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Stephens et al.

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(54) **SECURE PRIVATE PORTABLE VAULT CONTAINER**

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(51) **Int. Cl.**

G06F 21/00	(2013.01)
G06F 21/40	(2013.01)

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CPC ***G06F 21/40*** (2013.01); ***G06Q 30/0255*** (2013.01); ***H04L 9/088*** (2013.01)

(58) **Field of Classification Search**
CPC G06F 21/40; G06F 21/44; G06F 21/53; G06Q 30/0255; H04L 9/088; H04L 9/3213
See application file for complete search history.

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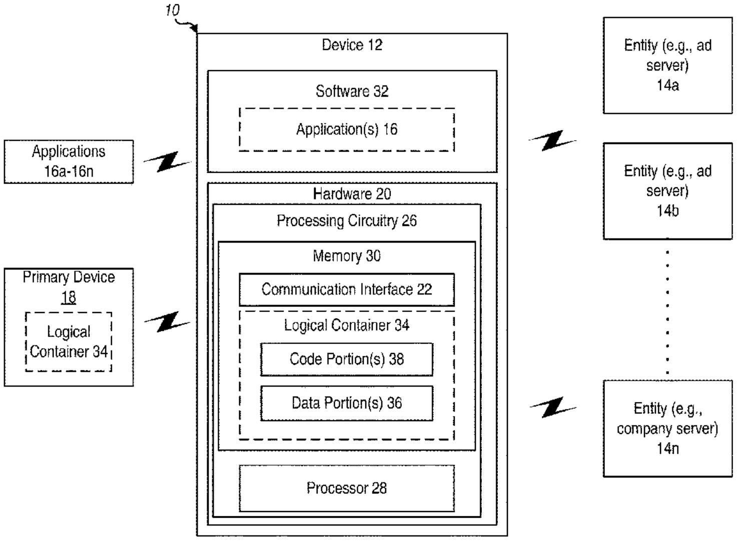
(74) *Attorney, Agent, or Firm* — Christopher & Weisberg, P.A.

(57) **ABSTRACT**

A method, system and apparatus are disclosed. A device includes processing circuitry that includes a processor and a memory, where the memory is configured to store a logical container including a plurality of encrypted data portions and a plurality of executable code portions. Each encrypted data portion and executable code portion is separately encrypted with a different encryption key and associated with a user. The processing circuitry receives, from a software application operating in another device, a first request associated with at least one encrypted data portion and one executable code portion of the logical container. The first request includes an encryption token associated with the software application. In response to the first request, the processing circuitry triggers a verification code portion to determine whether the first request is authorized and performs at least one operation to fulfill the first request in response to determining the request is authorized.

20 Claims, 13 Drawing Sheets



(51) **Int. Cl.**

H04L 9/08	(2006.01)
G06Q 30/02	(2012.01)

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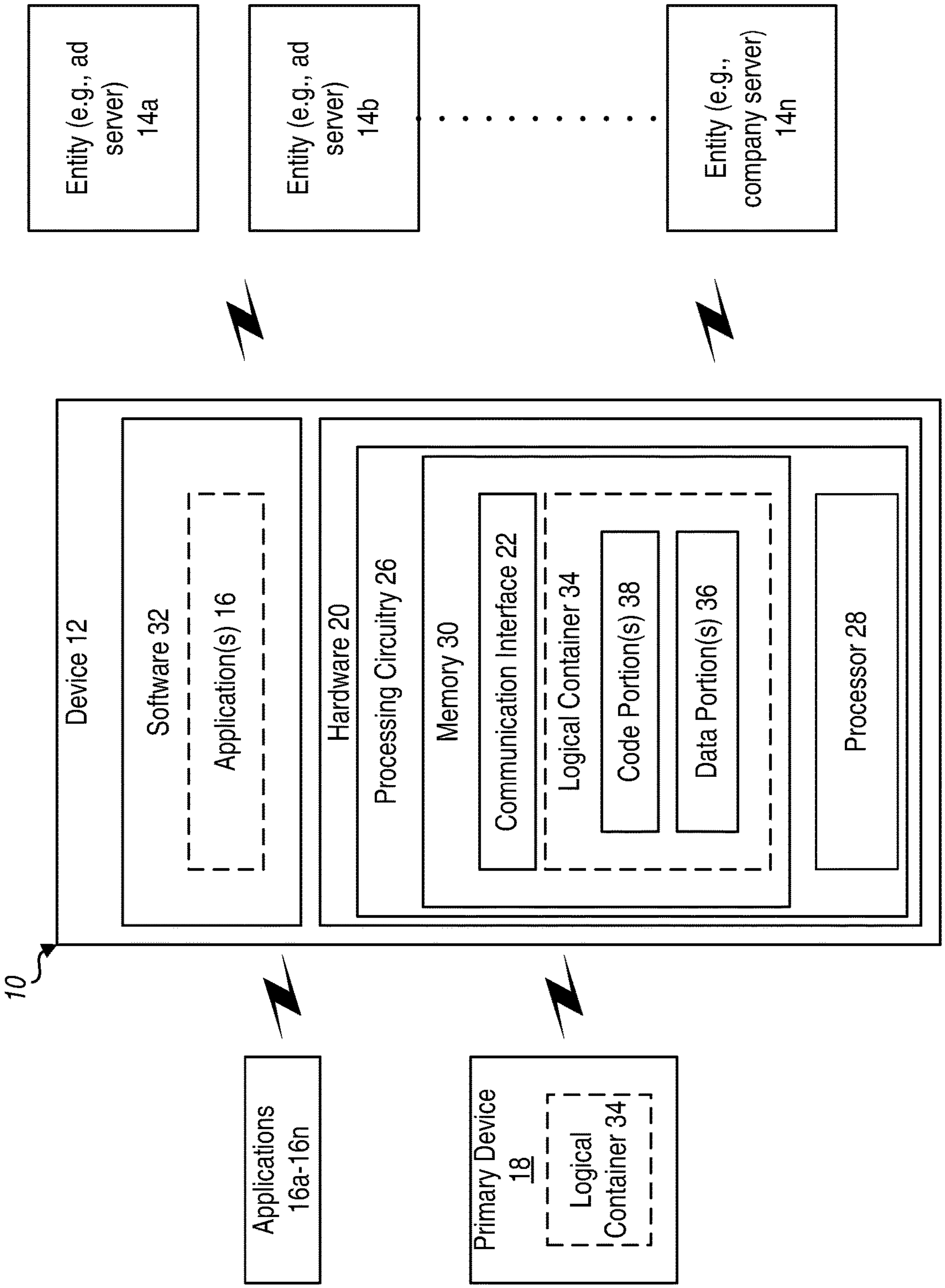
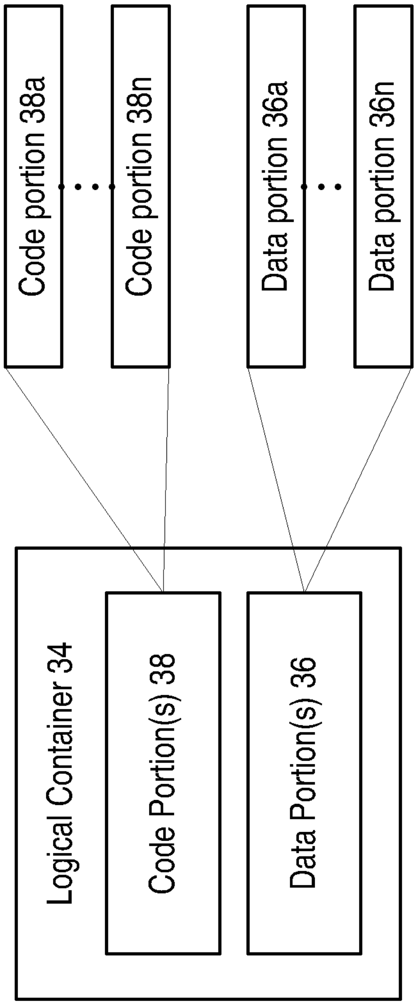

10
Device 12
Software 32
Application(s) 16
Hardware 20
Processing Circuitry 26
Memory 30
Communication Interface 22
Logical Container 34
Code Portion(s) 38
Data Portion(s) 36
Processor 28
Entity (e.g., ad server) 14a
Entity (e.g., ad server) 14b
Entity (e.g., company server) 14n
Applications 16a-16n
Primary Device 18
Logical Container 34

FIG. 1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Code portion 38n
Data portion 36a
Data portion 36n
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Code Portion(s) 38
Data Portion(s) 36

FIG. 2

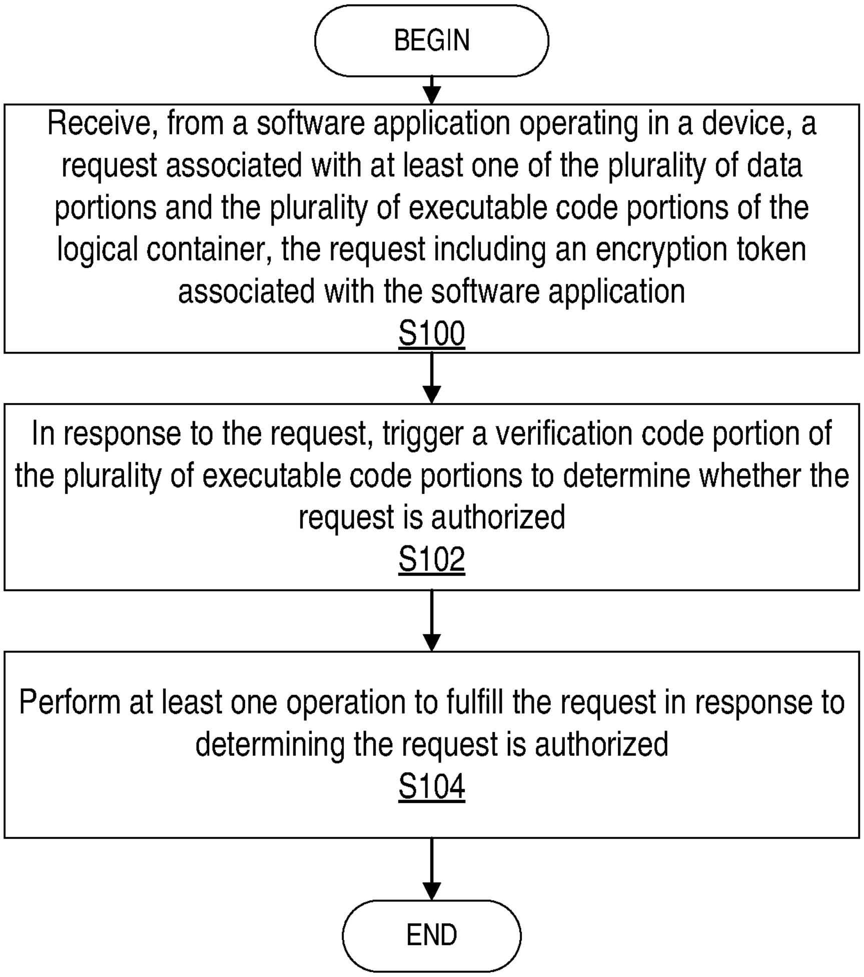

BEGIN
Receive, from a software application operating in a device, a request associated with at least one of the plurality of data portions and the plurality of executable code portions of the logical container, the request including an encryption token associated with the software application
S100
In response to the request, trigger a verification code portion of the plurality of executable code portions to determine whether the request is authorized
S102
Perform at least one operation to fulfill the request in response to determining the request is authorized
S104
END

