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Morris

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# (54) METHODS, SYSTEMS, AND COMPUTER PROGRAM PRODUCTS FOR SHARING A DATA OBJECT IN A DATA STORE VIA A COMMUNICATION

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This patent is subject to a terminal disclaimer.

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(22) Filed: **May 20, 2018**

**Related U.S. Application Data**

(63) Continuation of application No. 15/724,235, filed on Oct. 3, 2017, now Pat. No. 10,013,158, which is a continuation-in-part of application No. 14/274,623, filed on May 9, 2014, now abandoned, which is a continuation-in-part of application No. 13/626,635, filed on Sep. 25, 2012, now abandoned, and a continuation-in-part of application No. 13/624,906, filed on Sep. 22, 2012, now abandoned.

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*H04L 12/58* (2006.01)
*G06F 3/0482* (2013.01)
*G06F 3/0486* (2013.01)

(52) **U.S. Cl.**
CPC .......... ***G06F 3/0486*** (2013.01); ***G06F 3/0482*** (2013.01); ***H04L 51/22*** (2013.01)

(58) **Field of Classification Search**
CPC combination set(s) only.
See application file for complete search history.

(56) **References Cited**

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715/752

* cited by examiner

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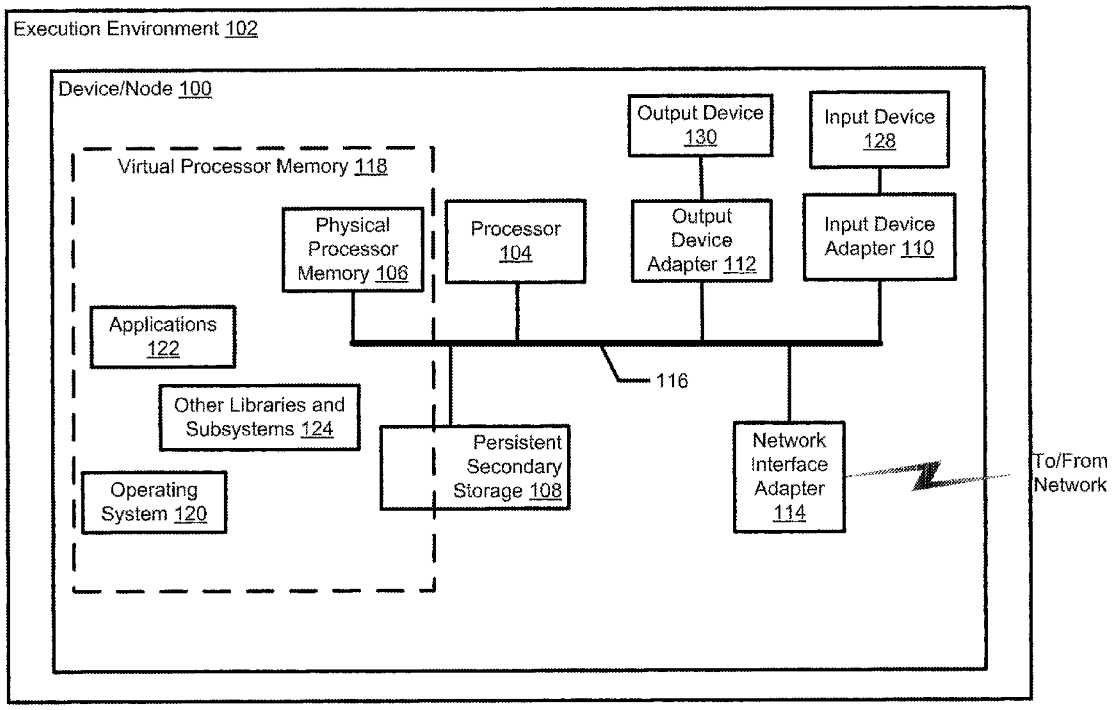
## (57) ABSTRACT

Methods, apparatuses, and systems are described for sharing a folder and any contents (e.g. file(s)) thereof, via at least one communication. In an aspect, the folder and any contents (e.g. file(s)) thereof may be shared through a specific combination of capabilities or operations involving an email message and a file explorer interface without an attachment included with the at least one email message.

**21 Claims, 15 Drawing Sheets**


Execution Environment 102
Device/Node 100
Output Device 130
Input Device 128
Virtual Processor Memory 118
Physical Processor Memory 106
Processor 104
Output Device Adapter 112
Input Device Adapter 110
Applications 122
116
Other Libraries and Subsystems 124
Persistent Secondary Storage 108
Network Interface Adapter 114
To/From Network
Operating System 120

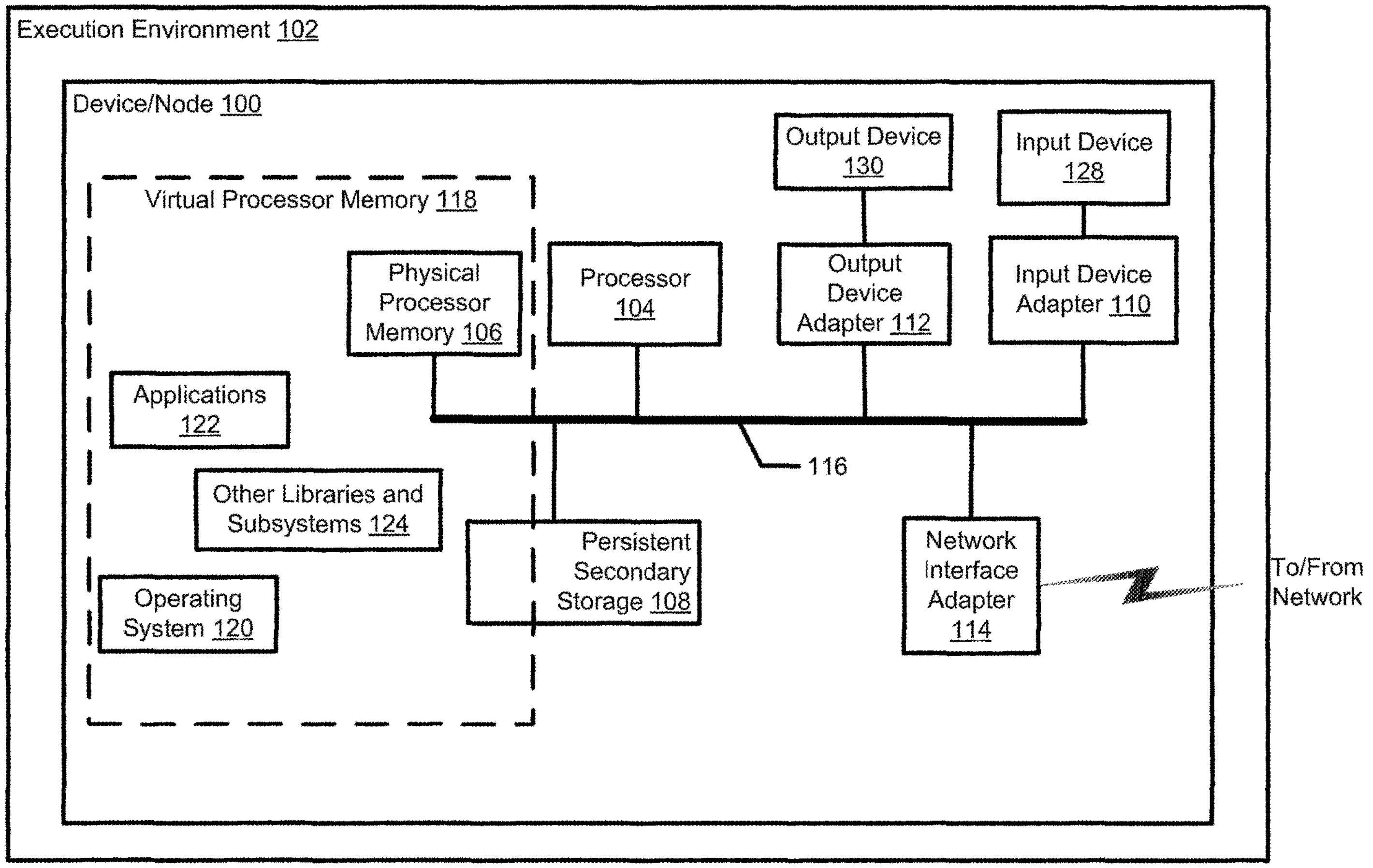

Execution Environment 102
Device/Node 100
Virtual Processor Memory 118
Physical Processor Memory 106
Applications 122
Other Libraries and Subsystems 124
Operating System 120
Processor 104
Persistent Secondary Storage 108
Output Device 130
Output Device Adapter 112
Input Device 128
Input Device Adapter 110
116
Network Interface Adapter 114
To/From Network

FIG. 1

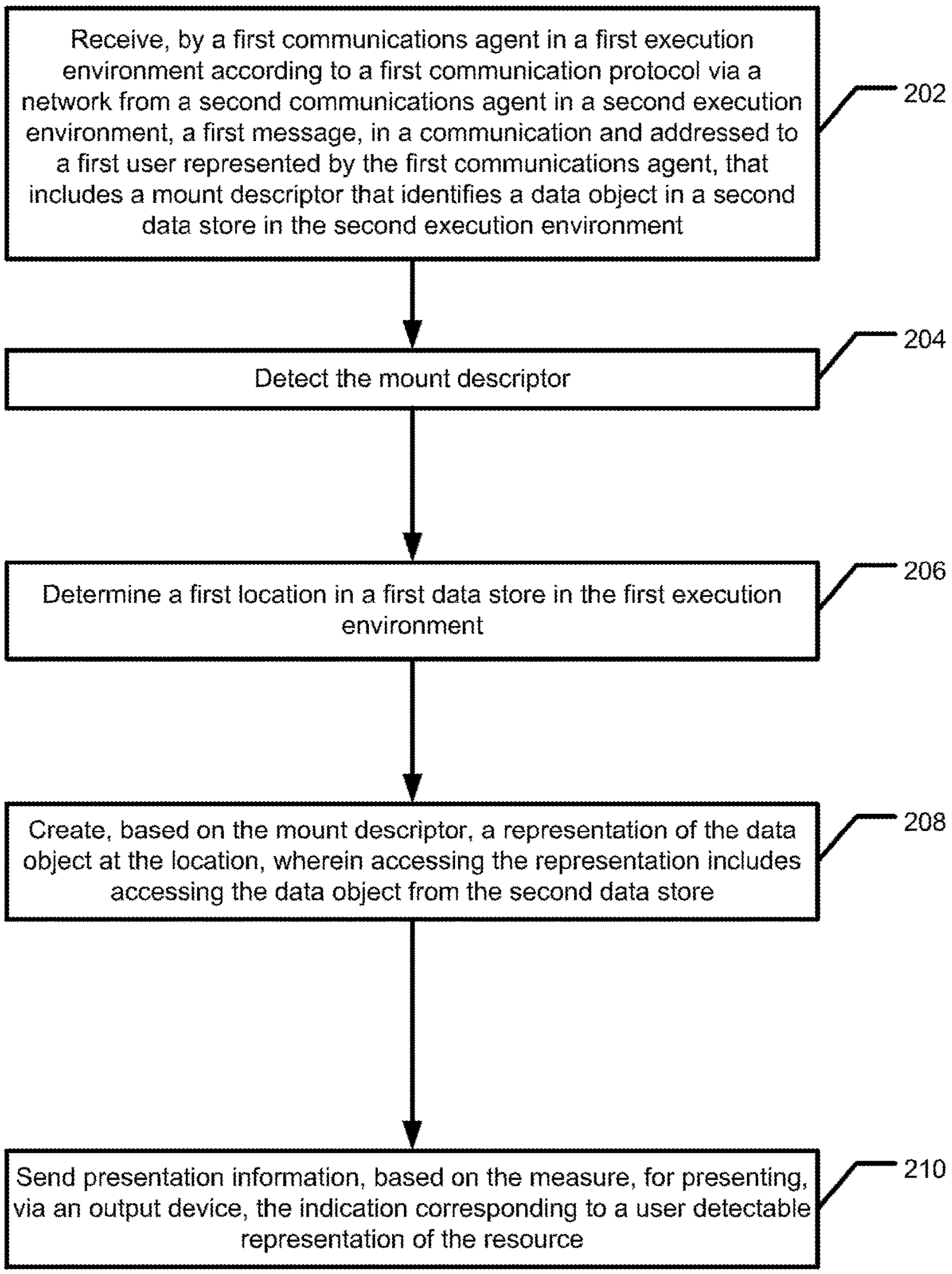

Receive, by a first communications agent in a first execution environment according to a first communication protocol via a network from a second communications agent in a second execution environment, a first message, in a communication and addressed to a first user represented by the first communications agent, that includes a mount descriptor that identifies a data object in a second data store in the second execution environment
202
Detect the mount descriptor
204
Determine a first location in a first data store in the first execution environment
206
Create, based on the mount descriptor, a representation of the data object at the location, wherein accessing the representation includes accessing the data object from the second data store
208
Send presentation information, based on the measure, for presenting, via an output device, the indication corresponding to a user detectable representation of the resource
210

FIG. 2A

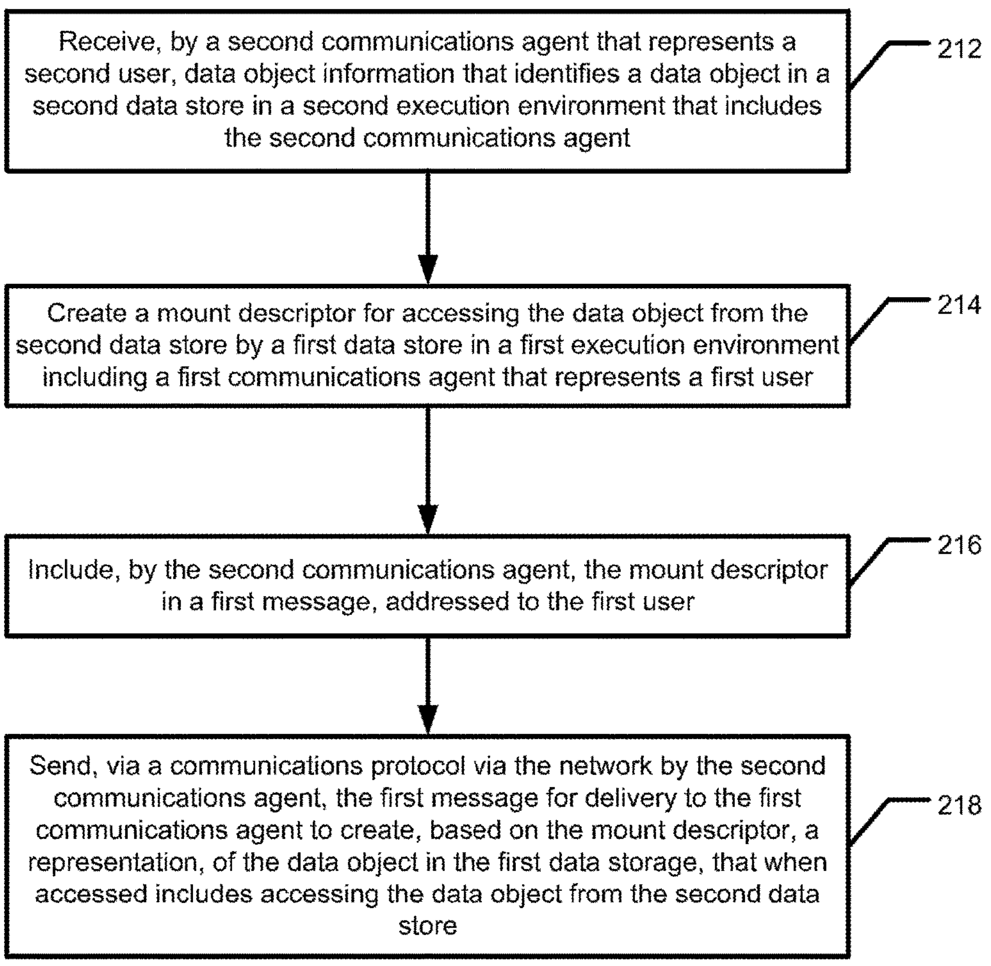

Receive, by a second communications agent that represents a second user, data object information that identifies a data object in a second data store in a second execution environment that includes the second communications agent
212
Create a mount descriptor for accessing the data object from the second data store by a first data store in a first execution environment including a first communications agent that represents a first user
214
Include, by the second communications agent, the mount descriptor in a first message, addressed to the first user
216
Send, via a communications protocol via the network by the second communications agent, the first message for delivery to the first communications agent to create, based on the mount descriptor, a representation, of the data object in the first data storage, that when accessed includes accessing the data object from the second data store
218

FIG. 2B

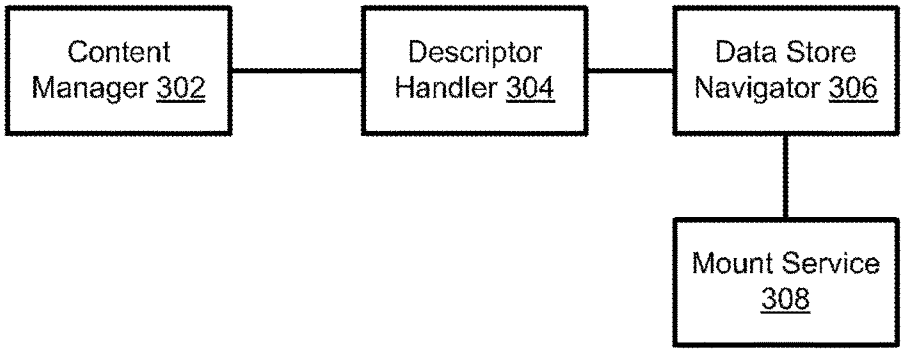

Content Manager 302
Descriptor Handler 304
Data Store Navigator 306
Mount Service 308

FIG. 3A

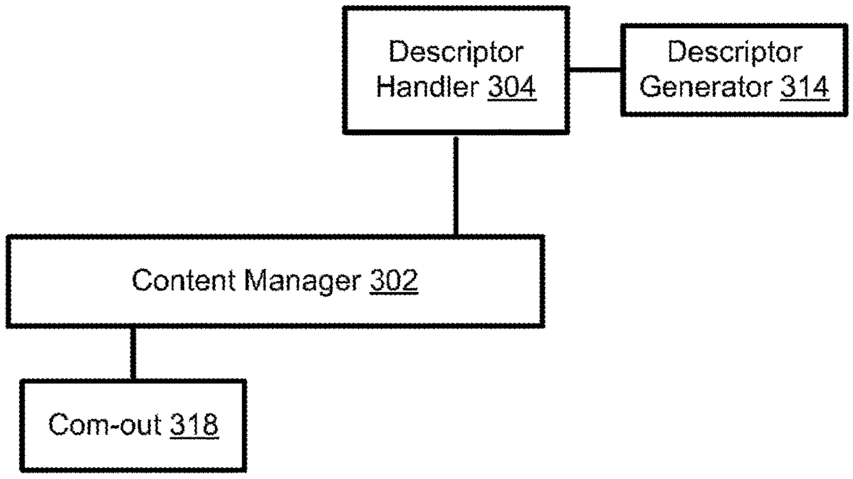

Descriptor Handler 304
Descriptor Generator 314
Content Manager 302
Com-out 318

FIG. 3B

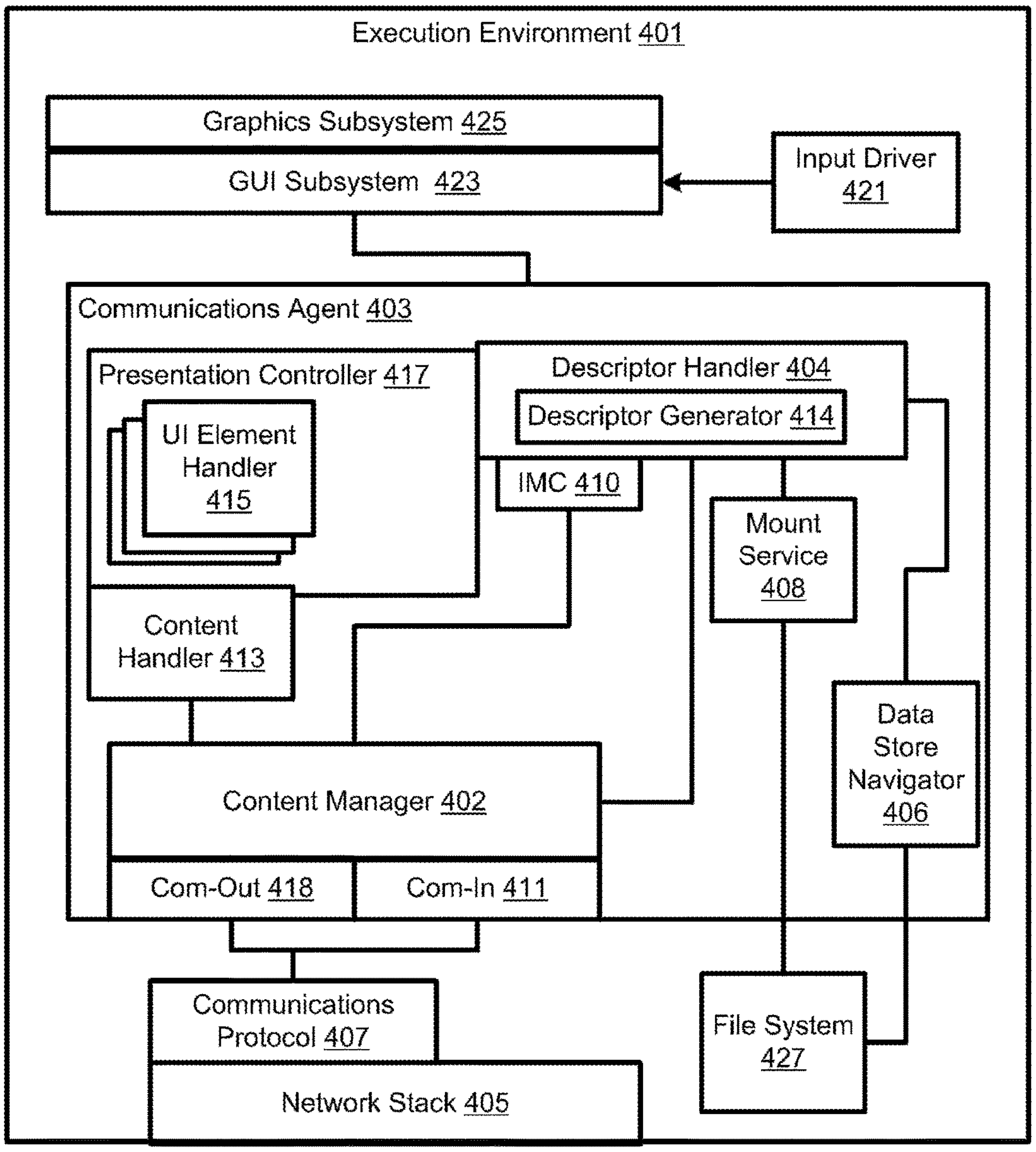

Execution Environment 401
Graphics Subsystem 425
GUI Subsystem 423
Input Driver 421
Communications Agent 403
Presentation Controller 417
UI Element Handler 415
Descriptor Handler 404
Descriptor Generator 414
IMC 410
Mount Service 408
Content Handler 413
Data Store Navigator 406
Content Manager 402
Com-Out 418
Com-In 411
Communications Protocol 407
Network Stack 405
File System 427

