data object request, sending a copy of the stored logical data object stored at the address location on the WAN from the first computing device to the second computing device using peer-to-peer communication.

19. The computer-implemented method of claim 18, wherein the sent copy of the stored logical data object is devoid of data or data files referred to by the stored logical data object.

20. A computer-implemented method, comprising:

using peer-to-peer communication, sending a request for a logical data object from a first computing device to a second computing device, the requested logical data object being stored at a remote address location on a wide area network (WAN);

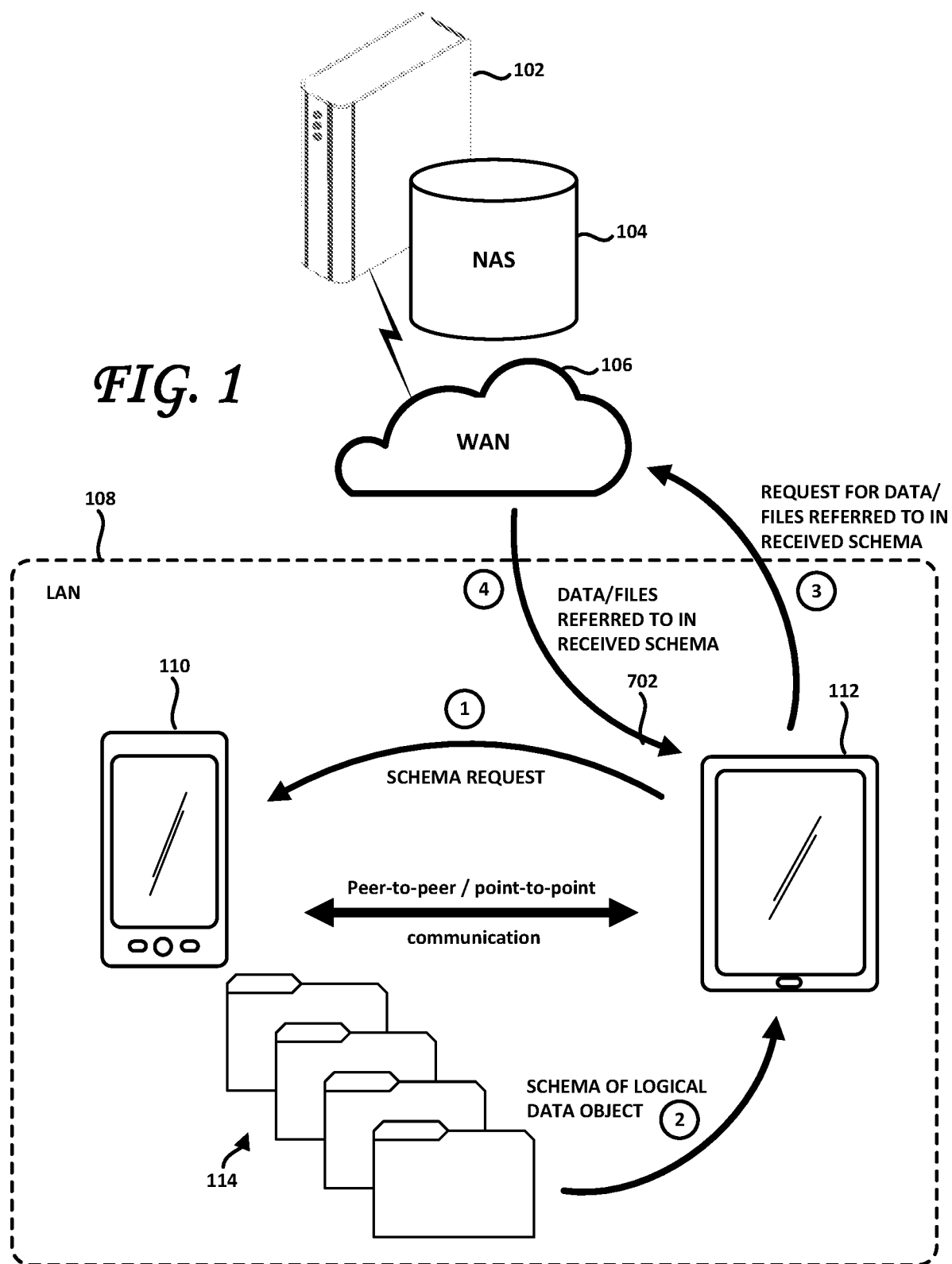
receiving a copy of the requested logical data object from the second device and storing the received copy of the logical data object in the first device;

requesting, by the first computing device, data referred to in the stored logical data object from an address location on the WAN specified in the stored logical data object; and