FIG. 3

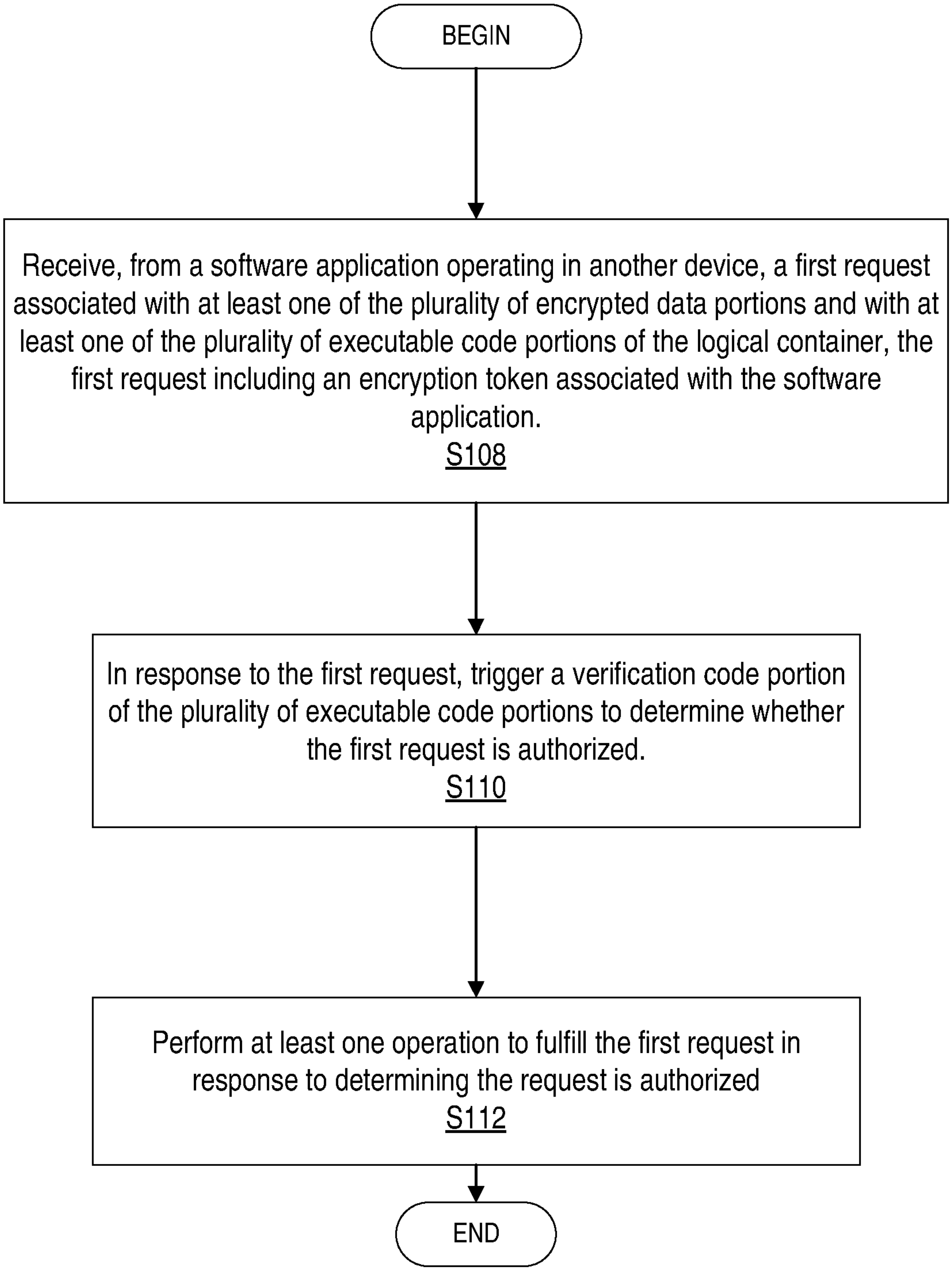
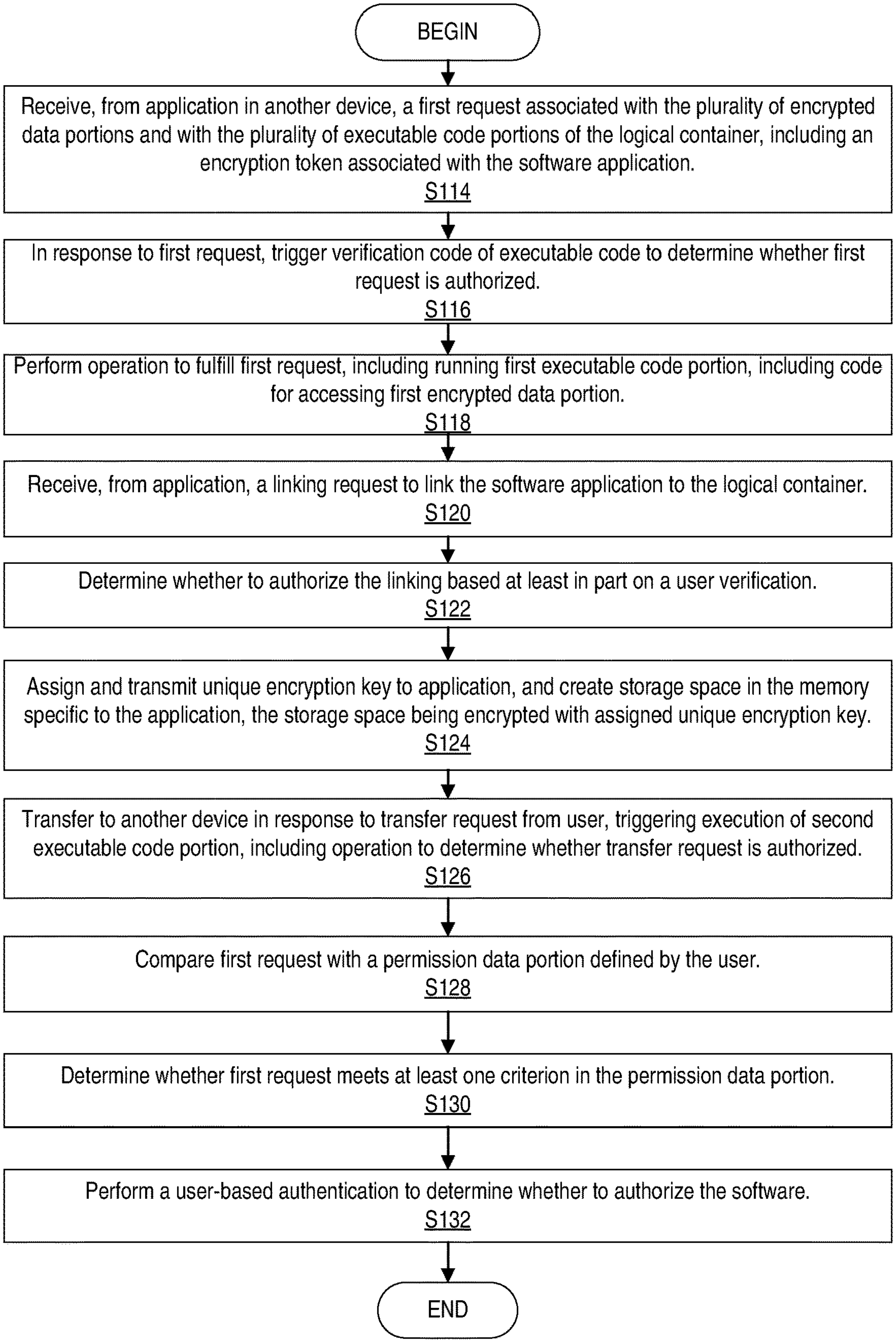

BEGIN
Receive, from a software application operating in another device, a first request associated with at least one of the plurality of encrypted data portions and with at least one of the plurality of executable code portions of the logical container, the first request including an encryption token associated with the software application.
S108
In response to the first request, trigger a verification code portion of the plurality of executable code portions to determine whether the first request is authorized.
S110
Perform at least one operation to fulfill the first request in response to determining the request is authorized
S112
END

FIG. 4



Receive, from application in another device, a first request associated with the plurality of encrypted data portions and with the plurality of executable code portions of the logical container, including an encryption token associated with the software application.
S114

In response to first request, trigger verification code of executable code to determine whether first request is authorized.
S116

Perform operation to fulfill first request, including running first executable code portion, including code for accessing first encrypted data portion.
S118

Receive, from application, a linking request to link the software application to the logical container.
S120

Determine whether to authorize the linking based at least in part on a user verification.
S122

Assign and transmit unique encryption key to application, and create storage space in the memory specific to the application, the storage space being encrypted with assigned unique encryption key.
S124

Transfer to another device in response to transfer request from user, triggering execution of second executable code portion, including operation to determine whether transfer request is authorized.
S126

Compare first request with a permission data portion defined by the user.
S128

Determine whether first request meets at least one criterion in the permission data portion.
S130

Perform a user-based authentication to determine whether to authorize the software.
S132

FIG. 5

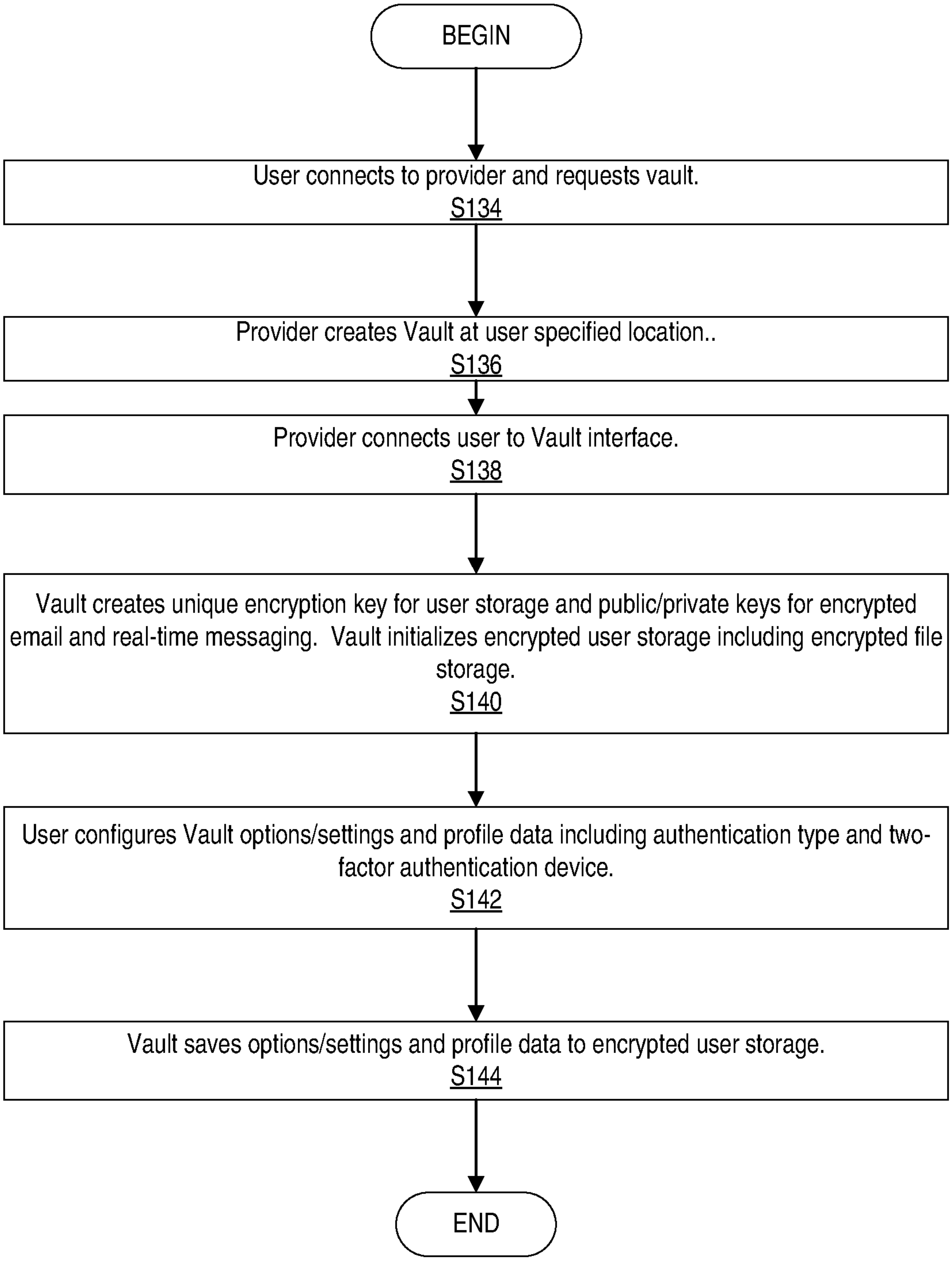

BEGIN
User connects to provider and requests vault.
S134
Provider creates Vault at user specified location..
S136
Provider connects user to Vault interface.
S138
Vault creates unique encryption key for user storage and public/private keys for encrypted email and real-time messaging. Vault initializes encrypted user storage including encrypted file storage.
S140
User configures Vault options/settings and profile data including authentication type and two-factor authentication device.
S142
Vault saves options/settings and profile data to encrypted user storage.
S144
END