FIG. 4

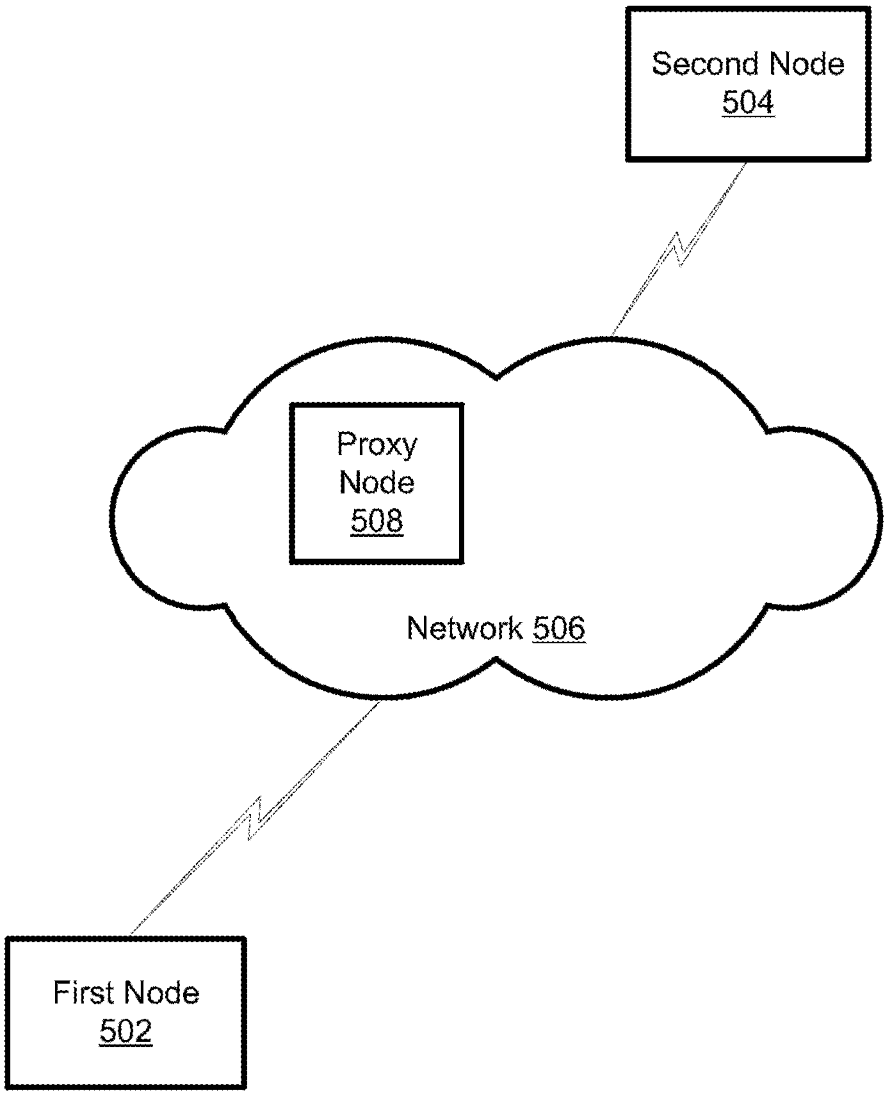


FIG. 5

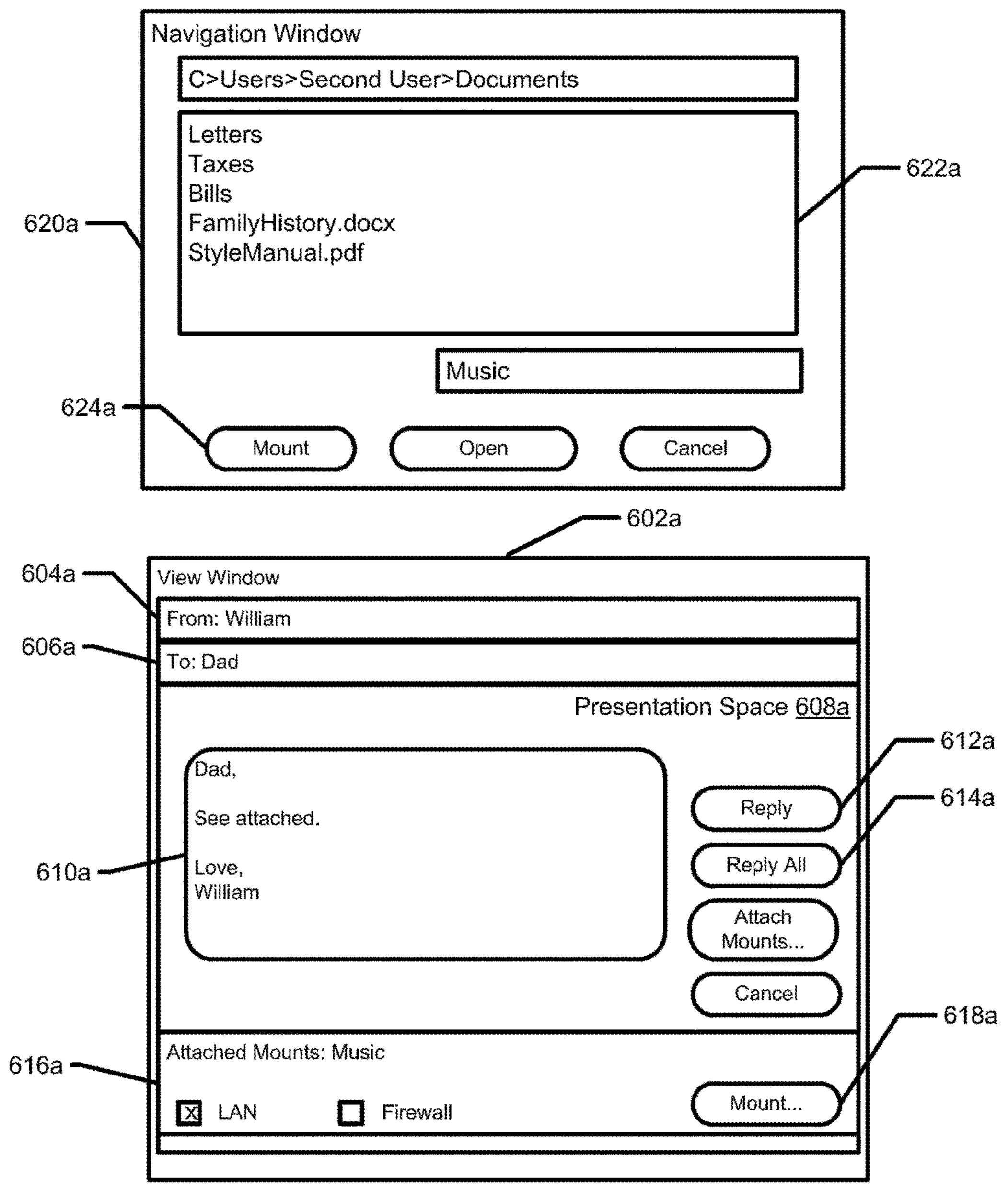

Navigation Window
C>Users>Second User>Documents
Letters
Taxes
Bills
FamilyHistory.docx
StyleManual.pdf
Music
Mount
Open
Cancel
620a
622a
624a
602a
View Window
From: William
To: Dad
Presentation Space 608a
Dad,
See attached.
Love,
William
Reply
Reply All
Attach Mounts...
Cancel
Attached Mounts: Music
☒ LAN
☐ Firewall
Mount...
604a
606a
610a
612a
614a
616a
618a

FIG. 6A

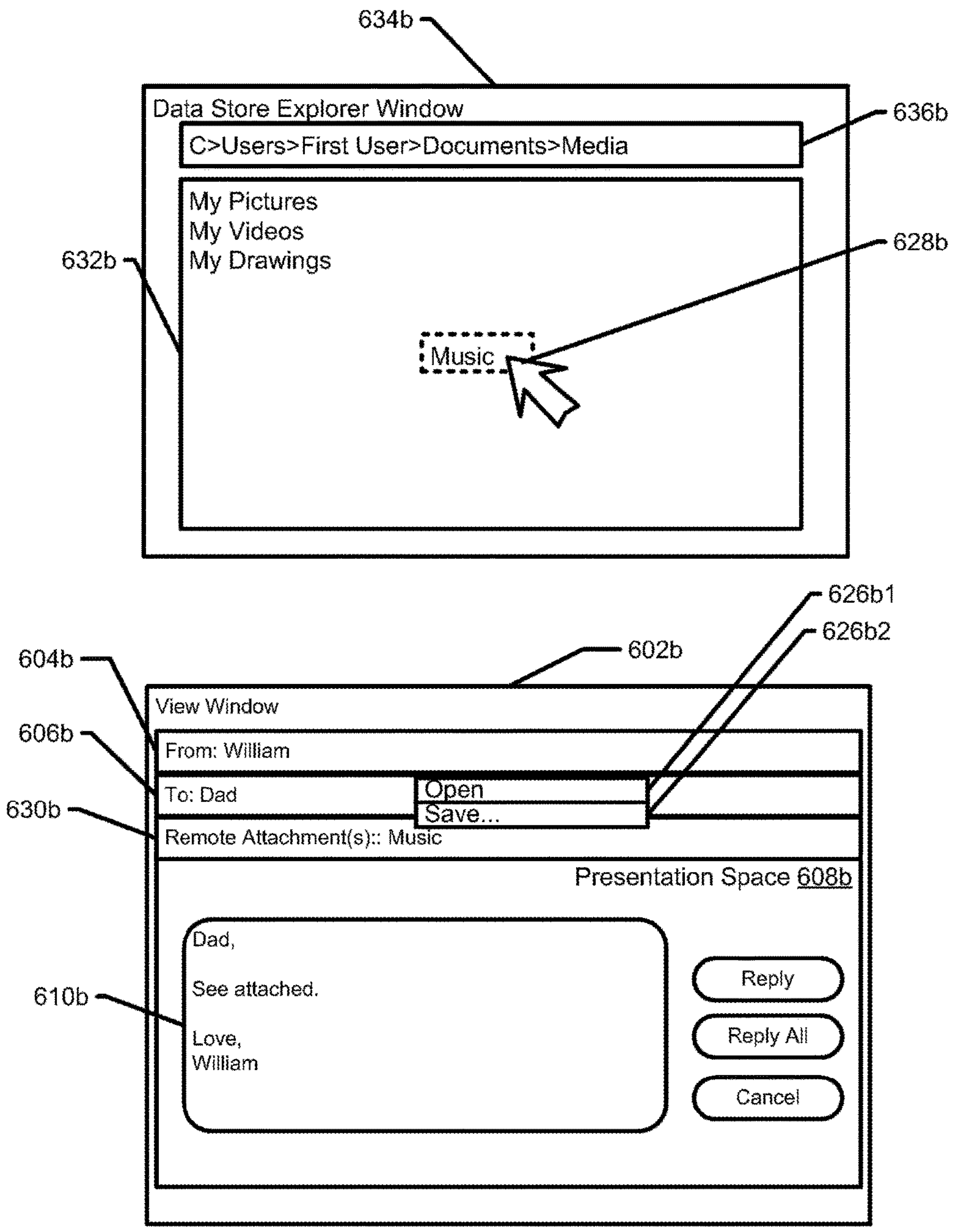

634b
Data Store Explorer Window
636b
C>Users>First User>Documents>Media
My Pictures
My Videos
My Drawings
632b
628b
Music
626b1
626b2
604b
602b
View Window
606b
From: William
To: Dad
Open
Save...
630b
Remote Attachment(s):: Music
Presentation Space 608b
Dad,
See attached.
610b
Love,
William
Reply
Reply All
Cancel

FIG. 6B

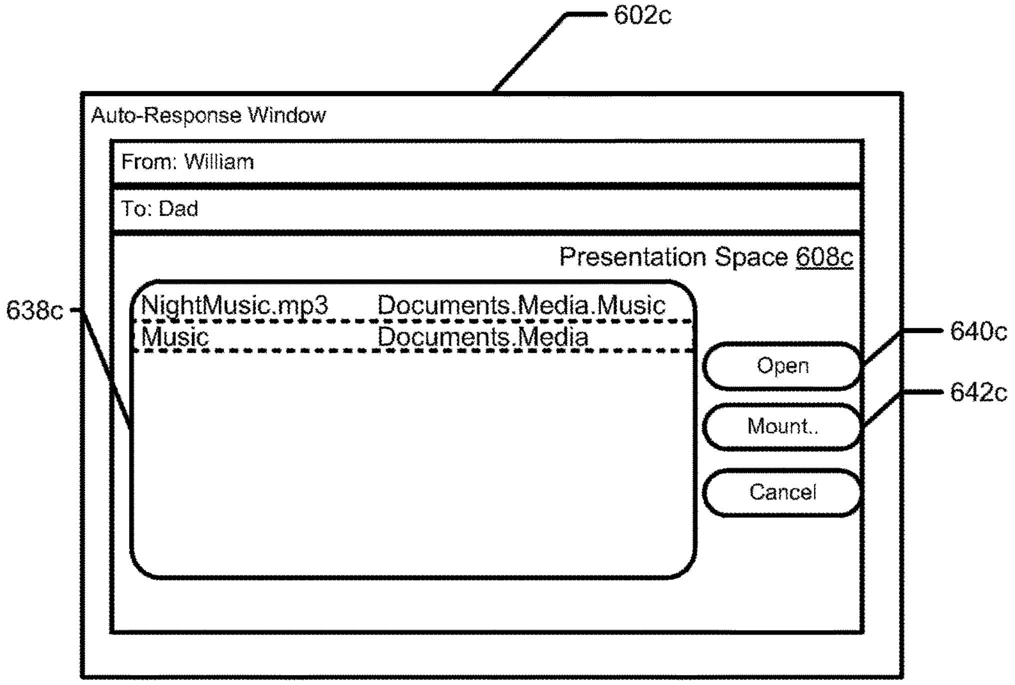

602c
Auto-Response Window
From: William
To: Dad
Presentation Space 608c
NightMusic.mp3 Documents.Media.Music
Music Documents.Media
638c
Open
640c
Mount..
642c
Cancel

FIG. 6C

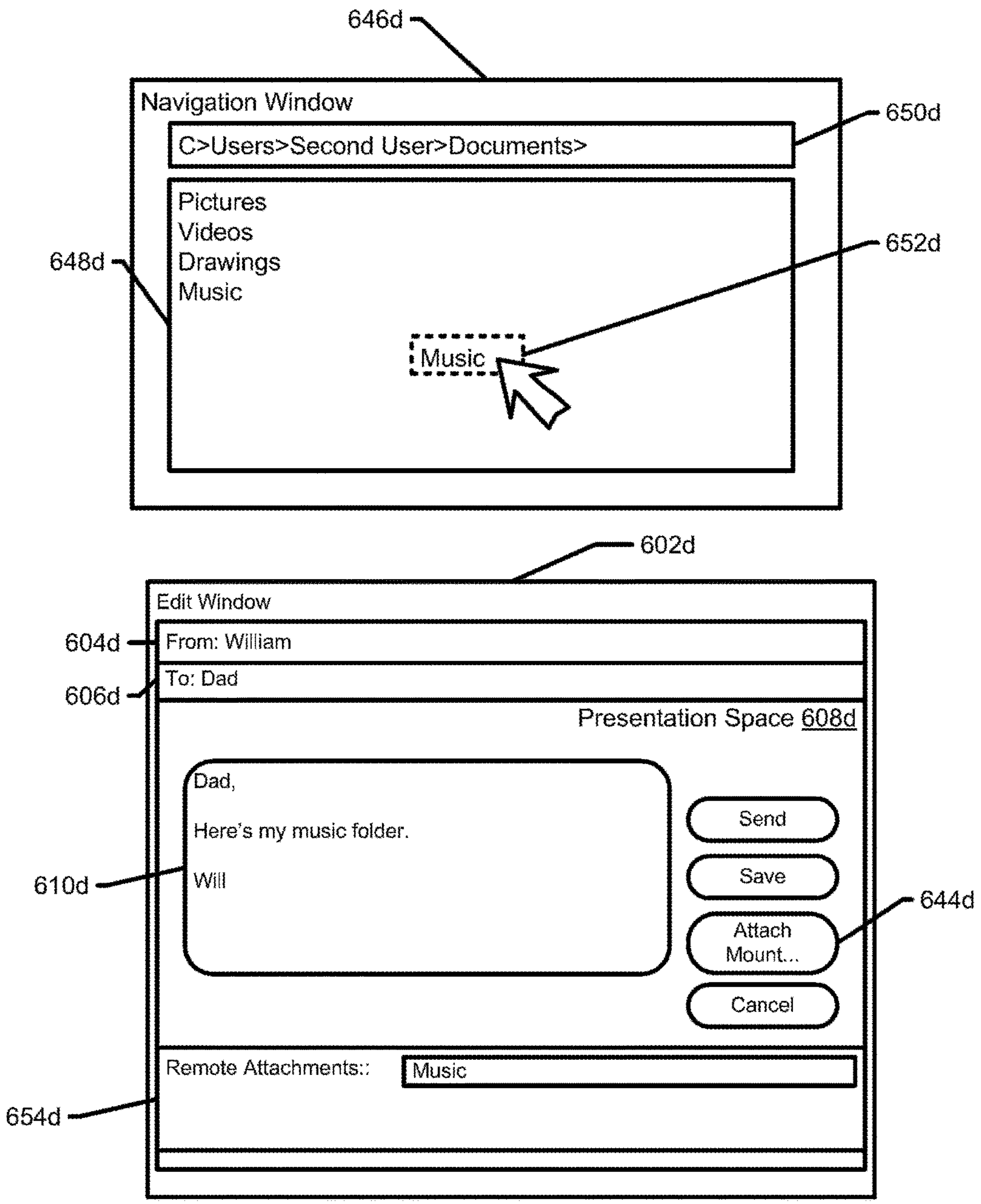
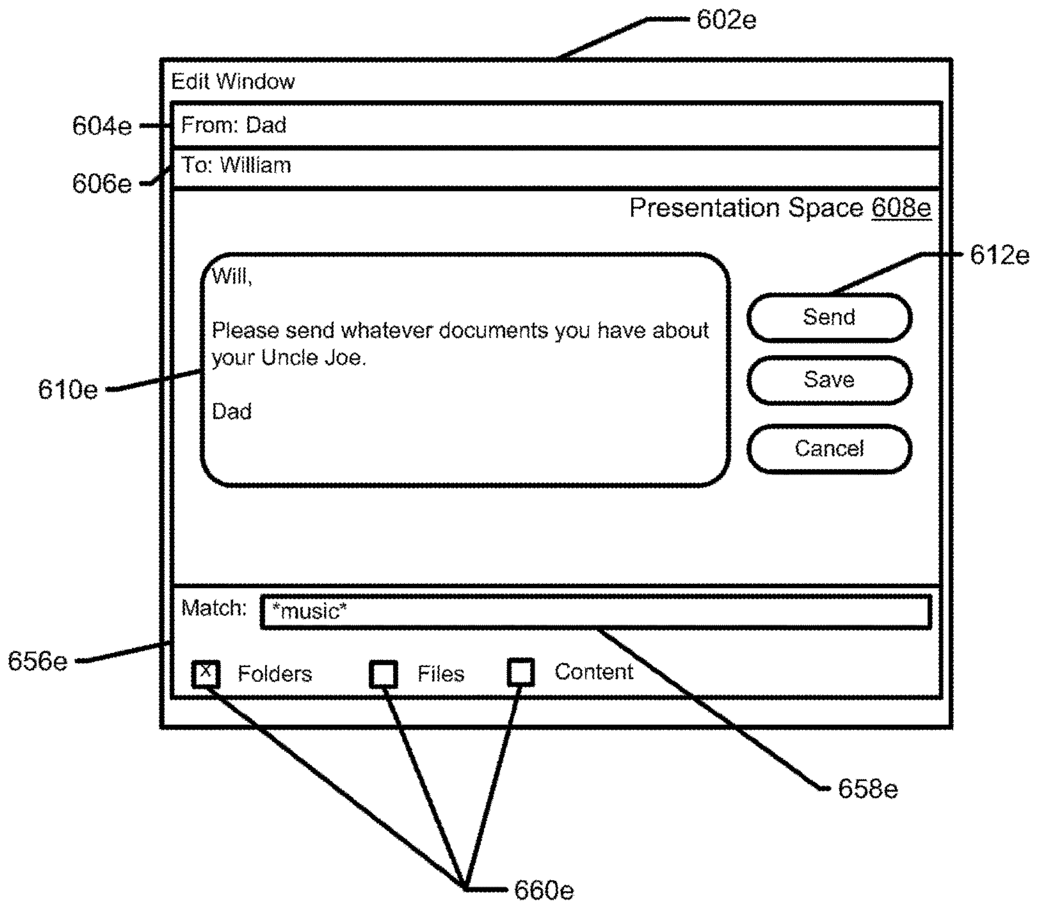