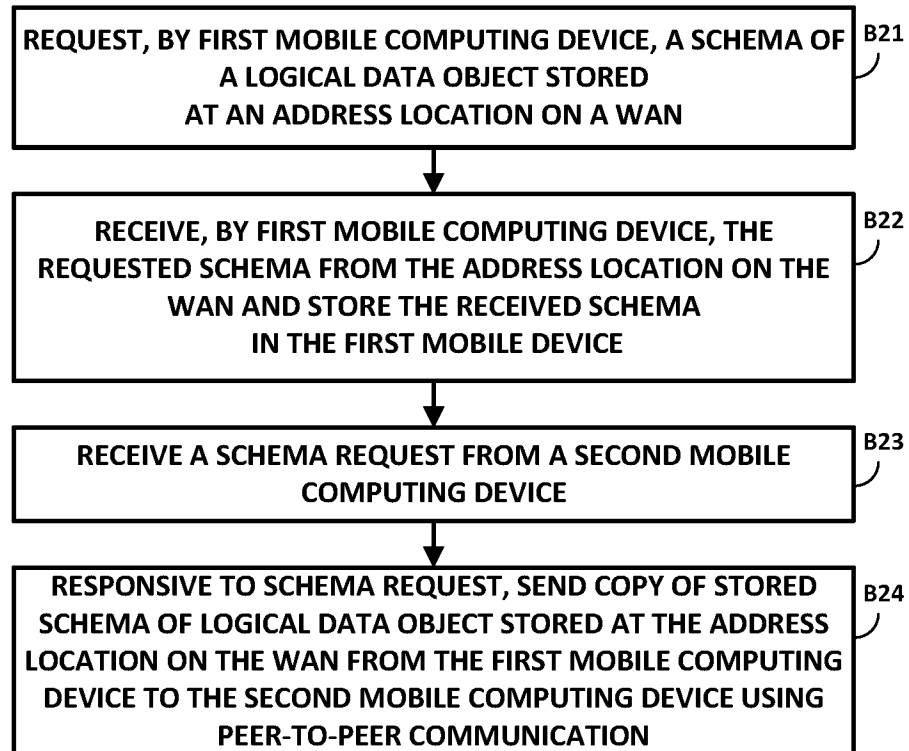
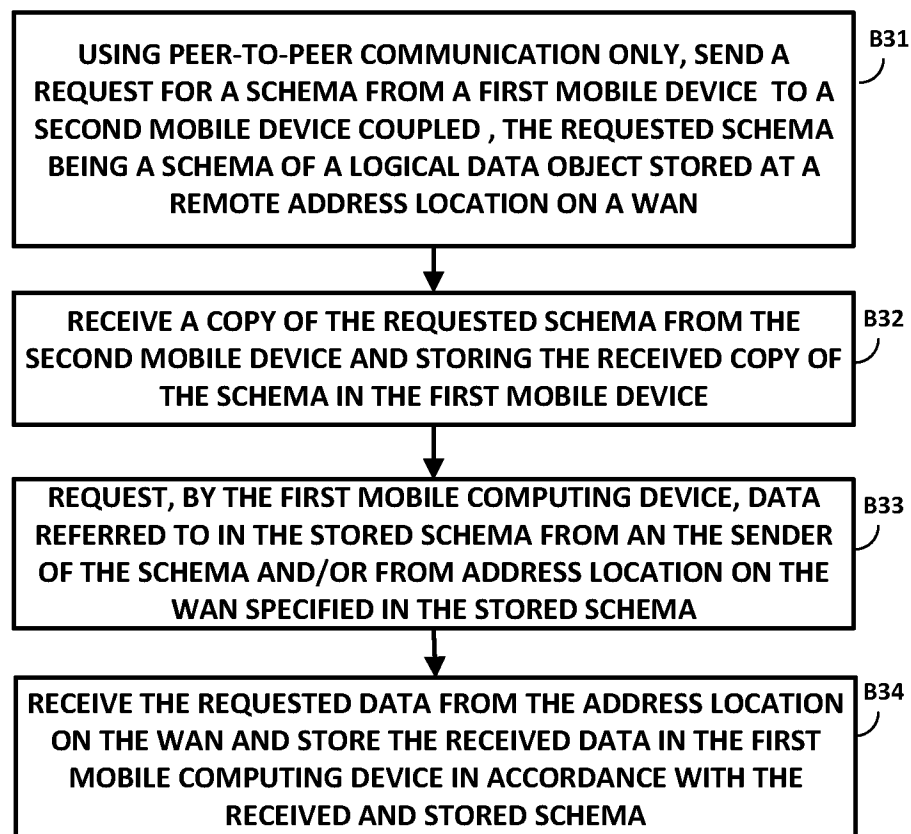
receiving the requested data from the address location on the WAN and storing the received data in the first device in accordance with the received and stored logical data object.

21. The computer-implemented method of claim 20, wherein the received and stored logical data object is devoid of data or data files referred to by the received logical data object.