FIG. 6

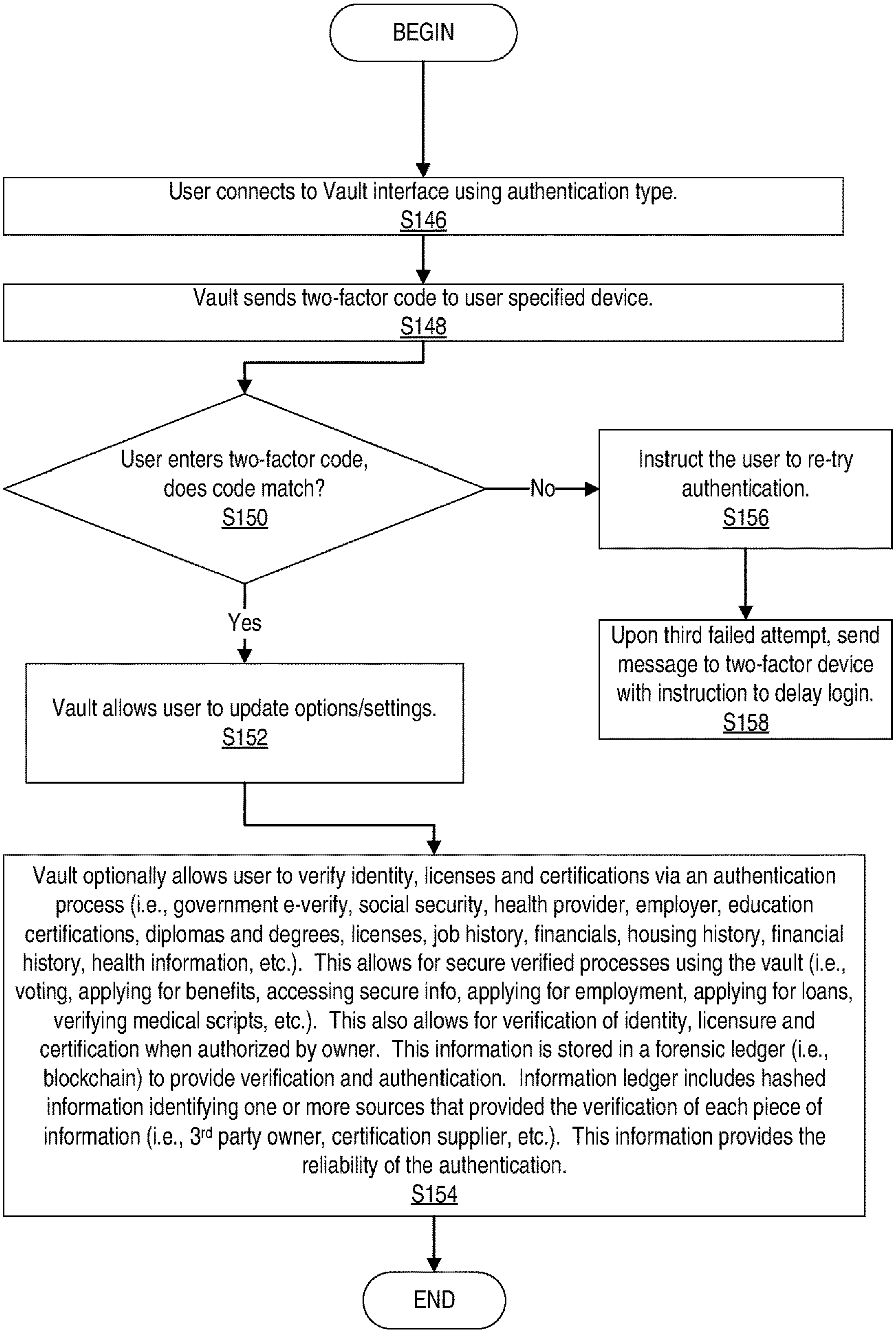

BEGIN
User connects to Vault interface using authentication type.
S146
Vault sends two-factor code to user specified device.
S148
User enters two-factor code, does code match?
S150
No
Instruct the user to re-try authentication.
S156
Upon third failed attempt, send message to two-factor device with instruction to delay login.
S158
Yes
Vault allows user to update options/settings.
S152
Vault optionally allows user to verify identity, licenses and certifications via an authentication process (i.e., government e-verify, social security, health provider, employer, education certifications, diplomas and degrees, licenses, job history, financials, housing history, financial history, health information, etc.). This allows for secure verified processes using the vault (i.e., voting, applying for benefits, accessing secure info, applying for employment, applying for loans, verifying medical scripts, etc.). This also allows for verification of identity, licensure and certification when authorized by owner. This information is stored in a forensic ledger (i.e., blockchain) to provide verification and authentication. Information ledger includes hashed information identifying one or more sources that provided the verification of each piece of information (i.e., 3rd party owner, certification supplier, etc.). This information provides the reliability of the authentication.
S154
END

FIG. 7

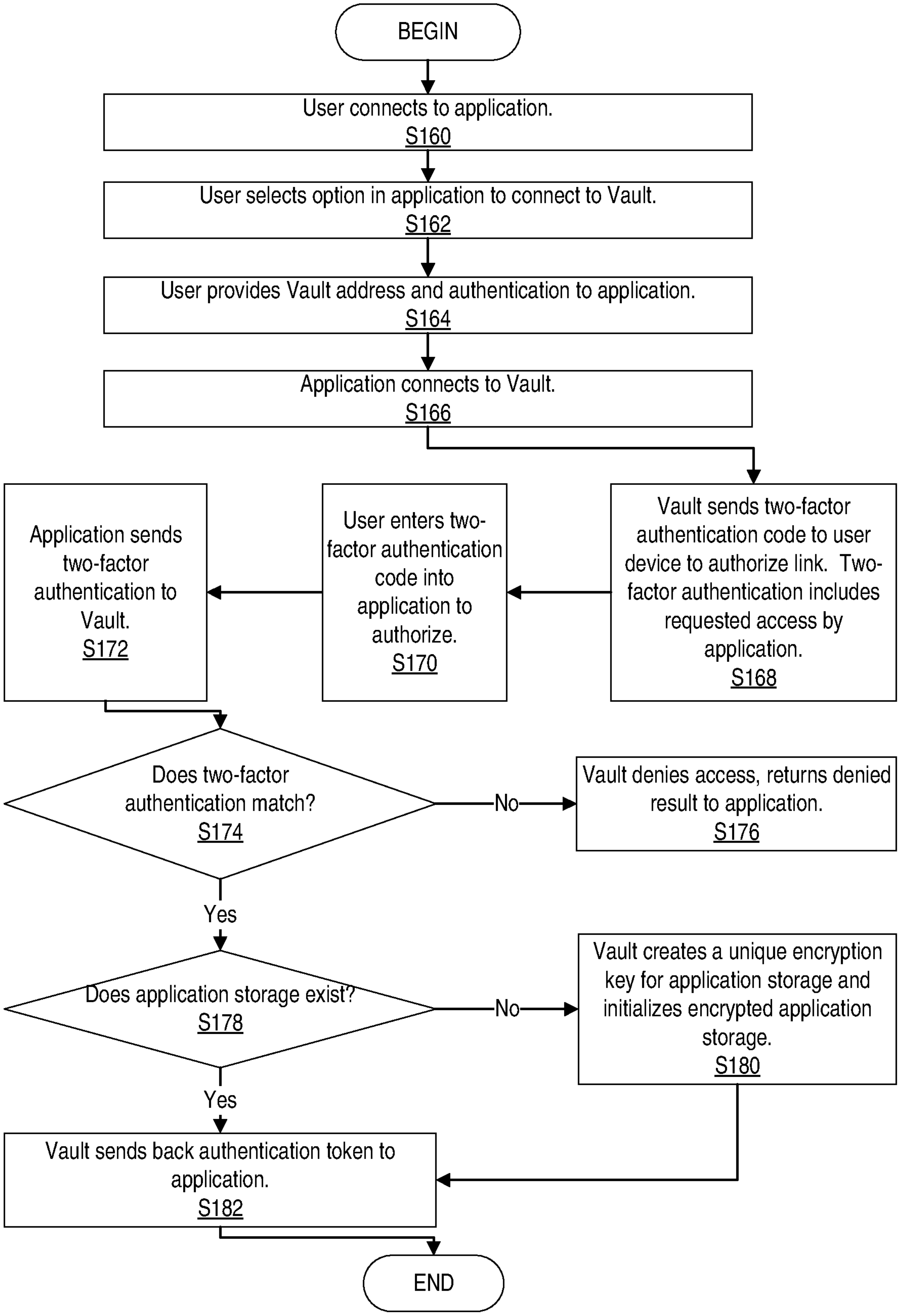

BEGIN
User connects to application.
S160
User selects option in application to connect to Vault.
S162
User provides Vault address and authentication to application.
S164
Application connects to Vault.
S166
Vault sends two-factor authentication code to user device to authorize link. Two-factor authentication includes requested access by application.
S168
User enters two-factor authentication code into application to authorize.
S170
Application sends two-factor authentication to Vault.
S172
Does two-factor authentication match?
S174
No
Vault denies access, returns denied result to application.
S176
Yes
Does application storage exist?
S178
No
Vault creates a unique encryption key for application storage and initializes encrypted application storage.
S180
Yes
Vault sends back authentication token to application.
S182
END

FIG. 8

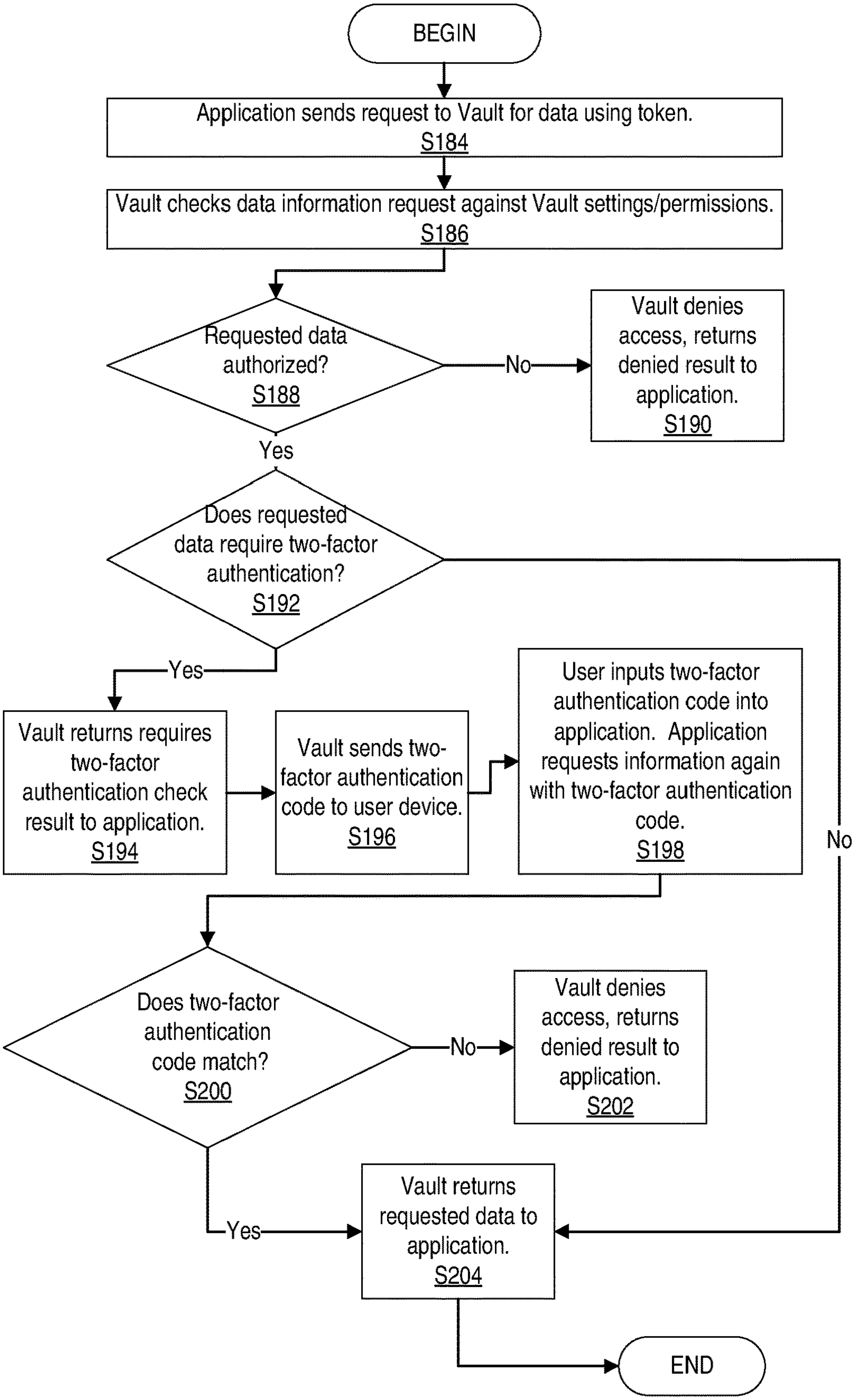

BEGIN
Application sends request to Vault for data using token.
S184
Vault checks data information request against Vault settings/permissions.
S186
Requested data authorized?
S188
No
Vault denies access, returns denied result to application.
S190
Yes
Does requested data require two-factor authentication?
S192
Yes
Vault returns requires two-factor authentication check result to application.
S194
Vault sends two-factor authentication code to user device.
S196
User inputs two-factor authentication code into application. Application requests information again with two-factor authentication code.
S198
No
Does two-factor authentication code match?
S200
No
Vault denies access, returns denied result to application.
S202
Yes
Vault returns requested data to application.
S204
END