646d
Navigation Window
C>Users>Second User>Documents>
650d
Pictures
Videos
Drawings
Music
648d
652d
Music
602d
Edit Window
604d
From: William
606d
To: Dad
Presentation Space 608d
Dad,
Here's my music folder.
Will
610d
Send
Save
Attach Mount...
644d
Cancel
Remote Attachments::
Music
654d

FIG. 6D

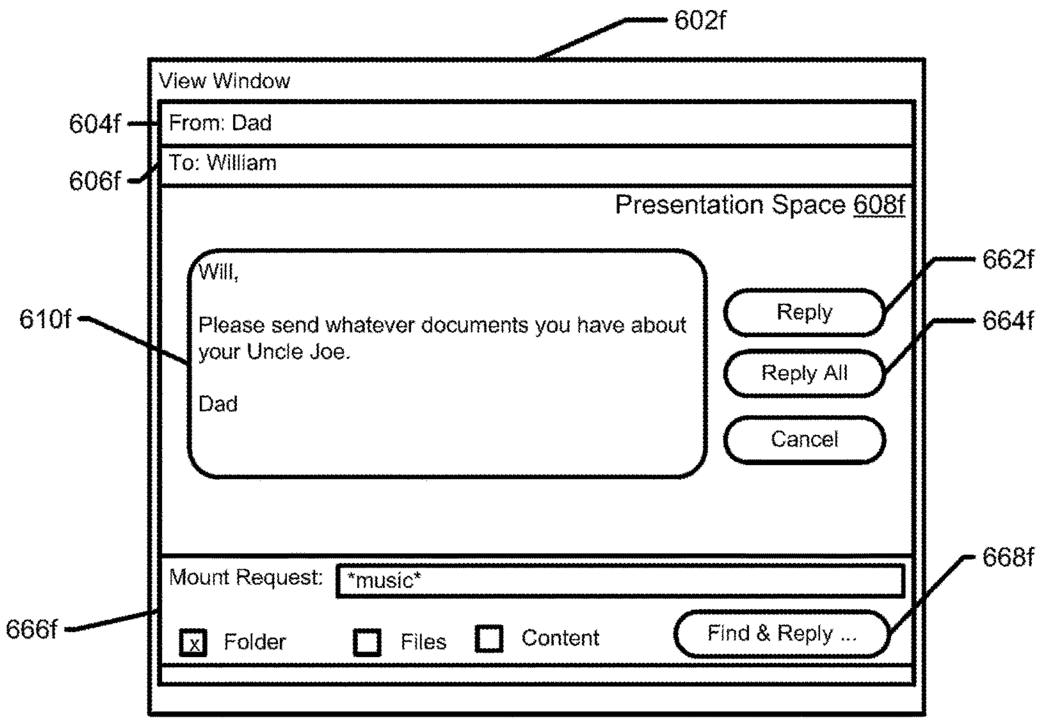


Will,

Please send whatever documents you have about your Uncle Joe.

Dad

FIG. 6E


602f
View Window
604f
From: Dad
606f
To: William
Presentation Space 608f
610f
Will,

Please send whatever documents you have about your Uncle Joe.

Dad
662f
Reply
664f
Reply All
Cancel
668f
Mount Request: *music*
666f
[✓ Folder] Files Content
Find & Reply ...

FIG. 6F

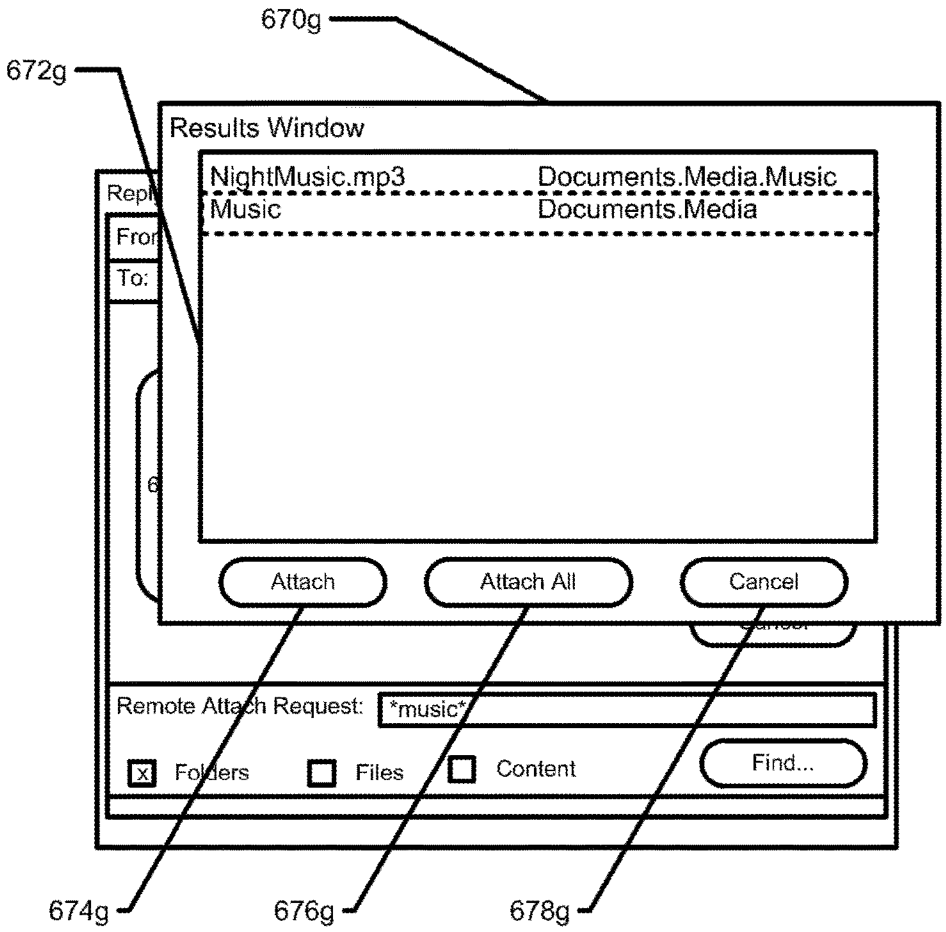

670g
672g
Results Window
NightMusic.mp3 Documents.Media.Music
Music Documents.Media
Attach
Attach All
Cancel
Repl
Fror
To:
Remote Attach Request:
*music*
Folders
Files
Content
Find...
674g
676g
678g

FIG.6G

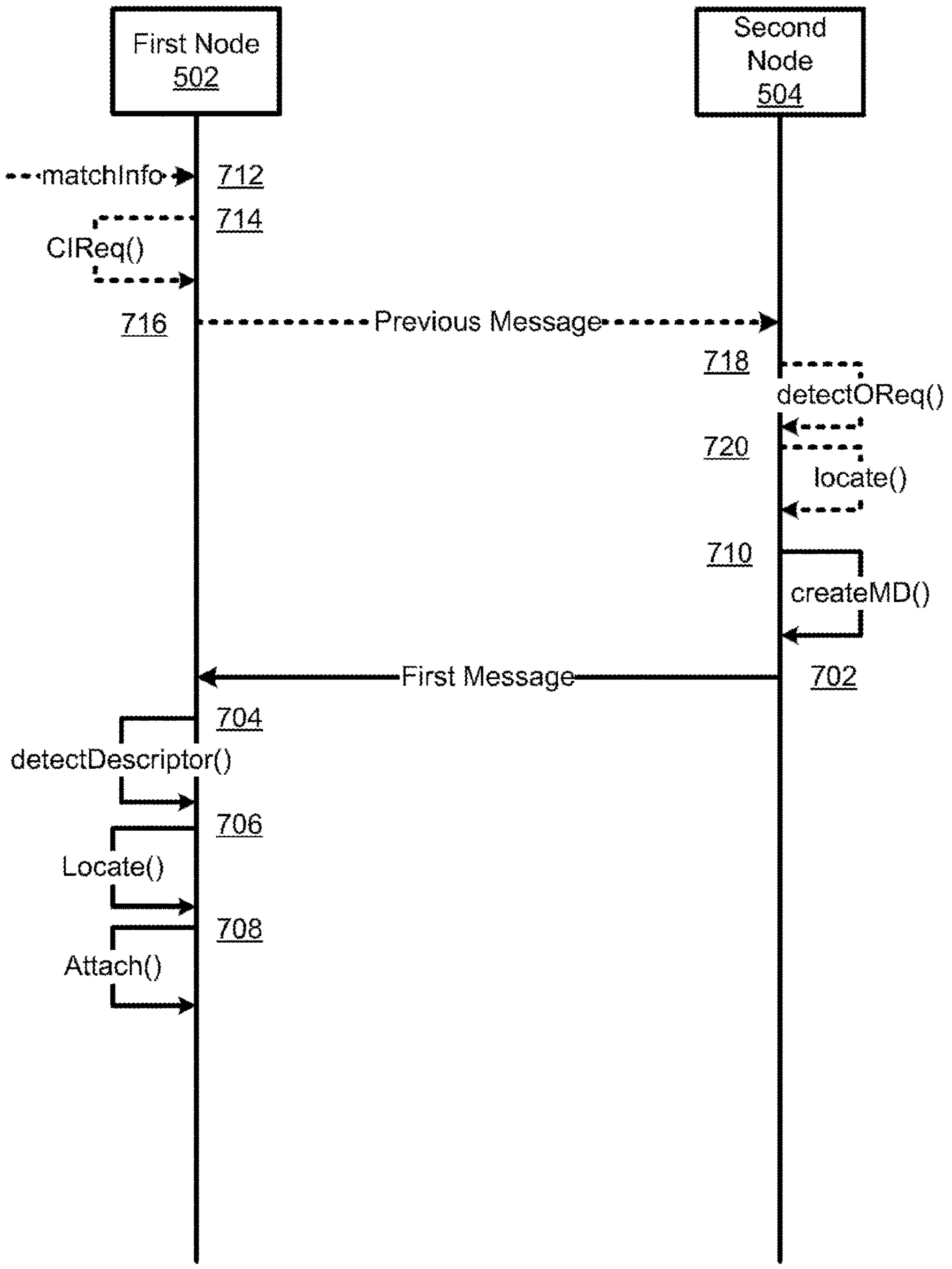
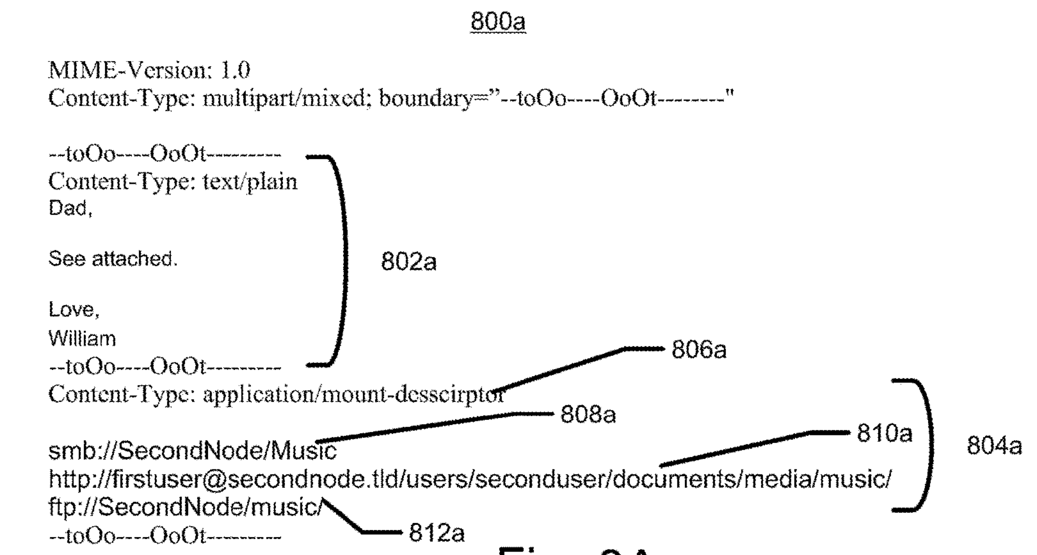

First Node
502
Second Node
504
matchInfo
712
714
CIReq()
716
Previous Message
718
detectOReq()
720
locate()
710
createMD()
First Message
702
704
detectDescriptor()
706
Locate()
708
Attach()

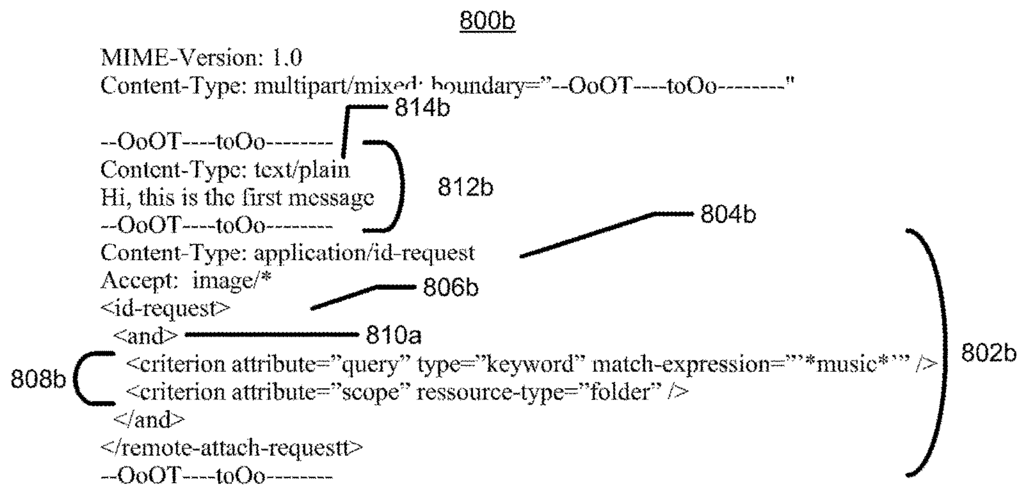
FIG. 7



```
MIME-Version: 1.0
Content-Type: multipart/mixed; boundary="--toOo----OoOt--------"

--toOo----OoOt---------
Content-Type: text/plain
Dad,

See attached.

Love,
William
--toOo----OoOt---------
Content-Type: application/mount-desscirptor

smb://SecondNode/Music
http://firstuser@secondnode.tld/users/seconduser/documents/media/music/
ftp://SecondNode/music/
--toOo----OoOt---------
```

800a
802a
806a
808a
810a
804a
812a

Fig. 8A



```
MIME-Version: 1.0
Content-Type: multipart/mixed; boundary="--OoOT----toOo--------"

--OoOT----toOo--------
Content-Type: text/plain
Hi, this is the first message
--OoOT----toOo--------
Content-Type: application/id-request
Accept:  image/*
<id-request>
  <and>
   <criterion attribute="query" type="keyword" match-expression="'*music*'" />
   <criterion attribute="scope" ressource-type="folder" />
  </and>
</remote-attach-requestt>
--OoOT----toOo--------
```

800b
814b
812b
804b
806b
810a
808b
802b

FIG. 8B

# METHODS, SYSTEMS, AND COMPUTER PROGRAM PRODUCTS FOR SHARING A DATA OBJECT IN A DATA STORE VIA A COMMUNICATION

## RELATED APPLICATIONS

The present application is a continuation of and claims priority to U.S. patent application Ser. No. 15/724,235 filed Oct. 3, 2017 and entitled "METHODS, SYSTEMS, AND COMPUTER PROGRAM PRODUCTS FOR SHARING A DATA OBJECT IN A DATA STORE VIA A COMMUNICATION," which is a continuation-in-part and claims priority to U.S. patent application Ser. No. 14/274,623 (published under US 2014-0365588 A1) filed May 9, 2014 and entitled "METHODS, SYSTEMS, AND COMPUTER PROGRAM PRODUCTS FOR PROCESSING A DATA OBJECT IDENTIFICATION REQUEST IN A COMMUNICATION," which is a continuation-in-part and claims priority to U.S. patent application Ser. No. 13/626,635 (published under US 2014-0089421 A1) filed Sep. 25, 2012 and entitled "METHODS, SYSTEMS, AND PROGRAM PRODUCTS FOR SHARING A DATA OBJECT IN A DATA STORE VIA A COMMUNICATION"; and U.S. patent application Ser. No. 13/624,906 (published US 2014-0089419 A1) filed Sep. 22, 2012 and entitled "METHODS, SYSTEMS, AND PROGRAM PRODUCTS FOR PROCESSING A DATA OBJECT IDENTIFICATION REQUEST IN A COMMUNICATION."

This application is related to the following U.S. Patent Applications, which are each incorporated herein by reference for all purposes:

U.S. patent application Ser. No. 13/626,635 (published under US 2014-0089421 A1) filed on 2012 Sep. 25 and entitled "METHODS, SYSTEMS, AND PROGRAM PRODUCTS FOR SHARING A DATA OBJECT IN A DATA STORE VIA A COMMUNICATION";

U.S. patent application Ser. No. 12/833,016 (published under US 2012-0011444 A1) filed on 2010 Jul. 9, entitled "METHODS, SYSTEMS, AND PROGRAM PRODUCTS FOR REFERENCING AN ATTACHMENT IN A COMMUNICATION";

U.S. patent application Ser. No. 12/833,014 (published under US 2012-0011207 A1) filed on 2010 Jul. 9, entitled "METHODS, SYSTEMS, AND PROGRAM PRODUCTS FOR PROCESSING A REQUEST FOR A RESOURCE IN A COMMUNICATION";

U.S. patent application Ser. No. 13/624,906 (published under US 2014-0089419 A1) filed on 2012 Sep. 22, entitled "METHODS, SYSTEMS, AND PROGRAM PRODUCTS FOR PROCESSING A DATA OBJECT IDENTIFICATION REQUEST IN A COMMUNICATION";

U.S. patent application Ser. No. 13/624,940 (published under US 2014-0089420 A1) filed on 2012 Sep. 23, entitled "METHODS, SYSTEMS, AND PROGRAM PRODUCTS FOR PROCESSING A REFERENCE IN A COMMUNICATION TO A REMOTE DATA OBJECT"; the entire contents of each are herein incorporated by reference for all purposes.

## BACKGROUND

A variety of means exist for sharing filed, folders, and other data via network. For each a user must know how to configure and/or setup the sharing. For example, sharing a file a Samba file system is different than sharing a via cloud based storage system, such as DROPBOX. Sharing via

email is still different. Sharing copies of files is perhaps the best know means and most widely used means for sharing copies. It would useful if sharing files, folders, directory data, and other network accessible data were as easy as sending an attachment in an email.

Accordingly, there exists a need for methods, systems, and computer program products for sharing a data object in a data store via a communication.

## SUMMARY

The following presents a simplified summary of the disclosure in order to provide a basic understanding to the reader. This summary is not an extensive overview of the disclosure and it does not identify key/critical elements of the invention or delineate the scope of the invention. Its sole purpose is to present some concepts disclosed herein in a simplified form as a prelude to the more detailed description that is presented later.

In one embodiment, an apparatus is provided, comprising: at least one non-transitory memory storing instructions; and one or more processors in communication with the at least one non-transitory memory, wherein the one or more processors execute the instructions to: cause, at a first node, display of at least one first interface with a first user interface element, utilizing first hypertext markup language-equipped code that is sent via at least one network; receive, from the first node via the at least one network, an indication of at least one folder via the first user interface element, utilizing the at least one first interface; cause, at the first node, display of at least one second interface with a second user interface element, utilizing second hypertext markup language-equipped code that is sent via the at least one network; receive, from the first node via the at least one network, indicia associated with at least one email address via the second user interface element, utilizing the at least one second interface; receive, from the first node via the at least one network, an indication to share the at least one folder; based on the receipt of the indication of the at least one folder, the indicia associated with the at least one email address, and the indication to share the at least one folder via the at least one network; generate at least one email message identifying the at least one folder and including a reference to the at least one folder, without including at least one file in the at least one folder as an attachment of the at least one email message; send, to a second node via the at least one network, the at least one email message, without including the at least one file in the at least one folder as an attachment of the at least one email message; based on the receipt of the indication of the at least one folder, the indicia associated with the at least one email address, and the indication to share the at least one folder via the at least one network; cause, utilizing particular code configured to be stored on a storage at the second node and further configured to cooperate with a file explorer interface, creation of a representation of the at least one folder in a location among one or more folders on the file explorer interface, where the storage at the second node does not store the at least one file in the at least one folder when the creation of the representation is caused; cause, at the second node, display of the representation of the at least one folder in the location among the one or more folders on the file explorer interface; detect, utilizing the file explorer interface at the second node, an indication to open the at least one file in the at least one folder; and in response to detection of the indication to open the at least one file in the at least one folder, cause retrieval of the

at least one file via the at least one network for permitting display of the at least one file utilizing the file explorer interface at the second node.

In another embodiment, a system is provided, comprising: at least one non-transitory memory storing instructions; and one or more processors in communication with the at least one non-transitory memory, wherein the one or more processors execute the instructions to: send a first communication over at least one network that results in display, at a first node, a first user interface element, a second user interface element, and a third user interface element; receive, from the first node via the at least one network, information associated with at least one data object via the first user interface element; receive, from the first node via the at least one network, an object associated with at least one email address via the second user interface element; receive, from the first node via the at least one network, an indication of a selection of the third user interface element; based on the receipt of the information associated with the at least one data object, the object associated with the at least one email address, and the indication of the selection of the third user interface element via the at least one network; send, to a second node via the at least one network, at least one email message identifying the at least one data object and including a reference to the at least one data object, without including a file attachment with the at least one email message; based on the receipt of the information associated with the at least one data object, the object associated with the at least one email address, and the indication of the selection of the third user interface element via the at least one network; cause, utilizing code configured to be stored on a storage at the second node and further configured to cooperate with a file explorer interface of a client-based file explorer application, creation of a representation of the at least one data object in a location among one or more folders on the file explorer interface, where the storage at the second node does not store any file in the at least one data object when the creation of the representation of the at least one data object is caused; and cause, at the second node, display of the representation of the at least one data object in the location among the one or more folders on the file explorer interface.