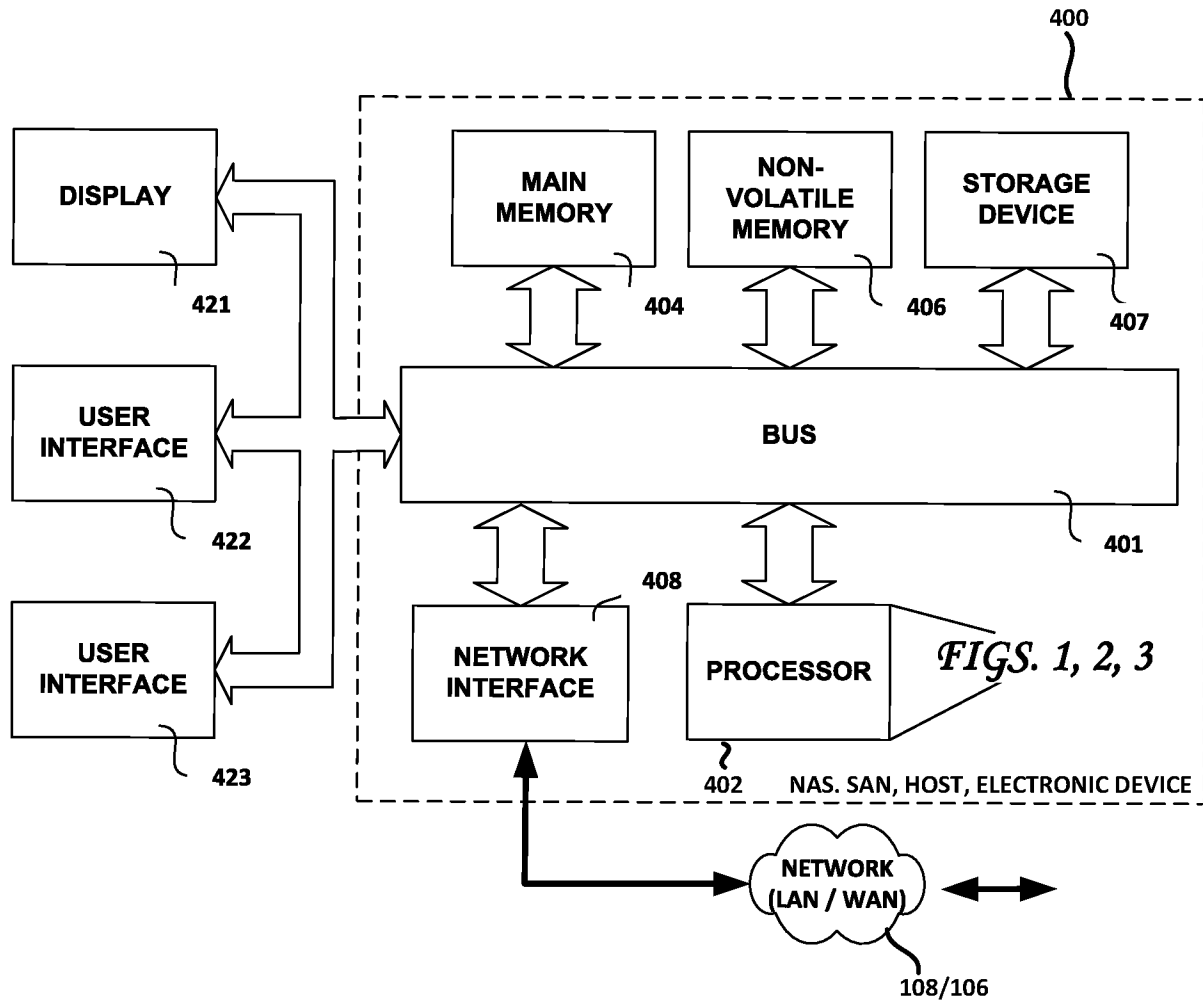
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FIG. 2*FIG. 3*

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**FIG. 4**

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2016/024214**A. CLASSIFICATION OF SUBJECT MATTER****G06F 17/40(2006.01)i, G06F 17/30(2006.01)i, G06F 15/16(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 17/40; G06F 15/16; H04Q 7/24; G06F 17/30; H04L 9/00; G06F 21/00

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: wide area network (WAN), local area network (LAN), peer to peer, schema, storage, logical data, permission, sharing, 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.
A	US 2010-0037051 A1 (KYUNG-AH CHANG et al.) 11 February 2010 See paragraphs [0007]-[0009], [0031]-[0034], and [0044]-[0047]; and figures 1-2 and 6.	1-21
A	US 2001-0034733 A1 (MICHEL PROMPT et al.) 25 October 2001 See paragraphs [0132]-[0137] and [0174]; and figures 4 and 12.	1-21
A	US 2008-0313085 A1 (DAVID KRAVITZ et al.) 18 December 2008 See paragraph [0019] and figure 4.	1-21
A	US 2014-0047516 A1 (ASHISH A. DESHPANDE et al.) 13 February 2014 See paragraphs [0036]-[0057] and figures 4A-4B.	1-21
A	US 2009-0097459 A1 (GERT MAGNUS JENDBRO et al.) 16 April 2009 See paragraphs [0010]-[0017] and figures 1-2.	1-21



Further documents are listed in the continuation of Box C.



See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

06 July 2016 (06.07.2016)

Date of mailing of the international search report

07 July 2016 (07.07.2016)

Name and mailing address of the ISA/KR

International Application Division

Korean Intellectual Property Office

189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea

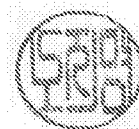


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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2016/024214

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