FIG. 9

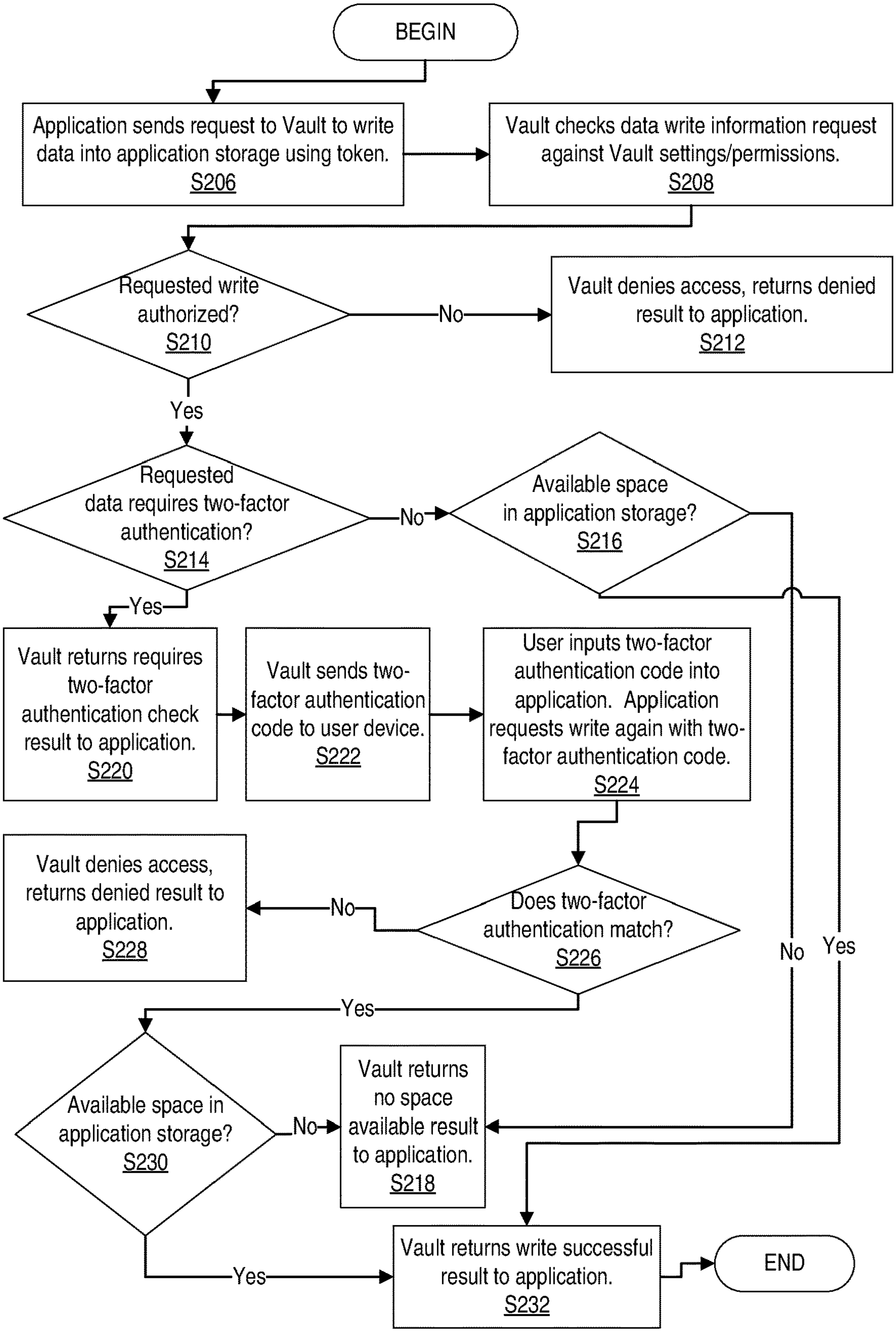

BEGIN
Application sends request to Vault to write data into application storage using token. S206
Vault checks data write information request against Vault settings/permissions. S208
Requested write authorized? S210
No
Vault denies access, returns denied result to application. S212
Yes
Requested data requires two-factor authentication? S214
No
Available space in application storage? S216
Yes
Vault returns requires two-factor authentication check result to application. S220
Vault sends two-factor authentication code to user device. S222
User inputs two-factor authentication code into application. Application requests write again with two-factor authentication code. S224
Vault denies access, returns denied result to application. S228
No
Does two-factor authentication match? S226
No
Yes
Yes
Available space in application storage? S230
No
Vault returns no space available result to application. S218
Yes
Vault returns write successful result to application. S232
END

FIG. 10

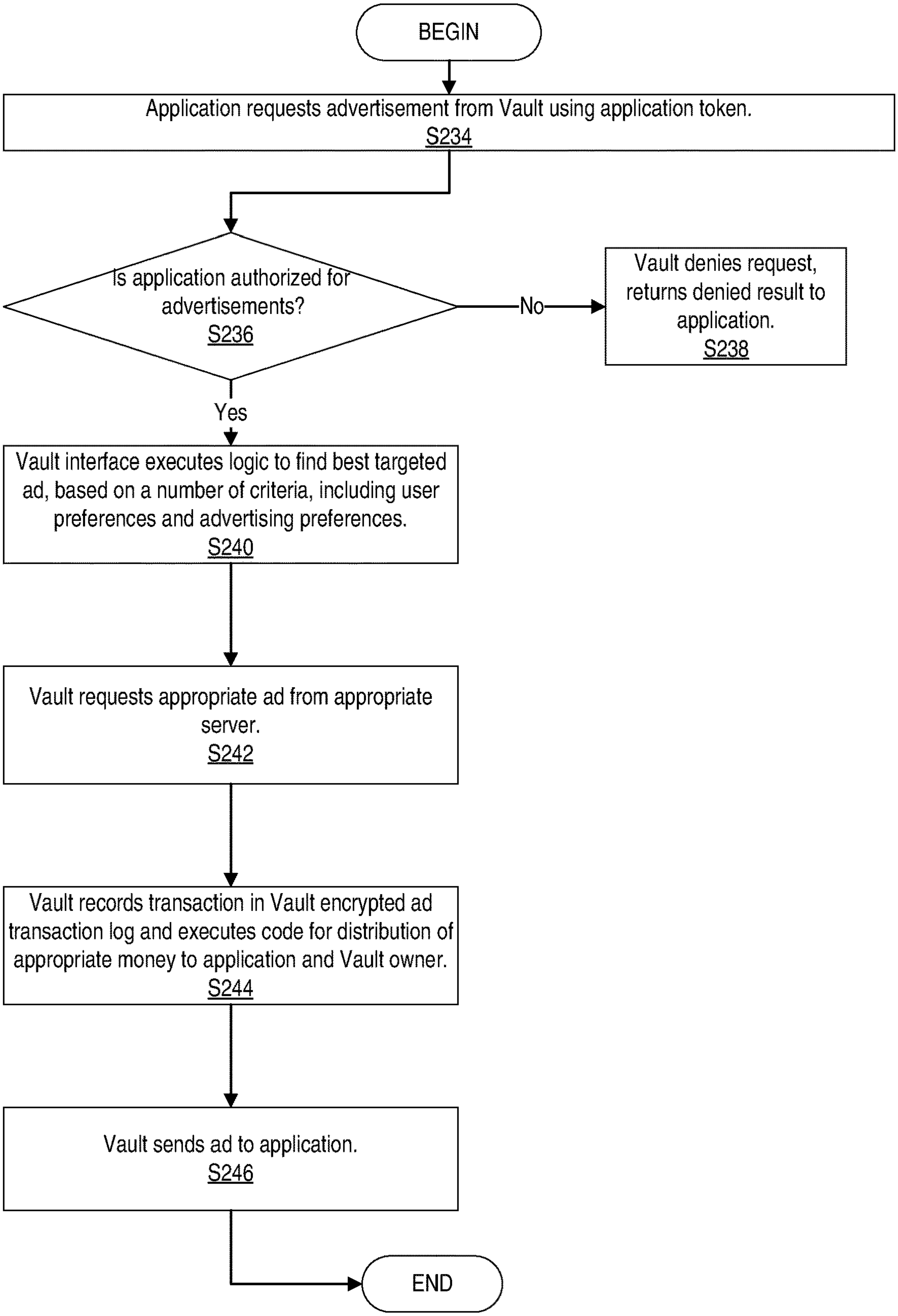

BEGIN
Application requests advertisement from Vault using application token.
S234
Is application authorized for advertisements?
S236
No
Vault denies request, returns denied result to application.
S238
Yes
Vault interface executes logic to find best targeted ad, based on a number of criteria, including user preferences and advertising preferences.
S240
Vault requests appropriate ad from appropriate server.
S242
Vault records transaction in Vault encrypted ad transaction log and executes code for distribution of appropriate money to application and Vault owner.
S244
Vault sends ad to application.
S246
END

FIG. 11

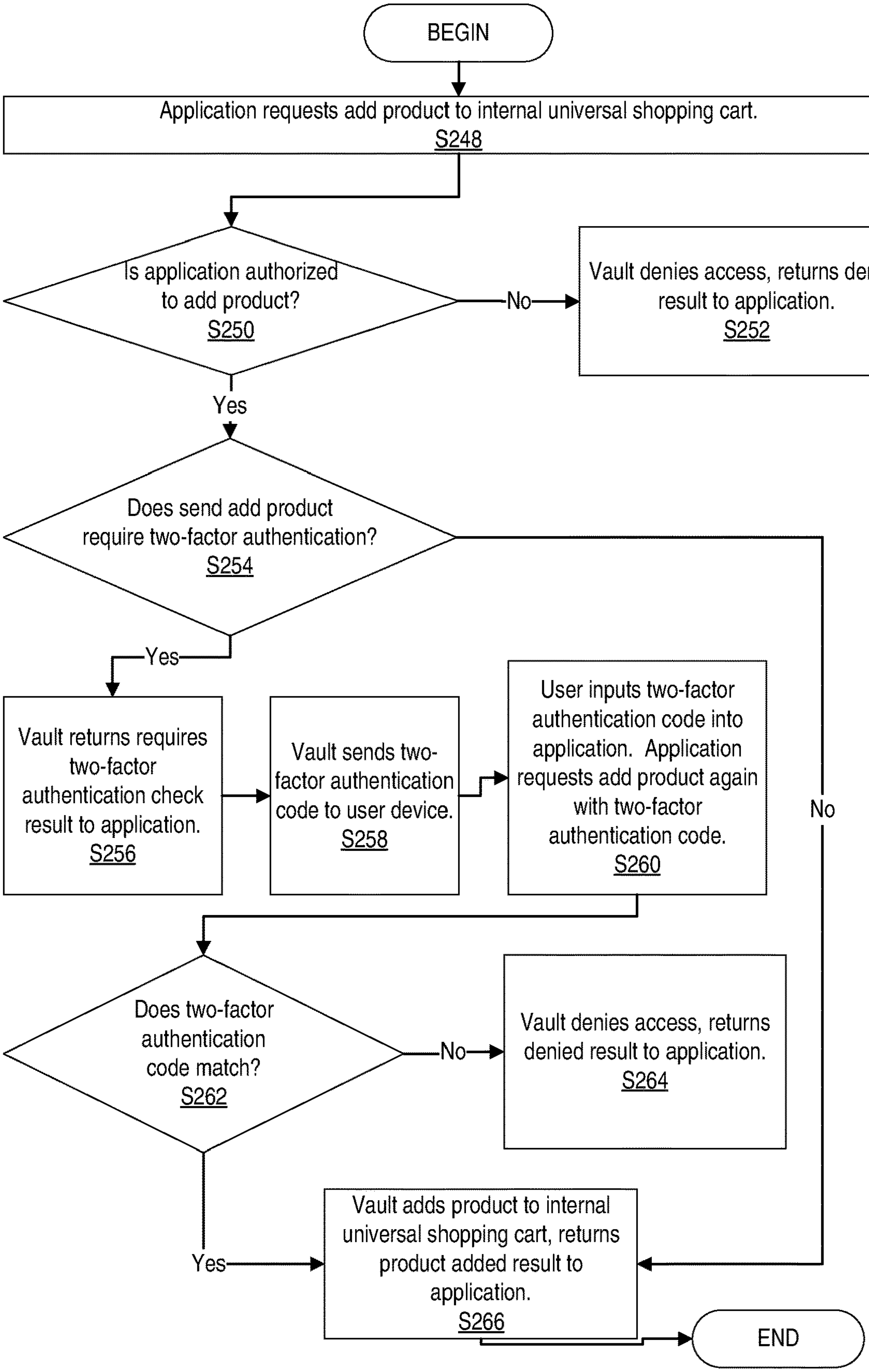

BEGIN
Application requests add product to internal universal shopping cart.
S248
Is application authorized to add product?
S250
No
Vault denies access, returns denied result to application.
S252
Yes
Does send add product require two-factor authentication?
S254
Yes
Vault returns requires two-factor authentication check result to application.
S256
Vault sends two-factor authentication code to user device.
S258
User inputs two-factor authentication code into application. Application requests add product again with two-factor authentication code.
S260
No
Does two-factor authentication code match?
S262
No
Vault denies access, returns denied result to application.
S264
Yes
Vault adds product to internal universal shopping cart, returns product added result to application.
S266
END