In still yet another embodiment, a computer-implemented method is provided, comprising: displaying, at a first node, at least one first interface with a first user interface element, utilizing first hypertext markup language-equipped code that is received via at least one network; receiving, utilizing the at least one first interface at the first node, an indication of at least one folder via the first user interface element; sending, from the first node via the at least one network, the indication of the at least one folder; displaying, at the first node, at least one second interface with a second user interface element, utilizing second hypertext markup language-equipped code that is received via the at least one network; receiving, utilizing the at least one second interface at the first node, indicia associated with at least one email address via the second user interface element; sending, from the first node via the at least one network, the indicia associated with the at least one email address; receiving, at the first node, an indication to share the at least one folder; sending, from the first node via the at least one network, the indication to share the at least one folder; after the indication of the at least one folder, the indicia associated with the at least one email address, and the indication to share the at least one folder are sent from the first node via the at least one network; receiving, at a second node via the at least one network, at least one email message identifying the at least one folder and including a reference to the at least one folder, without including at least one file in the at least one folder as an attachment of the at least one email message; after the indication of the at least one folder, the indicia associated with the at least one email address, and the indication to share the at least one folder are sent from the first node via the at least one network; creating, utilizing code configured to be stored on a storage at the second node and further configured to cooperate with a file explorer interface, a representation of the at least one folder in a location among one or more folders on the file explorer interface, where the storage of the second node does not store the at least one file in at least one folder when the representation is created; displaying, at the second node, the representation of the at least one folder in the location among the one or more folders on the file explorer interface; receiving, utilizing the file explorer interface at the second node, an indication to open the at least one file in the at least one folder; in response to the receipt of the indication to open the at least one file in the at least one folder, retrieving the at least one file via the at least one network; and in response to the retrieval of the at least one file via the at least one network, displaying the at least one file utilizing the file explorer interface at the second node.

In still yet another embodiment, a system is provided, comprising: a first node in communication with a second node via at least one network; said first node configured to: display, at the first node, a first user interface element, a second user interface element, and a third user interface element; receive, at the first node, information associated with at least one folder via the first user interface element; send, from the first node via the at least one network, the information associated with the at least one folder; receive, at the first node, an object associated with at least one email address via the second user interface element; send, from the first node via the at least one network, the object associated with the at least one email address; receive, at the first node, a message associated with a selection of the third user interface element; and send, from the first node via the at least one network, the message associated with the selection of the third user interface element; said second node configured to: after the information associated with the at least one folder, the object associated with the at least one email address, and the message associated with the selection of the third user interface element via the at least one network; receive, at the second node via the at least one network, at least one email message identifying the at least one folder and including a reference to the at least one folder, without including a file attachment with the at least one email message; after the information associated with the at least one folder, the object associated with the at least one email address, and the message associated with the selection of the third user interface element via the at least one network; create, utilizing code configured to be stored on a storage at the second node and further configured to cooperate with a file explorer interface, a representation of the at least one folder in a location among one or more folders on the file explorer interface, where the storage of the second node does not store any file in the at least one folder when the representation of the at least one folder is created; and display, at the second node, the representation of the at least one folder in the location among the one or more folders on the file explorer interface.

In other embodiments, methods and systems are described for sharing a data object in a data store via a communication. In one aspect, the method includes receiving, by a first communications agent in a first execution environment according to a first communication protocol via a network from a second communications agent in a second execution environment, a first message, in a communication and addressed to a first user represented by the first communications agent, that includes a mount descriptor that identifies a data object in a second data store in the second execution environment. The method further includes detecting the mount descriptor. The method still further includes determining a first location in a first data store in the first execution environment. The method additionally includes creating, based on the mount descriptor, a representation of the data object at the location, wherein accessing the representation includes accessing the data object from the second data store. Performing at least one the preceding actions comprising the method includes execution of an instruction by a processor.

Also, a system for sharing a data object in a data store via a communication is described that includes one or more processors and logic encoded in one or more tangible media for execution by the one or more processors that when executed is operable for receiving, by a first communications agent in a first execution environment according to a first communication protocol via a network from a second communications agent in a second execution environment, a first message, in a communication and addressed to a first user represented by the first communications agent, that includes a mount descriptor that identifies a data object in a second data store in the second execution environment; detecting the mount descriptor; determining a first location in a first data store in the first execution environment; and creating, based on the mount descriptor, a representation of the data object at the location, wherein accessing the representation includes accessing the data object from the second data store.

Further, a system for sharing a data object in a data store via a communication is described. The system includes a content manager component for receiving, by a first communications agent in a first execution environment according to a first communication protocol via a network from a second communications agent in a second execution environment, a first message, in a communication and addressed to a first user represented by the first communications agent, that includes a mount descriptor that identifies a data object in a second data store in the second execution environment. The system further includes a descriptor handler component for detecting the mount descriptor. The system still further includes a data store navigator component for determining a first location in a first data store in the first execution environment. The system additionally includes a mount service component for, creating, based on the mount descriptor, a representation of the data object at the location, wherein accessing the representation includes accessing the data object from the second data store. The system also includes a processor, wherein at least one of the content manager component, the descriptor handler component, the data store navigator component, and the mount service component includes an instruction that is executed by the processor during operation of the system.

Methods and systems are described for sharing a data object in a data store via a communication. In one aspect, the method includes receiving, by a second communications agent that represents a second user, data object information that identifies a data object in a second data store in a second execution environment that includes the second communications agent. The method further includes creating a mount descriptor for accessing the data object from the second data store by a first data store in a first execution environment including a first communications agent that represents a first user. The method still further includes including, by the second communications agent, the mount descriptor in a first message, addressed to the first user. The method additionally includes sending, via a communications protocol via the network by the second communications agent, the first message for delivery to the first communications agent to create, based on the mount descriptor, a representation, of the data object in the first data storage, that when accessed includes accessing the data object from the second data store. Performing at least one the preceding actions comprising the method includes execution of an instruction by a processor.

Also, a system for sharing a data object in a data store via a communication is described that includes one or more processors and logic encoded in one or more tangible media for execution by the one or more processors that when executed is operable for receiving, by a second communications agent that represents a second user, data object information that identifies a data object in a second data store in a second execution environment that includes the second communications agent; creating a mount descriptor for accessing the data object from the second data store by a first data store in a first execution environment including a first communications agent that represents a first user; including, by the second communications agent, the mount descriptor in a first message, addressed to the first user; and sending, via a communications protocol via the network by the second communications agent, the first message for delivery to the first communications agent to create, based on the mount descriptor, a representation, of the data object in the first data storage, that when accessed includes accessing the data object from the second data store.

Further, a system for sharing a data object in a data store via a communication is described. The system includes a descriptor handler component for receiving, by a second communications agent that represents a second user, data object information that identifies a data object in a second data store in a second execution environment that includes the second communications agent. The system further includes a descriptor generator component for creating a mount descriptor for accessing the data object from the second data store by a first data store in a first execution environment including a first communications agent that represents a first user. The system still further includes a content manager component for including, by the second communications agent, the mount descriptor in a first message, addressed to the first user. The system additionally includes a com-out component for, sending, via a communications protocol via the network by the second communications agent, the first message for delivery to the first communications agent to create, based on the mount descriptor, a representation, of the data object in the first data storage, that when accessed includes accessing the data object from the second data store. The system also includes a processor, wherein at least one of the descriptor handler component, the descriptor generator component, the content manager component, and the com-out component includes an instruction that is executed by the processor during operation of the system.

## BRIEF DESCRIPTION OF THE DRAWINGS

Objects and advantages of the present invention will become apparent to those skilled in the art upon reading this description in conjunction with the accompanying drawings, in which like reference numerals have been used to designate like or analogous elements, and in which:

FIG. **1** is a block diagram illustrating an exemplary hardware device included in and/or otherwise providing an execution environment in which the subject matter may be implemented;

FIG. **2**A is a flow diagram illustrating a method for sharing a data object in a data store via a communication according to an aspect of the subject matter described herein;

FIG. **2**B is a flow diagram illustrating a method for sharing a data object in a data store via a communication according to an aspect of the subject matter described herein;

FIG. **3**A is a block diagram illustrating an arrangement of components for sharing a data object in a data store via a communication according to another aspect of the subject matter described herein;

FIG. **3**B is a block diagram illustrating an arrangement of components for sharing a data object in a data store via a communication according to another aspect of the subject matter described herein;

FIG. **4** is a block diagram illustrating an arrangement of components for sharing a data object in a data store via a communication according to another aspect of the subject matter described herein;

FIG. **5** is a network diagram illustrating a system for sharing a data object in a data store via a communication according to another aspect of the subject matter described herein;

FIG. **6**A is a diagram illustrating a user interface presented via a display according to another aspect of the subject matter described herein;

FIG. **6**B is a diagram illustrating a user interface presented via a display according to another aspect of the subject matter described herein;

FIG. **6**C is a diagram illustrating a user interface presented via a display according to another aspect of the subject matter described herein;

FIG. **6**D is a diagram illustrating a user interface presented via a display according to another aspect of the subject matter described herein;

FIG. **6**E is a diagram illustrating a user interface presented via a display according to another aspect of the subject matter described herein;

FIG. **6**F is a diagram illustrating a user interface presented via a display according to another aspect of the subject matter described herein;

FIG. **6**G is a diagram illustrating a user interface presented via a display according to another aspect of the subject matter described herein;

FIG. **7** is a message flow diagram illustrating an exemplary data and execution flow for sharing a data object in a data store via a communication according to an aspect of the subject matter described herein;

FIG. **8**A illustrates an exemplary portion of a communication between an execution environment of a first node and an execution environment of a second node according to an aspect of the subject matter described herein; and

FIG. **8**B illustrates another exemplary portion of a communication between an execution environment of a first node and an execution environment of a second node according to an aspect of the subject matter described herein.

## DETAILED DESCRIPTION

One or more aspects of the disclosure are described with reference to the drawings, wherein like reference numerals are generally utilized to refer to like elements throughout,

and wherein the various structures are not necessarily drawn to scale. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of one or more aspects of the disclosure. It may be evident, however, to one skilled in the art, that one or more aspects of the disclosure may be practiced with a lesser degree of these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to facilitate describing one or more aspects of the disclosure.

Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure belongs. Although methods, components, and devices similar or equivalent to those described herein can be used in the practice or testing of the subject matter described herein, suitable methods, components, and devices are described below.

All publications, patent applications, patents, and other references mentioned herein are incorporated by reference in their entirety. In case of conflict, the present specification, including definitions, will control. In addition, the materials, methods, and examples are illustrative only and not intended to be limiting.

An exemplary device included in an execution environment that may be configured according to the subject matter is illustrated in FIG. **1**. An "execution environment", as used herein, is an arrangement of hardware and, in some aspects, software that may be further configured to include and/or otherwise host an arrangement of components for performing a method of the subject matter described herein. An execution environment includes and/or is otherwise provided by one or more devices. The execution environment is said to be the execution environment of the device and/or devices. An execution environment may be and/or may include a virtual execution environment including software components operating in a host execution environment. Exemplary devices included in and/or otherwise providing suitable execution environments for configuring according to the subject matter include personal computers, notebook computers, tablet computers, servers, portable electronic devices, handheld electronic devices, mobile devices, multiprocessor devices, distributed systems, consumer electronic devices, routers, communication servers, and/or any other suitable devices. Those skilled in the art will understand that the components illustrated in FIG. **1** are exemplary and may vary by particular execution environment.

FIG. **1** illustrates a hardware device **100** included in an execution environment **102**. FIG. **1** illustrates that execution environment **102** includes a processor **104**, such as one or more microprocessors; a physical processor memory **106** including storage locations identified by addresses in a physical memory address space of processor **104**; a persistent secondary storage **108**, such as one or more hard drives and/or flash storage media; an input device adapter **110**, such as a key or keypad hardware, a keyboard adapter, and/or a mouse adapter; an output device adapter **112**, such as a display and/or an audio adapter for presenting information to a user; a network interface component, illustrated by a network interface adapter **114**, for communicating via a network such as a LAN and/or WAN; and a communication mechanism that operatively couples elements **104**-**114**, illustrated as a bus **116**. Elements **104**-**114** may be operatively coupled by various means. Bus **116** may comprise any type of bus architecture, including a memory bus, a peripheral bus, a local bus, and/or a switching fabric.

As used herein a "processor" is an instruction execution machine, apparatus, or device. A processor may include one or more electrical, optical, and/or mechanical components that operate in interpreting and executing program instructions. Exemplary processors include one or more microprocessors, digital signal processors (DSPs), graphics processing units, application-specific integrated circuits (ASICs), optical or photonic processors, and/or field programmable gate arrays (FPGAs). Processor **104** may access machine code instructions and data via one or more memory address spaces in addition to the physical memory address space. A memory address space includes addresses identifying locations in a processor memory. The addresses in a memory address space are included in defining a processor memory. Processor **104** may have more than one processor memory. Thus, processor **104** may have more than one memory address space. Processor **104** may access a location in a processor memory by processing an address identifying the location. The processed address may be identified by an operand of a machine code instruction and/or may be identified by a register or other portion of processor **104**.

FIG. **1** illustrates a virtual processor memory **118** spanning at least part of physical processor memory **106** and may span at least part of persistent secondary storage **108**. Virtual memory addresses in a memory address space may be mapped to physical memory addresses identifying locations in physical processor memory **106**. An address space for identifying locations in a virtual processor memory is referred to as a virtual memory address space; its addresses are referred to as virtual memory addresses; and its processor memory is referred to as a virtual processor memory or virtual memory. The term "processor memory" may refer to physical processor memory, such as processor memory **106**, and/or may refer to virtual processor memory, such as virtual processor memory **118**, depending on the context in which the term is used.

Physical processor memory **106** may include various types of memory technologies. Exemplary memory technologies include static random access memory (SRAM) and/or dynamic RAM (DRAM) including variants such as dual data rate synchronous DRAM (DDR SDRAM), error correcting code synchronous DRAM (ECC SDRAM), RAMBUS DRAM (RDRAM), and/or XDR™ DRAM. Physical processor memory **106** may include volatile memory as illustrated in the previous sentence and/or may include nonvolatile memory such as nonvolatile flash RAM (NVRAM) and/or ROM.

Persistent secondary storage **108** may include one or more flash memory storage devices, one or more hard disk drives, one or more magnetic disk drives, and/or one or more optical disk drives. Persistent secondary storage may include a removable data storage medium. The drives and their associated tangible computer readable storage media provide volatile and/or nonvolatile storage for computer-readable instructions, data structures, program components, and other data for execution environment **102**.

Execution environment **102** may include software components stored in persistent secondary storage **108**, in remote storage accessible via a network, and/or in a processor memory. FIG. **1** illustrates execution environment **102** including an operating system **120**, one or more applications **122**, and other program code and/or data components illustrated by other libraries and subsystems **124**. In an aspect, some or all software components may be stored in locations accessible to processor **104** in a shared memory address space shared by the software components. The software components accessed via the shared memory address space are stored in a shared processor memory defined by the shared memory address space. In another aspect, a first software component may be stored in one or more locations accessed by processor **104** in a first address space and a second software component may be stored in one or more locations accessed by processor **104** in a second address space. The first software component is stored in a first processor memory defined by the first address space and the second software component is stored in a second processor memory defined by the second address space.

Software components typically include instructions executed by processor **104** in a computing context referred to as a "process". A process may include one or more "threads". A "thread" includes a sequence of instructions executed by processor **104** in a computing sub-context of a process. The terms "thread" and "process" may be used interchangeably herein when a process includes only one thread.

Execution environment **102** may receive user-provided information via one or more input devices illustrated by an input device **128**. Input device **128** provides input information to other components in execution environment **102** via input device adapter **110**. Execution environment **102** may include an input device adapter for a keyboard, a touch screen, a microphone, a joystick, a television receiver, a video camera, a still camera, a document scanner, a fax, a phone, a modem, a network interface adapter, and/or a pointing device, to name a few exemplary input devices.

Input device **128** included in execution environment **102** may be included in device **100** as FIG. **1** illustrates or may be external (not shown) to device **100**. Execution environment **102** may include one or more internal and/or external input devices. External input devices may be connected to device **100** via corresponding communication interfaces such as a serial port, a parallel port, and/or a universal serial bus (USB) port. Input device adapter **110** receives input and provides a representation to bus **116** to be received by processor **104**, physical processor memory **106**, and/or other components included in execution environment **102**.

An output device **130** in FIG. **1** exemplifies one or more output devices that may be included in and/or that may be external to and operatively coupled to device **100**. For example, output device **130** is illustrated connected to bus **116** via output device adapter **112**. Output device **130** may be a display device. Exemplary display devices include liquid crystal displays (LCDs), light emitting diode (LED) displays, and projectors. Output device **130** presents output of execution environment **102** to one or more users. In some embodiments, an input device may also include an output device. Examples include a phone, a joystick, and/or a touch screen. In addition to various types of display devices, exemplary output devices include printers, speakers, tactile output devices such as motion-producing devices, and other output devices producing sensory information detectable by a user. Sensory information detected by a user is referred herein to as "sensory input" with respect to the user.

A device included in and/or otherwise providing an execution environment may operate in a networked environment communicating with one or more devices via one or more network interface components. The terms "communication interface component" and "network interface component" are used interchangeably herein. FIG. **1** illustrates network interface adapter (NIA) **114** as a network interface component included in execution environment **102** to operatively couple device **100** to a network. A network interface component includes a network interface hardware (NIH) component and optionally a network interface software (NIS) component.

Exemplary network interface components include network interface controller components, network interface cards, network interface adapters, and line cards. A node may include one or more network interface components to interoperate with a wired network and/or a wireless network. Exemplary wireless networks include a BLUETOOTH network, a wireless 802.11 network, and/or a wireless telephony network (e.g., a cellular, PCS, CDMA, and/or GSM network). Exemplary network interface components for wired networks include Ethernet adapters, Token-ring adapters, FDDI adapters, asynchronous transfer mode (ATM) adapters, and modems of various types. Exemplary wired and/or wireless networks include various types of LANs, WANs, and/or personal area networks (PANs). Exemplary networks also include intranets and internets such as the Internet.

The terms "network node" and "node" in this document both refer to a device having a network interface component for operatively coupling the device to a network. Further, the terms "device" and "node" used herein may refer to one or more devices and nodes, respectively, providing and/or otherwise included in an execution environment unless clearly indicated otherwise.

The user-detectable outputs of a user interface are generically referred to herein as "user interface elements" or abbreviated as "UI elements". More specifically, visual outputs of a user interface are referred to herein as "visual interface elements". A visual interface element may be a visual output of a graphical user interface (GUI). Exemplary visual interface elements include windows, textboxes, sliders, list boxes, drop-down lists, spinners, various types of menus, toolbars, ribbons, combo boxes, tree views, grid views, navigation tabs, scrollbars, labels, tooltips, text in various fonts, balloons, dialog boxes, and various types of button controls including check boxes and radio buttons. An application interface may include one or more of the elements listed. Those skilled in the art will understand that this list is not exhaustive. The terms "visual representation", "visual output", and "visual interface element" are used interchangeably in this document. Other types of UI elements include audio outputs referred to as "audio interface elements", tactile outputs referred to as "tactile interface elements", and the like.

A visual output may be presented in a two-dimensional presentation where a location may be defined in a two-dimensional space having a vertical dimension and a horizontal dimension. A location in a horizontal dimension may be referenced according to an X-axis and a location in a vertical dimension may be referenced according to a Y-axis. In another aspect, a visual output may be presented in a three-dimensional presentation where a location may be defined in a three-dimensional space having a depth dimension in addition to a vertical dimension and a horizontal dimension. A location in a depth dimension may be identified according to a Z-axis. A visual output in a two-dimensional presentation may be presented as if a depth dimension existed allowing the visual output to overlie and/or underlie some or all of another visual output.

A "user interface (UI) element handler" component, as the term is used herein, includes a component of configured to send information representing a program entity for presenting a user-detectable representation of the program entity by an output device, such as a display. A "program entity" is an object included in and/or otherwise processed by an application or executable. The user-detectable representation is presented based on the sent information. Information that represents a program entity for presenting a user detectable representation of the program entity by an output device is referred to herein as "presentation information". Presentation information may include and/or may otherwise identify data in one or more formats. Exemplary formats include image formats such as raw pixel data, JPEG, video formats such as MP4, markup language data such as hypertext markup language (HTML) and other XML-based markup, a bit map, and/or instructions such as those defined by various script languages, byte code, and/or machine code. For example, a web page received by a user agent from a remote application provider may include HTML, ECMAScript, and/or byte code for presenting one or more UI elements included in a user interface of the remote application. Components configured to send information representing one or more program entities for presenting particular types of output by particular types of output devices include visual interface element handler components, audio interface element handler components, tactile interface element handler components, and the like.

A representation of a program entity may be stored and/or otherwise maintained in a presentation space. As used in this document, the term "presentation space" refers to a storage region allocated and/or otherwise provided for storing presentation information, which may include audio, visual, tactile, and/or other sensory data for presentation by and/or on an output device. For example, a buffer for storing an image and/or text string may be a presentation space as sensory information for a user. A presentation space may be physically and/or logically contiguous or non-contiguous. A presentation space may have a virtual as well as a physical representation. A presentation space may include a storage location in a processor memory, secondary storage, a memory of an output adapter device, and/or a storage medium of an output device. A screen of a display, for example, is a presentation space.

As used herein, the terms "program" and "executable" refer to any data representation that may be translated into a set of machine code instructions and may optionally include associated program data. The terms are used interchangeably herein. Program representations other than machine code include object code, byte code, and source code. Object code includes a set of instructions and/or data elements that either are prepared for linking prior to loading or are loaded into an execution environment. When in an execution environment, object code may include references resolved by a linker and/or may include one or more unresolved references. The context in which this term is used will make clear the state of the object code when it is relevant. This definition can include machine code and virtual machine code, such as Java™ byte code. As used herein, the terms "application", and "service" may be realized in one or more executables and/or in one or more hardware components. The terms are used interchangeably herein.

As used herein, the term "network protocol" refers to a formal set of rules, conventions and data structures that governs how computers and other network devices exchange information over a network. The rules, conventions, and data structures are said to be specified or defined in a specification and/or schema.

The term "network path" as used herein refers to a sequence of nodes in a network that are communicatively coupled for transmitting data in one or more data units of a specified network protocol between a pair of nodes in the network.

A "data unit", as the term is used herein, is a data entity specified according to a network protocol for transmitting data contained in and/or otherwise identified by the data entity. A data unit is transmitted between a pair of nodes in a network path to send the data in and/or otherwise identified by the data unit from a source node to a destination node that includes a protocol endpoint of the network protocol. A network protocol explicitly and/or implicitly specifies and/or otherwise identifies a schema that defines one or more of a format for a valid data unit and a vocabulary for content of a valid data unit. One example of a data unit is an Internet Protocol (IP) packet. The Internet Protocol defines a format for an IP packet that defines a header for identifying a destination address that identifies a destination node and a payload portion for including a representation of data to be delivered to the identified destination node. The terms "data unit", "data packet", and "packet" are used interchangeably herein. One or more data units of a first network protocol may transmit a message of second network protocol. For example, one or more data units of the IP protocol may include a TCP message. In another example, one or more TCP data units may transmit an HTTP message.

How data is packaged in one more data units for a network protocol may vary as the data traverses a network path from a source node to a destination node. Data may be transmitted in a single data unit between two consecutive nodes in a network path. Additionally, data may be exchanged between a pair of consecutive nodes in several data units each including a portion of the data. Data received in a single data unit by a node in a network path may be split into portions included in several respective data units for transmitting to a next node in the network path. Portions of data received in several data units may be combined into a single data unit for transmitting by a node in a network path. For purposes of describing the subject matter, a data unit in which data is received by a node is referred to as a different data unit than a data unit in which the data is forwarded by the node.

A "protocol address", as the term is used herein, for a network protocol is an identifier of a protocol endpoint that may be represented in a data unit of the protocol. For example 192.168.1.1 is an IP protocol address represented in a human readable format that may be included in an address portion of an IP header to identify a source and/or a destination IP protocol endpoint. A protocol address differs from a symbolic identifier, defined below, in that a symbolic identifier, with respect to a network protocol, maps to a protocol address. Thus, "www.mynode.com" may be a symbolic identifier for a node in a network when mapped to the protocol address 192.168.1.1. An identifier may be both a symbolic identifier and a protocol address depending on its role with respect to its use for a particular network protocol.

A node in a pair of nodes in a network path at one end of the sequence of nodes in the network path and/or the other end is referred to herein as a "path end node". Note that a node may have two NICs with one NIC at each end of a network path. A network path may be included as a portion of another network path that communicatively couples a same pair of nodes. Data may be transmitted via the sequence of nodes in a network path between path end nodes communicatively coupled via the network path. Data may be transmitted in one or both directions depending on an ordering of the nodes in the sequence.

"Path information" is any information that identifies a network path and/or hop path for data transmitted via one or more specified network protocols. Path information may be identified by identifying network interfaces, NICs, nodes, and/or hops included in a network path. "Address information" is any information that identifies a protocol address that, for a network protocol, identifies a protocol endpoint. Address information may identify a unicast protocol address for a network protocol. In identifying a protocol endpoint, a protocol address identifies a node and a network interface. Those skilled in the art will understand upon reading the descriptions herein that the subject matter disclosed herein is not restricted to the network protocols described and/or their corresponding OSI layers. For ease of illustration, the subject matter is described in terms of protocols that correspond to OSI layer three, also referred to as network layer protocols, in general. Particular descriptions are based on versions of the Internet Protocol (IP). Address information may identify one or more protocol addresses. Exemplary protocol addresses include IP addresses, IPX addresses, DECNet addresses, VINES Internet Protocol addresses, and Datagram Delivery Protocol (DDP) addresses.

An "interaction", as the term is used herein, refers to any activity including a user and an object where the object is a source of sensory data detected by the user. In an interaction the user directs attention to the object. An interaction may also include the object as a target of input from the user. The input from the user may be provided intentionally or unintentionally by the user. For example, a rock being held in the hand of a user is a target of input, both tactile and energy input, from the user. A portable electronic device is a type of object. In another example, a user looking at a portable electronic device is receiving sensory data from the portable electronic device whether the device is presenting an output via an output device or not. The user manipulating an input component of the portable electronic device exemplifies the device, as an input target, receiving input from the user. Note that the user in providing input is detecting sensory information from the portable electronic device provided that the user directs sufficient attention to be aware of the sensory information and provided that no disabilities prevent the user from processing the sensory information. An interaction may include an input from the user that is detected and/or otherwise sensed by the device. An interaction may include sensory information that is detected by a user included in the interaction that is presented by an output device included in the interaction.

As used herein "interaction information" refers to any information that identifies an interaction and/or otherwise provides data about an interaction between a user and an object, such as a portable electronic device. Exemplary interaction information may identify a user input for the object, a user-detectable output presented by an output device of the object, a user-detectable attribute of the object, an operation performed by the object in response to a user, an operation performed by the object to present and/or otherwise produce a user-detectable output, and/or a measure of interaction. The term "operational component" of a device, as used herein, refers to a component included in performing an operation by the device.

Interaction information for one object may include and/or otherwise identify interaction information for another object. For example, a motion detector may detect user's head turn in the direction of a display of a portable electronic device. Interaction information identifying the user's head is facing the display may be received and/or used as interaction information for the portable electronic device indicating the user is receiving visual input from the display. The interaction information may serve to indicate a lack of user interaction with one or more other objects in directions from the user different than the detected direction, such as a person approaching the user from behind the user. Thus the interaction information may serve as interaction information for one or more different objects.

As used herein, any reference to an entity "in" an association is equivalent to describing the object as "identified" by the association, unless explicitly indicated otherwise.

As used herein, the term "communication" refers to information including a message sent and/or for sending via a network between communicants. A message may include text data, audio data, and/or image data. The term "communicant" as used herein refers to a user included in a communication as a sender and/or a receiver of the information. A communicant is represented by a "communications agent" configured to operate in an execution environment to send data to and/or receive data from another communications agent, on behalf of the represented communicant, according to a communications protocol via network. A communications protocol defines and/or otherwise identifies an address space including communications addresses for delivering data sent in a communication from one communications agent to another. A communications protocol is a type of network protocol.

The term "communicant alias" as used herein refers to an identifier of a communicant in a communication where the communicant alias is not a communications address included in an address space of a communications protocol for sending and/or receiving data in the communication.

The term "attachment" as used herein refers to a portion of a communication that includes data from one communicant to another other than data in the message portion. A resource sent as an attachment is data that is typically not presented "inline" or in a message included in a message portion of a communication. Email attachments are perhaps the most widely known attachments included in communications. An email attachment is a file or other resource sent along with an email in a portion of the email separate from a message portion. As defined, other types of text communications as well as voice and video communications may include mount descriptor portions. A communication may include one or more resources as one or more attachments.

The terms "contactor" and "contactee" identify roles in a communication. A "contactor" provides information for identifying a "contactee" in a communication. A contactee may be included in a communication by a contactor and/or the contactor's communications agent. A contactor and/or a contactee are roles of a user or communicant of a communications agent and may be a living being, a node, a component, and/or an application. Both a contactor and a contactee are communicants in a communication.

The term "data object" as used herein refers to an entity, identifiable within a data store, for storing and/or accessing data. Exemplary data stores include file systems, directory service including DNS and LDAP, and data bases including relational databases and hierarchical databases, to name a few examples. Exemplary data objects include files and folders in a file system. Accessing a data object includes one or more of accessing data in the data object and accessing metadata, maintained by the data store, about the data object.

FIG. **3**A illustrates an arrangement of components in a system that operates in an execution environment, such as execution environment **102** in FIG. **1**. The arrangement of components in the system operates to perform the method illustrated in FIG. **2**A. The system illustrated includes a content manager component **302**, a descriptor handler component **304**, a data store navigator component **306**, and a mount service component **308**. A suitable execution environment includes a processor, such as processor **104**, to process an instruction in at least one of a content manager component, a descriptor handler component, and a data store navigator component, and a mount service component. FIG. **3**B illustrates an arrangement of components in a system that operates to perform the method illustrated in FIG. **2**B. The system illustrated includes a descriptor handler component **304**, a descriptor generator component **314**, a content manager component **302**, and a com-out component **318**. A suitable execution environment includes a processor, such as processor **104**, to process an instruction in at least one of a descriptor handler component, a descriptor generator component, a content manager component, and a com-out component.

Some components, illustrated in the drawings are identified by numbers with an alphanumeric suffix. A component may be referred to generically in the singular or the plural by dropping a suffix of a portion thereof of the component's identifier. For example, window UI elements, such as a window UI element **602***a* in FIG. **6**A, a window UI element **602***a* in FIG. **6**A, and their adaptations and analogs; are referred to herein generically as a window UI element **602** or window UI elements **602** when describing more than one. Other components identified with an alphanumeric suffix may be referred to generically or as a group in a similar manner.

The arrangement of components illustrated in FIG. **4** may be adapted to operate in a number of execution environments to perform the method illustrated in FIG. **2**A and/or the method illustrated in FIG. **2**B. FIG. **4** is a block diagram illustrating the components of FIG. **3**A, FIG. **3**B, and/or analogs of the components of FIG. **3**A and FIG. **3**B, respectively adapted to operate in an execution environment **401** that includes and/or otherwise is provided by one or more nodes. FIG. **1** illustrates key components of an exemplary device that may at least partially provide and/or otherwise be included in an execution environment. The components illustrated in FIG. **4** may be included in or otherwise combined with the components of FIG. **1** to create a variety of arrangements of components according to the subject matter described herein.

As stated, the various adaptations and analogs of the arrangement in FIG. **3**A as well as the various adaptations and analogs of the arrangement in FIG. **3**B illustrated and described herein are not exhaustive. For example, those skilled in the art will see based on the description herein that arrangements of components for performing the method illustrated in FIG. **2**A and the method illustrated in FIG. **2**B may each be distributed across more than one node and/or execution environment. For example, such arrangements may operate at least partially in a browser in a one execution environment and at least partially in a server in another execution environment interoperating via a network.

FIG. **5** illustrates a first node **502** and a second node as exemplary devices that each may be included in and/or otherwise adapted for providing an instance, adaptation, and/or analog of execution environment **401** in FIG. **4**. As illustrated in FIG. **5**, first node **502** and a second node **504** are operatively coupled to a network **506** via respective network interface components enabling execution environment **401** of first node **502** and execution environment **401** of second node **504** to exchange data in a communication on behalf of communicants represented by the respective nodes.

FIG. **4** illustrates a communications agent **403** including an adaptation of the arrangement of components in FIG. **3**A and an adaptation of the arrangement of components in FIG. **3**B. A first communications agent **403** may operate, in execution environment **401** of first node **502**, on behalf of a first communicant to communicate with a second communicant represented by a second communications agent **403** operating in execution environment **401** of second node **504**.

An execution environment **401** is illustrated in FIG. **4** hosting communications agent **403**. Components in FIG. **4** are referenced for illustrative purposes in describing communications agents operating in an execution environment of first node **502** and an execution environment **401** of second node **504**. Exemplary communications agents include email clients, phone clients including Voice over Internet Protocol (VoIP) clients, instant messaging clients, short message service (SMS) clients, multimedia message service (MMS clients), multi-media communications clients including video phone clients, and other data transfer agents.

Communications agents **403** such as illustrated in FIG. **4**, respectively operating in execution environment **401** of first node **502** and in execution environment **401** of second node **504** in FIG. **5** may interoperate via respective network stacks **405**. Communications agents **403** may communicate via one or more communications protocols. FIG. **4** illustrates communications protocol component **407** exemplifying a subsystem for exchanging data via network **506** according to one or more communications protocols, such as simple mail transfer protocol (SMTP), an instant messaging protocol, and/or a real-time voice and/or video protocol. A communication between communications agents **403** in execution environment **401** of first node **502** and execution environment **401** of second node **504** may include more than one type of data and may use one or more communications protocols in exchanging one or more types of data via network **506**.

Instances, adaptations, and/or analogs of communications agent **403** in FIG. **4**, in execution environment **401** of first node **502** and in execution environment **401** of second node **504**, respectively, may communicate via discrete messages, a request/reply protocol, a data streaming protocol, a session and/or connection-oriented protocol, a connectionless protocol, a real-time communications protocol, an asynchronous communication, a store and forward communications protocol, a reliable delivery communications protocol, a best-effort delivery communications protocol, and/or a secure protocol, to name a few communications options.

FIG. **4** illustrates communications agent **403** including a content manager component **402**. Content manager component **402** may interoperate with communications protocol layer component **407** and/or network stack **405** to receive data in one or more communications via network **506** with another communications agent in another node. Content manager component **402**, in FIG. **4**, is operatively coupled, via com-in component **411**, to communications protocol component **407** and operates to receive the data from the other node.

Data received in a communication may include one or more data portions having respective content types. Exemplary content types include plain text, markup such as hypertext markup language (HTML), audio data, image data, and/or executable data. Executable data may include script instruction(s), byte code, and/or machine code. In FIG. **4**, communications agent **403** includes one or more content handler components **413** to process data received according to its content type. A data type may be identified by a MIME type identifier. Exemplary content handler components **413** include text/html content handler components for processing HTML representations; application/xmpp-xml content handler components for processing extensible messaging and presence protocol (XMPP) streams including presence tuples, instant messages, and audio content handlers including and/or configured to retrieve suitable codices; video content handler components for processing video representations of various types; and still image data content handler components for processing various image data representations.

Content handler component(s) **413** process received data representations and may provide transformed data from the representations to one or more user interface element handler components **415**. One or more user interface element handler components **415** are illustrated in a presentation controller component **417** in FIG. **4**. Presentation controller component **417** may manage visual, audio, and other types of output for its including application as well as receive and route detected user and other inputs to components and extensions of its including application, communications agent **403**. A user interface element handler component **415** may be adapted to operate at least partially in a content handler component **413** such as a text/html content handler component and/or a script content handler component. Additionally or alternatively, a user interface element handler component in an execution environment **401** may be received in a communication. For example, a communication, such as an email, may include an HTML content type portion and a script content type portion.

FIGS. **6**A-H illustrate various user interfaces, some of which include window UI elements **602** presentable in a presentation space of a display device, such as output device **130** in FIG. **1**. A window UI element **602** may include a contactor UI element **604** for presenting an identifier of a communicant in the role of a contactor in a communication represented by the window UI element **602**. A window UI element **602** may also include a contactee UI element **606** for presenting one or more contactee identifier(s) identifying one or more communicants in the role of contactee(s) in the communication. A presentation space **608** may be included in each window UI element **602** for presenting a user message UI element **610** that my present a user message from one user to another. A presentation space **608** may also be provided for presenting one or more UI elements that correspond to user inputs for exchanging data in and/or otherwise managing a communication.

Data to send in a communication to a communications agent in execution environment **401** of second node **504** may be received by one or more content handler component(s) **413** operating in execution environment **401** of first node **502** to transform the data into one or more data representations suitable for transmitting in the communication and/or suitable for processing by the communications agent in execution environment **401** of second node **504**. The one or more data representations may be provided to content manager component **402** for sending in the communication to execution environment **401** of second node **504**. Content manager component **402** may package the one or more data representations in a message formatted according to a communications protocol of the communications agent. Communications protocol component **407** may send the data according to the specification(s) of the communications protocol. Content manager component **402** may alternatively or additionally encode and/or otherwise transform one or more of the data representations so that the data may be sent in a data stream such as voice stream and/or a video stream in the communication to a communications agent via a network.

Content manager component **402** operating in execution environment **401** included in and/or otherwise provided by a node, such as execution environment **401** of first node **502**, may provide the packaged, encoded, and/or transformed data to communications protocol component **407** via a com-out component **418**. Com-out component **418** as described above operatively couples communications agent **402** to communications protocol component **407** according to an interface provided by communications protocol component **407** to send data in a communication according to a communications protocol. Communications protocol component **407** may further package and/or otherwise transform the data to send via network stack **405** for delivery via network **506** to another node, such as second node **504**.

As described above, a communications protocol may operate via one or more nodes in a network in a network path communicatively coupling a first node and a second node. Exemplary path nodes include mail relay nodes, phone switch nodes, and proxy nodes such as instant messaging proxies for communicating through firewalls. As indicated, proxy node **508** may operate as a path node.

A contactee is identified for sending data in a communication. A contactee may be represented by a communications address in an address space of a communications protocol. In one aspect, information identifying a communications address may be received from a communicant of a communications agent in an execution environment. In FIG. **4**, presentation controller **417** and/or a UI element handler **415**, presenting and/or managing interaction with contactor UI element **604***a* in FIG. **6**A for execution environment **401** of first node **502**, may receive a contactor alias in response to a user input corresponding to UI element handler **415**. The user/communicant of execution environment **401** of first node **502** may enter a contactor alias, such as "William", via a keyboard and/or select a predefined communicant alias presented in a selection UI control element via a UI element handler component **415**. The user input may be detected by input driver **421**. Corresponding input information may be routed to presentation controller **417** by GUI subsystem **423**. GUI subsystem **423** operates to send presentation information to a display device via a graphics subsystem **425**. Communication agent **403** may identify a communication address associated with the contactor alias, "William". Other communications address, such as for one or more contactees, may be received similarly and/or in any suitable manner. In an aspect, one or more contactor and/or contactee identifiers may be determined automatically.

Data may be sent in a communication according to a form or type of the communication and/or other attribute of the communication such as a security attribute, the amount of data to be sent, a priority setting, a task setting, and the like. Some forms of communication do not require a session and/or a connection between nodes representing communicants in the communication in order to send data between and/or among the nodes, while other forms of communication do. An email and/or instant message may use a store and forward model of delivery.

Data may be sent in a communication in response to a communicant input. In FIG. **6**A a contactor may provide an input corresponding to reply UI element **612***a* in FIG. **6**A. The input may be received by presentation controller component **417** and/or one or more UI element handlers **415** corresponding to reply UI element **612***a*. In response to detecting the input, presentation controller component **417**

may provide data to be sent in the communication to one or more content handler components **413** according to the content type(s) of the data to be sent.

The one or more content handler components **413** may encode, format, and/or otherwise transform the data for sending in a message, such as an email message. The one or more content handler components **413** may provide data to be sent to content manager **402**, instructing content manager component **402** to send the data in the communication for delivery to a communications agent in execution environment **401** of second node **504**. Content manager component **402** interoperating with com-out component **418** may further format and/or transform the data for sending in the communication according to a communications protocol, for example according to an email communications protocol, by communications protocol component **407**. Communications protocol component **407** may send the communication for delivery to the communications agent in execution environment **401** of second node **504** via network **506**.

One or more path nodes may relay data sent in the communication between execution environment **401** of first node **502** and execution environment **401** of second node **504**. A path node may determine a next node and/or a network interface in a network path communicatively coupling execution environment **401** of first node **502** and execution environment **401** of second node **504** for exchanging data in a communication between communication agents **403** in the respective execution environments **401** of first node **502** and second node **504**.

For session-oriented and/or connection-oriented communication a session and/or connection may be established if a session/connection has not already been established. Data may be sent for delivery to a communications agent identified based on a contactee communications address during session and/or connection setup. For example, for a voice communication a voice communication may be established via a session initiation protocol. Communications protocol component **407** may operate according to the session initiation protocol specifications. Communications protocol component **407** operating in execution environment **401** of execution environment **401** of first node **502** may locate a communications agent by communicating with one or more nodes in network **506** according to the session initiation protocol. Communications protocol component **407** may locate a communications agent in execution environment **401** of second node **504**, based on a communications address for the contactee.

Once a communication session is established, such as a voice session, data may be sent according to the session communications protocol, such as RTP. Data may be sent according to the session initiation protocol in the communication for managing the voice communication session and/or for exchanging text, image, and/or other data outside of the voice session. One or more path nodes may be included in session and/or connection setup. Alternatively or additionally, one or more path nodes may be included in a network path in a session and/or connection.

With reference to FIG. 2A, a block **202** illustrates that the method includes receiving, by a first communications agent in a first execution environment according to a first communication protocol via a network from a second communications agent in a second execution environment, a first message, in a communication and addressed to a first user represented by the first communications agent, that includes a mount descriptor that identifies a data object in a second data store in the second execution environment. Accordingly, a system for sharing a data object in a data store via a communication includes means for receiving, by a first communications agent in a first execution environment according to a first communication protocol via a network from a second communications agent in a second execution environment, a first message, in a communication and addressed to a first user represented by the first communications agent, that includes a mount descriptor that identifies a data object in a second data store in the second execution environment. For example, the arrangement in FIG. **3**A, includes content manager component **302** that is operable for receiving, by a first communications agent in a first execution environment according to a first communication protocol via a network from a second communications agent in a second execution environment, a first message, in a communication and addressed to a first user represented by the first communications agent, that includes a mount descriptor that identifies a data object in a second data store in the second execution environment. FIG. **4** illustrates content manager component **402** as an adaptation and/or analog of the content manager component **302** in FIG. **3**A. One or more content manager components **402** operate in an execution environment **401**. The system for sharing a data object in a data store via a communication includes one or more processors and logic encoded in one or more tangible media for execution by the one or more processors that when executed is operable for receiving, by a first communications agent in a first execution environment according to a first communication protocol via a network from a second communications agent in a second execution environment, a first message, in a communication and addressed to a first user represented by the first communications agent, that includes a mount descriptor that identifies a data object in a second data store in the second execution environment.