FIG. 12

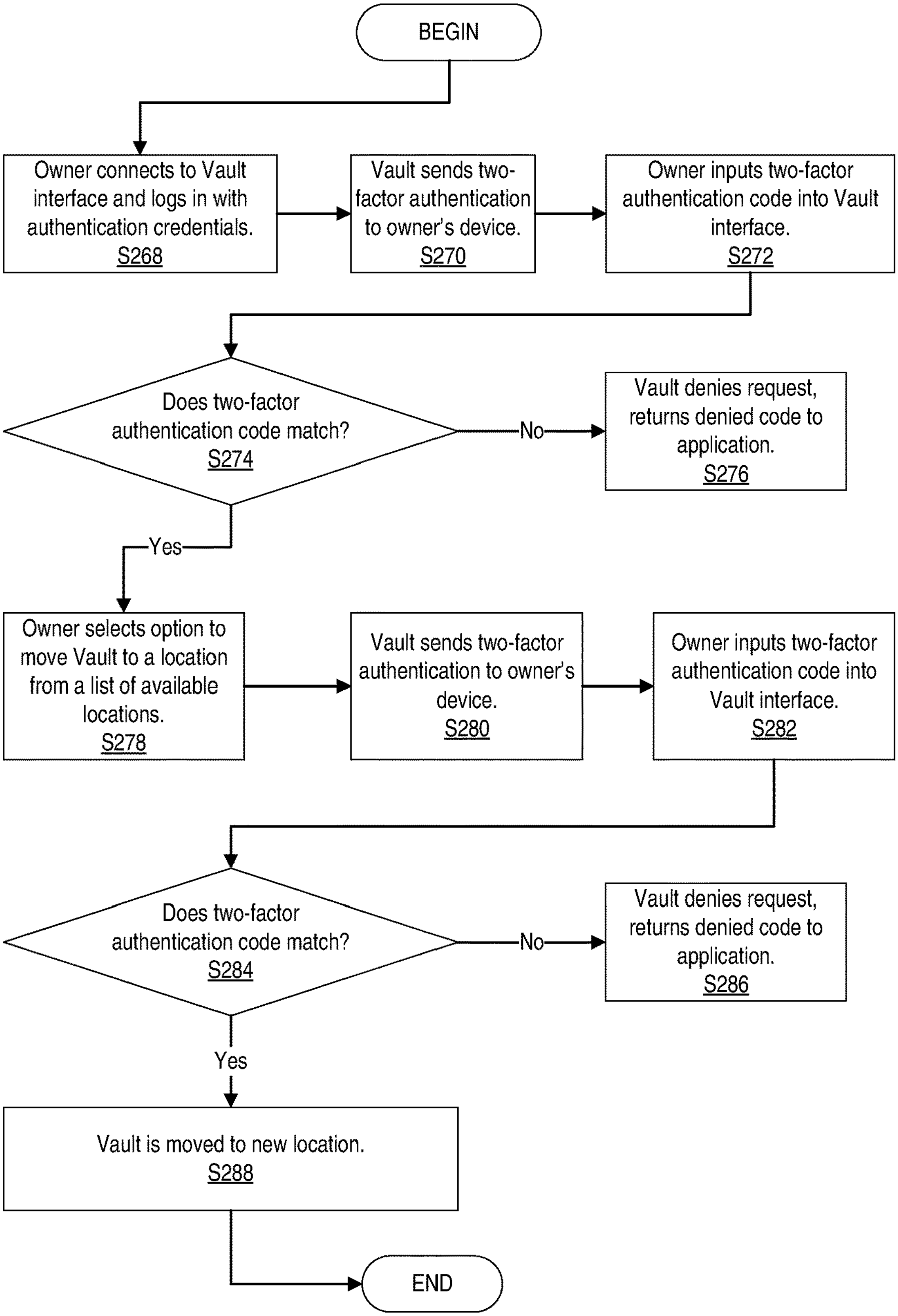

BEGIN
Owner connects to Vault interface and logs in with authentication credentials. S268
Vault sends two-factor authentication to owner's device. S270
Owner inputs two-factor authentication code into Vault interface. S272
Does two-factor authentication code match? S274
No
Vault denies request, returns denied code to application. S276
Yes
Owner selects option to move Vault to a location from a list of available locations. S278
Vault sends two-factor authentication to owner's device. S280
Owner inputs two-factor authentication code into Vault interface. S282
Does two-factor authentication code match? S284
No
Vault denies request, returns denied code to application. S286
Yes
Vault is moved to new location. S288
END

FIG. 13

SECURE PRIVATE PORTABLE VAULT CONTAINER

CROSS REFERENCE TO RELATED APPLICATION

The present application claims priority to and the benefit of the filing date of U.S. Provisional Patent Application Ser. No. 63/086,193, filed Oct. 1, 2020, which is incorporated herein by reference in its entirety.

FIELD

The present disclosure relates data security, and in particular to a logical vault or container such as a user-managed logical container.

BACKGROUND

In today's electronic driven society, users may generate vast amounts of electronic user-specific data. A user may have various accounts such bank account(s), email account(s), shopping account(s), over-the-top (OTT)/video platform account(s), among other personal account(s), etc. which may be accessible and/or usable over the internet. For example, an online shopping account with a retailer may be associated with login/password data, payment (e.g., credit card, bank account, etc.) data, shopping history, email address, personal data (e.g., address information, etc.), content viewing history, advertisement viewing history, geographic information, browsing history, etc., which may all be stored by the retailer and/or accessible by retailer according to the terms of service between the retailer and user. That is, a software application associated with the retailer may be configured to collect vast amounts of data from the user while using the software application or even when the application is not in use, and transmit this data for storage at a remote site for use by both the user and retailer according to terms of service that are subject to change by the retailer.

This common situation is not without issues. First, users tend to have little to no control over how the vast amounts of user data are used. The retailer or entity that operates the software application may have access to this vast amount of information where the retailer can use highly personal data for numerous purposes such as advertisements, data analytics, etc., without having to inform the user when the data is being used. Also, the retailer may even be able to sell this highly personal data to other companies, such as data analytic companies that parse through and analyze the data in order to monetize the results. Further, even if the user deletes the software application and user data from the user's mobile phone, there is no way to confirm whether the user's data was also deleted from the remote database where the data is stored. Therefore, the lack of user control over the user's data is one issue facing users today.

Second, having a retailer or third party store vast amounts of user data that is available to the system is vulnerable to hacking or security breaches that may result in some or all of the user data being exposed. The user has little to no influence as to: how the user data is stored by the retailer and the extend of security procedures for securing the data. Third, existing solutions are not readily scalable as software application creators have to build the user and storage backends. Fourth, the retailer that has access to the user data is able to generate revenue from advertising using the user data but may be liable for misuse of user data.

Therefore, existing systems suffer from various issues with respect to management of data associated with a user.

SUMMARY

Some embodiments advantageously provide methods, systems and devices for a user-managed logical container. According to one or more embodiments, systems and methods that allow for individual users to create, own and control a stand-alone secure, encrypted, private, personal, portable, geographically independent electronic vault container (i.e., logical vault/container) are provided. The vault can be located in the cloud or on a removable device determined by the owner and is used to store, control, share or prevent sharing of any personal or personally owned data such as a user profile, application data, secure email, secure real-time messaging, secure real-time notifications, browsing history, content viewing history, advertising profiles, purchasing profiles, financial data (e.g., credit card information, etc.), universal sharable shopping cart, user preferences, authorized advertisers, advertising profiles, geolocation information, parental controls, etc. with services such as social media platforms, online sales platforms, search engines, email providers, messaging systems, etc. The vault may optionally include a built-in capability for communicating via a virtual private network (VPN) which allows the owner/user to communicate securely and anonymously with the vault via the VPN.

According to one or more embodiments, a method is provided that allows for users to create and control access to a secure, private, personal, portable electronic virtual container, vault (i.e., logical vault/container). The vault can be used to securely store and provide controlled secure access to data/information such as one or more of personal data, application data, advertising transactions and financial transaction. The vault may also provide for secure web browsing via a built-in virtual private network (VPN). The vault provides granular secure access to data, advertisements and financial transactions via internal code stored in the vault that acts as a real-time owner configurable data control system (i.e., virtual/logical controller stored in the vault as executable code). All data and transaction queries are authorized in real-time by the controller. The vault allows the owner/user to configure controller access and functionality systems via an interface such as an application program interface (API) that is located internally, i.e., located/stored in the vault as executable code. Controller authorized third party applications can store and retrieve information by querying the controller. Controller authorized third party applications can request advertising and financial transactions by querying the controller.

One or more embodiments may provide one or more of the following advantages:

Users own, store and control their data via the vault such that no data is stored by a company. Users can update authorized queries by a company for information in real time;

Allows software application creators/developers to create applications without having to build the user and storage backends as they can link to the individual users' vault using, for example, sdk, to store and retrieve all application information in a secure, dedicated application area in the vault.

Each user may have their own separate vault which is not exposed to hackers, thereby reducing liability;

The vault provides and may automatically monetize the advertisements to the application based on the parameters set by the owner/user. The owner/user may receive a portion of the advertisement revenue. This allows application developers to take advantage of advertising while reducing the risk of liability associated with using the user data; and

Companies may logically store products in the vault's universal shopping cart such as a wish list, which can be securely stored and shared with other platforms or vault owners. Products can be purchased through the vault's financial interface.

Further, various types of applications can advantageously use the vault described herein.

According to one aspect, a device is provided. The device includes processing circuitry that includes a processor, and a memory where the memory is configured to store a logical container. The logical container includes a plurality of encrypted data portions and a plurality of executable code portions where each of the plurality of encrypted data portions and the plurality of executable code portions are separately encrypted with a different encryption key and are associated with a user is provided. The processing circuitry is configured to receive, from a software application operating in another device, a first request associated with at least one of the plurality of encrypted data portions and with at least one of the plurality of executable code portions of the logical container, where the first request includes an encryption token associated with the software application. In response to the first request, the processing circuitry triggers a verification code portion of the plurality of executable code portions to determine whether the first request is authorized, and performs at least one operation to fulfill the first request in response to determining the request is authorized.

According to this aspect, in some embodiments, the at least one operation includes running a first executable code portion of the plurality of executable code portions where the first executable code portion includes code for accessing a first encrypted data portion of the plurality of encrypted data portions. In some embodiments, the processing circuitry is further configured to receive, from the software application, a linking request to link the software application to the logical container. The processing circuitry determines whether to authorize the linking based at least in part on a user verification. In response to determining the linking is authorized, the processing circuitry assigns and transmits a unique encryption key to the software application, and creates a storage space in the memory that is specific to the software application, where the storage space is encrypted with the assigned unique encryption key. In some embodiments, the logical container is configured to be transferable to another device in response to a transfer request from the user, where the transfer request triggers the execution of a second executable code portion of the plurality of executable code portions and where the second executable code portion includes at least one operation to determine whether the transfer request is authorized. In some embodiments, the logical container is configured to request a targeted advertisement for the user based on at least one of the plurality of encrypted data portions. In some embodiments, the plurality of encrypted data portions includes at least one of the user's advertising history and the user's purchase history. In some embodiments, the plurality of executable code portions includes an advertising request application program interface, API, code portion. In some embodiments, the apparatus is a cloud computing node of a third party entity. In some embodiments, the apparatus is accessible by a primary device associated with the user to access the logical container using a two-factor authentication. In some embodiments, the verification code portion is configured to cause the processing circuitry to compare the first request with a permission data portion of the plurality of encrypted data portions that is defined by the user, determine whether the first request meets at least one criterion in the permission data portion, and perform a user-based authentication to determine whether to authorize the software application

According to another aspect, a method for securing a user's data is provided. The method is implemented by a device including processing circuitry, where the processing circuitry includes a processor and a memory, and where the memory is configured to store a logical container. The logical container includes a plurality of encrypted data portions and a plurality of executable code portions. Each of the plurality of encrypted data portions and the plurality of executable code portions is separately encrypted with a different encryption key and is associated with a user. The method includes receiving, from a software application operating in another device, a first request associated with at least one of the plurality of encrypted data portions and with at least one of the plurality of executable code portions of the logical container. The first request includes an encryption token associated with the software application. In response to the first request, the method triggers a verification code portion of the plurality of executable code portions to determine whether the first request is authorized. The method then performs at least one operation to fulfill the first request in response to determining the request is authorized.

According to this aspect, in some embodiments, the method further includes running a first executable code portion of the plurality of executable code portions, where the first executable code portion includes code for accessing a first encrypted data portion of the plurality of encrypted data portions. In some embodiments, the method further includes receiving, from the software application, a linking request to link the software application to the logical container, determining whether to authorize the linking based at least in part on a user verification, assigning and transmitting a unique encryption key to the software application in response to determining the linking is authorized, and creating a storage space in the memory that is specific to the software application, where the storage space is encrypted with the assigned unique encryption key. In some embodiments, the method further includes transferring the logical container to another device in response to a transfer request from the user, where the transfer request triggers the execution of a second executable code portion of the plurality of executable code portions, and where the second executable code portion includes at least one operation to determine whether the transfer request is authorized. In some embodiments, the plurality of encrypted data portions includes at least one of the user's advertising history and the user's purchase history. In some embodiments, the plurality of executable code portions includes an advertising request application program interface, API, code portion. In some embodiments, the device is a cloud computing node of a third party entity. In some embodiments, the method further includes comparing the first request with a permission data portion of the plurality of data portions that is defined by the user, determining whether the first request meets at least one criterion in the permission data portion, and performing a user-based authentication to determine whether to authorize the software application.

According to yet another aspect, a cloud computing node including processing circuitry is provided. The processing circuitry includes a processor and a memory, where the memory is configured to store a logical container, and where the logical container includes a plurality of encrypted data portions and a plurality of executable code portions. Each of the plurality of encrypted data portions and the plurality of executable code portions is separately encrypted with a different encryption key and being associated with a user. The plurality of encrypted data portions includes at least one of the user's advertising history and the user's purchase history. The plurality of executable code portions includes an advertising request application program interface, API, code portion. The processing circuitry is configured to receive, from a software application operating in another device, a first request associated with at least one of the plurality of encrypted data portions and with at least one of the plurality of executable code portions of the logical container. The first request includes an encryption token associated with the software application. In response to the first request, the processing circuitry triggers a verification code portion of the plurality of executable code portions to determine whether the first request is authorized, and performs at least one operation to fulfill the first request in response to determining the first request is authorized. The at least one operation includes running a first executable code portion of the plurality of executable code portions, where the first executable code portion includes code for accessing a first encrypted data portion of the plurality of encrypted data portions, receiving, from the software application, a linking request to link the software application to the logical container, and determining whether to authorize the linking based at least in part on a user verification. In response to determining the linking is authorized, the processing circuitry assigns and transmits a unique encryption key to the software application, and creates a storage space in the memory that is specific to the software application. The storage space is encrypted with the assigned unique encryption key. The logical container is configured to transfer to another device in response to a transfer request from the user, where the transfer request triggers the execution of a second executable code portion of the plurality of executable code portions. The second executable code portion includes at least one operation to determine whether the transfer request is authorized. The verification code portion is configured to compare the first request with a permission data portion of the plurality of data portions that is defined by the user, determine whether the first request meets at least one criterion in the permission data portion, and perform a user-based authentication to determine whether to authorize the software application.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete understanding of the present embodiments, and the attendant advantages and features thereof, will be more readily understood by reference to the following detailed description when considered in conjunction with the accompanying drawings wherein:

FIG. **1** is a block diagram of a system according to the principles of the disclosure;

FIG. **2** is a block diagram of a logical container **34** according to the principles of the disclosure;

FIG. **3** is a flowchart of an example process in a device according to the principles of the disclosure;

FIG. **4** is a flowchart of another example process according to the principles of the disclosure;

FIG. **5** is a flowchart of another example process according to the principles of the disclosure;

FIG. **6** is a flowchart of another example process according to the principles of the disclosure;

FIG. **7** is a flowchart of another example process according to the principles of the disclosure;

FIG. **8** is a flowchart of another example process according to the principles of the disclosure;

FIG. **9** is a flowchart of another example process according to the principles of the disclosure;

FIG. **10** is a flowchart of another example process according to the principles of the disclosure;

FIG. **11** is a flowchart of another example process according to the principles of the disclosure;

FIG. **12** is a flowchart of another example process according to the principles of the disclosure; and

FIG. **13** is a flowchart of another example process according to the principles of the disclosure.

DETAILED DESCRIPTION

Before describing in detail exemplary embodiments, it is noted that the embodiments reside primarily in combinations of apparatus components and processing steps related to user-managed logical container (also referred to as a "vault"). As used herein, the term "container" refers to logical elements such as data structures used to organize and store objects, such as data elements. Accordingly, components have been represented where appropriate by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the embodiments so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein. Like numbers refer to like elements throughout the description.

As used herein, relational terms, such as "first" and "second," "top" and "bottom," and the like, may be used solely to distinguish one entity or element from another entity or element without necessarily requiring or implying any physical or logical relationship or order between such entities or elements. The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the concepts described herein. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises," "comprising," "includes" and/or "including" when used herein, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

In embodiments described herein, the joining term, "in communication with" and the like, may be used to indicate electrical or data communication, which may be accomplished by physical contact, induction, electromagnetic radiation, radio signaling, infrared signaling or optical signaling, for example. One having ordinary skill in the art will appreciate that multiple components may interoperate and modifications and variations are possible of achieving the electrical and data communication.

In some embodiments described herein, the term "coupled," "connected," and the like, may be used herein to indicate a connection, although not necessarily directly, and may include wired and/or wireless connections.

In some embodiments, the device can be any type of wired and/or wireless device capable of communicating with one or more entities and/or devices. In one or more embodiments, the device may be a wireless device, mobile device, laptop, tablet, computer, mobile terminal, smart phone, USB dongles, Internet of Things (IoT) device, wearable, TV, etc.

Unless otherwise defined, all terms (including 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. It will be further understood that terms used herein should be interpreted as having a meaning that is consistent with their meaning in the context of this specification and the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

Some embodiments provide a user-managed logical container. Referring now to the drawing figures, in which like elements are referred to by like reference numerals, there is shown in FIG. **1** a schematic diagram of a system **10**, according to one or more embodiments, which comprises device **12** that is in communication with one or more entities **14***a*-**14***n*, one or more applications **16** (e.g., software application executed in a separate device/apparatus), a primary device **18**, etc., as described herein. In one or more embodiments, device **12** may be a container/vault device or server that may be operated by a third party and is responsible for at least the creation and/or initialization of a logical container. Device **12** includes hardware **20** enabling it to perform one or more device **12** functions described herein. Hardware **20** includes communication interface **22** for communicating with an interface of different entities **14**, for example, via wired and/or wireless communication. That is, communication interface **22** facilitates a connection to one or more entities **14** and/or other devices **12** in system **10**.

In one or more embodiments, the hardware **20** of device **12** may include processing circuitry **26**. Processing circuitry **26** may include processor **28** and memory **30**. In particular, in addition to or instead of a processor, such as a central processing unit, and memory, the processing circuitry **26** may comprise integrated circuitry for processing and/or control, e.g., one or more processors and/or processor cores and/or FPGAs (Field Programmable Gate Array) and/or ASICs (Application Specific Integrated Circuitry) adapted to execute instructions. The processor **28** may be configured to access (e.g., write to and/or read from) the memory **30**, which may comprise any kind of volatile and/or nonvolatile memory, e.g., cache and/or buffer memory and/or RAM (Random Access Memory) and/or ROM (Read-Only Memory) and/or optical memory and/or EPROM (Erasable Programmable Read-Only Memory).

Thus, device **12** further has software **32** stored internally in, for example, memory **30**, or stored in external memory (e.g., database, storage array, network storage device, etc.) accessible by device **12** via an external connection. The software **32** may be executable by the processing circuitry **26**. The processing circuitry **26** may be configured to control any of the methods and/or processes described herein and/or to cause such methods, and/or processes to be performed, e.g., by device **12**. Processor **28** corresponds to one or more processors **28** for device **12** functions described herein. The memory **30** is configured to store data, programmatic software code and/or other information such as in logical container **34** configuration described herein.

In some embodiments, memory **30** includes a logical container that includes one or more data portions **36***a*-**36***n* (collectively referred to as data portion **36**) where each data portion **36** is encrypted differently from other data portions **36**. For example, each data portion **36** may be encrypted using a respective encryption key and may have a respective storage location in memory **30**. In one or more embodiments, one or more data portions **36** are stored in memory **30** using a password/biometric key and may only be written or accessed when authorized by the user (i.e., owner of data and/or logical container **34**) and decrypted using the key. Further, one or more data portions **36** may be configured such as by the user (i.e., data and/or logical container **34** owner) to have one or more of a fixed amount of storage, rolling storage and unlimited storage in, for example, memory **30**. Some examples of data stored in data portions **36** include one or more of owner data with file storage, advertising and purchase history, access and request history including request location, application data for code portion **38***a*, application data for code portion **38***b*, etc., among other data associated with the user and/or an application.

In some embodiments, logical container **34** includes one or more code portions **38***a*-**38***n* (collectively referred to as code portion **38**) where each code portion **38** is encrypted using a respective encryption key and may have a respective storage location in memory **30**. In particular, code portion **38** may correspond to executable code (i.e., executable software instruction). Some examples of code portions **38** include one or more interface application program interface (API), security and two factor authentication (2FA) code, advertising request API code, owner web administrator, permission, profile, advertisement interface code, real-time encrypted messaging, notification, email, optional VPN code, optional video conference server code, optional voice assistant code, etc., among other code. Software **32** and/or one or more code portions **38**, when executed by the processor **28** and/or processing circuitry **26**, causes the processor **28** and/or processing circuitry **26** to perform one or more processes, as described herein.

The communication system **10** further includes the entity **14** already referred to. Entity **14** may generally correspond to a server that is in communication with device **12** where the server may request and/or provide data to device **12**. For example, entity **14** may request data in one or more data portions **36** from device **12** and/or provide data associated with one or more code portions **38** and/or one or more requests from logical container **34**. Further, one or more applications **16** may be in communication with device **12** where application **16** is able to request and/or provide data from/to device **12**, as described herein. Also, primary device **18** may generally refer to a device similar to device **12** that the user may designate as the user's primary device that may be used to request and configure the logical container, for 2FA, modify one or more options/settings for the logical container, etc., as described herein.

Further, while logical container **34** is described as residing in memory **30** of device **12**, logical container **34** may advantageously be transferred, with permission for the user/owner, to another device **12**, primary device **18**, entity **14**, cloud network, USB drive, etc., thereby providing the user with control of where the logical container **34** is stored.

FIG. **2** is a block diagram of an example logical container **34** according to the principles of the disclosure. In one or more embodiments, code portion **38** includes separately encrypted and stored code portions **38***a*-**38***n* where each code portion **38** may be associated with a different encryption key from the other code portions **38**. Further, data portion **36** may include separately encrypted and stored data portions **36***a*-**36***n* where each data portion **36** may be associated with a different encryption key from other data portions **36**.

FIG. **3** is a flowchart of an example process in a device **12** according to the principles of the disclosure. One or more blocks described herein may be performed by one or more elements of device **12** such as by one or more of processing circuitry **26** (including the logical container **34**), processor **28**, and/or communication interface **22**. Device **12** is configured to receive (Block S**100**), from a software application **16** operating in another device, a request associated with at least one of the plurality of data portions **36** and the plurality of executable code portions **38** of the logical container **34** where the request includes an encryption token associated with the software application **16**. Device **12** is configured to, in response to the request, trigger (Block S**102**) a verification code portion **38** of the plurality of executable code portions **38** to determine whether the request is authorized, as described herein. Device **12** is configured to perform (Block S**104**) at least one operation to fulfill the request in response to determining the request is authorized, as described herein.

FIG. **4** is a flowchart of another example process according to the principles of the disclosure. One or more blocks and/or device **12** functions described below may be performed by one or more elements of device **12** such as by one or more of processing circuitry **26** (including the logical container **34**), processor **28**, and/or communication interface **22**. Device **12** is configured to receive (Block S**108**), from a software application **16** (e.g., software application executed in a separate device/apparatus), a first request associated with at least one of the plurality of data portions **36** and the plurality of executable code portions **38** of the logical container **34** where the first request includes an encryption token associated with the software application **16**. Device **12** is configured to, in response to the request, trigger (Block S**110**) a verification code portion **38** of the plurality of executable code portions **38** to determine whether the first request is authorized, as described herein. Device **12** is configured to perform (Block S**112**) at least one operation to fulfill the first request in response to determining the first request is authorized, as described herein.

In some embodiments, the at least one operation includes running a first executable code portion of the plurality of executable code portions **38**, where the first executable code portion includes code for accessing a first encrypted data portion of the plurality of encrypted data portions **36**. In some embodiments, device **12** is configured to receive, from the software application **16**, a linking request to link the software application **16** to the logical container **34** and determines whether to authorize the linking based at least in part on a user verification. In response to determining the linking is authorized, device **12** assigns and transmits a unique encryption key to the software application **16** and creates a storage space in the memory **30** that is specific to the software application **16**. The storage space is encrypted with the assigned unique encryption key. In some embodiments, the logical container **34** is configured to be transferrable to another device in response to a transfer request from the user. The transfer request triggers the execution of a second executable code portion of the plurality of executable code portions **38**, where the second executable code portion includes at least one operation to determine whether the transfer request is authorized.

In some embodiments, the logical container **34** is configured to request a targeted advertisement for the user based on at least one of the plurality of encrypted data portions **36**. In some embodiments, the plurality of encrypted data portions **36** includes at least one of the user's advertising history and the user's purchasing history. In some embodiments, the plurality of executable code portions **38** includes an advertising request application program interface, API, code portion. In some embodiments, the device **12** is a cloud computing node of a third party entity. In some embodiments, the device **12** is accessible by a primary device **18** associated with the user to access the logical container **34** using a two-factor authentication. In some embodiments, the verification code portion is configured to cause the processing circuitry **26** to compare the first request with a permission data portion of the plurality of data portions **36** that is defined by the user, determine whether the first request meets at least one criterion in the permission data portion, and perform a user-based authentication to determine whether to authorize the software application **16**.

FIG. **5** is a flowchart of another example process according to the principles of the disclosure. One or more blocks described herein may be performed by one or more elements of device **12** such as by one or more of processing circuitry **26** (including the logical container **34**), processor **28**, and/or communication interface **22**. Device **12** is configured to receive (Block S**114**), from a software application **16** (e.g., software application executed in a separate device/apparatus), a first request associated with at least one of the plurality of data portions **36** and the plurality of executable code portions **38** of the logical container **34**, where the first request includes an encryption token associated with the software application **16**. Device **12** is configured to, in response to the request, trigger (Block S**116**) a verification code portion **38** of the plurality of executable code portions **38** to determine whether the first request is authorized, as described herein. Device **12** is configured to perform (Block S**118**) at least one operation to fulfill the first request in response to determining the first request is authorized, as described herein. The at least one operation includes running a first executable code portion of the plurality of executable code portions **38**, where the first executable code portion includes code for accessing a first encrypted data portion of the plurality of encrypted data portions **36**.