FIG. **7** includes a data flow message that illustrates a first message **702**, including a mount descriptor, received via network **506** by execution environment **401** including and/or otherwise provided by first node **502**. First message **702** is sent via a communications protocol by a communications agent **403** in execution environment **401** including and/or otherwise provided by second node **504**.

First message **702** may be addressed to a user of execution environment **401** of first node **502** by a communications address, that identifies the user, from an address space of the communications protocol. First message may be from a user, identified by a communications address in the address space of the communications protocol and represented by communications agent **403** in of execution environment **401** of second node **504**. The communications protocol may include a protocol specified for exchanging at least one of an email, an instant message, a short messaging service message (SMS), a multi-media message (MMS), an audio message, a video message, and an attachment. First message **702** may include a user readable message from the user of execution environment **401** of second node **504**. Receiving first message **702** may include detecting the mount descriptor in first message **702** along with the user readable message.

As described above, content manager component **402** operating in execution environment **401** of first node **502** may interoperate with communications protocol layer component **407** and/or network stack **405** to receive data in one or more communications via network **506** with another communications agent in another node. A communication may be direct and/or indirect, such via an email relay. Content manager component **402** in FIG. **4** operatively couples one or more content handler components **413** with network **506**, via com-in component **411**, communications protocol component **407**, and/or network stack **405** to receive and process the data from the other execution environment of the other node. Thus, content manager component **402** operating in execution environment **401** of first node **502** may receive data, such as sent via first message **702**, which includes a mount descriptor. FIG. **8**A includes an exemplary content portion **800***a* of an email message. Content portion **800***a* includes a user readable message portion **802***a* and a mount descriptor portion **804***a* described in more detail below. The received communication may include a message addressed to a user represented by communications agent **403** in execution environment **401** of first node **502**.

Returning to FIG. **2**A, a block **204** illustrates that the method further includes detecting the mount descriptor. Accordingly, a system for sharing a data object in a data store via a communication includes means for detecting the mount descriptor. For example, the arrangement in FIG. **3**A, includes descriptor handler component **304** that is operable for detecting the mount descriptor. FIG. **4** illustrates descriptor handler component **404** as an adaptation and/or analog of descriptor handler component **304** in FIG. **3**A. One or more descriptor handler components **404** operate in an execution environment **401**. The system for sharing a data object in a data store via a communication includes one or more processors and logic encoded in one or more tangible media for execution by the one or more processors that when executed is operable for detecting the mount descriptor. In FIG. **4**, descriptor handler component **404** is illustrated as a component of communications agent **403**.

FIG. **7** includes a data flow that illustrates a detect descriptor data flow **704** that may be internal to execution environment **401** of first node **502** and/or that may include a message received via network **506** by first node **502**. In an aspect, detect descriptor data flow **704** may illustrate a data flow to descriptor handler component **404** operating in execution environment **401** of first node **502**. A mount descriptor may be identified to and/or otherwise provided to descriptor handler component **404**. Content handler component **402**, operating as described with respect to block **202** of FIG. **2**A, may identify and/or otherwise provide a mount descriptor to a descriptor handler component **404**.

Content manager component **402** may provide some or all of the data in a received message, such as first message **702**, to descriptor handler component **404**. Descriptor handler component **404** may identify and/or otherwise detect a mount descriptor in the message sent from the execution environment **401** of second node **504**. Content manager component **402** may interoperate with descriptor handler component **404** in identifying the mount descriptor. The mount descriptor may be identified for processing by descriptor handler component **404** by content manager component **402** according to a schema for the message. For example, a portion of an email message may include a MIME-type identifier that identifies a corresponding part of the email as a mount descriptor and/or otherwise identifies the part for routing to descriptor handler component **404** in communications agent **403** in execution environment **401** of first node **502**.

Returning to FIG. **2**A, a block **206** illustrates that the method yet further includes determining a first location in a first data store in the first execution environment. Accordingly, a system for sharing a data object in a data store via a communication includes means for determining a first location in a first data store in the first execution environment. For example, the arrangement in FIG. **3**A, includes data store navigator component **306** that is operable for determining a first location in a first data store in the first execution environment. FIG. **4** illustrate data store navigator components **406** as an adaptations and/or analogs of data store navigator component **306** in FIG. **3**A. One or more data store navigator components **406** operate in an execution environment **401**. The system for sharing a data object in a data store via a communication includes one or more processors and logic encoded in one or more tangible media for execution by the one or more processors that when executed is operable for determining a first location in a first data store in the first execution environment. In FIG. **4**, a data store navigator component **406** is illustrated as a component of application **403**.

FIG. **7** includes a data flow message that illustrates a locate data flow **706** that may be internal to execution environment **401** of first node **502** and/or that may include a message received via network **506** by first node **502**. Locate data flow **706**, in an aspect, illustrates a data flow to data store navigator component **406** operating in execution environment **401** of first node **502**. Data store navigator component **406** may be invoked automatically in response to detecting a mount descriptor. In another aspect, data store navigator component **406** may be invoked in response to a user input.

FIG. **6**A illustrates a view window UI element **602***a* as an exemplary user interface that may be presented by communications agent **403** operating in execution environment **401** of first node **502** to present data received in a communication, such as first message **702**, from execution environment **401** of second node **504**. FIG. **6**A illustrates a contactor UI element **604***a*, a contactee UI element **606***a*, and a presentation space **608***a* of the view window UI element **602***a*. Presentation space **608***a* includes a user message UI element **610***a*. The various UI elements may be presented by one or more UI element handler components **415** in communications agent **403** in execution environment **401** of first node **502**. A reply UI element **612***a* and a reply all UI element **614***a* illustrate UI elements in presentation space **608***a* presented to allow a user of the execution environment **401** of first node **502** to respond and/or otherwise instruct execution environment **401** of first node **502** to perform an operation based on the message received in the communication. FIG. **6**A illustrates an attached mounts UI element **616***a* identifying, based on the mount descriptor in first message **702**, a "Music" folder as a mountable folder from a data store of execution environment **401** of second node **504**.

In an aspect, determining a location in a data store for creating a representation of a data object may include presenting a navigation UI element for navigating the data store. The location may be determined in response to detecting a user input identifying the location. View window UI element **602***a* in FIG. **6**A includes a mount UI element **618***a* for receiving user input to display a navigation window UI element **620***a* for identifying a location in a data store of execution environment **401** of first node **502** to mount and/or otherwise attach the remote "Music" folder identified in the mount descriptor. In response to an input directed to mount UI element **618***a*, a corresponding UI element handler **415** may interoperate with data store navigator component **406** to present navigation window UI element **620***a* that includes a presentation space **622***a* for presenting a user detectable representation of one or more locations in a data store of execution environment **401** of first node **502**.

FIG. **6**A illustrates a mount UI element **624***a* allowing a user to provide user input(s) to instruct communications agent **403** in execution environment **401** of first node **502** to request that a data object identified in the mount descriptor be attached to a location, identified in navigation window UI element **602***b*, in the data store in execution environment **401** of first node **502**.

In another aspect, files and/or other data entities identified in a mount descriptor may be illustrated in a manner similar to attachments rather than in a separate UI element as in FIG. **6**A. Creating a representation of a data object may include receiving an indication by a communications agent to access the data object identified by a mount descriptor. In response, a location in a data store for creating the representation may be determined automatically. Further, in response to receiving the indication the representation may be created automatically at the location. Still further, in response to receiving the indication, the data object may be accessed via the network based on the mount descriptor.

In response to detecting the mount descriptor in first message **702**, execution environment **401** of first node **502** may present a view window UI element **602***b* in FIG. **6**B including data received in the first message **702** to a user of execution environment **401** of first node **502** as described with respect to FIG. **6**A. Context menu **626***b* provides UI elements to allow the user to instruct execution environment **401** of first node **502** to retrieve a data object, in response to an input corresponding to "Open" menu UI element **626***b***1**, identified in a mount descriptor received from execution environment **401** of second node **504**. Context menu **626***b* provides UI elements to allow the user to instruct execution environment **401** of first node **502** to attach and/or otherwise mount a representation of a data object, in response to an input corresponding to "Save . . . " menu UI element **626***b***2**, identified in a mount descriptor at a location in the data store of execution environment **401** of first node **502**.

Alternatively or additionally, a location for creating representation of a data object may be determined by detecting user input included in performing a drag and drop operation on a representation of the data object presented via an output device. The drag and drop operation may be performed to attach a data object identified in a received mount descriptor to create a representation of the data object at a location in a data store. FIG. **6**B includes a pointer UI element **628***b* dragging a representation of the "Music" folder from remote attachments UI element **630***b* in view window UI element **602***b*. The representation of the "Music" folder is shown over a listing pane **632***b*, in a navigation window UI element **634***b*, showing data entities in the data store of execution environment **401** of first node **502** at a location identified in a path UI element **636***b*.

FIG. **6**C illustrates another exemplary user interface that execution environment **401** of first node **502** may present to the user to allow the user to instruct execution environment **401** of first node **502** to mount and/or otherwise attach a representation of a data object identified in a mount descriptor to a location in a data store of execution environment **401** of first node **502**. Auto-response window **602***c* may be presented in response to a mount descriptor received in a communication without a user message. Rather than a UI element for displaying a user message, a remote data object pane UI element **638***c* may be presented that identifies data objects located and/or otherwise identified by execution environment **401** of second node **504** in a mount descriptor received by execution environment **401** of first node **502**. UI elements in presentation space **608***c* are illustrated that allow a user to instruct execution environment **401** of first node **502** to retrieve a data object, in response to an input corresponding to "Open" UI element **640***c*, identified in a mount descriptor received from execution environment **401** of second node **504**. Mount UI element **642***c* allows the user to instruct execution environment **401** of first node **502** to attach and/or otherwise mount a representation of a data object, identified in a mount descriptor at a location in the data store of execution environment **401** of first node **502**.

Returning to FIG. **2**A, a block **208** illustrates that the method yet further includes creating, based on the mount descriptor, a representation of the data object at the location, wherein accessing the representation includes accessing the data object from the second data store. Accordingly, a system for sharing a data object in a data store via a communication includes means for creating, based on the mount descriptor, a representation of the data object at the location, wherein accessing the representation includes accessing the data object from the second data store. For example, the arrangement in FIG. **3**A, includes mount service component **308** that is operable for creating, based on the mount descriptor, a representation of the data object at the location, wherein accessing the representation includes accessing the data object from the second data store. FIG. **4** illustrates mount service component **408** as an adaptation and/or analog of mount service component **308** in FIG. **3**A. One or more mount service components **408** operate in an execution environment **401**. The system for sharing a data object in a data store via a communication includes one or more processors and logic encoded in one or more tangible media for execution by the one or more processors that when executed is operable for creating, based on the mount descriptor, a representation of the data object at the location, wherein accessing the representation includes accessing the data object from the second data store. In FIG. **4**, a mount service component **408** is illustrated as a component of data store navigator component **406**.

FIG. **7** includes data flow message that illustrates an attach data flow **708** that may be internal to execution environment **401** of first node **502** and/or that may include a message received via network **506** by execution environment **401** of first node **502**. Attach data flow **708** illustrates a data flow to mount service component **408** operating in execution environment **401** of first node **502**. Mount service component **408** may be invoked automatically in response to detecting a mount descriptor in an aspect. In another aspect, mount service component **408** may be invoked in response to a user input. A representation of a data object identified in a mount descriptor may be created automatically in response to detecting the mount descriptor and/or detecting a user input associated with the message in which the mount descriptor was received.

Once a location is identified, in a data store of an execution environment, for attaching and/or otherwise mounting a representation of a data object in a data store in another execution environment; any of a variety means available to the execution environment mounting the data object may be utilized.

FIG. **8**A illustrates a mount descriptor identifying alternative URLs for accessing the "Music" folder in the data store in execution environment **401** of second node **504**. A Samba URL **808***a* identifies a protocol and a location for accessing the "Music" folder. Mount service component **408** in execution environment **401** of first node **502** may interoperate with a Samba client (not shown) included in and/or associated with file system **427**, which in an aspect may be and/or may be included in the data store of execution environment **401** of first node **502**. Samba URL **808***a* may include user identification and authentication information to the Samba client if needed. Alternatively, the Samba client

and/or mount service **408** may receive such information from the user and/or from a pre-stored profile. In an aspect, the "Music" folder may be mounted, as a drive, in execution environment **401** of first node **502**.

In another aspect, a mount descriptor may identify a representation of a data object that is to be removed and/or otherwise unmounted. A first execution environment may detect a mount descriptor that identifies data object in a data store in a second execution environment. It may be determined that the data object is represented at a location in data store of the first execution environment. The representation may be removed based on the mount descriptor.

In yet another aspect, a mount descriptor may identify a printer accessible to second execution environment. A first execution environment may create a representation of the printer, accessible in the first execution environment, based on the mount descriptor. Accessing the representation of the printer may include accessing the printer via the network. The printer may be accessed directly and/or indirectly, for example via the second execution environment. Samba as well as other services allows access to printers. Thus, a mount descriptor may identify a printer in and/or accessible to execution environment **401** of second node **504** to mount in execution environment **401** of first node **502**.

As an alternative and/or in case execution environment **401** of first node **502** does not include a Samba client and/or a compatible analog, a mount descriptor may specify one or more alternatives in addition to or instead Samba. For example, execution environments may be separated and/or otherwise blocked by one or more firewalls, Mount Service **408** may operate to mount the "Music" found via another identifier in mount descriptor **804***a*. Web Distributed Authoring and Versioning (WebDAV) is an extension of the Hypertext Transfer Protocol (HTTP) that facilitates collaboration between users in editing and managing documents and files stored on World Wide Web servers. A WebDAV URL **810***a* identifies HTTP as an access protocol and identifies a location in execution environment **401** of second node **504** for accessing the "Music" folder. Mount service component **408** in execution environment **401** of first node **502** may interoperate with a WebDAV client (not shown) included in and/or associated with file system **427**, which in an aspect may be and/or may be included in the data store of execution environment **401** of first node **502**. WebDAV URL **810***a* may include user identification and authentication information to the WebDAV client if needed. Alternatively, the WebDAV client and/or mount service **408** may receive such information from the user and/or from a pre-stored profile. In an aspect, the "Music" folder may be mounted as a folder in, for example, a pre-existing Music folder in execution environment **401** of first node **502**. The two music folders may be presented as a merged entity. In another aspect, the "Music" folder identified in the mount descriptor may be mounted at a location in the pre-existing Music folder. The mounted folder may be renamed to distinguish it from a folder with the same name and/or to identify its source by user and/or by node, for example. Alternatives to WebDAV include the file transfer protocol FTP.

In yet another aspect, a representation of a data object a may include and/or may otherwise be based on a replica of at least a portion of the data object. The replica may be synchronized with other replicas and/or an original data object. A mount service **408** may interoperate with an XtreeemFS client to create a representation of a data object identified in a mount descriptor at location in a data store. XtreemFS replicates file data across multiple storage servers, which can be distributed worldwide. The replication algorithm is designed to handle problems and failure scenarios that can occur in distributed systems including message loss, network partitions, server crashes, and the like. When a replicated file is opened, XtreemFS automatically elects a primary replica for that file which processes all file operations. If the primary fails, one of the backup replicas will automatically take over after a short failover period. To an application accessing a file via XtreemFS a regular file and/or folder and a replicated representation behave the same or similarly.

For read-only access, replicas of an original folder and/or file may be created and distributed to various replication servers to enhance performance. Through replication a caching infrastructure may be built in order to reduce latency and bandwidth consumption. Partial replicas may be supported, in addition to or instead of full replicas. File, folder, and/or other data object metadata may also be replicated.

Thus, as described above, a representation of a remote data object may be created based on a mount descriptor that includes information for accessing the data object based on at least one of Samba, content management interoperability services (CMIS), Web Distributed Authoring and Versioning (WedDAV), Atom Publishing Protocol (AtomPub), file transfer protocol (FTP), RSS, SSH FTP, and an identified network file system.

Other distributed file systems that may be accessed to mount a. representation of a data object identified in a mount descriptor at a location in a data store. The Andrew File System (AFS), the Distributed File System (DFS), and the Network File System (NFS). Atom Publishing Protocol (AtomPub), file transfer protocol (FTP), RSS, SSH FTP, and content management interoperability services (CMIS) are other means for mounting a data object identified in a mount descriptor.

With reference to FIG. **2**B, a block **212** illustrates that the method includes receiving, by a second communications agent that represents a second user, data object information that identifies a data object in a second data store in a second execution environment that includes the second communications agent. Accordingly, a system for sharing a data object in a data store via a communication includes means for receiving, by a second communications agent that represents a second user, data object information that identifies a data object in a second data store in a second execution environment that includes the second communications agent. For example, the arrangement in FIG. **3**B, includes descriptor handler component **304** that is operable for receiving, by a second communications agent that represents a second user, data object information that identifies a data object in a second data store in a second execution environment that includes the second communications agent. FIG. **4** illustrates descriptor handler component **404** as an adaptation and/or analog of descriptor handler component **304** in FIG. **3**B. One or more descriptor handler components **404** operate in an execution environment **401**. The system for sharing a data object in a data store via a communication includes one or more processors and logic encoded in one or more tangible media for execution by the one or more processors that when executed is operable for receiving, by a second communications agent that represents a second user, data object information that identifies a data object in a second data store in a second execution environment that includes the second communications agent. In FIG. **4**, a descriptor handler component **404** is illustrated as a component of communications agent **403**.

FIG. **7** includes data flow message that illustrates a create mount descriptor (createMD) data flow **710** data flow to create and/or otherwise construct a mount descriptor that identifies a data object in a data store of execution environment **401** of second node **504**. Create mount descriptor data flow **710** in FIG. **7** may, in FIG. **4**, represent providing and/or otherwise identifying access information to descriptor handler component **404** to process in creating a mount descriptor for a data object identified by the data object information. Create mount descriptor data flow **710** may be internal to execution environment **401** of second node **504** and/or may include interoperation by execution environment **401** of second node **504** via a network with another node.

FIG. **6**D, illustrates an edit window UI element **602***d* that, in an aspect, may be presented by communication agent **403** in execution environment **401** of second node **504** in response to a user input to create a new email. In an aspect, a user of communications agent **403** operating in execution environment **401** of second node **504** may provide input corresponding to attach mount UI element **644***d* in edit window UI element **602***d*. A corresponding UI element handler component **415** may operate to invoke data store navigator component **406** to present a navigation window UI element **646***d* to locate one or more data objects in response to user interaction. Data store navigation component **406** may interoperate with one or more UI element handlers **415**, directly or indirectly via descriptor handler component **404**, in an aspect, to present the navigation window UI element **646***d* and its contents.

Navigation window UI element **646***d* is presented to receive data object information in response to user input to identify a data object in a data store of execution environment **401** of second node **504**. A folder content pane UI element **648***d* in navigation window UI element **646***d* is presented including representations of one or more data objects at a location, identified in a path UI element **650***d*. A pointer UI element **652***d* illustrates a drag and drop operation of a “Music” folder represented in contents pane UI element **648***d*, dropped on edit window UI element **602***d*. In response, to detecting the drag and drop operation by one or more UI element handler components **415**, data store navigator component **406** may interoperate with the one or more UI element handle components **415** to provide data object information identifying the data object to descriptor handler component **404**.

Returning to FIG. **2**B, a block **214** illustrates that the method further includes creating a mount descriptor for accessing the data object from the second data store by a first data store in a first execution environment including a first communications agent that represents a first user. Accordingly, a system for sharing a data object in a data store via a communication includes means for creating a mount descriptor for accessing the data object from the second data store by a first data store in a first execution environment including a first communications agent that represents a first user. For example, the arrangement in FIG. **3**B, includes descriptor generator component **314** that is operable for creating a mount descriptor for accessing the data object from the second data store by a first data store in a first execution environment including a first communications agent that represents a first user. FIG. **4** illustrates descriptor generator component **414** as an adaptation and/or analog of descriptor generator component **314** in FIG. **3**B. One or more descriptor generator components **414** operate in an execution environment **401**. The system for sharing a data object in a data store via a communication includes one or more processors and logic encoded in one or more tangible media for execution by the one or more processors that when executed is operable for creating a mount descriptor for accessing the data object from the second data store by a first data store in a first execution environment including a first communications agent that represents a first user. In FIG. **4**, descriptor generator component **414** is illustrated as a component of communications agent **403**.

As described above, FIG. **7** illustrates a create mount descriptor (createMD) data flow **710**. Create mount descriptor data flow **710** may result from a request from a remote node, described below, and/or may result in access information received in response to user input, also described above. Access information received by descriptor handler component **404** may be provided to and otherwise identified to a descriptor generator component **414** which may also be included in create mount descriptor data flow **710**. Descriptor generator component **414** operates to create and/or otherwise construct a mount descriptor.

Data objects located and/or otherwise identified by data object information received by descriptor handler component **404** may be identified to descriptor generator component **414** to construct and/or otherwise create a mount descriptor identifying the data objects. A descriptor handler component may be a type of content handler component that operates to process data object information to create a mount descriptor that conforms to a schema for creating and/or otherwise constructing a valid mount descriptor. The descriptor generator component **414** may construct and/or otherwise create a mount descriptor based on a schema that defines and/or otherwise identifies a valid mount descriptor for a particular type of communication supported by a communications agent. The mount descriptor is constructed and/or otherwise created, based on the data object information, by the descriptor generator component **414**.

Descriptor generator component **414** in execution environment **401** of second node **504** may provide the mount descriptor to content manager component **402** to include and/or otherwise identify the mount descriptor in a communication with execution environment **401** of first node **502**, such as an email and/or instant message. Content manager component **402** may interoperate with other types of content handler components **413** to create and/or otherwise construct a message that includes the valid mount descriptor.

A mount descriptor may be included in a message according to a protocol schema that identifies the message as valid according to a communications protocol. In an aspect, the descriptor generator component **414** may interoperate with the content manager component **402** to create a valid mount descriptor according to a specified schema for the message, so that the message is valid according to a communications protocol supported by a communications protocol component **407** that operates to send the message. As described above, the content manager component **402** may operate in execution environment **401** of second node **504** along with a descriptor generator component **414** to transform data object information into a mount descriptor to include along with data for other parts of a communication into one or more representations suitable for transmitting in a communication, such as a message, to another node, such as first node **502**. Some or all of the representations transmitted are suitable for processing by the communications agent in execution environment **401** of first node **502**. The content manager component **402** in the execution environment **401** of second node **504** may package the one or more data representations including a representation of the mount descriptor into a message formatted according to the communications protocol.

A descriptor generator component **414** and/or a content manager component **402** may operate to construct a mount

descriptor in a communication. A content type identifier may be included in a position and/or location that identifies a mount descriptor in a communication. The position or location may be absolute or relative. For example, a schema for a communication may define that a mount descriptor in a communication is included in the communication at the end of the communication. There may be one or more mount descriptors at the end. In another aspect, a schema for a communication may specify that a portion of a communication following a particular type of message portion is a mount descriptor. Other mount descriptors may follow. If no mount descriptor is included, the mount descriptor portion may include no content or may include an indicator that no mount descriptor is included.

FIG. **8**A includes an exemplary content portion **800***a* of an email message. Content portion **800***a* includes a user message portion **802***a* and a mount descriptor portion **804***a* described in more detail above. FIG. **8**A illustrates an “application/mount-descriptor” MIME type identifier that may be defined to identify a schema for content including one or more mount descriptors. FIG. **8**A illustrates a mount descriptor **804***a* including two identifiers for the “Music” folder. A first identifier **808***a* illustrates a Samba URL for accessing the “Music” folder via a Samba file sharing system. The second identifier **810***a* illustrates a WebDAV HTTP URL that may allow a receiving node to access the identified data object via a WebDAV server operating in and/or available to an execution environment sending the mount descriptor **804***a*. An FTP URL **812***a* illustrates a file transfer protocol (FTP) that may allow a receiving node to access the identified data object via a FTP server operating in and/or available to an execution environment sending the mount descriptor **804***a*

Other means are described about with respect to operation of the method illustrated in FIG. **2**A. All such means are suitable for performing the method illustrated in FIG. **2**B.

Returning to FIG. **2**B, a block **216** illustrates that the method yet further includes including, by the second communications agent, the mount descriptor in a first message, addressed to the first user. Accordingly, a system for sharing a data object in a data store via a communication includes means for including, by the second communications agent, the mount descriptor in a first message, addressed to the first user. For example, the arrangement in FIG. **3**B, includes content manager component **302** that is operable for including, by the second communications agent, the mount descriptor in a first message, addressed to the first user. FIG. **4** illustrates content manager component **402** as an adaptation and/or analog of content manager component **302** in FIG. **3**B. One or more content manager components **402** operate in an execution environment **401**. The system for content manager includes one or more processors and logic encoded in one or more tangible media for execution bye the one or more processors that when executed is operable for including, by the second communications agent, the mount descriptor in a first message, addressed to the first user. In FIG. **4**, a content manager component **402** is illustrated as a component of application **403**.

As described above, FIG. **7** illustrates first message **702**, including a mount descriptor, sent via network **506** by execution environment **401** of second node **504** to execution environment **401** of first node **502**. In an aspect described below, first message **702** may be sent in response to previous message **708**.

A mount descriptor generated by a descriptor generator component **414**, along with a user message and any other data to include in a communication, may be provided and/or otherwise identified to content manager component **402** for sending in the communication. The content manager component **402** in execution environment **401** of second node **504** may package data from descriptor generator component **414** including a representation of the mount descriptor into the message formatted according to the communications protocol.

Returning to FIG. **2**B, a block **218** illustrates that the method yet further includes sending, via a communications protocol via the network by the second communications agent, the first message for delivery to the first communications agent to create, based on the mount descriptor, a representation, of the data object in the first data storage, that when accessed includes accessing the data object from the second data store. Accordingly, a system for sharing a data object in a data store via a communication includes means for sending, via a communications protocol via the network by the second communications agent, the first message for delivery to the first communications agent to create, based on the mount descriptor, a representation, of the data object in the first data storage, that when accessed includes accessing the data object from the second data store. For example, the arrangement in FIG. **3**B, includes com-out component **318** that is operable for sending, via a communications protocol via the network by the second communications agent, the first message for delivery to the first communications agent to create, based on the mount descriptor, a representation, of the data object in the first data storage, that when accessed includes accessing the data object from the second data store. FIG. **4** illustrates com-out component **418** as an adaptation and/or analog of com-out component **318** in FIG. **3**B. One or more com-out components **418** operate in an execution environment **401**. The system for sharing a data object in a data store via a communication includes one or more processors and logic encoded in one or more tangible media for execution by the one or more processors that when executed is operable for sending, via a communications protocol via the network by the second communications agent, the first message for delivery to the first communications agent to create, based on the mount descriptor, a representation, of the data object in the first data storage, that when accessed includes accessing the data object from the second data store. In FIG. **4**, a com-out component **418** is illustrated as a component of application **403**.

Com-out component **418** may provide the mount descriptor, the user message, and any other data for sending in the communication in representations suitable for sending by communications protocol component **407** to the communications agent in execution environment **401** of first node **502**. Communications protocol component **407** operating in execution environment **401** of second node **504** may send the data as and/or in a communication, such as an email message, according to the specification(s) of the communications protocol. Communications protocol component **407** may further package and/or otherwise transform the data to send via network stack **405** for delivery via network **506** to execution environment **401** of first node **502**.

Content manager component **402** may alternatively or additionally encode and/or otherwise transform one or more of the data representations for sending in a data stream such as voice stream and/or a video stream for communicating in a communication with the communications agent in execution environment **401** of first node **502**

The methods illustrated in FIG. **2**A-B may include additional aspects supported by various adaptations and/or analogs of the arrangement of components in FIG. **3**A-B.

In an aspect, a mount descriptor may be received as a response to a data object request in a message previously sent. A data object request may include some or all of a keyword expression, a regular expression, an XQuery expression, an XPath expression, a file system path expression, and a structured query language statement.

The previously sent message may include the data object request in the message separate from a user readable message. The user readable message may be detected by a receiving execution environment along with the data object request. The data object request may be included in the previously sent message according to a schema that identifies the message as valid according a communications protocol by which the message was sent in the communication.

The data object request may include match information identifying a matching criterion for locating and/or otherwise identifying a data object to be mounted. With respect to FIG. **4** and FIG. **5**, execution environment **401** of first node **502** may request a mount descriptor from execution environment **401** of second node **504**. FIG. **7** includes a data flow message that illustrates a match information data flow **712** that may occur at least partially in execution environment **401** of first node **502** and/or may include a message (not shown) received via network **506** by execution environment **401** of first node **502**. Match information data flow **712** may represent, in FIG. **4**, a data flow to an identify mount constructor (IMC) component **410** operating in execution environment **401** of first node **502**. The data flow may be via descriptor handler component **404**.

Sending a message including a data object request may include receiving, by a first execution environment, matching information, identifying a data object matching criterion, from a first user. The message, including a data object request based on the data object matching criterion, may be sent, via the network, to a second execution environment. The message is addressed to the second user. The data object request may be included in the message according to a schema that identifies the previous message as valid according a communications protocol in the communication. A mount descriptor may be received in a subsequent message, in response to sending the data object request.

In various aspects, IMC component **410** may receive matching information from a user via one or more UI element handler components **415**. The matching information may be received, in response to a user input detected by an input device of an execution environment **401** that includes the IMC component **410**. Alternatively or additionally, matching information may be received by an IMC component in a message received via a network. For example, a user may identify matching information to a browser operating in a client node. The browser may send the matching information via a network communicatively coupling the client node to a web service provider node. The web service provider node may include an IMC component that may operate to receive the matching information identified in the message from the browser. In another aspect, an IMC component may be provided in whole or in part by execution environment **401** of node **502** to a browser in another execution environment.

FIG. **6**E illustrates an exemplary user interface that may be presented by communications agent **403** operating in execution environment **401** of first node **502**. A UI element handler component **415** may operate to present a user interface element to allow a user to identify matching information. A matching information (MI) UI element **656***e* is illustrated in FIG. **6**E as an example. The same or different

UI element handler component **415** may present various other UI elements included in MI UI element **656***e*. MI UI element **656***e* and one or more UI elements it includes may be presented by one or more corresponding UI element handler component(s) **415** that may operate based on a schema that defines valid matching information and/or data object requests for including in a communication via a communications agent **403**. The schema defines one or more rules and/or a vocabulary that defines whether matching information and/or a data object request is valid. Those skilled in the art will understand that numerous languages and/or schemas for providing matching information and/or data object requests currently exist including relatively simple key word based queries to relatively more complicated regular expression languages and data base query languages, such as various versions of structured query language (SQL). New schemas are and will be created, and are, thus, considered within the scope of the subject matter described herein.

MI UI element **656***e* illustrates a user interface for a keyword based schema. Match textbox UI element **658***e* illustrates a textbox allowing a user to enter a keyword expression. Various checkbox UI elements **660***e* allow a user to define a scope of a data object request by identifying whether a resulting data object request is to be applied to folders, files, and/or content of files in a data store. A communications agent **403** may support more than one data object request schema and/or corresponding matching information schema. A communications agent may provide a user interface to receive valid matching information for each respective schema.

FIG. **7** includes data flow message that illustrates a create data object request (CIReq) data flow **714** that may be internal to execution environment **401** of first node **502** and/or may include a message received via network **506** by first node **502**. With respect to FIG. **4**, CIReq data flow **714** may illustrate a data flow to an IMC component **410** operating in execution environment **401** of first node **502**. Match information may be identified to and/or otherwise provided to IMC component **410**.

An IMC component **414** may be a type of content handler component and/or may be included in a content handler component that operates to process match information to create a data object request that conforms to a schema for creating and/or otherwise constructing a valid data object request. IMC component **410** may construct and/or otherwise create a data object request based on a schema that defines and/or otherwise identifies a valid data object request and/or a valid mount descriptor for a particular type of communication supported by a communications agent. The data object request descriptor is constructed and/or otherwise created, based on the match information, by IMC component **410**. IMC component **410** in execution environment **401** of first node **502** may provide the data object request to content manager component **402** to include and/or otherwise identify the data object request in a communication with execution environment **401** of second node **504**, such as email and/or instant message. Content manager component **402** may interoperate with other types of content handler components **413** to create and/or otherwise construct a message that includes the valid data object request.

In an aspect, IMC component **410** may interoperate with the content manager component **402** to create the valid data object request according to a specified schema for the message, so that the message is valid according to a communications protocol supported by a communications protocol component **407** that operates to send the message. As described above, the content manager component **402** may operate in execution environment **401** of first node **502** along with IMC component **410** to transform match information into a data object request to include along with data for other parts of a communication into one or more representations suitable for transmitting in a communication, such as a message, to another node, such as second node **504**. Some or all of the representations transmitted are suitable for processing by the communications agent in execution environment **401** of second node **504**. The content manager component **402** in the execution environment **401** of first node **502** may package the one or more data representations including a representation of the data object request into a message formatted according to the communications protocol.

In FIG. **8**B, a portion of an email communication **800***b* is illustrated formatted as a multipart/mixed content type including data object request portion **802***b*. A data object request portion of a communication may be identified as a data object request by its location in the communication and/or by an identifier or markup element, such as a MIME type identifier. A data object request may be detected based on content included in the message and/or based on metadata such as content-type header **804***b* identifying a MIME type identifier, such as "application/id-request", which may be defined for representing one or more matching criteria in a data object request. The "application/id-request" MIME type identifier is exemplary. Other MIME type identifiers exist and/or may be defined to identify a data object request in a communication.

An IMC component and/or a content manager component may operate to construct a data object request in a communication based on XQuery, regular expression, and/or SQL content, to name a few examples. A content type identifier may be included in a position and/or location that identifies a data object request in a communication. The position or location may be absolute or relative. For example, a schema for a communication may define that a data object request in a communication is included in the communication at the end of the communication. There may be one or more data object requests at the end. In another aspect, a schema for a communication may specify that a portion of a communication following a particular type of message portion is a data object request. Other data object requests may follow. If no data object request is included, the data object request portion may include no content or may include an indicator that no data object request is included.

FIG. **8**B illustrates an "application/id-request" MIME type identifier that may be defined to identify a schema for an XML-based language for specifying id-request XML documents. FIG. **8**B illustrates id-request document **806***b*. Id-request document **806***b*, as illustrated, includes criterion tag elements **808***b* corresponding to the form elements in a user interface FIG. **6**A. A criterion tag element **808***b* identifies a matching criterion name, such as "query" indicating that the criterion is a query expression or a portion thereof. A "type" attribute identifies a schema with the identifier "keyword" for the expression. The criterion tag element **808***b* identifies a value for a query "*music*" in a match-expression attribute. Another criterion tag element **808***b* specifies a scope query specified in the first criterion tag element. FIG. **8**B illustrates an "and" tag **810***b* indicating that all the matching criteria must be met for identifying a data object. An "or" tag (not shown) may be defined by a schema for id-request documents. Other operator elements and operator precedence may be defined by the schema.

Grouping elements for managing operator precedence, such as parenthesis element, may be defined by the schema.

FIG. **7** includes a data flow that illustrates a previous message **716** (with respect to first message **702**) including a data object request. Previous message **716**, as shown, may be sent via network **506** by execution environment **401** of first node **502** to execution environment **401** of second node **504**. In an aspect, first message **702** may be sent in response to previous message **716**.

In various aspects, a data object request may be based on a date, a time, a length of time, a file type, a database record key, content of the data object, a content type identifier, a format rule, a vocabulary, a role of a user, a security attribute, a location in a data store such as a file system, an attribute of an identified data object, a size, a task, a transaction, a state, a user, a group, a requester, a relationship including a requesting user and a responding user, a keyword, a tag, a folder, and/or a path portion of a data object identifier, to name a few examples.

A descriptor handler component in an execution environment may receive data object information in response to a request from a communications agent in another execution environment. As described above, FIG. **7** illustrates previous message **716**, including a data object request, received via network **506** by execution environment **401** of second node **504** from execution environment **401** of first node **502**.

In addition to packaging representations of data in a structure and/or format for sending a message according to a communications protocol, a content manager component **402** may operate to detect a data object request received and/or otherwise identified in a message received in a communication. Content manager component **402** operating in execution environment **401** of second node **504** may receive the message, illustrated by previous message **716**, in a communication with execution environment **401** of first node **502**. Com-in component **411** in execution environment **401** of second node **504** may receive the message via communication protocol component **407** and network stack **405**. Previous message **716** may be delivered to execution environment **401** of second node **504** via network **506** based on a communications address of a communicant represented by communications agent **403** in execution environment **401** of second node **504**. A communications agent may represent more than one communicant identified by different addresses.

Previous message **716** in FIG. **7** may be received in one or more packets via network **506** by network stack **405** and communications protocol component **407** in an instance of and/or analog of execution environment **401** including and/or otherwise provided by second node **504**. The data in the communication may be received by com-in component **411**. Com-in component **411** may provide the data to content manager component **402**. Content manager component **402** may determine one or more content types of the data. The content and/or portions of the content may be provided to one or more content type handler components **413** based on the one or more content types identified by content manager component **402**. For example, FIG. **8**B illustrates message portion **812***b* including “text/plain” MIME type identifier **814***b* as a content type identifier. Message portion **812***b* may be provided to a text/plain content handler **413**. Audio data in a voice communication may be provided to an audio content handler component **413**, and video data in a video communication may be provided to a video content handler component **413**.

FIG. **7** includes a data flow message that illustrates a detect data object request (detectOReq) data flow **718** that may be internal to execution environment **401** of second node **504** and/or may include interoperation with another node via a network. With respect to FIG. **4**, detect data object request data flow **718** may correspond to a data exchange and/or other interoperation between content handler component **402** and descriptor handler component **404** to detect and/or otherwise process the data object request received in previous message **716** by execution environment **401** of first node **504**. FIG. **7** further includes a data flow message that illustrates a locate message **720**, that may be included in an aspect of the method illustrated in FIG. **2**B, for locating one or more data objects based on the data object request. The data object request may include and/or otherwise identify a matching criterion. The matching criterion may be identified based on match information identified by the communicant represented by execution environment **401** of first node **502**. The one or more data objects may be located and/or otherwise identified by determining a data object or data objects that match the matching criterion. The data object(s) may be in a data store in and/or otherwise accessible to execution environment **401** of second node **504**, such as one or more files in a file system of execution environment **401** of second node **504**. Locate message **720** may be internal to execution environment **401** of second node **504** and/or may include a message exchanged with a remote device, such as database server and/or a network attached storage device providing storage locations for some or all of a file system of execution environment **401** of second node **504**.

Com-in component **411** in execution environment **401** of second node **504**, as described above, provides the previous message **716**, received from execution environment **401** of first node **502**, to content manager component **402**. Content manager component **402** is operatively coupled, via com-in component **411**, to communications protocol component **407** for receiving data in communications with other nodes, such as execution environment **401** of first node **502**. Thus, execution environment **401** of second node **504** may receive a message via a com-in component **411** in a communication with execution environment **401** of first node **502**. The message may include a data object request based on match information identified by a user to communications agent **403** in execution environment **401** of first node **502**.

Data received in a communication, such as in a message, may include data of various content types. In FIG. **4**, communications agent **403** in execution environment **401** of second node **504** includes one or more content handler components **413** to process data received according to its content type. Content manager component **402** may detect and/or otherwise identify a portion of the message as the data object request sent from execution environment **401** of first node **502**. The data object request may be identified by content manager component **402** according to a schema for the message and/or a schema for the data object request. For example, a portion of the message may include a MIME-type identifier that identifies the portion as a data object request and/or otherwise identifies the portion for routing to descriptor handler component **404** operating in and/or otherwise on behalf of execution environment **401** of second node **504**. Alternatively or additionally, the data object request may have structure and/or content that is valid and identifiable according to a schema for defining and/or otherwise identifying valid data object requests. A descriptor handler component may be provided as a type of content handler component, in an aspect. Alternatively or additionally, a descriptor handler component may interoperate with one or more content handler components to detect a data object request in a message received by a content manager component.

As such, descriptor handler component **404** may operate along with other content handler components **413** to process data representations received in the message **716** from execution environment **401** of first node **502**. Descriptor handler component **404** may also provide transformed data from the representations to one or more user interface element handler components **415**. Descriptor handler component **404** operates to validate and process data object requests according to a schema defining valid data object requests. Various portions of a message including a data object request may be provided to one or more content handler components **413**, including descriptor handler component **404**, to interoperate with presentation controller component **417** in execution environment **401** of second node **504** to present some or all of the received message, including the data object request.

FIG. **6**F illustrates a window, view window UI element **602***f*, presenting an exemplary representation of a message, such as previous message **716**, received in a communication from execution environment **401** of first node **502** by second node **504**. FIG. **6**F, view window UI element **602***f* includes a contactor UI element **604***f*, a contactee UI element **606***f*, and a presentation space **608***f* of the view window UI element **602***g* that includes a user message UI element **610***f* including a text portion of the message provider by the communicant represented by execution environment **401** of first node **502**. The various UI elements may be presented by one or more UI element handler components **415** in communications agent **403** operating in execution environment **401** of second node **504**. A reply UI element **662***f* and a reply all UI element **664***f* are illustrated as exemplary UI elements in presentation space **608***f* presented to allow a user of execution environment **401** of second node **504** to respond and/or otherwise perform an operation based on the received message. FIG. **6**F illustrates a data object request UI interface element **666***f* where the data object request identified in the message from execution environment **401** of first node **502** is represented to the communicant represented by the execution environment **401** of second node **504**. In an aspect, the communicant is allowed to authorize the request by providing an input corresponding to a find and reply UI element **668***f*. In another aspect, the communicant may allowed to modify the data object request.

As described herein in an aspect, content manager component **402** may detect content type information to detect a data object request in a communication. For example, the message portion illustrated in FIG. **8**B may be received in previous message **716**. Content manager component **402** may detect "application/id-request" MIME type identifier in content-type header **804***b*. The "application/id-request" MIME type identifier may be defined to identify a data object request based on one or more matching criteria for identifying a requested data object. Content manager component **402** may identify data object request portion **802***b* as including the data object request.

In response to detecting a data object request in previous message **716**, content manager component **402** may provide data some or all of the data object request to descriptor handler component **404**. For example, descriptor handler component **404** may be configured to operate according to a schema defining a format and/or a vocabulary for an XML-based language for id-request documents. Content manager component **402** may provide id-request document **806***b*, as a data object request, to descriptor handler component **404**.

Descriptor handler component **404** may operate according to the id-request schema. In an aspect, descriptor handler component **404** may process more than one data object request content type. Alternatively or additionally, execution environment **401** may include multiple descriptor handler components **404** for supporting multiple data object request content types.

As described above, in an aspect, a user may be allowed to select which data objects, if any, are to be identified in a mount descriptor from one or more data objects located and/or otherwise identified by descriptor handler component **404** based on a received data object request. In another aspect, communications agent **403** in FIG. **4** may invoke descriptor handler component **404** automatically to locate one or more data objects based on a matching criterion identified in a data object request and in response to detecting a data object request in a communication, such previous message **716** in FIG. **7**. In another aspect, communications agent **403** may invoke descriptor handler component **404** automatically to locate one or more data objects based on a data object request in a communication in response to detect an indication to present, via a output device, some or all of a user message received in a message in the communication. Descriptor handler component **404** may be invoked and/or may operate based on the data object request and/or matching criterion identified to locate a data object prior to, during, and/or after other content received in the communication is processed. Results of a locate operation may be received as data object information.