Device **12** is configured to receive (Block S**120**), from the software application **16**, a linking request to link the software application **16** to the logical container **34** and to determine (Block S**122**) whether to authorize the linking based at least in part on a user verification. In response to determining the linking is authorized, the device **12** assigns and transmits (Block S**124**) a unique encryption key to the software application **16** and creates a storage space in the memory **30** that is specific to the software application **16**. The storage space is encrypted with the assigned unique encryption key. The logical container **34** is configured to be transferrable to another device in response to a transfer request from the user, where the transfer request (Block S**126**) triggers the execution of a second executable code portion of the plurality of executable code portions **38**, and where the second executable code portion includes at least one operation to determine whether the transfer request is authorized. The verification code portion is configured to cause the processing circuitry **26** to compare (Block S**128**) the first request with a permission data portion of the plurality of data portions **36** that is defined by the user, determine (Block S**130**) whether the first request meets at least one criterion in the permission data portion, and perform (Block S**132**) a user-based authentication to determine whether to authorize the software application **16**.

FIG. **6** is a flowchart of another example process according to the principles of the disclosure. In particular, FIG. **6** relates to creation or association of a logical container with a specific user (i.e., owner). Device **12** may be a container/vault device and/or server or cloud computing node of a third party entity that contains a logical container **34** having user-modifiable settings and/or profiles. For example, a user connects to provider and requests a vault (Block S**134**). That is, the user may dynamically request the creation of a vault.

The provider creates (Block **S136**) the vault at a user specification location such as in device **12**. The provider connects (Block **S138**) the user to the vault interface. The vault creates (Block **S140**) a unique encryption key for user storage and public and/or private keys for encrypted email and real-time messaging. The vault also initializes (Block **S140**) encrypted user storage including encrypted file storage. The user configures (Block S**142**) the vault with options and/or settings and profile data including authentication type and configures a two-factor authentication device. The vault saves (Block **S144**) the options and/or settings and the profile data to encrypted user storage.

FIG. **7** is a flowchart of another example process according to the principles of the disclosure. In particular, FIG. **7** relates to user modification and/or updating of the settings and/or options of the logical container **34** that was previously associated with the specific user (i.e., owner). Device **12** may be a container/vault device and/or server or cloud computing node of a third party entity that contains a logical container **34** having user-modifiable settings and/or profiles. For example, a user connects (Block **S146**) to the vault interface using an authentication type. The vault sends (Block **S148**) a two-factor authentication code to a user-specified device. The user enters (Block S**150**) a two-factor code, and the vault checks whether the code matches. If there is no match, then the vault instructs (Block **S156**) the user to re-try authentication. Upon a third failed attempt, the vault sends (Block **S158**) a message to the two-factor authentication device with instructions to delay login. If there is a match, then the vault allows (Block **S152**) the user to update options and/or settings. The vault optionally allows (Block S**154**) the user to verify identity, licenses and certifications via an authentication process (i.e., government e-verify, social security, health provider, employer, education certifications, diplomas and degrees, licenses, job history, financials, housing history, financial history, health information, etc.). This allows for secure verified processes using the vault (i.e., voting, applying for benefits, accessing secure info, applying for employment, applying for loans, verifying medical scripts, etc.). This also allows for verification of identity, licensure and certification when authorized by owner. This information is stored in a forensic ledger (i.e., blockchain) to provide verification and authentication. Information ledger includes hashed information identifying one or more sources that provided the verification of each piece of information (i.e., third party owner, certification supplier, etc.). This information provides the reliability of the authentication.

FIG. **8** is a flowchart of another example process according to the principles of the disclosure. In particular, FIG. **8** relates to linking application **16** to logical container **34** such as to authorize application **16** to access logical container, create a unique encryption key for a data portion **36** for the linked application **16** and initialize encryption application storage in data portion **36**. Device **12** may be a container/vault device and/or server or cloud computing node of a third party entity that contains a logical container **34**. For example, a user connects (Block S**160**) to an application **16**. The user selects (Block S**162**) an option in the application **16** to connect to the vault. The user provides (Block S**164**) the vault address and authentication information to the application. The application connects (Block S**166**) to the vault. The vault sends (Block S**168**) a two-factor authentication code to a user device to authorize the link, where the two-factor authentication includes the requested access by application. The user enters (Block S**170**) a two-factor authentication code into the application. The application sends (Block S**172**) the two-factor authentication code to the vault. The vault checks (Block **S174**) whether the two-factor authentication matches. If there is no match, then the vault denies access and returns (Block **S176**) the "denied" result to the application. If there is a match, then the vault checks (Block **S178**) whether application storage exists. If not, then the vault creates (Block **S180**) a unique encryption key for application storage and initializes encrypted application storage. Then, the vault sends back (Block S**182**) an authentication token to the application.

FIG. **9** is a flowchart of another example process according to the principles of the disclosure. In FIG. **9**, application **16**, that may have been previously linked to logical container **34** as described in FIG. **8**, requests information from logical container **34**, i.e., request data from one or more data portions **36**. Device **12** may be a container/vault device and/or server or cloud computing node of a third party entity that contains a logical container **34**. The logical container **34** may execute one or more code portions **38** to handle the request where logical container **34** may perform various actions to deny or fulfill the request (i.e., perform at least one operation). In one or more embodiments, all communication to and from logical container **34** is either through SSL and internal VPN if VPN is activated, or through a session unique key used to encrypt the data in transport. In one or more embodiments, all interactions are logged by the logical container **34** including IP address in the access transaction log in user storage.

For example, in some embodiments, the application **16** sends (Block **S184**) a data information request to the vault using a token. The vault checks (Block **S186**) the data information request against vault settings and/or permissions. The vault checks (Block **S188**) whether the requested data is authorized. If not, then the vault denies (Block S**190**) access and returns a "denied" result to the application **16**. If it is authorized, then the vault checks (Block S**192**) whether the requested data information requires two-factor authentication. If not, then the vault returns (Block **S204**) the requested data to the application **16**. If it does require two-factor authentication, then the vault proceeds with the two-factor authentication procedure. The vault returns (Block **S194**) a "requires two-factor authentication check" result to the application **16**. The vault sends (Block S**196**) a two-factor authentication code to a user device. The user inputs a two-factor authentication code into the application **16**. The application **16** then requests (Block S**198**) the data information again with the two-factor authentication code. The vault checks (Block **S200**) whether the two-factor authentication code matches. If not, then the vault denies (Block **S202**) access and returns a "denied" result to the application. If it does match, then the vault returns (Block **S204**) the requested data to the application **16**.

FIG. **10** is a flowchart of another example process according to the principles of the disclosure. In particular, application **16** that was previously linked to logical container **34** sends a request to logical container **34** to perform a data write, i.e., to perform an operation. Device **12** may be a container/vault device and/or server or cloud computing node of a third party entity that contains a logical container **34**. The logical container **34** may execute one or more code portions **38** to handle the request where logical container **34** may perform various actions to deny or fulfill the request (i.e., perform at least one operation).

For example, the application **16** sends (Block **S206**) a request to the vault to write data into application storage using a token. The vault checks (Block **S208**) the data write information request against vault settings and/or permissions. The vault checks (Block S**210**) whether the requested write is authorized. If not, then the vault denies (Block S**212**) access and returns a "denied" result to the application **16**. If it is authorized, then the vault checks (Block S**214**) whether the requested data write requires a two-factor authentication. If not, then the vault checks (Block S**216**) whether there is available space in application storage. If there is available space, then the vault returns (Block S**232**) a "write successful" result to the application **16**. If there is no available space, then the vault returns (Block S**218**) a "no space available" result to the application **16**. If the requested data write requires two-factor authentication, then the vault returns (Block S**220**) a "requires two-factor authentication check" result to the application **16**. The vault sends (Block S**222**) a two-factor authentication code to the user device. The user inputs (Block S**224**) the two-factor authentication code into the application **16**. The application **16** sends (Block S**224**) the write request to the vault again with the two-factor authentication code. The vault checks (Block S**226**) whether the two-factor authentication code matches. If not, then the vault denies (Block S**228**) access and returns a "denied" result to the application **16**. If it does match, then the vault checks (Block S**23**) if there is available space in application storage. If not, then the vault returns (Block S**218**) a "no space available" result to the application **16**. If there is available space, then the vault returns (Block S**232**) a "write successful" result to the application **16**.

FIG. **11** is a flowchart of another example process according to the principles of the disclosure. In FIG. **11**, application **16**, which was previously linked, requests an advertisement from logical container **34**. It is contemplated that device **12** may be a container/vault device and/or server or cloud computing node of a third party entity that contains a logical container **34**. Since logical container **34** includes one or more data portions **36** with user specific data such as personal data, logical container **34** is in the best position to request the targeted advertisement for the user based on the one or more data portions **36**, as allowed by the user's preferences and advertisement preferences. The logical container **34** may execute one or more code portions **38** (e.g., vault interface code portion) to handle the request where logical container **34** may perform various actions to deny or fulfill the request (i.e., perform at least one operation). For example, an application **16** requests (Block S**234**) an advertisement from the vault using an application token. The vault checks (Block S**236**) if the application **16** is authorized for advertisements. If not, then the vault denies the request and returns (Block S**238**) a "denied" result to the application. If it is authorized, then the vault interface executes (Block S**240**) logic to find the best targeted advertisement based on a number of criteria, including user preferences and advertising preferences. The vault requests (Block S**242**) an appropriate advertisement from the appropriate server. The vault records the transaction in the vault encrypted advertisement transaction log and executes (Block S**244**) code for distribution of appropriate money to application **16** and vault owner. The vault sends (Block S**246**) the advertisement to the application **16**.

FIG. **12** is a flowchart of another example process according to the principles of the disclosure. In particular, application **16** requests to add a product to an internal universal shopping cart stored by logical container **34** such as in a data portion **36**. Device **12** may be a container/vault device and/or server or cloud computing node of a third party entity that contains a logical container **34**. The logical container **34** may execute one or more code portions **38** to handle the request where logical container **34** may perform various actions to deny or fulfill the request (i.e., perform at least one operation). Further, in one or more embodiments, the internal universal shopping cart stored in data portion **36** may be shared by logical container **34** by executing one or more code portions **38**.

For example, an application **16** requests (Block S**248**) to add a product to an internal universal shopping cart. The vault checks (Block S**250**) whether the application **16** is authorized to add the product. If not, then the vault denies (Block S**252**) access and returns a "denied" result to the application **16**. If it is authorized, then the vault checks (Block S**254**) whether the add product request requires two-factor authentication. If not, then the vault adds the product to the internal universal shopping cart and returns (Block S**266**) the "product added" result to the application **16**. If it does require two-factor authentication, then the vault returns (Block S**256**) a "requires two-factor authentication check" result to the application **16**. The vault sends (Block S**258**) a two-factor authentication code to a user device. The user inputs the two-factor authentication code into the application **16**, and the application **16** requests (Block S**260**) to add the product again with the two-factor authentication code. The vault checks (Block S**262**) whether the two-factor authentication code matches. If not, then the vault denies access and returns (Block S**264**) a "denied" result to the application **16**. If it does match, then the vault adds the product to the internal universal shopping cart and returns (Block S**266**) a "product added" result to the application **16**.

FIG. **13** is a flowchart of another example process according to the principles of the disclosure. The ability to move or transfer logical container **34** with code portions **38** and data portions **36** to another device or entity upon user request advantageously allows the user to total control over logical container **34**. Device **12** may be a container/vault device and/or server or cloud computing node of a third party entity that contains a logical container **34**. For example, the user may request for logical container **34** to move transferred to a USB drive, which allows the user control as to when the data portions **36** are electronically available. In particular, the user/owner may connect to the logical container **34** interface such as via primary device **18** in order to select a new location to move the logical container **34**. The logical container **34** may execute one or more code portions **38** to handle the request where logical container **34** may perform various actions to deny or fulfill the request (i.e., perform at least one operation).

For example, an owner connects to the vault interface and logs in (Block S**268**) with authentication credentials, as described here. The vault sends (Block S**270**) a two-factor authentication to the owner's device. The owner inputs (Block S**272**) the two-factor authentication code into the vault interface. The vault checks (Block S**274**) whether the two-factor authentication code matches. If not, then the vault denies the request and returns (Block S**276**) a "denied" result to the application **16**. If it does match, then the owner selects (Block S**278**) an option to move the vault to a location from a list of available locations. The vault sends (Block S**280**) another two-factor authentication code to the owner's device. The owner inputs (Block S**282**) the two-factor authentication code into the vault interface. The vault checks (Block S**284**) whether the two-factor authentication code matches. If not, then the vault denies (Block S**286**) the request and returns a "denied" code to the application **16**. If it does match, then the vault is moved (Block S**288**) to a new location.