FIG. **6**G illustrates a results window UI element **670***g* includes results pane UI element **672***g* including representations of two data objects located and/or otherwise identified by data store navigator component **406** based on the data object request. A user may select one or more data objects to identify in a mount descriptor. An attach UI element **674***g* may be presented, as illustrated, to allow a user to instruct communications agent **403** to identify one or more selected data objects in results pane UI element **672***g* in a mount descriptor. An attach all UI element **6774***g* is illustrated to allow for user input instructing communication agent **403** to identify all data objects represented in the UI element **670***g* in one or more mount descriptors in a communication with execution environment **401** of first node **502**. A cancel UI element **678***g* allows a user to end presentation of results window UI element **670***g*. A user may opt to identify no data objects represented in the dialog UI element **670***g* and located and/or otherwise identified by data store navigator component **406** based on the data object request.

Data objects located and/or otherwise identified by data store navigator component **406** may be identified in data object information to descriptor generator component **414** to construct and/or otherwise create one or more mount descriptors identifying the data objects. As described above, a user may be allowed to select which data objects, if any, are to be identified in a mount descriptor from one or more data objects located and/or otherwise identified by data store navigator component **406**. In another aspect, communications agent **403** in FIG. **4** may invoke data store navigator component **406** automatically to locate one or more data objects based on a matching criterion identified in a data object request and in response to detecting a data object request in a communication. In another aspect, communications agent **403** may invoke data store navigator component **406** automatically to locate one or more data objects based on a data object request in a communication in response to detecting an indication to present, via a output device, some or all of a user readable message received in a message in the communication. Data store navigator component **406** may be invoked and/or may operate based on the data object request and/or matching criterion identified to locate a data object prior to, during, and/or after other content received in the communication is processed.

In another aspect, a data object request UI element may be presented to receive one or more additional matching criteria from a user. Based on the data object request UI element and input from the user, descriptor handler component **404** may receive one or more additional matching criterion information and/or may receive input to modify a matching criterion identified in a received data object request. Descriptor handler component **404** may locate one or more data objects in response to receiving the additional criterion.

In another aspect, a data object located and/or otherwise identified by data object information in response to receiving a data object request must match a query identified by the data object request. Alternatively or additionally, a data object request may include an instruction and/or input for generating a data object, and locating the data object may include generating the data object. Generating a data object may include creating the data object and/or may include modifying and/or otherwise transforming an existing data object. For example, execution environment **401** of second node **504** may include a template stored in a file system. A data object request may identify the template. A descriptor handler component **404** may operate to identify a document or other data object that may be created, is being created, and/or has been created based on the template. In response to a data object request, execution environment **401** of second node **504** may return a mount descriptor that identifies the created and/or modified data object.

As described above, in various aspects, a data object request may be detected and/or represented based on various syntaxes, grammars, vocabularies, and/or languages. For example, a data object request may be identified and/or represented according to a file system search syntax, a regular expression language, a structured query language (SQL) query, a universal data object identifier schema, an XPATH based language, an XQuery based language, an XML based language, an HTML based language (form-based), and/or a keyword-value pair based language.

A data object request and/or a mount descriptor in a communication may be communicated via a network according to a first communications protocol. A user message may be exchanged between communicants in the communication via a second communications protocol. For example, a data object request and/or a mount descriptor may be sent on behalf of a first communicant by execution environment of a first node including a communications agent representing the first communicant. The data object request and/or the mount descriptor may be included in a communication along with a user readable message sent to the execution environment of a second node. The communicants represented by the execution environment of the first node and the execution environment of the second node may communicate via one or more exchanges of audio exchanged via a voice over IP (VoIP) communications protocol.

Exemplary data objects that may be requested via a data object request include a file, a program component, a data base record, video data, audio data, markup language, binary data, text data, an output of a service. Requested data objects may be pre-existing, volatile, and/or generated in response to the request.

As described above, receiving match information may include receiving a message, identifying the match information, via network from a node that received match information from the user. For example, match information may be received from a browser by a web server.

Match information and/or a data object request may be generated, detected, and/or otherwise processed according to a schema that identifies at least one of a rule and a vocabulary that defines a valid data object request. Similarly, a mount descriptor may be generated, detected, and/or otherwise processed according to a schema. One or more schemas may alone or together define one or more of valid data object information, match information, a data object request, and/or a mount descriptor. A schema, as just described, may be identified based on a data received and/or otherwise identified by an execution environment hosting a communications agent via the network from another execution environment hosting communications agent and/or from a path node included in a network path in the network communicatively coupling the node to one or more nodes that respectively host a communications agent.

In a further aspect, multiple alternative schemas may be defined for each of data object information, match information, data object requests, and/or mount descriptors. A schema may be selected and/or otherwise identified from the multiple schemas based by execution environment **401** of first node **502** and the execution environment **401** of second node **504** and/or based on information exchanged by the two nodes. For example, a schema may be selected by the first communicant and/or the second communicant. One may inform the other, via a communications protocol and/or via any other suitable means. The communicants may negotiate which schema to use via any suitable means.

The communications agents in execution environment **401** of second node **504** and execution environment **401** of first node **502** may select a schema For example, a schema may be identified and/or otherwise selected based on a communications protocol supported and/or a communications protocol not supported by one or both nodes. That is, in a negotiation to select communication protocol to use allowing communicants to exchange information, a schema may be identified. A schema may be identified and/or otherwise selected based on an attribute of the data object. A schema for identifying image data may be different than a schema for editable documents. A schema for identifying a data object in a first file system may be different than a schema for identifying a data object in a different data store.

As described above. In an aspect match information and/or a data object request, data object information, and/or a mount descriptor may identify a scope that specifies all or some portion of one or more data stores for locating, identifying, and/or otherwise accessing a data object. For example, a communication agent **403** in execution environment **401** of first node **502** may receive user input that identifies a folder in a file system of the execution environment **401** of second node **504** that defines a scope for locating a data object.

Match information and/or a data object request may be represented in a representation that includes a complete or a portion of at least one of a keyword expression, a regular expression, an XQuery expression, an XPath expression, a file system path expression, and a structured query language statement.

Further as also described above, a data object request and/or a mount descriptor may be included in a message according to a schema that identifies the message as valid for a specified communications protocol. Those skilled in the art are aware that schemas for email differ from schemas for instant messages and from streamed audio, for example.

A data object request and/or a mount descriptor may be exchanged in a communication in which audio data and/or image data is also exchanged. Multimedia may be a packaged to include one or more data streams which may include text based data streams. A data object request and/or a mount descriptor may be included in an email, an instant message, a multi-media message, a short-message service message, and/or a data stream. The data stream may include audio data, image data, and/or text data.

A data object request and/or a mount descriptor may be included in and/or detected in a communication based on a location in the communication and/or based on a marker, such as an identifier in the communication that identifies a location for the data object request, the mount descriptor, an access request, and/or an access response. The location may be absolute, such as fixed number of bytes or fields from the start or end of a message. Alternatively or additionally, the location may be identified by a location relative to another detectable portion of the communication. FIGS. **8**A-B illustrate the user of MIME type identifiers as markers that identify locations for one or more of a data object request and/or a mount descriptor in a communication.

A data object request and/or a mount descriptor or respective portions thereof may include at least a portion of a keyword expression, a regular expression, expression including a Boolean operator, an expression including a precedence information, and a structured query language statement.

With respect to the method illustrated in FIG. **2**B, the method as described above may include locating and/or otherwise identifying a data object automatically in response to receiving a data object request that matches and/or otherwise identifies the data object. Further, a mount descriptor may be created and/or otherwise generated automatically, in response to locating and/or otherwise identifying the data object.

In an aspect, in response to receiving and/or otherwise detecting a data object request, a user interface may be presented based on the data object request to prompt a user to process the data object request in some manner, such as authorizing the request and/or modify the request by restricting its scope. In response to detecting user input targeting and/or otherwise corresponding to the presented user interface, one or more data object may be located and/or otherwise identified based on the data object request.

A user may change a received data object request. One or more data object may be located and/or otherwise identified based on the changed data object request.

In a further aspect, once one or more data objects are located and/or otherwise identified based on a data object request and/or otherwise by data object information, a user interface may be presented to allow a user to identify the one or more data objects. Information from a user may be received that selects one or more data objects to identify in a mount descriptor and/or to not identify in the mount descriptor. A user, in an aspect, may be allowed to identify a data object not located and/or otherwise identified by the user's node. The data object, based on the user input, is identified in the mount descriptor.

In light of the description provided above, a mount descriptor may be generated automatically in response to detecting a corresponding data object request by an execution environment **401** of first node. Further, the automatically generated mount descriptor may be sent to the node that sent the corresponding data object request,

The methods illustrated in FIG. **2**A-B may yet further include additional aspects supported by various adaptations

and/or analogs of the arrangement of components in FIG. **3**A-B. Performing the method illustrated in FIG. **2**A and/or the method illustrated in FIG. **2**B and/or any of its extension and/or in any of its aspects may include one or more of calling a function or method of an object, sending a message via a network; sending a message via an inter-process communication mechanism such as a pipe, a semaphore, a shared data area, and/or a queue; and/or receiving a request such as poll and responding to invoke, and sending an asynchronous message.

Output devices suitable for presenting a representation of a data object and/or a tag include a visual output device, an audio output device, and a tactile output device. One output device may present a data object and another output device may present a tag with which the data object is tagged.

Any action included in performing the method illustrated in FIG. **2**A as well as any action included in performing the method illustrated in FIG. **2**B may include sending and/or receiving a message via a network. Further, a message, included in performing any of the subject matter described herein and/or any of its extensions in any of its aspects, may an asynchronous message without a corresponding request.

To the accomplishment of the foregoing and related ends, the descriptions and annexed drawings set forth certain illustrative aspects and implementations of the disclosure. These are indicative of but a few of the various ways in which one or more aspects of the disclosure may be employed. The other aspects, advantages, and novel features of the disclosure will become apparent from the detailed description included herein when considered in conjunction with the annexed drawings.

It should be understood that the various components illustrated in the various block diagrams represent logical components that are configured to perform the functionality described herein and may be implemented in software, hardware, or a combination of the two. Moreover, some or all of these logical components may be combined, some may be omitted altogether, and additional components may be added while still achieving the functionality described herein. Thus, the subject matter described herein may be embodied in many different variations, and all such variations are contemplated to be within the scope of what is claimed.

To facilitate an understanding of the subject matter described above, many aspects are described in terms of sequences of actions that may be performed by elements of a computer system. For example, it will be recognized that the various actions may be performed by specialized circuits or circuitry (e.g., discrete logic gates interconnected to perform a specialized function), by program instructions being executed by one or more processors, or by a combination of both. The description herein of any sequence of actions is not intended to imply that the specific order described for performing that sequence must be followed.

Moreover, the methods described herein may be embodied in executable instructions stored in a tangible computer readable medium for use by or in connection with an instruction execution machine, system, apparatus, or device, such as a computer-based or processor-containing machine, system, apparatus, or device. As used here, a "tangible computer readable medium" may include one or more of any suitable media for storing the executable instructions of a computer program in one or more forms including an electronic, magnetic, optical, and electromagnetic form, such that the instruction execution machine, system, apparatus, or device may read (or fetch) the instructions from the tangible computer readable medium and execute the instructions for carrying out the described methods. A non-transitory computer readable storage medium is tangible. A non-exhaustive list of conventional exemplary tangible computer readable storage media includes a portable computer diskette; a random access memory (RAM); a read only memory (ROM); an erasable programmable read only memory (EPROM or Flash memory); optical storage devices, including a portable compact disc (CD), a portable digital video disc (DVD), a high definition DVD (HD-DVD™), and a Blu-Ray™ disc; and the like.

Thus, the subject matter described herein may be embodied in many different forms, and all such forms are contemplated to be within the scope of what is claimed. It will be understood that various details may be changed without departing from the scope of the claimed subject matter. Furthermore, the foregoing description is for the purpose of illustration only, and not for the purpose of limitation, as the scope of protection sought is defined by the claims as set forth hereinafter together with any equivalents.

All methods described herein may be performed in any order unless otherwise indicated herein explicitly or by context. The use of the terms "a" and "an" and "the" and similar referents in the context of the foregoing description and in the context of the following claims are to be construed to include the singular and the plural, unless otherwise indicated herein explicitly or clearly contradicted by context. The foregoing description is not to be interpreted as indicating that any non-claimed element is essential to the practice of the subject matter as claimed.

I claim:

**1**. A method, comprising:

at first node:

displaying a first user interface element, a second user interface element, and a third user interface element,

receiving information associated with at least one folder via the first user interface element,

sending, via at least one network, the information associated with the at least one folder,

receiving an object associated with at least one email address via the second user interface element,

sending, via the at least one network, the object associated with the at least one email address,

receiving an indication of a selection of the third user interface element, and

sending, via the at least one network, the indication of the selection of the third user interface element;

at a second node:

after the information associated with the at least one folder, the object associated with the at least one email address, and the indication of the selection of the third user interface element is sent from the first node via the at least one network: receiving, via the at least one network, at least one email message identifying the at least one folder and including a reference to the at least one folder, without including a file attachment with the at least one email message,

after the information associated with the at least one folder, the object associated with the at least one email address, and the indication of the selection of the third user interface element is sent from the first node via the at least one network: creating, utilizing code configured to be stored on a storage at the second node and further configured to cooperate with a file explorer interface, a representation of the at least one folder in a location among one or more folders on the file explorer interface, and

displaying the representation of the at least one folder in the location among the one or more folders on the file explorer interface.

**2**. The method of claim **1**, wherein the object associated with the at least one email address includes the at least one email address or an alias, and the file explorer interface is displayed using a file explorer client application and not via a web page; wherein the at least one email message is sent without including the file attachment with the at least one email message, and the storage at the second node does not store any file in response to the representation of the at least one folder being created, both for avoiding any file from having to be communicated to and stored at the second node until requested by at least one user at the second node.

**3**. The method of claim **1**, wherein the file explorer interface is displayed by a client-based file explorer application, and where the storage of the second node does not store any file in the at least one folder in response to the representation of the at least one folder being created.

**4**. The method of claim **1**, wherein the file explorer interface is displayed by a client-based file explorer application associated with an operating system.

**5**. A method, comprising:

at a first node:

causing display of at least one first interface with a first user interface element, utilizing first hypertext markup language-equipped code,

receiving an indication of at least one folder via the first user interface element, utilizing the at least one first interface,

causing display of at least one second interface with a second user interface element, utilizing second hypertext markup language-equipped code,

receiving indicia associated with at least one email address via the second user interface element, utilizing the at least one second interface, and

receiving an indication to share the at least one folder for causing to be sent, to a second node via at least one network, at least one email message identifying the at least one folder and including a reference to the at least one folder, without including any file in the at least one folder as an attachment of the at least one email message; and

at the second node:

causing, via particular code configured to be stored on a storage at the second node and further configured to cooperate with a file explorer interface, creation of a representation of the at least one folder in a location among one or more folders on the file explorer interface,

causing display of the representation of the at least one folder in the location among the one or more folders on the file explorer interface,

receiving an indication to open at least one file in the at least one folder, and

in response to detection of the indication to open at least one file in the at least one folder, causing retrieval of the at least one file via the at least one network for permitting display of the at least one file.

**6**. The method of claim **5**, wherein the indicia associated with the at least one email address includes an alias associated with the at least one email address.

**7**. The method of claim **5**, wherein the indicia associated with the at least one email address includes the at least one email address.

**8**. The method of claim **5**, wherein the at least one first interface and the at least one second interface are separate windows that are displayed utilizing a single web page.

**9**. The method of claim **5**, and further comprising:

at the second node:

receiving an indication of a selection of the reference to the at least one folder, and

causing display of the at least one folder, utilizing third hypertext markup language-equipped code.

**10**. The method of claim **5**, wherein the location among the one or more folders at the second node is based on user input received via the at least one first interface at the first node.

**11**. The method of claim **5**, wherein the location among the one or more folders at the second node is determined by user input at the first node.

**12**. The method of claim **5**, wherein the location among the one or more folders at the second node is automatically determined.

**13**. The method of claim **5**, wherein the at least one folder is identified as a result of search criteria received from a user.

**14**. The method of claim **5**, wherein the at least one email message and the file explorer interface are caused to be displayed at the second node via separate interfaces for permitting access to the at least one folder via multiple different interfaces only after receiving an indication of a selection of the reference to the at least one folder.

**15**. The method of claim **5**, wherein the indication of the at least one folder is capable of being received in response to a first single user input, the indicia associated with the at least one email address is capable of being received in response to a second single user input that immediately follows the first single user input, and the indication to share the at least one folder is capable of being received in response to a third single user input that immediately follows the second single user input.

**16**. The method of claim **5**, wherein, in response to the creation of the representation of the at least one folder being caused, an additional representation on the file explorer interface is caused to be created that represents the at least one file, where the file explorer interface is displayed by a file explorer client application without a web page.

**17**. The method of claim **16**, wherein the at least one folder and the at least one file are stored and synchronized utilizing at least one server, and wherein the at least one email message is sent without including the at least one file as an attachment of the at least one email message, and the storage at the second node does not store the at least one file in response to the creation of the representation of the at least one folder being caused, both for avoiding the at least one file from having to be communicated to and stored at the second node until the at least one file is requested by a user at the second node using the additional representation.

**18**. The method of claim **5**, wherein at least one of:

said at least one first interface is an email interface;

said at least one second interface is an email interface;

said at least one first interface is a single interface;

said at least one second interface is a single interface;

said at least one first interface is different from the said at least one second interface;

said at least one first interface include a plurality of first interfaces;

said at least one second interface includes a plurality of second interfaces;

said display of the at least one first interface is caused by serving the at least one first interface via the at least one network;

said display of the at least one second interface is caused by serving the at least one first interface via the at least one network;

said first hypertext markup language-equipped code is included in a first web page and the second hypertext markup language-equipped code is included in a second web page;

said indication of the at least one folder is generated based on a user selection of the at least one folder;

said indication of the at least one folder is generated based on a user at least one of searching or locating the at least one folder;

said indication of the at least one folder is generated based on a user input in connection with a folder-related user interface element associated with the at least one folder;

said indication of the at least one folder is generated based on a user entry of text associated with the at least one folder;

said indication of the at least one folder includes a name of the at least one folder;

said indicia associated with the at least one email address is generated based on a user selection of the at least one email address;

said indicia associated with the at least one email address is generated based on a user locating the at least one email address;

said indicia associated with the at least one email address is generated based on a user input in connection with an email-related user interface element;

said indicia associated with the at least one email address is generated based on a user entry of text associated with the at least email message;

said indicia associated with the at least one email address is received before the indication of the at least one folder;

said indicia associated with the at least one email address is received after the indication of the at least one folder;

said indicia includes a text string that is associated with the at least one email address;

said indication to share is generated by a user selection of a mount button;

said indication to share indicates a desire of a user to begin a sharing process;

said indication to share indicates a desire of a user to continue a sharing process;

said indication to share is generated in connection with a drag and drop operation;

said indication to share is received, utilizing the at least one second interface;

said at least one email message is generated based on the receipt of the indication of the at least one folder, the indicia associated with the at least one email address, and the indication to share the at least one folder, by being generated in response to the receipt of all of the indication of the at least one folder, the indicia associated with the at least one email address, and the indication to share the at least one folder via the at least one network;

said at least one email message is generated based on the receipt of the indication of the at least one folder, the indicia associated with the at least one email address, and the indication to share the at least one folder vi, by being generated only after the receipt of all of the indication of the at least one folder, the indicia associated with the at least one email address, and the indication to share the at least one folder via the at least one network;

said representation is created based on the receipt of the indication of the at least one folder, the indicia associated with the at least one email address, and the indication to share the at least one folder via the at least one network, by being created in response to the receipt of all of the indication of the at least one folder, the indicia associated with the at least one email address, and the indication to share the at least one folder via the at least one network;

said representation is created based on the receipt of the indication of the at least one folder, the indicia associated with the at least one email address, and the indication to share the at least one folder via the at least one network, by being created only after the receipt of all of the indication of the at least one folder, the indicia associated with the at least one email address, and the indication to share the at least one folder via the at least one network;

said representation includes a folder icon;

said representation includes a folder visual element;

said representation is created based on at least one aspect of the at least one email message;

said indication to open the at least one file includes a selection of the at least one file;

said indication to open the at least one file includes a selection of the at least one file and a detection of a selection of an open user interface element;

said storage at the second node does not store the at least file until after the retrieval of the at least one file;

said storage at the second node includes at least one of volatile memory or non-volatile memory;

said file explorer interface is associated with an email interface that displays the at least one email message;

said file explorer interface is part of an email interface that displays the at least one email message;

said file explorer interface is accessed via an email interface that displays the at least one email message;

said email message includes a mount descriptor;

the at least one file is retrieved via the at least one network from a server in communication between the first node and the second node;

the at least one file is retrieved via the at least one network from a server in communication between the first node and a third node;

said reference includes a uniform resource identifier; or

said reference includes a link.

**19**. A method, comprising:

at a first node:

sending a communication over at least one network that results in display of a first user interface element, a second user interface element, and a third user interface element,

receiving information associated with at least one data object via the first user interface element,

receiving at least one object associated with at least one email address via the second user interface element,

receiving a message associated with a selection of the third user interface element, and

causing to be sent, to a second node via the at least one network, at least one email message identifying the at least one data object and including a reference to the at least one data object, without including a file attachment with the at least one email message; and

at the second node:

causing, utilizing code configured to be stored on a storage at the second node and further configured to cooperate with a file explorer interface of a client-based file explorer application, creation of a representation of the at least one data object in a location among one or more folders on the file explorer interface, and

causing display of the representation of the at least one data object in the location among the one or more folders on the file explorer interface.

**20**. The method of claim **19**, wherein the email message is sent without including the file attachment with the at least one email message, for avoiding the at least one file from having to be communicated to the second node until the at least one file is requested by a user at the second node.

**21**. The method of claim **19**, wherein the storage at the second node does not store any file in the at least one data object in response to the creation of the representation of the at least one data object being caused.

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