Further, in one or more embodiments, logical container **34** may include code portion **38** for performing validation of one or more data portions **36**. For example, logical container **34** may execute a validation code portion **38** where logical container **34** requests for some or all of data portion **36** (e.g., including a loan application, social security number, voter information, housing history, employment history, education history, diplomas, certifications, government licensing, government clearance, trade certifications, military service history, prescriptions, etc.) to be verified. Validation code portion **38** may be configured to determine the appropriate server or third party server (e.g., government server) with which to request validation, and to transmit the request with some or all of the data portion **36** to be validated. Logical container **34** may receive a digital certification or digital data indicating that some or all of the data portion **36** was validated where the certification may be stored with the validated data portion **36** or in a separate data portion **36**. The specific signaling and flowchart for this validation embodiment may be following one or more of the figures described and/or provided with the disclosure where the specific request and entity **14** may be modified as described above. In one or more embodiments, the validated data may be requested by application **16** where the logical container **34** may provide a single-use hyperlink to the requirement entity/application **16** where the requesting entity/application **16** would access the link and could be authorized in real-time by the user/owner of the logical container **34** via a notification confirmation. The access of the validated data would be logged in the logical container **34**.

Some Examples

In one example, a search engine application may use the logical container described herein to store user profile and search history while continuing to protect user privacy. The search engine, using the logical container, is also able to provide targeted advertising and generate revenue to the user while continuing to protect user privacy and helping prevent misuse of the user data.

In another example, social media companies using the logical container will be able to store user profiles, messages and other application specific information in application protected sections in the logical container. The social media companies using the logical container will be able to generate revenue from targeted advertisement while providing user privacy and helping prevent misuse of user data.

In another example, technology companies that provide various services such as e-mail, search engine, cloud computing, etc., are able to use the logical container described herein to store user profiles, email and other application specific information in application protected section in the locker. These companies are able to generate revenue from targeted advertising while protecting user privacy by use of the logical container. Further, the logical container reduces the risk of misuse of data.

In another example, geolocation service user profiles, geolocation and other application specific information is stored in the application protected section (i.e., code portion) of the logical container such that there is reduced risk of having user location data compromised. The geolocation service is also able to generate revenue from targeted advertising while providing user privacy and reducing the risk of the misuse of user data.

In another example, a cellphone or mobile device application using the logical container is able to store all user contacts, text messages, calendar and other phone specific information in application protected sections (i.e., code portion) of the logical container. If a user switches mobile phone service providers, user is able to download all information onto a new phone using the logical container.

Example A1. An apparatus (e.g., device/server **12**) including processing circuitry **26** comprising a processor **28** and memory **30**, the memory **30** configured to store a logical container **34** including a plurality of data portions **36** and a plurality of executable code portions **38**, each of the plurality of data portions **36** and the plurality of executable code portions **38** being separately encrypted with a different encryption key and being associated with a user, the processing circuitry configured to: receive, from a software application (e.g., application **16**) operating in another device, a request associated with at least one of the plurality of data portions **36** and the plurality of executable code portions **38** of the logical container **34**, the request including an encryption token associated with the software application **16**; in response to the request, trigger a verification code portion of the plurality of executable code portions **38** to determine whether the request is authorized; and perform at least one operation to fulfill the request in response to determining the request is authorized.

Example A2. The apparatus of Example A1, wherein the verification code portion is configured to cause the processing circuitry **26** to: compare the request with a permission data portion of the plurality of data portions **36** that is defined by the user; determine whether the request meets at least one criterion in the permission data portion; perform user based authentication to determine whether to authorize the software application **16**.

Example A3. The network node of Embodiment A1, wherein the processing circuitry **26** is further configured to: receive, from the software application **16**, a request to link the software application to the logical container; determine whether to authorize the linking based at least in part on user verification; in response to determining the linking is authorized, assigning and transmitting a unique encryption key to the software application; and create a storage space in memory **30** that is specific to the software application **16**, the storage space being encrypted with the assigned unique encryption key.

As will be appreciated by one of skill in the art, the concepts described herein may be embodied as a method, data processing system, computer program product and/or computer storage media storing an executable computer program. Accordingly, the concepts described herein may take the form of an entirely hardware embodiment, an entirely software embodiment or an embodiment combining software and hardware aspects all generally referred to herein as a "circuit" or "module." Any process, step, action and/or functionality described herein may be performed by, and/or associated to, a corresponding module, which may be implemented in software and/or firmware and/or hardware. Furthermore, the disclosure may take the form of a computer program product on a tangible computer usable storage medium having computer program code embodied in the medium that can be executed by a computer. Any suitable tangible computer readable medium may be utilized including hard disks, CD-ROMs, electronic storage devices, optical storage devices, or magnetic storage devices.

Some embodiments are described herein with reference to flowchart illustrations and/or block diagrams of methods, systems and computer program products. It will be understood that each block of the flowchart illustrations and/or block diagrams, and combinations of blocks in the flowchart illustrations and/or block diagrams, can be implemented by computer program instructions. These computer program instructions may be provided to a processor of a general purpose computer (to thereby create a special purpose computer), special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, create means for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

These computer program instructions may also be stored in a computer readable memory or storage medium that can direct a computer or other programmable data processing apparatus to function in a particular manner, such that the instructions stored in the computer readable memory produce an article of manufacture including instruction means which implement the function/act specified in the flowchart and/or block diagram block or blocks.

The computer program instructions may also be loaded onto a computer or other programmable data processing apparatus to cause a series of operational steps to be performed on the computer or other programmable apparatus to produce a computer implemented process such that the instructions which execute on the computer or other programmable apparatus provide steps for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

It is to be understood that the functions/acts noted in the blocks may occur out of the order noted in the operational illustrations. For example, two blocks shown in succession may in fact be executed substantially concurrently or the blocks may sometimes be executed in the reverse order, depending upon the functionality/acts involved. Although some of the diagrams include arrows on communication paths to show a primary direction of communication, it is to be understood that communication may occur in the opposite direction to the depicted arrows.

Computer program code for carrying out operations of the concepts described herein may be written in an object oriented programming language such as Python, Java® or C++. However, the computer program code for carrying out operations of the disclosure may also be written in conventional procedural programming languages, such as the "C" programming language. The program code may execute entirely on the user's computer, partly on the user's computer, as a stand-alone software package, partly on the user's computer and partly on a remote computer or entirely on the remote computer. In the latter scenario, the remote computer may be connected to the user's computer through a local area network (LAN) or a wide area network (WAN), or the connection may be made to an external computer (for example, through the Internet using an Internet Service Provider).

Many different embodiments have been disclosed herein, in connection with the above description and the drawings. It will be understood that it would be unduly repetitious and obfuscating to literally describe and illustrate every combination and subcombination of these embodiments. Accordingly, all embodiments can be combined in any way and/or combination, and the present specification, including the drawings, shall be construed to constitute a complete written description of all combinations and subcombinations of the embodiments described herein, and of the manner and process of making and using them, and shall support claims to any such combination or subcombination.

It will be appreciated by persons skilled in the art that the embodiments described herein are not limited to what has been particularly shown and described herein above. In addition, unless mention was made above to the contrary, it should be noted that all of the accompanying drawings are

not to scale. A variety of modifications and variations are possible in light of the above teachings without departing from the scope of the following claims.

The invention claimed is:

1. A device including processing circuitry, the processing circuitry comprising:

a processor;

a memory in communication with the processor, the memory being configured to store a logical container, the logical container including a plurality of encrypted data portions and a plurality of executable code portions, each of the plurality of encrypted data portions and the plurality of executable code portions being separately encrypted with a different encryption key and being associated with a user; and

the processing circuitry configured to:

receive, from a software application operating in another device, a first request associated with at least one of the plurality of encrypted data portions and with at least one of the plurality of executable code portions of the logical container, the first request including an encryption token associated with the software application;

in response to the first request, trigger a verification code portion of the plurality of executable code portions to determine whether the first request is authorized; and

perform at least one operation to fulfill the first request in response to determining the request is authorized.

2. The device of claim **1**, wherein the at least one operation includes running a first executable code portion of the plurality of executable code portions, the first executable code portion including code for accessing a first encrypted data portion of the plurality of encrypted data portions.

3. The device of claim **1**, wherein the processing circuitry is further configured to:

receive, from the software application, a linking request to link the software application to the logical container;

determine whether to authorize the linking based at least in part on a user verification;

in response to determining the linking is authorized, assign and transmit a unique encryption key to the software application; and

create a storage space in the memory that is specific to the software application, the storage space being encrypted with the assigned unique encryption key.

4. The device of claim **1**, wherein the logical container is configured to be transferable to another device in response to a transfer request from the user, the transfer request triggering the execution of a second executable code portion of the plurality of executable code portions, the second executable code portion including at least one operation to determine whether the transfer request is authorized.

5. The device of claim **1**, wherein the logical container is configured to request a targeted advertisement for the user based on at least one of the plurality of encrypted data portions.

6. The device of claim **5**, wherein the plurality of encrypted data portions includes at least one of the user's advertising history and the user's purchase history.

7. The device of claim **1**, wherein the plurality of executable code portions includes an advertising request application program interface, API, code portion.

8. The device of claim **1**, wherein the device is a cloud computing node of a third party entity.

9. The device of claim **1**, wherein the device is accessible by a primary device associated with the user to access the logical container using a two-factor authentication.

10. The device of claim **1**, wherein the verification code portion is configured to cause the processing circuitry to:

compare the first request with a permission data portion of the plurality of encrypted data portions that is defined by the user;

determine whether the first request meets at least one criterion in the permission data portion; and

perform a user-based authentication to determine whether to authorize the software application.

11. A method implemented by a device for securing a user's data, the device including processing circuitry, the processing circuitry including a processor and a memory, the memory being configured to store a logical container, the logical container including a plurality of encrypted data portions and a plurality of executable code portions, each of the plurality of encrypted data portions and the plurality of executable code portions being separately encrypted with a different encryption key and being associated with a user, the method comprising:

receiving, from a software application operating in another device, a first request associated with at least one of the plurality of encrypted data portions and with at least one of the plurality of executable code portions of the logical container, the first request including an encryption token associated with the software application;

in response to the first request, triggering a verification code portion of the plurality of executable code portions to determine whether the first request is authorized; and

performing at least one operation to fulfill the first request in response to determining the request is authorized.

12. The method of claim **11**, further comprising running a first executable code portion of the plurality of executable code portions, the first executable code portion including code for accessing a first encrypted data portion of the plurality of encrypted data portions.

13. The method of claim **11**, further comprising:

receiving, from the software application, a linking request to link the software application to the logical container;

determining whether to authorize the linking based at least in part on a user verification;

in response to determining the linking is authorized, assigning and transmitting a unique encryption key to the software application; and

creating a storage space in the memory that is specific to the software application, the storage space being encrypted with the assigned unique encryption key.

14. The method of claim **11**, further comprising transferring the logical container to another device in response to a transfer request from the user, the transfer request triggering the execution of a second executable code portion of the plurality of executable code portions, the second executable code portion including at least one operation to determine whether the transfer request is authorized.

15. The method of claim **11**, further comprising requesting a targeted advertisement for the user based on at least one of the plurality of encrypted data portions.

16. The method of claim **15**, wherein the plurality of encrypted data portions includes at least one of the user's advertising history and the user's purchase history.

17. The method of claim **11**, wherein the plurality of executable code portions includes an advertising request application program interface, API, code portion.

18. The method of claim **11**, wherein the device is a cloud computing node of a third party entity.

19. The method of claim **11**, further comprising:

comparing the first request with a permission data portion of the plurality of data portions that is defined by the user;

determining whether the first request meets at least one criterion in the permission data portion; and

performing a user-based authentication to determine whether to authorize the software application.

20. A cloud computing node, comprising:

processing circuitry including:

a processor;

a memory in communication with the processor, the memory being configured to store a logical container, the logical container including a plurality of encrypted data portions and a plurality of executable code portions, each of the plurality of encrypted data portions and the plurality of executable code portions being separately encrypted with a different encryption key and being associated with a user, the plurality of encrypted data portions including at least one of the user's advertising history and the user's purchase history, the plurality of executable code portions including an advertising request application program interface, API, code portion; and

the processing circuitry being configured to:

receive, from a software application operating in a device, a first request associated with at least one of the plurality of encrypted data portions and with at least one of the plurality of executable code portions of the logical container, the first request including an encryption token associated with the software application;

in response to the first request, trigger a verification code portion of the plurality of executable code portions to determine whether the first request is authorized;

perform at least one operation to fulfill the first request in response to determining the first request is authorized, the at least one operation including running a first executable code portion of the plurality of executable code portions, the first executable code portion including code for accessing a first encrypted data portion of the plurality of encrypted data portions;

receive, from the software application, a linking request to link the software application to the logical container;

determine whether to authorize the linking based at least in part on a user verification;

in response to determining the linking is authorized, assign and transmit a unique encryption key to the software application, and create a storage space in the memory that is specific to the software application, the storage space being encrypted with the assigned unique encryption key;

the logical container being configured to:

transfer to another device in response to a transfer request from the user, the transfer request triggering the execution of a second executable code portion of the plurality of executable code portions, the second executable code portion including at least one operation to determine whether the transfer request is authorized; and the verification code portion being configured to:

compare the first request with a permission data portion of the plurality of data portions that is defined by the user;

determine whether the first request meets at least one criterion in the permission data portion; and

perform a user-based authentication to determine whether to authorize the software application.

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